Patterns of activity in Ireland's consumer-facing service sectors: An experimental application of the Principal Component Approach

Working Paper

December 2025

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1. Introduction

Ireland's consumer-facing service sectors are employment-intensive and are typically embedded in local communities. The performance of these sectors is anchored to domestic demand and supply conditions. As a result, they are particularly sensitive to shifts in household demand and input cost pressures, making them more exposed to cyclical volatility than the internationally traded sectors. Recent years have illustrated the speed with which shocks can translate into stress for these sectors. As official statistics are released with inherent lags, evolving conditions may not be fully captured for some time.

Against this backdrop, there is a strong case for developing diagnostic tools that can provide a more timely read on evolving sectoral pressures and facilitate the in-house monitoring of sectoral stress. This paper outlines one potential approach to building a high-frequency, data-driven alert system, to detect early signs of distress in Ireland's consumer-facing services sectors, specifically hospitality, retail, and tourism. We propose a form of "early warning signal" that captures both the demand- and supply-side dynamics for the consumer-facing services sectors. We do so by applying a Principal Component Analysis (or PCA) framework. By combining multiple timely indicators into a single composite measure, we can track trends in underlying activity in near real-time and flag emerging sectoral downturns that may not present in headline aggregate statistics (which are often produced at a lag).

The analysis aims to provide a clearer evidence base for understanding emerging sectoral stress. The proposed framework for analysis supports more informed monitoring of sectoral conditions as they evolve over time. Rather than tracking numerous individual indicators (each noisy and partial in isolation), a composite measure derived using PCA extracts the common component across multiple high-frequency indicators and offers a clearer view of underlying sectoral performance. This is an experimental indicator and as such, it will be subject to refinement and revision over time.

The COVID-19 period was uniquely disruptive for consumer-facing sectors, such as retail, hospitality and tourism services. Public-health restrictions, mobility limitations, and sudden shifts in consumer behaviour caused an unprecedented collapse in activity, followed by an uneven and often volatile rebound. These sectors faced prolonged closures, capacity constraints, labour shortages, and sharp swings in demand, underscoring their vulnerability to shocks and the importance of timely monitoring tools. Now, as the economy moves further from the crisis, it becomes increasingly important to assess its lasting impacts. Indeed, in many cases changes to consumer behaviour[1] or professional circumstances (i.e., remote working) initially wrought by the crisis have not fully reset to their pre-pandemic status and this also has had consequences for certain sectors.

The analysis and results presented here are the first-step in the development of an early warning alert system. Throughout this report, an "alert" refers to a purely statistical signal suggesting that an indicator has moved into the lower tail of its historical distribution. These alerts are intended to guide policymakers' monitoring and interpretation of emergent patterns (rather than to imply any specific policy action). We will continue to monitor the robustness of our estimates, and to make adjustments, as necessary. Our analysis is intended as an aid to understanding the performance of the consumer-

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[1] For example, an increasing take-up of home delivery across the food and beverage sub-sector.

facing services sectors. It is also important to note that the findings presented in this paper are conditional on the input data used and may change with data revisions or alternative model specifications.

Background

The hospitality, retail, and tourism sectors are among Ireland's most labour-intensive sectors, and play a central role in sustaining employment and local economic activity. However, these sectors are also highly sensitive to wider shifts in the economic environment, including changes in discretionary spending and consumer confidence.

Employment trends show the central role of consumer-facing services in the labour market. When taken together, the "Wholesale and Retail" sector alongside the "Accommodation and Food Service" sector make significant contributions to employment in Ireland. The pandemic shock in 2020 – and the resulting restrictions on social and commercial activity – is evident in the decline in employment during this time. In absolute terms, employment numbers recovered steadily thereafter and had surpassed their pre-pandemic peak by 2022 (see Figure 1a). As of Q2 2025, these sectors contribute approximately one-in-five jobs in the State, albeit that the most recent quarterly data shows a slight year-on-year reduction in the numbers employed in the "Accommodation and Food Service" sector.[2]

Figure 1a: Employment by Sector, 2016 Q2 – 2025 Q2
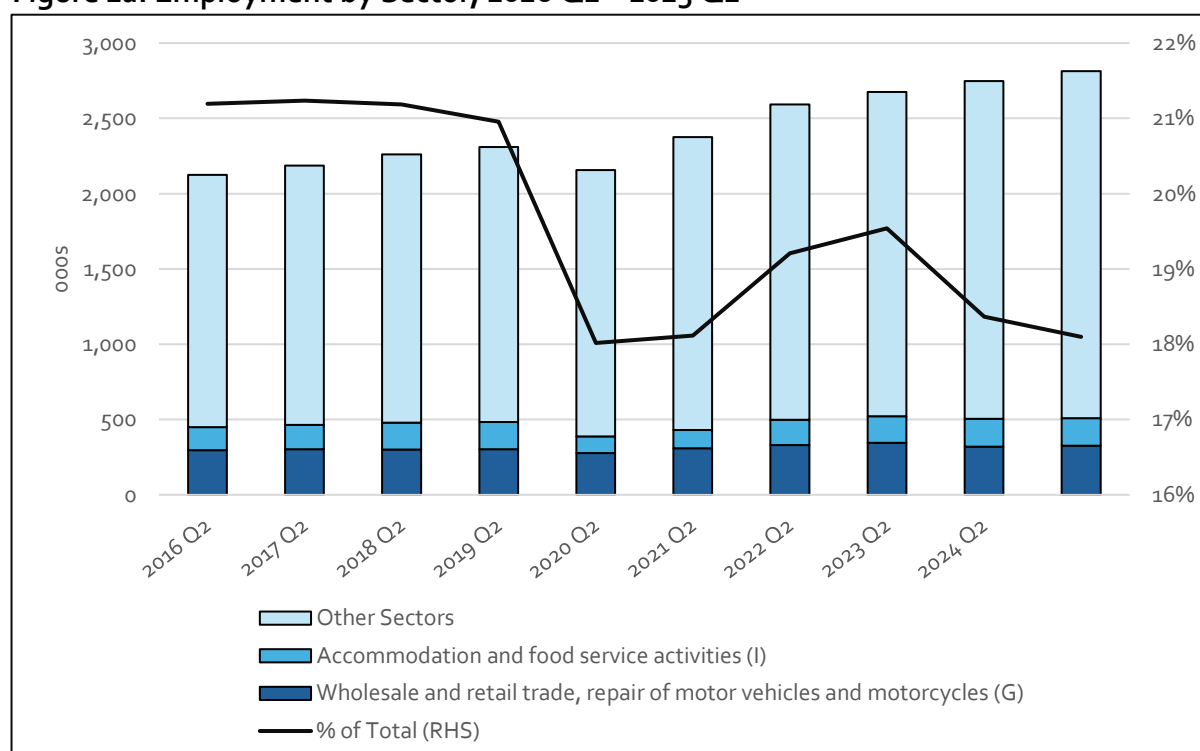

Source: CSO – Labour Force Survey

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[2] For tourism specifically, administrative data suggests that employment in the sector has averaged almost 10% of total employment through 2025 (approximately 220,000 people).[2]

In terms of Gross Value Added (GVA) the "Distribution, Transport, Hotels and Restaurants" sector,[3] has contributed steadily to GVA growth since 2016, though its share of overall GVA remains relatively small compared with the wider economy (see Figure 1b). Irish economic growth continues to be driven by other activities, particularly in the high-value traded sectors. As of Q2 2025, these consumer-facing services sectors account for approximately 10% of economy-wide GVA – while this is in line with trends from the post-pandemic period, it does represent a drop relative to the pre-pandemic era (when these sectors accounted for roughly 13-14% of GVA).

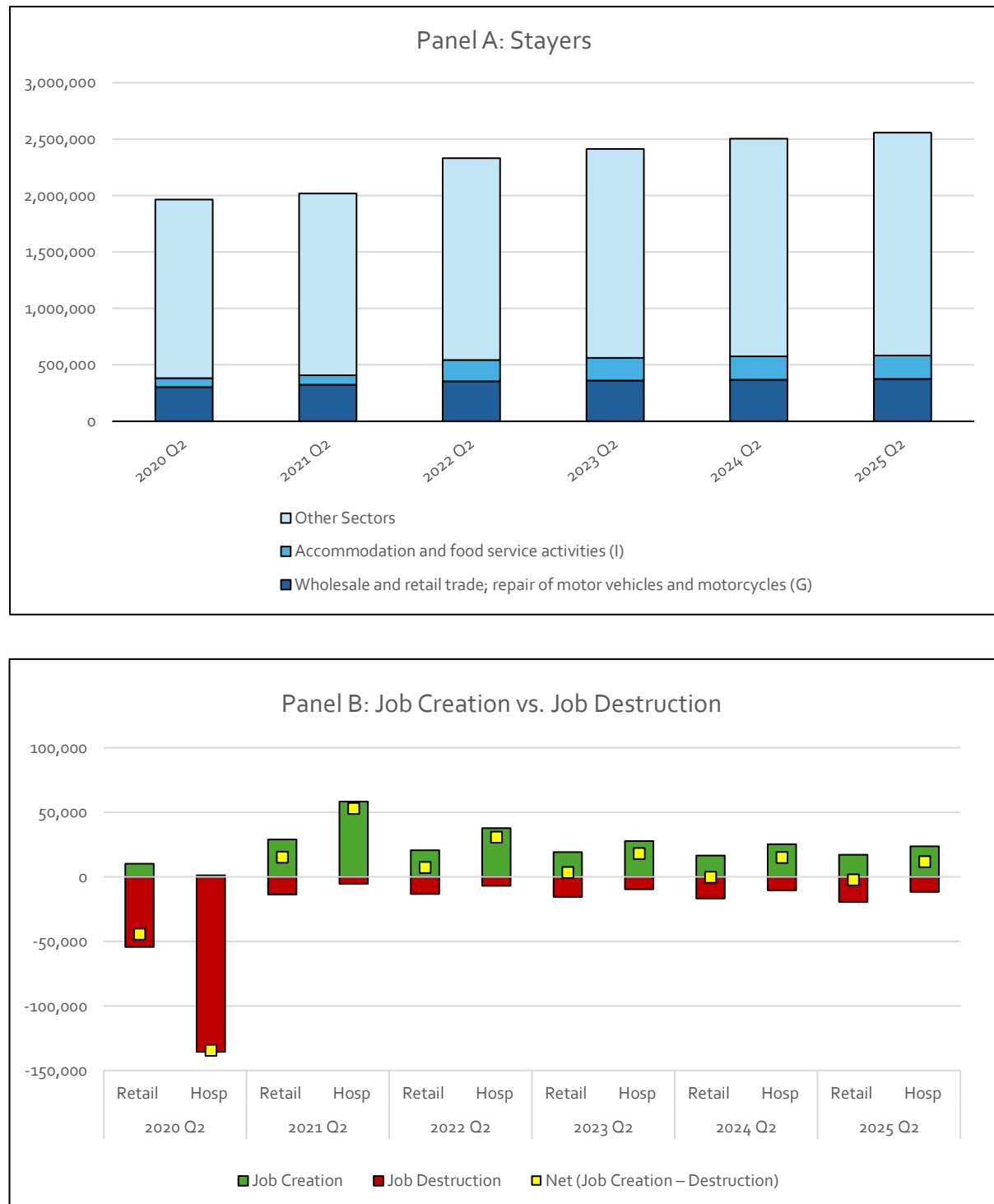**Figure 1b: Gross Value Added by Sector, 2016 Q2 – 2025 Q2**
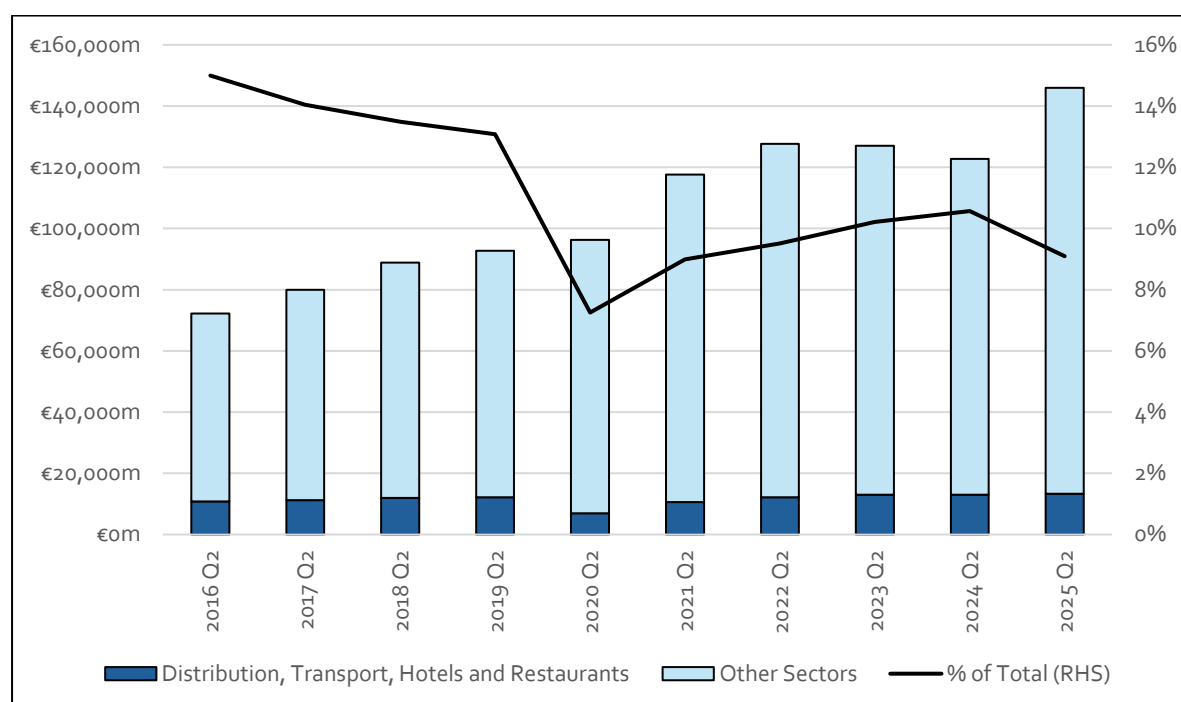
Source: CSO

Figure 1c Panel A shows that the overall employment stock – or "stayers" – has risen steadily since Q2 2020 (+592,946, +30%), with approximately two-thirds (+391,806) of this increase coming from "other" sectors (i.e. those outside of hospitality and retail). "Accommodation and Food Services" rebounded strongly post-pandemic (+130,952, from 77,854 to 208,806), while "Wholesale and Retail" also grew – albeit more modestly (+70,188, to 373,925).

The impact of the pandemic period can be seen in the data on net job creation (that is, job creation minus job destruction). As shown in Figure 1c Panel B, net job creation was broadly negative for both the retail and hospitality sectors during the pandemic trough in 2020 Q2. This was followed by a sharp rebound in 2021, and subsequently, a moderation through 2022-2025. While net job creation in the

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[3] Sectoral groupings differ between the GVA and employment data, because they are drawn from separate CSO datasets with separate classification systems. The National Accounts data report GVA with reference to the NACE Rev. 2 sector "Distribution, Transport, Hotels and Restaurants," which is a broad aggregation designed to capture output across consumer-facing services. In contrast, the Labour Force Survey provides employment estimates at a more granular level of detail, publishing separate series for "Wholesale and Retail Trade" and for "Accommodation and Food Service Activities." As a result, the employment series shown here are the closest available proxies, but they do not map exactly onto the GVA grouping.

hospitality sector has averaged 13,000 in Q2 over 2023-2025, the retail sector experienced negative net job creation during this time (with a net loss of 2,358 jobs in Q2 2025). While the stock of employment has expanded steadily since the pandemic, net job gains have normalised since the rebound in activity in 2021 – hospitality rebounded particularly strongly, but is now adding fewer net jobs, while retail is showing signs of softness.

Figure 1c: Labour Market Churn, 2020 Q2 – 2025 Q2

Panel A: Stayers

☐ Other Sectors
☐ Accommodation and food service activities (I)
☐ Wholesale and retail trade; repair of motor vehicles and motorcycles (G)

Panel B: Job Creation vs. Job Destruction

☐ Job Creation ☐ Job Destruction ☐ Net (Job Creation – Destruction)

Source: CSO – Labour Market Churn. Note: "Retail" refers to "Wholesale and Retail Trade" (NACE G) and "Hosp" refers to "Accommodation and Food Service" (NACE I)

Beyond their economic importance, the hospitality and retail sectors contribute to Ireland's wider tourism offering and to the overall attractiveness of the country as a place to live and work. A stable domestic services base supports the broader business environment, including Ireland's ability to attract and retain internationally mobile talent. Ensuring the resilience of these sectors is relevant for maintaining aspects of Ireland's broader competitiveness and quality-of-life proposition. While consumer-facing services make up a smaller share of measured output, they employ large numbers of people and tend to react quickly to changes in household finances and sentiment. For this reason, they can be the earliest signals of emerging pressure in the domestic economy. Monitoring these sectors can offer a practical way to detect turning points sooner than traditional macroeconomic aggregates allow.

In recent years, these sectors have operated within an exceptionally strong macroeconomic environment, characterised by record employment growth, sustained sub-5 per cent unemployment, rising disposable incomes, and robust growth in modified domestic demand (MDD) and GNI*, both well above their long-run averages.[4] This backdrop has supported solid demand across the consumer-facing services economy. At the same time, firms have been adjusting to higher operating costs and improvements in working conditions which, while positive for employees, have added pressure on firms. Rising input costs, shifts in consumer behaviour, and uncertainty in the economic outlook also continue to shape trading conditions.

1. Methodology and Data

Estimation Technique

Principal Component Analysis (PCA) has been used to derive "nowcasts" of quarterly macroeconomic data, using input data at higher frequencies than would typically be published as part of regular reporting on the National Accounts.[5] This method was also used during the COVID-19 pandemic to produce real-time estimates of economic activity, and to assess on an ongoing basis, the macroeconomic impact of pandemic-related restrictions on economic activity.[6]

PCA is a dimensionality reduction technique that produces a set of linear combinations (variance-maximising weighted averages) of the original variables, called principal components. Together, these principal components explain all variance in the dataset. Generally, the largest share of the variance is explained by the first principal component (PC1). This is a linear combination of the variables in the dataset, where the weights correspond to the eigenvector associated with the largest eigenvalue of the covariance matrix. For the purposes of this analysis, we extract the first principal component as our indicator. This indicator can be expressed as:

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[4] See: Annual National Accounts 2024, CSO.
[5] See: Conefrey, T. and G. Walsh. 2018. "A Monthly Indicator of Economic Activity for Ireland". Central Bank of Ireland, *Economic Letter*, Vol. 2018, No. 14.
[6] See: Conefrey, T. and G. Walsh. 2018. "Measuring Economic Activity in Real Time during COVID-19". Central Bank of Ireland, *Economic Letter*, Vol. 2020, No. 7. See also: Daly, L. and L. Rehill. 2020. "Where are we now? Examining Irish Economic Developments in Real-time". Department of Finance.

$$PC_t = \rho_1 Z_{1,t} + \rho_2 Z_{2,t} + \cdots + \rho_N Z_{N,t}$$

Where ρ denotes the eigenvectors, Z denotes the input variables, t denotes time, and N is the total number of variables. When applied in this context, PCA provides a means of synthesising a broad range of high-frequency variables into a single composite index. The information contained within this index allows for the close-to-real time tracking of the performance of the consumer-facing services sectors.

Our analysis is organised hierarchically. We begin with the most aggregated view of the consumer-facing economy, before progressively unpacking this into more granular components. We first develop an overall composite indicator, which combines demand- and supply-side variables relevant to the consumer-facing services sectors. This provides a single, high-level overview of conditions – an accessible summary of broad movements in the sector that is suitable for headline monitoring and comparison over time. This composite index can also be decomposed, into demand-side and supply-side contributions. This provides insight into how much of the composite at each point reflects consumer behaviour (e.g., spending; sentiment) versus operating pressures (e.g., costs; labour supply).

This indicator is constructed using a fixed-loading PCA. In effect, this means that we anchor the PCA to a pre-pandemic calibration window, from January 2017 to February 2020. All input variables are transformed to year-on-year changes and standardised within this calibration window. This grounds the indicator in a period when correlations across variables were more representative of steady-state dynamics than the period that followed. The aim here is to minimise the risk that crisis-era distortions dominate the estimated loadings (or weights) and provide a sensible baseline against which dynamics in the post-pandemic era can be assessed.[7] Consequently, the PCA derived indicator measures deviations from the pre-pandemic norm.

PCA is then estimated on this window, and the resulting loadings (or weights) are held fixed and are applied to the full sample. For each month, the index value is constructed as the weighted sum of the standardised inputs. For ease of interpretation, we rescale the indicator such that, over the calibration window, the index has a mean of 100 and a standard deviation of 10 – i.e. a value of 100 corresponds to the pre-pandemic average, and a 10-point change represents one calibration-period standard deviation.

To more explicitly understand what drives changes in the overall composite, our analytical framework then separates activity into its two economic channels – we estimate a composite demand indicator and a composite supply indicator, each constructed using the same fixed-loading PCA approach. These indicators are standalone series that track broad demand conditions and supply pressures separately, allowing us to observe their independent evolution over time.

Finally, the analysis moves to the most granular level and constructs sector-specific demand and supply indicators for tourism, hospitality, and retail – key consumer-facing services sectors. These indicators highlight heterogeneity across sectors and help identify emerging stress points that may appear in only one part of the consumer-facing economy.

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[7] The choice of calibration period is unavoidably subjective. Any fixed window involves a judgment about what constitutes "normal" conditions, and different choices would yield slightly different weights. However, the purpose of the calibration is not to claim a uniquely correct period but to anchor the composite indicators in a stable, interpretable baseline. The rolling PCA indicators included later in the analysis further mitigate this sensitivity by allowing the factor structure to adapt to more recent dynamics when required.

Overall, this approach combines a headline indicator with a detailed diagnostic framework. While our composite indicator summarises the broad picture, the individual demand and supply composites reveal the underlying forces driving movements, and the individual sectoral indicators provide the granularity needed to derive sector-specific insights. A summary of our approach is provided in the Figure 2 below.

Figure 2: Hierarchy of Analysis
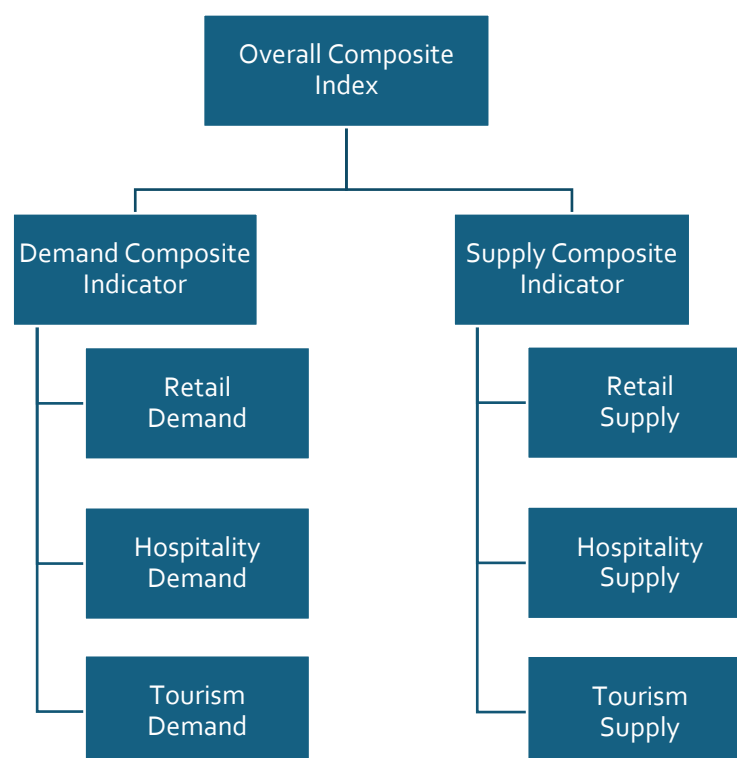
Finally, we construct alternative specifications of the demand, supply, and individual sectoral indices. As outlined, these fixed-loading indicators are deliberately anchored to pre-pandemic conditions, giving a stable, comparable benchmark over time. However, the structure of consumer-facing sectors (and the relationship between the underlying variables) is unlikely to hold constant. We estimate rolling versions of these indicators to allow our model to adapt to these changes. By re-estimating the PCA on a moving window of recent data, the rolling series automatically adjusts the weight placed on each individual variable as underlying relationships evolve. This makes the rolling indices more responsive to turning points and better suited to detecting emerging pressures or recoveries that may not yet be visible in the fixed-loading framework. Another key advantage of the rolling specification approach is that it accommodates a broader set of variables: recent data series that begin only after the pandemic period can be incorporated naturally as the rolling window advances.

However, as the rolling index is not anchored to the pre-pandemic baseline, it is less suited to comparisons between the pre- and post-pandemic periods. The rolling specification can also "learn" from post-pandemic anomalies, meaning that structural breaks are harder to identify. For these reasons, we treat the rolling measure as an experimental complement to the fixed-loading indicator series. Used together, these two versions of our indicators give a fuller picture – a more stable headline view alongside a higher-frequency early-warning tool for monitoring demand, supply, and

sector-specific conditions. As outlined later, we propose a framework for operationalising our indicator series into an early warning alert system.

Data

We use a broad range of variables that capture both demand- and supply-side dynamics. For each of three consumer-facing services sectors – hospitality, tourism and retail – we assemble a monthly panel spanning 2017 to 2025. The panel combines high-frequency indicators from multiple sources, including: transactions (i.e. debit and credit card spending), official activity indices (CSO retail sales volumes; CSO services volumes), official price indices (CSO producer price indices), labour market capacity (employees on payroll; work permits issued), transport capacity (Small Public Service Vehicle licences; scheduled airline seats), hotel accommodation (average daily rate (ADR); occupancy) and Google Trends searches (capturing both demand intent and signals of business stress). The full dataset is summarised in Table 1 and Table 2.

We transform these variables primarily using 12-month differencing (or 12-month log differencing where appropriate) to remove deterministic seasonality. All nominal monetary variables (e.g. ADR, card spending, VAT receipts) are converted to real-terms by deflating using the relevant components of the Consumer Price Index (e.g. CPI for hotels and restaurants; CPI for goods) to ensure comparability in real terms. To reduce volatility in VAT data stemming from filing schedules, we construct a three-month moving average of monthly VAT receipts, input with a lag to account for the delay between when the activity occurs and when the VAT payment is received. Google Trends series are grouped into topic composites (accommodation, restaurants, retail, etc.) to reduce noise.

Finally, all inputs are standardised using z-scores, with signs oriented so that higher values consistently represent stronger demand or more favourable supply conditions (for example, cost-inflation and stress indicators are inverted). These standardised inputs form the basis for both the fixed and rolling PCA indicators.

Table 1: Variables included in supply-side indicator

Variable	Hospitality	Retail	Tourism	Source	Beginning
Google Trends Searches:				Google Trends	Jan 2017
"Business Supports	X	X	X		
"Closing a Business"	X	X	X		
"Insolvency"	X	X	X		
"Liquidation"	X	X	X		
Wholesale & Industrial Price Index:				CSO	Jan 2017
Energy	X	X	X		
Food Products	X				
Manufacture of Beverages	X				
Live Register:				CSO	Jan 2017
SOC 92	X		X		
SOC 71		X			
Number of Employees on Payroll:				CSO / Revenue	Jan 2022
Accommodation & Food Services	X		X		
Wholesale & Retail Trade		X			
Work Permits Issued:				DETE	Jan 2022
Accommodation & Food Services	X		X		
Wholesale & Retail Trade		X			
SPSV Driver Licences	X		X	National Transport Authority	Jan 2017
Hotel Room Occupancy	X		X	STR	Jan 2022
Airbnb Occupancy			X	Lighthouse Intelligence	Jan 2022
Scheduled Seats to RoI Airports			X	OAG Aviation	Jan 2017
New Retail Leases		X		Property Services Regulatory Authority	Jan 2017

Table 2: Variables included in demand-side indicator

Variable	Hospitality	Retail	Tourism	Source	Beginning
Google Trends Searches:				Google Trends	Jan 2017
"Hotels in Ireland"	X		X		
"Weekend Breaks Ireland"	X		X		
"Airbnb Ireland"	X		X		
"Holiday Rentals Ireland"	X		X		
"ResDiary"	X				
"OpenTable"	X				
"Shop Online"		X			
"Opening Hours"		X			
Debit & Credit Card Spending:				Central Bank of Ireland	Jan 2017
Restaurants & Dining	X				
Accommodation	X		X		
Retail		X			
Retail Sales Index, Volume Adjusted:				CSO	Jan 2017
Overall		X			
Bars	X				
Services Index, Volume Adjusted:				CSO	Jan 2017
Accommodation & Food Services	X		X		
Wholesale & Retail Trade		X			
Consumer Sentiment	X	X		Irish League of Credit Unions	Jan 2017
VAT receipts		X		Revenue	Jan 2017
Overseas Arrivals			X	CSO	Jan 2017
Hotel Room Occupancy	X		X	STR	Jan 2022
ADR (Average Daily Rate for Hotel Room)	X		X	STR	Jan 2022
Short Break Intent – 3 months	X		X	Fáilte Ireland (BBT)	Jan 2022
Nights Spent at Tourist Accommodation			X	CSO	Jan 2022
Airbnb Occupancy			X	Lighthouse Intelligence	Jan 2022

Operationalising an Alert System

To operationalise our indicator series into an early warning signal, we map the indicators to a set of risk tiers: "Watch", "Caution", and "Alarm". These risk tiers are defined on the lower tail of the reference distribution and are triggered when the indicator falls to ≤ −1, ≤ −1.5, and ≤ −2 standard deviations from its mean, respectively. Since the indicators are scaled to a mean of 100 and a standard deviation of 10, the thresholds correspond to index values of 90, 85, and 80. For supply-side indicators, the sign is oriented so that downward movements reflect increasing supply-side pressures – for example rising input costs or reduced capacity – while for demand-side indicators, downward movements reflect weaker demand conditions.

2. Results

As outlined previously, PCA identifies the linear combination of input variables that explains the largest proportion of their common variance. The first principal component (PC1) therefore represents the dominant shared trend across the dataset. For the fixed-loading indicator, PCA loadings (or weights) are estimated over the period January 2017 through February 2020. These weights are then held constant and applied to the full dataset, including post-pandemic observations through April 2025. The indicators are rescaled over that calibration window to have a mean of 100 and a standard deviation of 10. This approach anchors the indicator to a pre-pandemic baseline. By contrast, in the rolling version, PCA loadings are re-estimated each month on a trailing 21-month window. Indicators are standardised and rescaled within each window, providing a "nowcast" of short-term momentum.

It should be noted that alerts are more easily triggered in the case of the fixed-loading indicators. As the fixed specification benchmarks each month against the pre-pandemic mean and standard deviation (typically a less volatile distribution with a smaller σ) and uses constant loadings, even modest shortfalls in activity are more likely to breach the -1σ threshold set out by our proposed alert system and therefore trigger an alert. By contrast, the rolling indicators are benchmarked against a more recent 21-month window, which usually reflects higher post-pandemic volatility (and thus a larger σ), making the same fall in activity less likely to cross the alert threshold. In addition, because PCA loadings are re-estimated each month in the case of the rolling version, the relative influence of different variables will change over time.

Overall Composite Indicator

The overall composite indicator (including both demand- and supply-side variables) shows three distinct phases. Before the pandemic, demand and supply contributions moved closely together around the calibration baseline, indicating a broadly balanced evolution of underlying conditions (see Figure 3a). With the onset of COVID-19 in early 2020, the composite drops sharply, driven almost entirely by an exceptionally large deterioration in the demand contribution. This reflects the collapse in mobility, discretionary consumption, and international arrivals. Supply conditions also weaken during this time – albeit to a much smaller extent – illustrating that the shock was dominated by the sudden contraction in demand as administrative restrictions on commercial activity took effect.

From mid-2020 into 2021, the composite recovers rapidly. The rebound is again led by demand, which swings from deeply negative to strongly positive, as restrictions eased and activity normalised. Supply conditions also improve gradually, although the recovery is more muted. Since 2022, the composite stabilises near its long-run calibration level. Demand and supply contributions converge again, though demand displays more month-to-month variability, while supply remains relatively stable. Over this period, neither side shows significant imbalance, indicating that the consumer-facing economy has returned to a state driven largely by normal cyclical variation rather than acute stress.
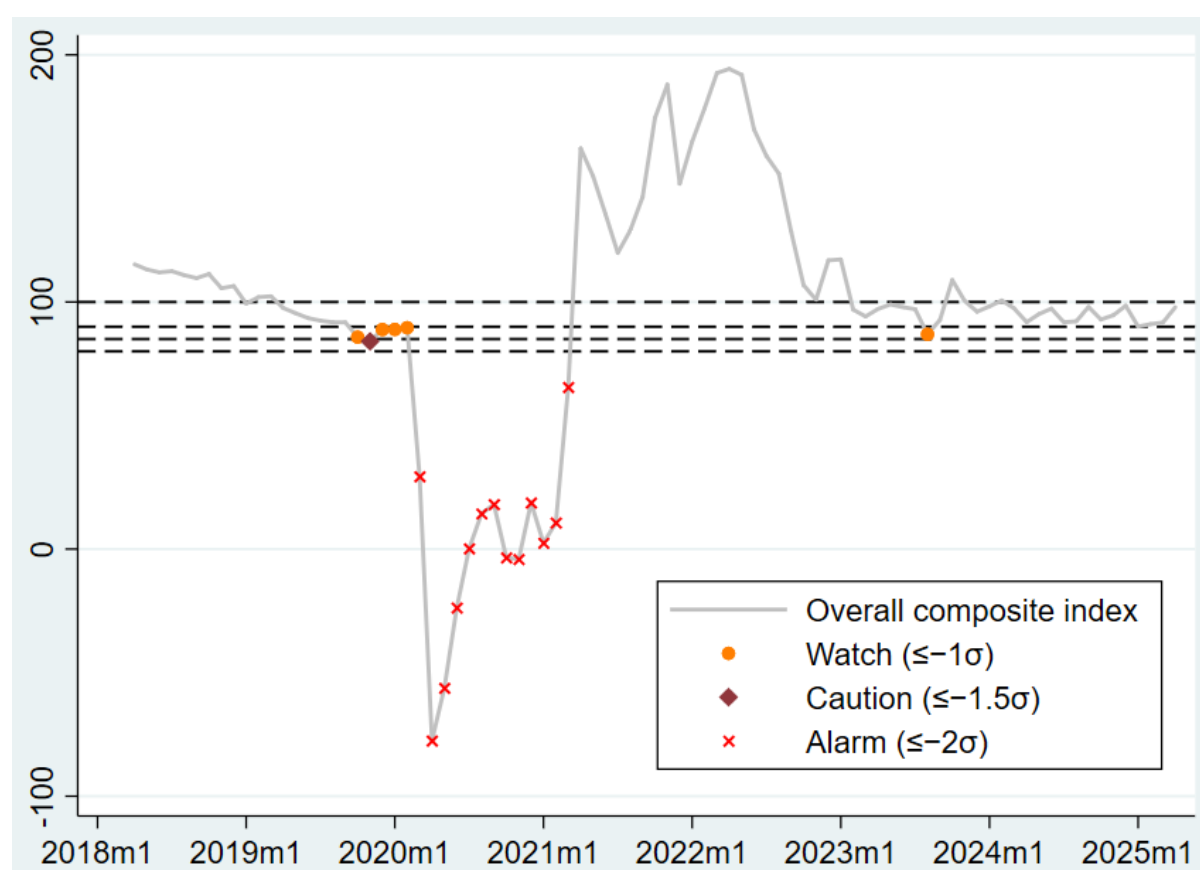
Figure 3a: Overall Composite Indicator
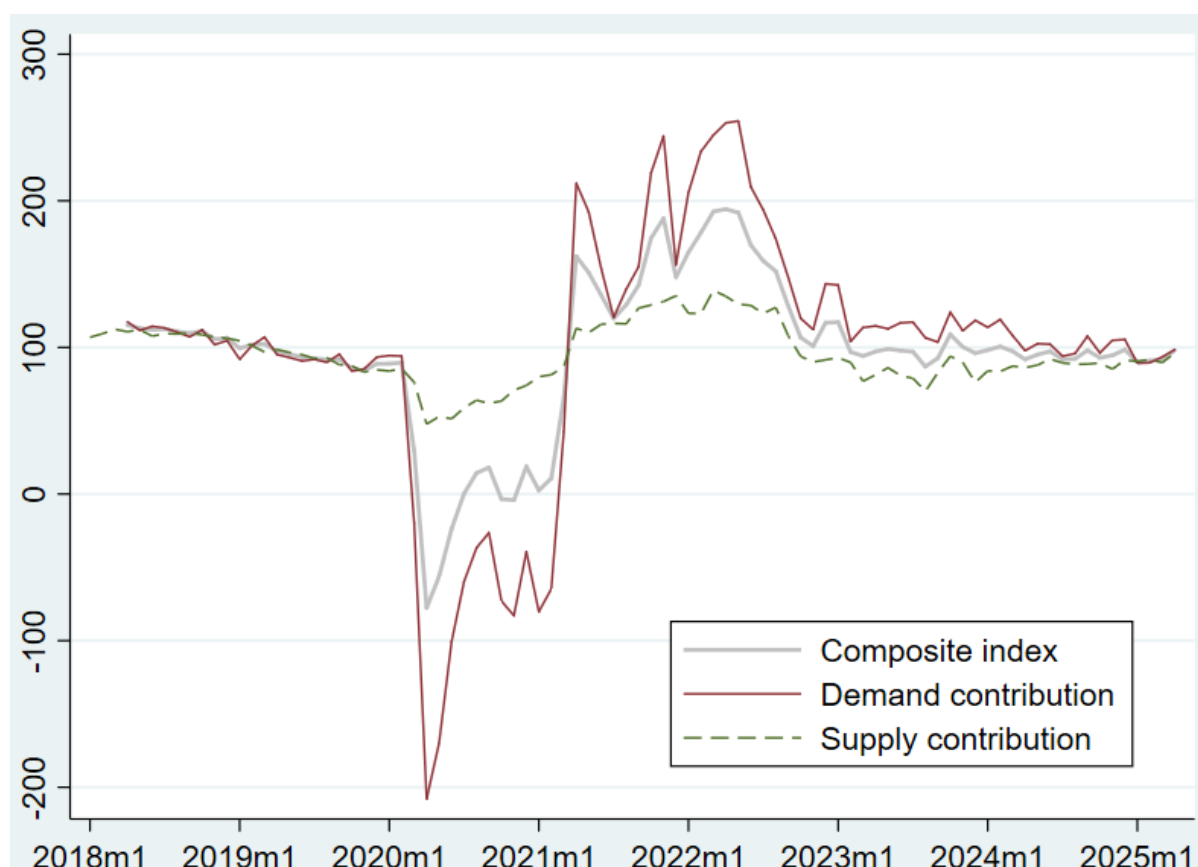
Next, we examine the overall composite indicator using our proposed alert mechanism. This provides a structured way to identify periods of potential stress based on the extent of deviations from historical norms (see Figure 3b). In early 2020, the indicator breaches the -1σ, -1.5σ, and -2σ thresholds in rapid succession. These escalating "Watch", "Caution", and "Alarm" signals accurately mark the onset of the severe economic disruption brought about by the onset of the pandemic. The duration and depth of the alert period coincide closely with lockdowns and the collapse in consumer-facing activity.

Following the sharp rebound in 2021, the indicator moves decisively above the alert thresholds. No further alarms are triggered after the reopening period. Since 2022, the index has fluctuated within a narrow band around the calibration baseline. Only one isolated "Watch" signal appears in late 2023, reflecting a modest and temporary softening rather than a broader deterioration. Overall, the alert framework displays high sensitivity in periods of genuine stress (i.e., 2020) while avoiding excessive false positives in more normal conditions.

Figure 3b: Overall Composite Indicator, with warning system

To understand the underlying drivers of this overall composite indicator, we first look at the contributions of individual variables. As the indicator is a weighted sum of standardised variables, each indicator's contribution depends on its loading (or weight) and its recent movement. By averaging recent contributions, we highlight the individual variables (across both demand and supply) that have exerted the greatest influence on the composite in absolute terms. This provides a clear view of the key forces shaping the headline signal.

Figure 3c shows the ten variables that make the largest absolute average contribution to the composite index over the past twelve months. As shown, Google Trends indicators for restaurant activity emerge as the strongest contributor, signalling that consumer engagement with hospitality services continues to be a leading driver of monthly variation in the composite. Labour-market indicators also feature prominently (the live register for SOC 71 and SOC 92), and SPSV driver licences also rank among the largest contributors. Card spending in restaurants and overseas arrivals also make meaningful contributions, pointing to ongoing sensitivity to discretionary expenditure and inbound tourism flows. Broader consumer sentiment and retail-wholesale activity indicators contribute moderately. The Wholesale Energy Price Index, while less dominant, registers as a non-trivial contributor, indicating that price pressures continue to exert an observable influence on the overall composite.

**Figure 3c: Largest contributing factors over the last 12 months (based on absolute average)**
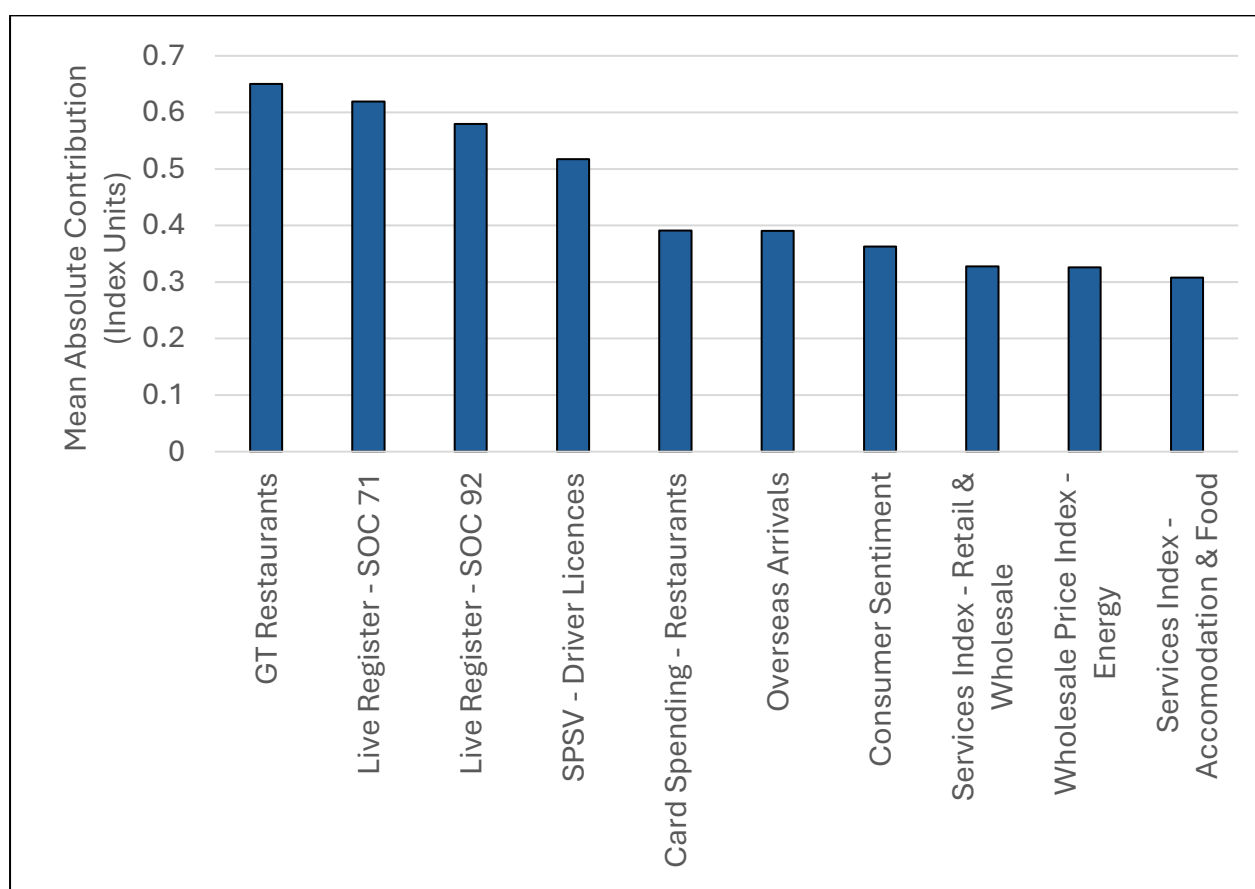
Composite Demand Indicator

The demand-side composite (including demand-side variables only) displays an intuitive pattern around the pandemic shock – a sharp deterioration through 2020, followed by a rapid rebound during the reopening period and a subsequent stabilisation from late-2022 onward (see Figure 3d). Interestingly, the early-warning markers highlight that pre-pandemic demand conditions were already softening, with several "Watch" and "Caution" signals emerging in 2019, reflecting perhaps an early weakening in consumer sentiment.

During 2020, the index enters deep "Alarm" territory, signalling acute demand-side stress consistent with the collapse in mobility, consumer activity, and international travel. The persistence of repeated alarm signals across much of 2020-2021 underscores both the severity and duration of the demand shock. From 2022 onward, demand conditions normalise considerably. The demand composite fluctuates close to its long-run mean and does not trigger any sustained warning signals. This suggests that while the post-pandemic recovery has levelled off, there is no current evidence of broad-based demand weakness. Isolated watch points in 2023 and 2024 indicate temporary soft patches but not a structural deterioration. Overall, the demand composite shows a sector that has transitioned from severe pandemic-era stress to a relatively stable state with no material signs of emerging stress.

**Figure 3d: Composite Demand Indicator**
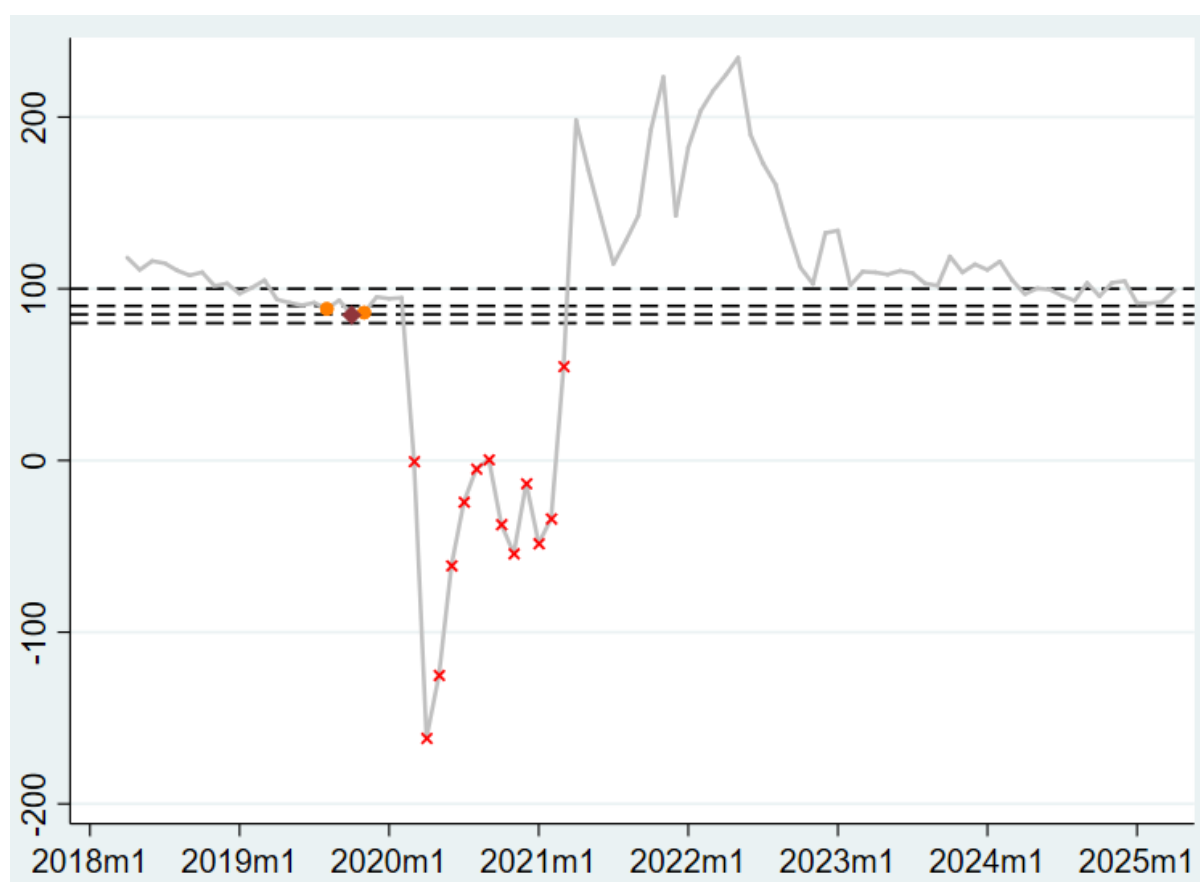
Supply-side Indicators

Compared with the composite demand indicator, the supply-side measure shows a more gradual deterioration prior to the pandemic, followed by a prolonged period of operational strain during the reopening phase. In the pre-pandemic period, the composite sits close to its long-run average but registers several "Watch" alerts. These early signals may reflect a mild tightening in labour supply and emerging cost pressures.

The supply index falls sharply in 2021-2022, repeatedly entering "Alarm" territory. This period aligns with the capacity constraints that emerged in the post-lockdown rebound – labour markets reopened unevenly, input costs rose (particularly for food and energy), and business distress signals were elevated (as illustrated by Google Trends data for closures, insolvencies, and liquidations). The clustering of deep alarm signals in late-2021 and early-2022 highlights that the reopening recovery placed substantial strain on the supply side, even as demand was recovering strongly. This asymmetry – strong demand but constrained supply – characterised much of the post-pandemic adjustment in consumer-facing sectors.

From mid-2022 onward, supply conditions stabilise markedly. The index rises back toward its historical range, and by 2023 most alert signals have dissipated. Overall, the composite supply indicator depicts a sector that experienced its most severe operational pressures during the reopening period, followed by a steady normalisation. While remaining somewhat below its pre-

pandemic peak, the composite supply indicator now shows no signs of acute supply-side stress, indicating that capacity pressures have largely eased. Current conditions appear stable, with no significant supply-related warnings in recent months.

Figure 3e: Composite Supply Indicator
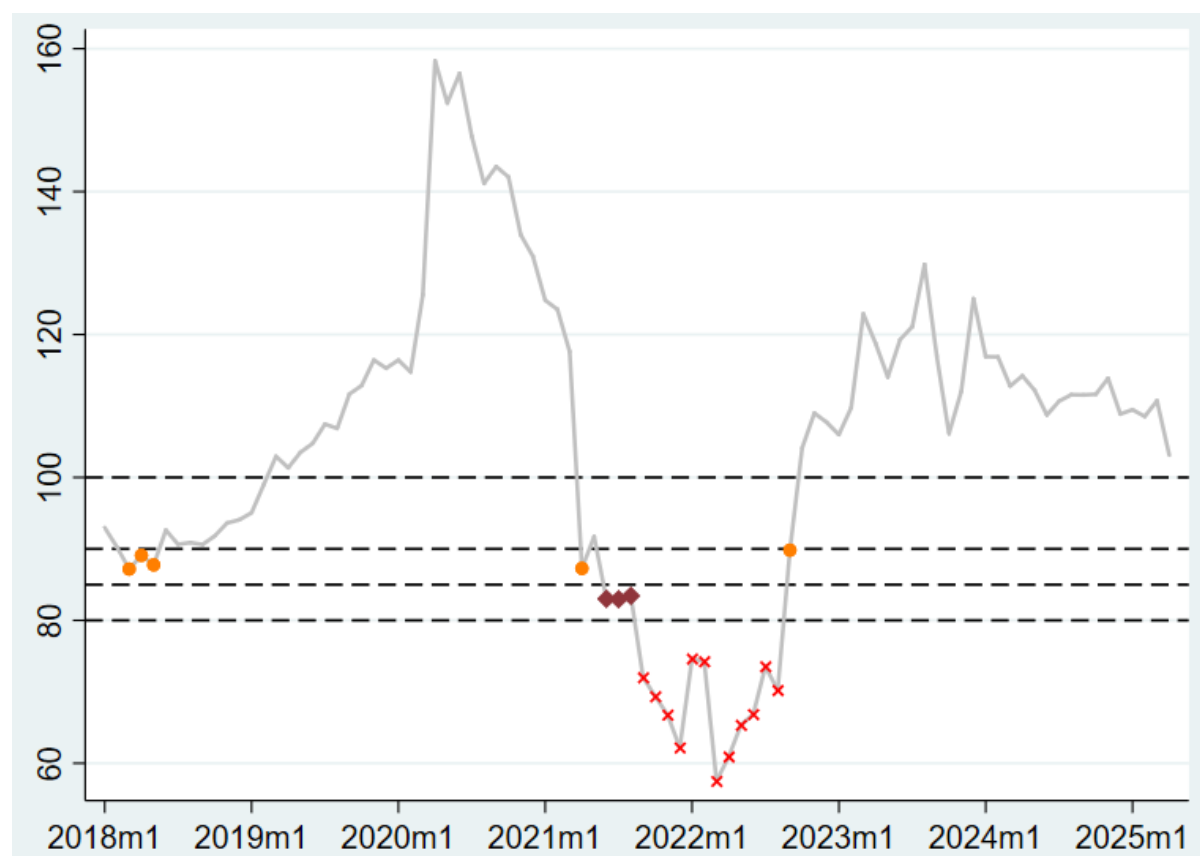
Rolling Window Indicators

The rolling composite indicators offer a more responsive read of demand and supply conditions. Unlike the fixed-loading indicators above – which use pre-pandemic weights – the rolling version continually re-estimates loadings over a 21-month window, allowing the indicator to adapt as relationships between variables change. This makes the rolling composites more sensitive to recent shifts, and, possibly, better suited for early-warning purposes, even though they are naturally more volatile.

The rolling demand composite (see Figure 3f) shows a brief softening in mid-2023, where the index dips into "Watch" territory on two occasions, signalling mild but notable weakness in consumer-facing demand. This short-lived deterioration is followed by a sharp drop in late 2023, triggering an "Alarm" event – indicating a month of materially subdued demand relative to typical conditions. However, this weakness does not persist: the indicator rebounds quickly through early 2024 and fluctuates around or above its benchmark for much of the following period. Despite some volatility (typical of the rolling PCA framework) the broader pattern suggests that demand conditions
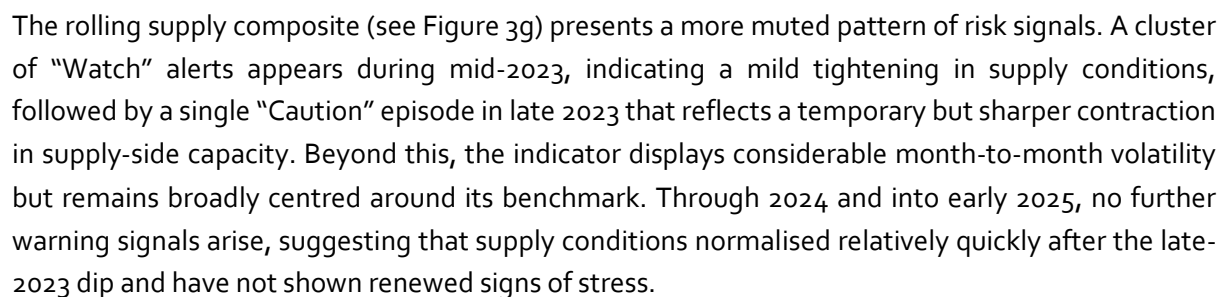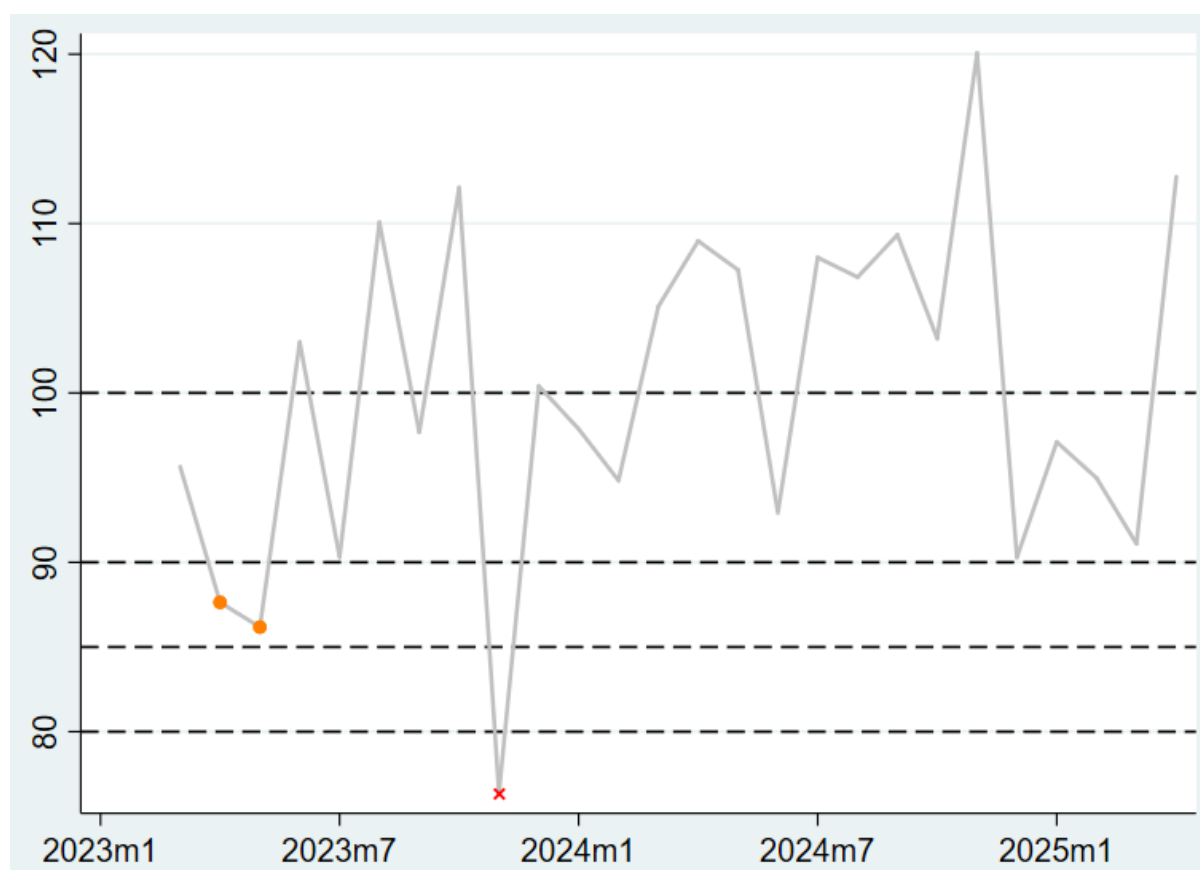
stabilised after late 2023 and into 2024, with no renewed signs of sustained distress emerging through 2024 and early 2025.

Figure 3f: Rolling Demand Composite

The rolling supply composite (see Figure 3g) presents a more muted pattern of risk signals. A cluster of "Watch" alerts appears during mid-2023, indicating a mild tightening in supply conditions, followed by a single "Caution" episode in late 2023 that reflects a temporary but sharper contraction in supply-side capacity. Beyond this, the indicator displays considerable month-to-month volatility but remains broadly centred around its benchmark. Through 2024 and into early 2025, no further warning signals arise, suggesting that supply conditions normalised relatively quickly after the late-2023 dip and have not shown renewed signs of stress.

Figure 3g: Rolling Supply Composite

Sectoral Indicators

Next, for a more granular analysis, we construct sector-specific indicators for tourism, hospitality, and retail, with variables allocated to each sector in line with classifications detailed in Table 1 and Table 2. We construct both fixed-loading and rolling window versions of these indicators. These sectoral measures can uncover patterns that may be obscured in the composite results, highlighting how conditions can diverge across different parts of the consumer-facing economy. By focusing on a smaller set of tailored variables for each sector, the indicators provide a more granular view of emerging pressures.

Demand-side

Unsurprisingly (and as identified in our composite indicators) all three sectors experienced a collapse in activity in 2020 and 2021, reflecting the curtailment in economic and social activities during the COVID-19 pandemic (see Figure 4a-4c). This was followed by a sharp rebound in 2022. From 2024 to 2025, the fixed-loading versions of our indicators for hospitality, retail, and tourism, cluster around their pre-pandemic baselines, suggesting that activity has broadly normalised. Within this, hospitality is at (or slightly above) its historical baseline, while retail and tourism intermittently fall below. This is reflected in occasional "Watch" and "Caution" alerts for these two sectors in 2024-2025, indicating temporary dips below pre-pandemic norms rather than a sustained shortfall. Overall,

hospitality activity appears relatively stronger than retail and tourism, with no immediate signs of broad-based weakness in demand for the sector.

The rolling indicators are more sensitive to emerging trends (see Figures 5a-5c). For hospitality, the rolling index signals a mild "Watch" episode in late 2024, followed by a sharp rebound in January 2025 and a gradual easing through spring, without further alerts. For retail, no recent alerts are observed. For tourism, the rolling index flags two "Watch" events in late 2024, before rising back towards average activity levels in early 2025, with no subsequent alerts. Compared with the rolling measures, the fixed indicators register more frequent "Watch" events, particularly in tourism, suggesting that demand in the sector remains slightly below its pre-pandemic norm, even as the rolling index points to improvement relative to the more recent past.

In summary, following the collapse in 2020-2021, and the rebound in 2022, activity has broadly normalised to pre-pandemic levels by 2024-2025. Demand in the hospitality sector appears relatively stronger than in retail and tourism, where activity has at times fallen slightly below pre-pandemic norms. The rolling indicators suggest stable-to-improving momentum across all three sectors, with only isolated and non-persistent alerts.

Supply-side

The significant disruptions caused by the COVID-19 pandemic are also visible in the fixed-loading versions of our sectoral supply-side indicators (see Figures 6a-6c). For hospitality, the supply-side indicator shows a substantial easing after the pandemic shock, followed by a gradual drift back toward baseline. The rolling series remains comfortably above the mean of 100 through late-2024 and early-2025, before edging lower (see Figures 7a-7c). No alerts are triggered, consistent with a normalisation of supply conditions. Taken together, demand activity near (or slightly below) trend (Figure 6a) and easing supply pressures suggest that pricing pressures in the sector may soften in the near-term.

The fixed-loading version of the retail supply-side indicator points to a normalisation relative to the pre-pandemic period. By contrast, the rolling indicator registers a brief "Alarm" in early 2025, followed by a partial recovery into "Caution" and "Watch" territory. Retail is the only sector to record a recent alert, with signals triggered in each of the three most recent months reviewed here (February-April 2025).

For the tourism sector, the fixed supply-side indicator has normalised relative to the pre-pandemic period. The rolling indicator, however, displays three consecutive "Caution" alerts in late 2024 and early 2025, before a recovery takes hold – the indicator trends upwards from February through April 2025. The absence of sustained "Caution" or "Alarm" alerts suggests that capacity is not currently binding, and that strengthening demand (Figure 7c) can be accommodated without immediate bottlenecks.

3. Conclusion and Next Steps

We develop a hierarchy of indicators that track conditions across the consumer-facing economy, using Principal Component Analysis (PCA) to distil information from a broad set of high-frequency variables. The framework begins with an overarching composite indicator that combines all demand- and supply-side signals. This is complemented by separate demand and supply composites, allowing us to distinguish movements driven by changes in consumer behaviour from those arising from operating pressures or capacity constraints. The analysis then narrows to sector-specific indicators for retail, hospitality and tourism, where dedicated sets of high-frequency variables capture the heterogeneous dynamics across each sector.

We employ both a fixed-loading PCA approach (where loadings are estimated over a pre-pandemic calibration window) as well as an experimental rolling window framework (where loadings are re-estimated within a moving 21-month window). All indicators are scaled to a common 100/10 index and mapped to a transparent three-tier alert system ("Watch", "Caution", "Alarm"), providing a simple operational early-warning structure. Taken together, this system combines stability and comparability (fixed-loading PCA) with sensitive early detection (rolling window PCA) and proposes a monitoring toolkit for real-time assessment of demand and supply conditions in consumer-facing service sectors.

As one might expect, our results show that the COVID-19 pandemic is associated with a sharp collapse in activity in 2020-2021 – clearly visible through both the demand- and supply-side indicators – followed by a normalisation of activity levels from 2024 and into 2025. Our composite indicators successfully capture the acute stress of the COVID-19 period – registering sharp contractions in demand, tightening supply conditions, and triggering "Alarm" alerts across sectors. Our individual sectoral indicators generally point to stable or improving momentum. Within this, hospitality demand appears relatively stronger, while retail and tourism record intermittent – but not sustained – alerts. On the supply-side, however, the retail sector stands out (with consecutive alerts triggered between February and April 2025).

Going forward, this framework will serve as the basis for ongoing monitoring by the Department of Enterprise, Tourism and Employment, providing timely insights into trends across these sectors. More broadly, the framework contributes to our goal of enhancing the Department's ability to monitor the resilience of Ireland's consumer-facing service economy, complementing existing insolvency and business demography data, and helping policymakers to anticipate and mitigate cyclical risks.

This work is not an end-point but rather a first step in the development of policy relevant diagnostic tools and as such, further work will likely be necessary to refine and enhance our approach A natural next step is to assess how well these indicators perform as forward-looking tools. Much of the practical value of these PCA-based indicators will also depend on how effective these prove to be in anticipating turning points in sectoral employment and output, and the incidence of business closures. This will be evaluated as part of our ongoing work. Further work should also explore the robustness of these indicators, including tests of alternative calibration windows, adjustments to

rolling window length, and assessment of how sensitive results are to the inclusion or exclusion of specific variables.
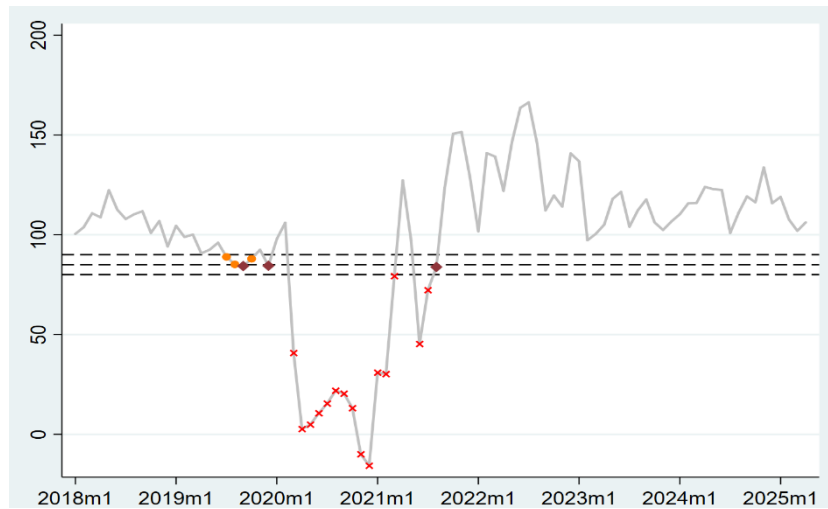
Figure 4a: Hospitality Demand, Fixed
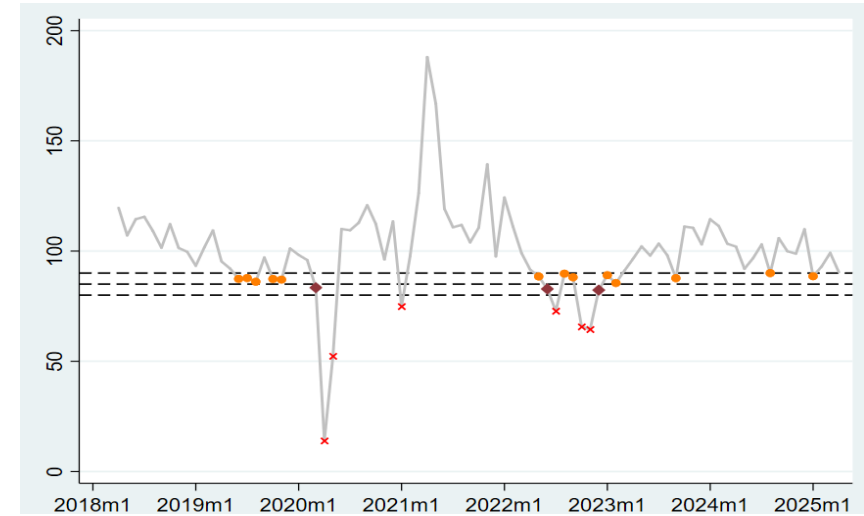
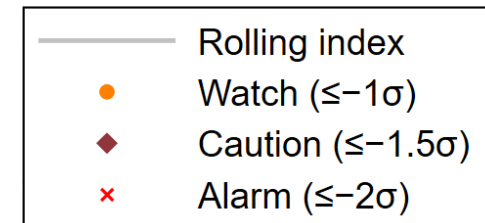**Figure 4b: Retail Demand, Fixed**

Figure 4c: Tourism Demand, Fixed

Rolling index
Watch (≤−1σ)
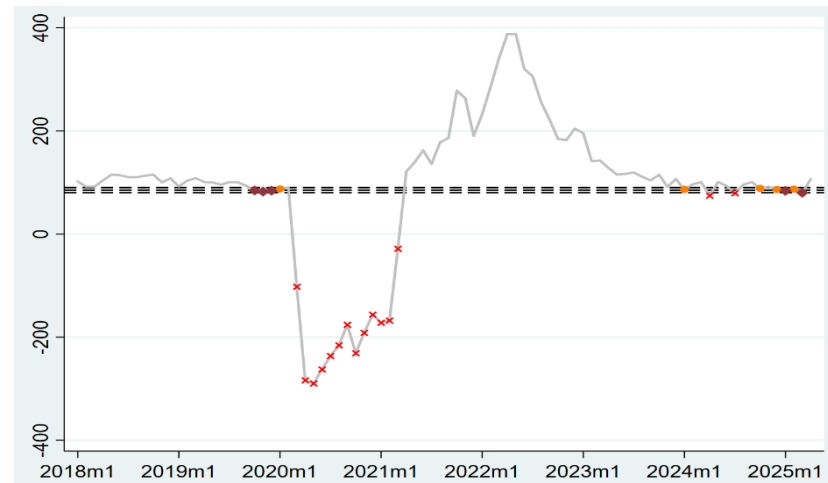Caution (≤−1.5σ)
Alarm (≤−2σ)

Figure 5a: Hospitality Demand, Rolling
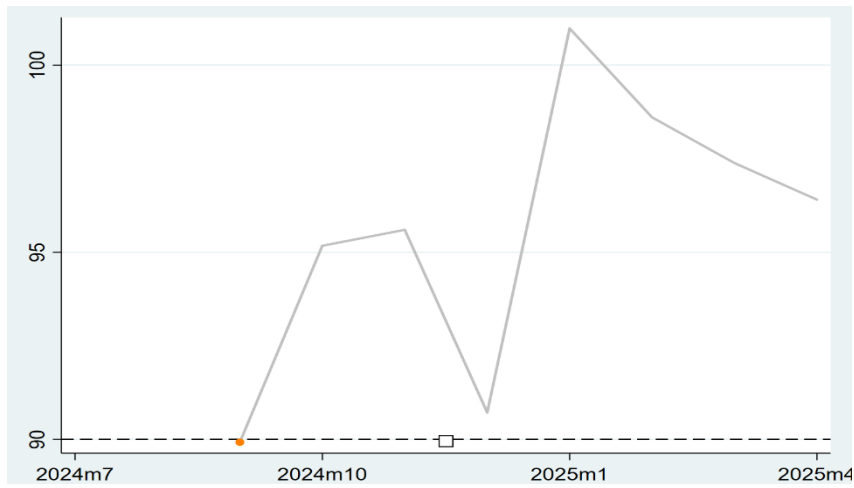
Figure 5b: Retail Demand, Rolling
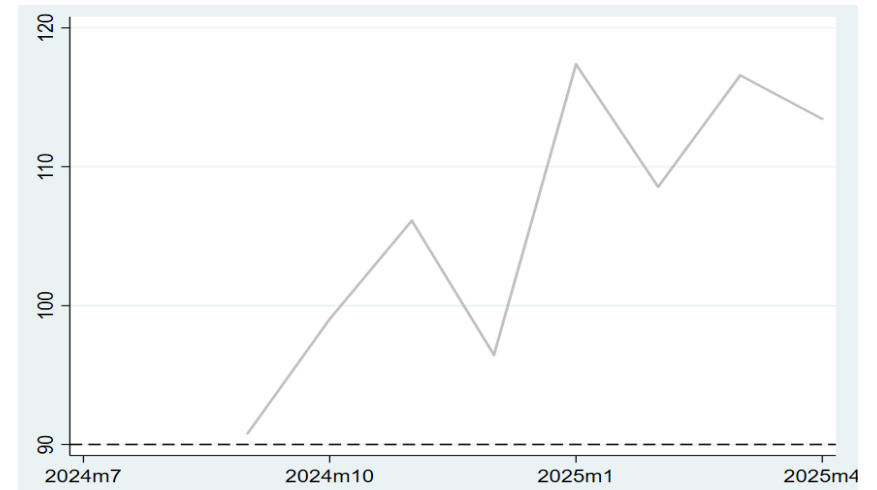
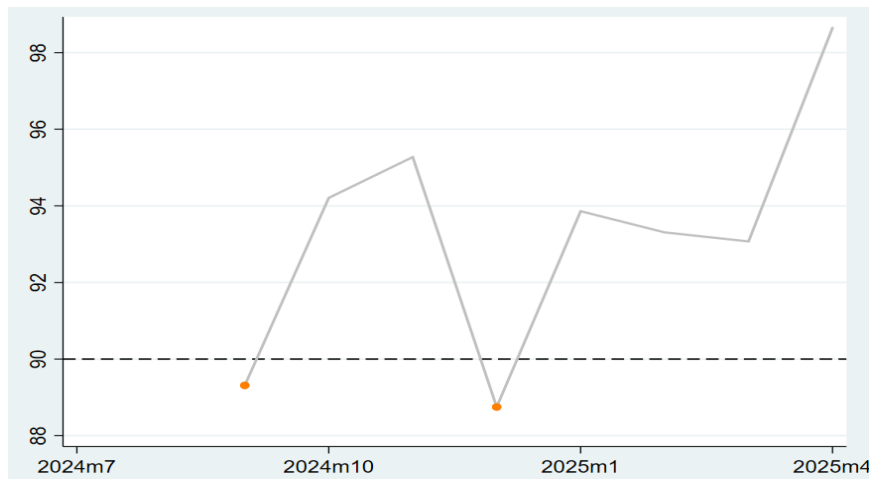**Figure 5c: Tourism Demand, Rolling**

Rolling index
Watch (≤−1σ)
Caution (≤−1.5σ)
Alarm (≤−2σ)
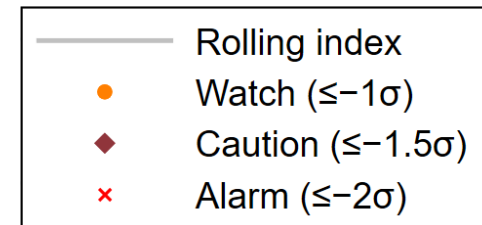
Figure 6a: Hospitality Supply, Fixed
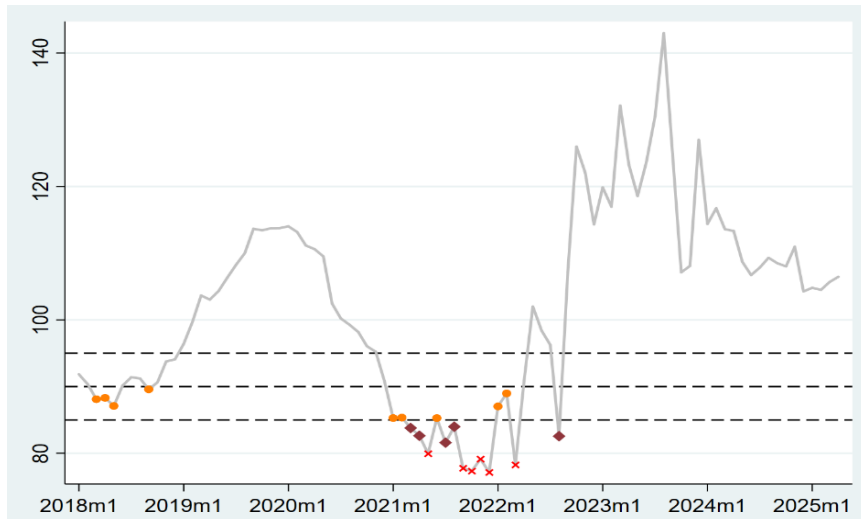
Figure 6b: Retail Supply, Fixed
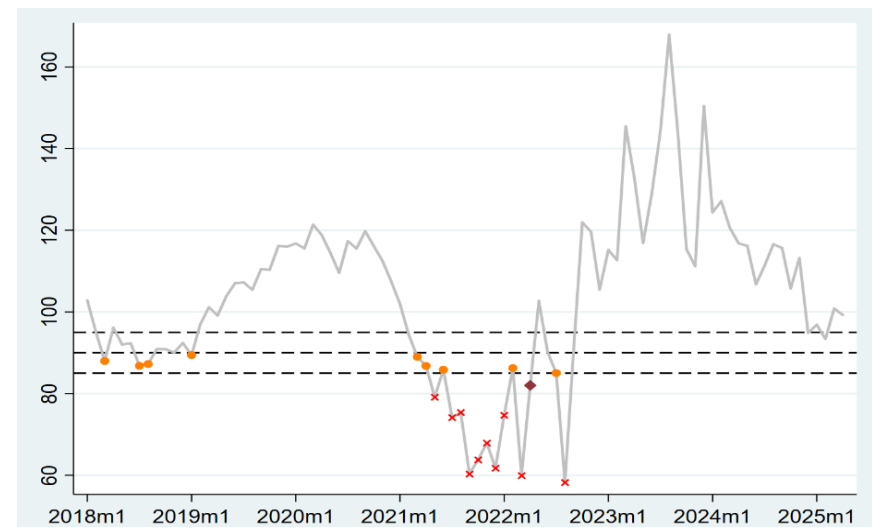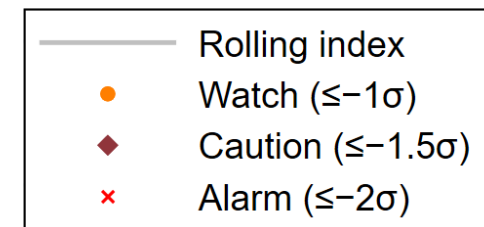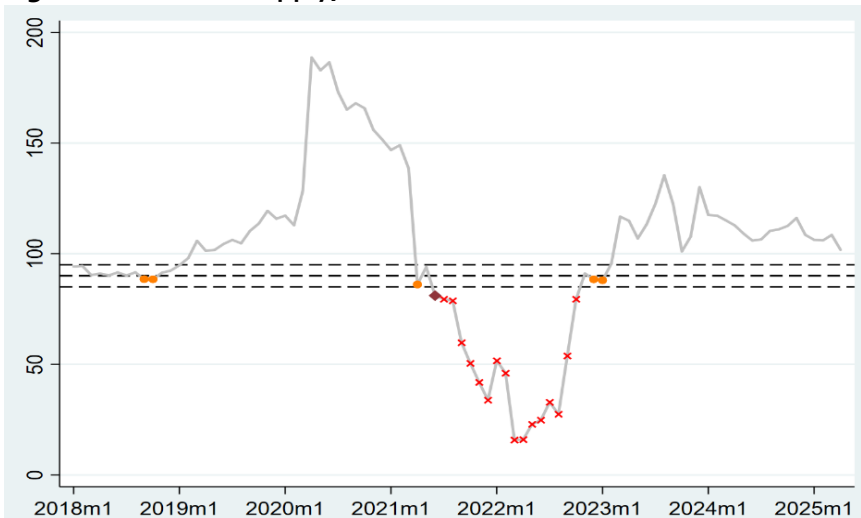

Figure 6c: Tourism Supply, Fixed

Rolling index
Watch (≤−1σ)
Caution (≤−1.5σ)
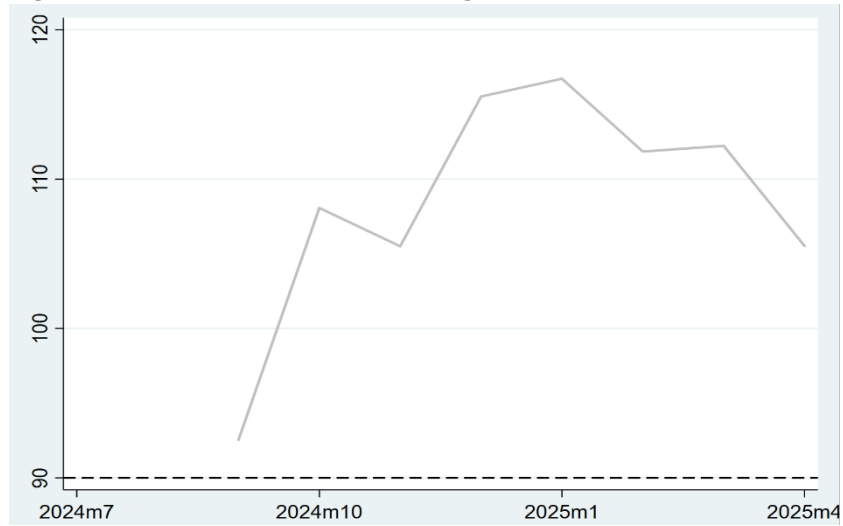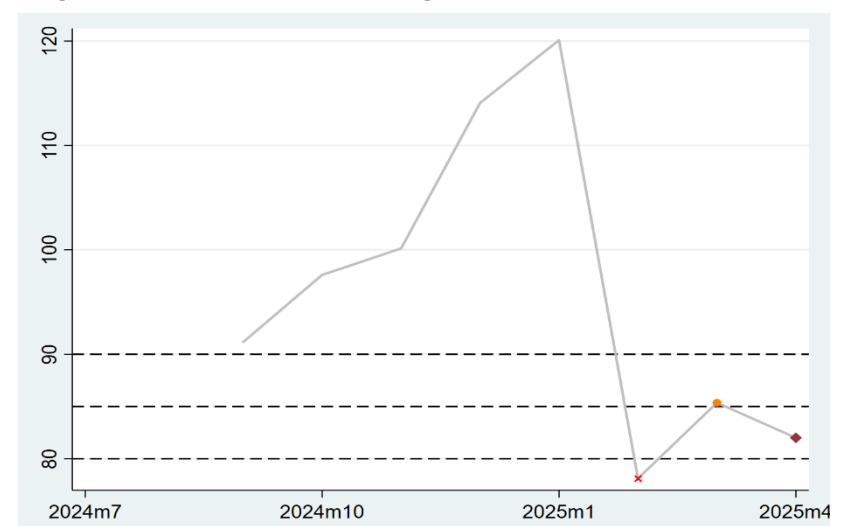Alarm (≤−2σ)

Figure 7a: Hospitality Supply, Rolling

Figure 7b: Retail Supply, Rolling

Figure 7c: Tourism Supply, Rolling

Rolling index
● Watch (≤−1σ)
◆ Caution (≤−1.5σ)
× Alarm (≤−2σ)