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The Impact of Weather and Day of the Week on Consumption: Evidence from High-Frequency Data**Chang Soo Jung**Junior Economist, Macro Forecasting & Research Team,
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- ① **Daily card spending, captured through high-frequency datasets designed to monitor short-term consumption trends, varies substantially depending on both weather conditions and day of the week.** Offline activities are limited by adverse weather conditions such as heat waves or heavy rainfall, resulting in a measurable reduction in consumption expenditure. Furthermore, since consumption patterns differ by day of the week, the impact of adverse weather also varies depending on when during the week these conditions occur.

This study examines the impact of weather on consumption by leveraging daily card spending data alongside temperature and precipitation variables while also explicitly considering interactions with the day of the week. Drawing on these analyses, we estimate the effects of major adverse weather events that have occurred this year on overall consumption.

- ② **First, analysis of the relationship between weather and consumption revealed that (1) card spending declined by 7% during heat waves, 3% during cold waves, and 6% during periods of heavy rainfall—each a statistically significant reduction.** These effects were most evident in offline activities, particularly in sectors such as offline shopping and dining out. In contrast, online shopping showed stable consumption patterns regardless of weather conditions.

(2) Subsequent analysis of consumption patterns by day of the week revealed that total card spending was highest on Fridays. Offline consumption displayed a noticeable concentration on Saturdays compared to other weekdays. On weekdays (Monday through Friday), the share of online shopping was relatively high. Expenditures on automobiles, medical services, and education—which typically occur on business days—were also prominent on weekdays.

(3) Furthermore, the interaction effect of weather deterioration on Fridays and Saturdays—when offline consumption is highest—was estimated. The results indicate that rainfall on these days led to a larger decline in card spending associated with offline consumption compared to other days of the week. When weather cleared following periods of restrained consumption due to rainfall, consumption rebounded to higher-than-usual levels—a phenomenon known as the pent-up effect. Meanwhile, the impact of heat and cold waves showed little variation across days of the week. This pattern appears to reflect heightened seasonal demand during summer and winter—such as vacations and purchases of cooling or heating equipment—which partially offsets the negative effects of extreme weather conditions.

- ③ Building on these analyses, **the impact of major weather events on consumer spending this year was estimated. Results indicate that cold waves during the first quarter and summer heat waves (June through August) contributed to a 0.18-percentage-point decline in annual consumption growth.** However, below-average rainfall during the same period boosted consumption by approximately 0.09 percentage points. Consequently, the net impact of weather conditions on the private consumption growth rate for the year is estimated at approximately -0.09 percentage points.
- ④ **This study provides valuable empirical evidence for the timely monitoring of consumer spending behavior using daily card spending and weather data. By quantifying temporary sources of variation in consumption, it is expected to enhance the accuracy of short-term consumption forecasts.**

- Disclaimer: The views expressed herein are those of the authors, and do not necessarily reflect the official views of the Bank of Korea. When reporting or citing this paper, the authors' names should be always explicitly stated.
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I. Background

1. Daily card spending, analyzed using high-frequency datasets designed for short-term consumption tracking, reveals substantial variation depending on weather factors and day of the week. The frequent occurrence of heat waves and heavy rainfall, as during the last summer, constrains offline activities—particularly in-person and physical store transactions—leading to pronounced shifts in spending patterns. Moreover, daily consumption exhibits considerable variation in both the value of card transactions and composition of purchase categories, depending on the day of the week. There are marked differences in consumer purchasing behavior between weekdays and weekends. For example, on rainy days, demand for delivery services tends to increase as consumers reduce their outdoor activities. On weekends, offline spending typically rises, with heightened retail activity at large markets and department stores as well as increased tourism and dining expenditures. Therefore, **to improve the accuracy of private consumption forecasts, it is essential to conduct quantitative analysis on the impact of weather factors on consumption, as well as on the extent to which these effects differ by day of the week.**

2. Domestic and international studies consistently find that consumption exhibits clear variation in response to weather factors and day of the week. Multiple studies show that adverse weather conditions, such as rain or snow, lead to declines in offline shopping, while improved weather is associated with increases in overall retail spending (Arunraj & Ahrens, 2015; Li et al., 2017; Tian & Song, 2021; Bonfrer et al., 2022). KEB (2019) found, through analysis of domestic data, that sales in business sectors related to offline activities are highly sensitive to weather conditions. By analyzing the day-of-the-week effect on U.S. online retail spending, Bussiere (2016) identified that weekdays are characterized by higher levels of utilitarian consumption—such as purchases of food, life necessities, and essential goods—while weekends see an increase in hedonistic consumption, including in categories related to fashion, hobbies, entertainment, and social activities. Han Jeonghee and Lee Geuncheol (2016) projected changes in domestic energy consumption by incorporating both the day-of-the-week effect and temperature variation.

3. This study empirically examines the effects of weather factors and day of the week on consumption by utilizing daily card spending data—a widely recognized high-frequency indicator for monitoring and forecasting private consumption trends—along with temperature and precipitation data. The analysis aims to address the following key questions: (1) Does adverse weather—such as heat waves, cold waves, and precipitation—significantly reduce card spending? (2) How do consumption patterns, including the value of card transactions and composition of purchase categories, differ according to the day of the week? (3) Are the effects of adverse weather amplified on specific days when offline consumption activity typically increases? and (4) How much have major weather events this year affected consumption?

II. Impact of Weather and Day of the Week on Card Spending

Data used and analytical method

4. To analyze the effects of weather conditions and day of the week on consumption, we employed daily data on card spending, disaggregated by region and business sector, along with daily precipitation and temperature data by region. As presented in **Table 1**, card spending by business sector in 17 cities and provinces is set as the dependent variable, while adverse weather events due to precipitation and temperature are incorporated as dummy explanatory variables. The Composite Consumer Sentiment Index (CCSI) and consumer price inflation are included as control variables¹ in the panel model specified in **Equation (1)**.

¹ Monthly data were converted to daily frequency using a 30-day moving average method.

Card spending data² are based on approved card transactions, excluding taxes and utility bills, as indicated in **Table 2**. Transactions are categorized³ by business sector into e-commerce,⁴ offline consumption (including offline shopping and services), automobiles, medical services, and education.

For the purposes of this study, adverse weather events are characterized as follows: heat waves and cold waves are defined as days—excluding those with rain or snow—on which the daily maximum temperature reaches or exceeds 35°C or reaches or falls below 0°C, respectively.⁵ Precipitation events are defined as days⁶ without heat wave or cold wave conditions on which daily precipitation is 20mm or more.⁷ Accordingly, the three categories of adverse weather events—heat wave, cold wave, and precipitation—are defined as independent and mutually exclusive; they do not occur simultaneously.⁸ In other words, within the analysis dataset, precipitation events do not occur on days classified as heat waves or cold waves, and vice versa, as days with precipitation do not satisfy the criteria for heat wave or cold wave conditions. The analysis period begins on January 1, 2023.⁹

$$y_{it} = \alpha + \sum_{j=1}^J \beta^j D_{it}^j + \sum_{k=1}^K \gamma^k x_t^k + \mu_i + e_{it} \quad (1)$$

Table 1. Variable definitions and model specifications

Categories	Variable names
y_{it}	Card spending by region (i) ¹⁾ and day (t) (in-log) ²⁾
x_t^k	Control variables: Composite Consumer Sentiment Index (CCSI, in-log), consumer price inflation
μ_i	Region-specific fixed effects (i)
D_{it}^j	Region (i) - and day (t)-specific dummies
	Weather effects
	Model I
	Interaction effects of weather and day of the week
	Heat wave : daily highest temperature $\geq 35^\circ\text{C}$ (April-September)
	Cold wave : daily highest temperature $\leq 0^\circ\text{C}$ (October-March)
	Precipitation (precipitation of 20mm or more)
	Friday and Saturday
	Weather (Model I)
	Fri/Sat \times weather (Model I)

Notes: 1) Regional breakdown applies to 17 cities and provinces.

2) Card spending is log-transformed for time series stability, with monthly trend adjustments.

² In 2024, card spending totaled KRW 1,190 trillion, a figure broadly comparable to the nominal private consumption of KRW 1,240 trillion. However, card spending reflects approved transaction amounts, without netting out cancelled transactions, and also encompasses corporate card spending, which is not included in GDP-based private consumption. Additionally, unlike GDP-based private consumption, which comprises domestic consumption and residents' overseas consumption and excludes non-residents' domestic consumption, this study covers only domestic transactions made with cards issued in Korea.

³ Business sectors are categorized according to their sensitivity to weather conditions (e-commerce transactions and offline consumption) and their reliance on business days for activity (automobiles, medical services, and education).

⁴ E-commerce transactions are attributed to Seoul and Gyeonggi Province, where the vast majority (99.9%) of merchants—including payment gateway (PG) service providers—are registered.

⁵ According to the Korea Meteorological Administration's special weather report standards, a heat wave watch is issued when a daily maximum temperature of 33°C or above (35°C or above for a warning) is forecast to persist for two or more consecutive days. A cold wave watch is issued when a morning minimum temperature of -12°C or below (-15°C or below for a warning) is expected to last for two or more consecutive days.

⁶ Korea's daily average precipitation is approximately 10 to 20mm. Analysis of the relationship between daily precipitation and card spending indicates that precipitation of 20mm or more significantly constrains consumer activity (see **Figure 2**). In this analysis, precipitation encompasses both rainfall and snowfall, as the dataset does not differentiate between the two. However, since daily precipitation levels attributed to snowfall rarely exceed 20mm (with 1cm of snowfall being approximately equivalent to 1mm of precipitation), cases of daily precipitation above 20mm are effectively limited to rainfall. Therefore, only rainfall events are considered in this paper's analysis.

⁷ Days without heat wave, cold wave, or precipitation events are classified as usual weather.

⁸ Although these criteria differ from the official standards used for special weather reports, mutually exclusive weather conditions were defined in this study to isolate the effects of different weather conditions on card spending.

⁹ Card transaction data have been available since 2019. For this analysis, data spanning from the first quarter of 2023 to the second quarter of 2025 were used, excluding periods affected by the COVID-19 pandemic and the recent distribution of consumption coupons for livelihood recovery, in order to control for extraordinary factors unrelated to weather.

Table 2. Classification of card spending¹⁾ by business sector

Category		Major items
Total		Total approvals excluding taxes and utility bills
▶ E-commerce transactions	Offline spending ²⁾	Internet transactions, TV home shopping, payment gateway (PG) ³⁾ payments, food delivery app payments, etc.
▶ Offline shopping (or “shopping”)		Large stores (marts and department stores), ⁴⁾ small and medium-sized retail stores, clothing, food, etc.
▶ Offline services		Restaurants (dining out), accommodations, gas stations, mass transportation, leisure, etc.
▶ Automobiles		Automobile sales and repairs
▶ Medical services		Medical institutions and services (hospitals, pharmacists, etc.)
▶ Education		Educational institutions and services (schools, private institutes, etc.)

Notes: 1) Based on approved credit card and debit card amounts, without netting out cancelled transactions. Regions are classified by merchant registration location.

2) The sum of offline shopping and offline service spending is defined as “offline consumption.”

3) PG-based payments in e-commerce include some offline transactions made through mobile payment.

4) Restaurants at department stores or marts (classified by merchant registration) may be designated as offline shopping, unlike usual restaurants, which are counted as offline service.

Consumption changes in response to weather conditions

5. Card spending declines on days when adverse weather events—such as heat waves, cold waves, or precipitation—occur, with the decrease most pronounced in offline spending compared to periods of usual weather. Examining the relationship between temperature and card spending, offline spending—such as shopping and dining out—generally increases as weather becomes warmer. However, when the daily maximum temperature exceeds 35°C, offline spending drops noticeably (see **Figure 1**). Additionally, the relationship between precipitation and card spending shows a negative correlation, with offline spending declining on rainy days (see **Figure 2**).

Heat waves, cold waves, and precipitation all exert a negative impact on offline spending.

Figure 1. Offline card spending by temperature interval¹⁾ (Seoul metropolitan area)

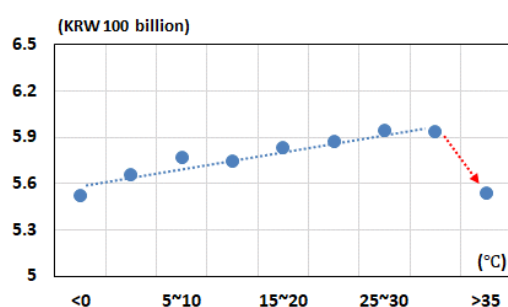
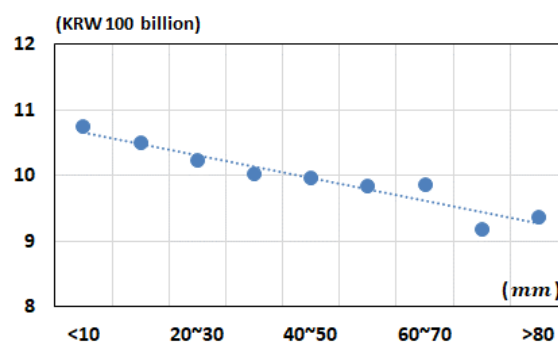


Figure 2. Offline card spending by precipitation interval (nationwide)



Note: 1) Daily maximum temperature.

Source: authors' estimation.

6. Panel regression analysis indicates that, compared to usual weather, daily card spending decreases by 7% during heat waves, 3% during cold waves, and 6% during precipitation events (see Figures 3 to 5). The decline in spending was most pronounced for dining out and other offline service categories. Offline service spending is more sensitive to precipitation, falling by 9% compared to usual weather—greater than the declines observed during heat waves (-5%) or cold waves (-6%). Offline shopping also declines in response to adverse weather conditions, with a stronger decrease during periods of precipitation (-6%) compared to cold waves (-3%); no statistically significant change was observed during heat waves. This can be attributed to increased seasonal demand during heat waves and cold waves—such as for summer getaways and vacations, and purchases of cooling and heating devices and related products—which partially offsets the reduction in consumption activities typically constrained by adverse weather. Meanwhile,

e-commerce transactions showed no significant changes in response to adverse weather conditions.¹⁰

These estimates represent average effects. If adverse weather conditions become more extreme—such as during severe heat waves, cold waves, or heavy rainfall—the decline in daily card spending may be even greater. Moreover, consumption may be influenced by not only current adverse weather conditions but also by forecasts of weather deterioration. If adverse weather is anticipated, consumers may adjust their spending plans—resulting in intertemporal substitution—with little overall change in consumption volume.¹¹ Nevertheless, if weather deterioration is more severe than anticipated or occurs unexpectedly, daily card spending may decline sharply.

Daily card spending drops significantly during periods of heat waves, cold waves, and precipitation.

Figure 3. Heat waves’ impact on daily card spending¹⁾²⁾ based on empirical analysis

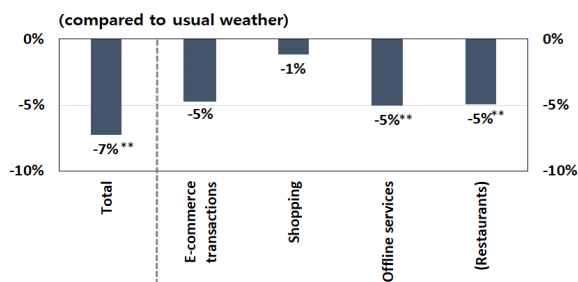


Figure 4. Cold waves’ impact on daily card spending¹⁾²⁾ based on empirical analysis

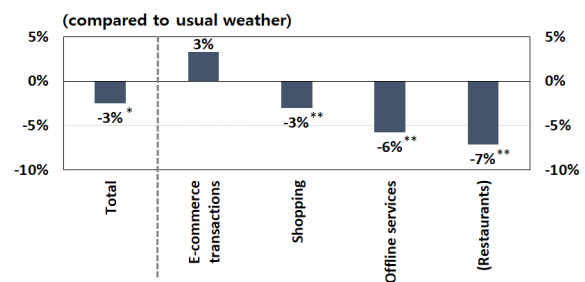
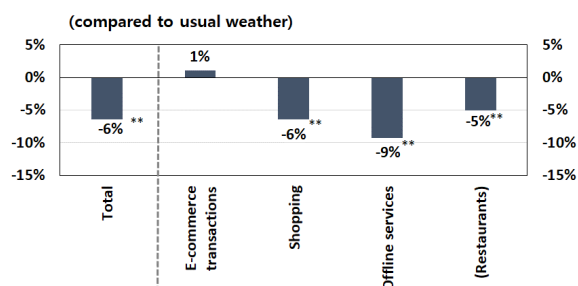


Figure 5. Precipitation’s impact on daily card spending¹⁾²⁾ based on empirical analysis



Notes: 1) E-commerce transactions are measured in Seoul and Gyeonggi, where payment gateways corporations are located.

2) ** and * indicate significance levels of 95% and 90%, respectively.

Source: authors’ estimation.

¹⁰ The analysis suggests that the sectoral consumption substitution effect—namely, a decrease in offline spending and a corresponding increase in online consumption—may not be significant during adverse weather. However, it should be noted that as the merchant registration locations for e-commerce transactions are concentrated in Seoul and Gyeonggi Province, the impact of adverse weather in other regions may not be adequately reflected in these results.

¹¹ For example, if heavy rain is forecast for a Saturday, offline spending originally planned for that day may be pushed forward to Friday or postponed until Sunday. In this case, although Saturday’s spending decreases, the total consumption volume over the weekend remains largely unchanged.

Variation in consumption by day of the week

7. Card spending patterns reveal that card spending is higher on weekdays, while weekends see a noticeable decline. The composition of spending also differs markedly by day of the week. E-commerce transactions, as well as spending on automobiles, medical services, and education, are concentrated on weekdays. In contrast, offline expenditures such as shopping and dining out increase significantly during weekends. Average daily card spending increases from approximately KRW 3.2 trillion (KRW 144,000 per household¹²) for Mondays through Thursdays to KRW 3.4 trillion (KRW 151,000 per household) on Fridays. On Saturdays and Sundays, average daily spending drops to KRW 2.6 trillion (KRW 116,000 per household) and KRW 2.1 trillion (KRW 92,000 per household), respectively (see Figure 6).

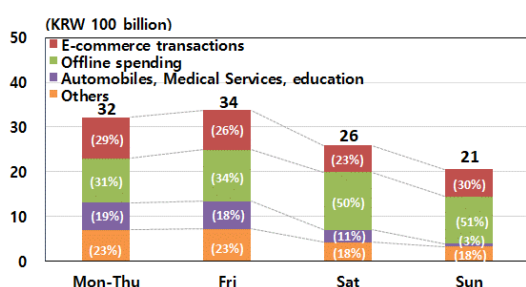
Looking at spending shares by sector, for Mondays through Thursdays, offline spending (31%) and e-commerce transactions (29%) each represent about one-third of total spending. Spending on automobiles, medical services, and education, which is highly influenced by business days, also comprises a substantial share at 19%. On Fridays, the share of e-commerce transactions declines to 26%, while offline spending rises to 34%. During weekends, offline expenditures such as shopping and dining out surge to 50 to 51%, exceeding half of total spending, whereas spending on automobiles, medical services, and education drops sharply.

Meanwhile, offline spending peaks on Saturdays at KRW 1.3 trillion (KRW 58,000 per household), followed by Fridays at KRW 1.1 trillion (KRW 51,000 per household), indicating that offline activities are concentrated on Fridays and Saturdays (see Figure 7).

8. When spending is divided between business days and non-business days, total card spending is higher on business days, whereas offline spending is greater on non-business days. Overall, monthly total card spending is affected by the number of business days in each month (see Figure 8). Daily spending data show that card spending on non-business days, including weekends and holidays, is on average 31% lower than on business days. This decline is driven by reduced activity in business day-sensitive sectors, such as e-commerce transactions (-36%) and spending on automobiles, medical services, and education (-66% to -89%). Conversely, on non-business days, spending on offline shopping and dining out is 29% and 15% higher, respectively, compared to business days (see Figure 9).¹³

The size and sectoral composition of card spending differ markedly according to the day of the week.

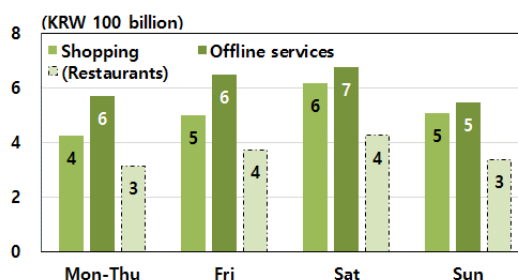
Figure 6. Average card spending by day of the week and business sector¹⁾



Note: 1) "Others" include finance, insurance, and communication costs.

Source: authors' estimation.

Figure 7. Average offline card spending by day of the week

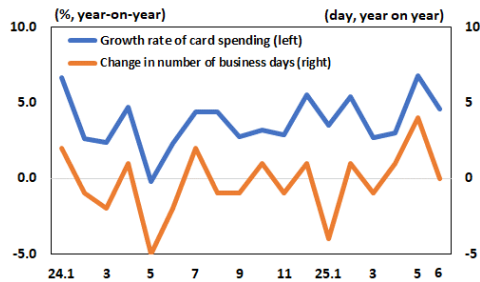


¹² Based on 22.29 million general households reported in Statistics Korea's "Population and Housing Census 2024."

¹³ The impact of the designation of a temporary holiday on consumption remains unclear and is difficult to analyze due to limited sample size. However, in two recent instances—the Chuseok holiday in 2023 (October 2) and Lunar New Year's Day in 2025 (January 27)—the negative effect of fewer business days combined with a positive effect from increased offline spending during the extended holidays. For more information, see Box. "Change in Card Spending Before and After Temporary Holiday Designation."

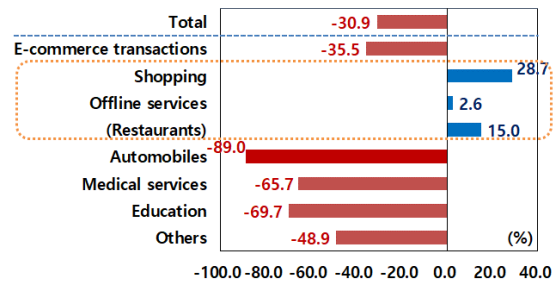
Daily card spending is also influenced by the number of business days.

Figure 8. Monthly card spending and number of business days



Note: 1) Weekends and holidays.
Source: authors' estimation.

Figure 9. Average card spending on non-business days¹⁾ compared to business days



Interaction effect of weather and day of the week

9. As discussed above, **offline spending is highest on Fridays and Saturdays. When adverse weather conditions occur on these days, offline activity is restricted, potentially amplifying the impact on consumption. Empirical analysis shows that precipitation on Fridays and Saturdays results in a larger decline in offline spending** (see Figures 10 to 12). The interaction effect between weather and day of the week is analyzed by incorporating weather variables, Friday and Saturday dummy variables, and their interaction terms into the panel model specified in Equation (1), as presented in Model II of Table 1. When it rains on a Friday or Saturday, total card spending decreases by 8%, compared to a 6% decrease on other days. By business sector, the decline in offline shopping spending due to precipitation widens from 7% on other days to 8% on Fridays and Saturdays, while the drop in offline service spending—such as dining out—increases from 10% to 11%.

In contrast, during heat waves or cold waves, unlike precipitation events, card spending on Fridays and Saturdays showed smaller declines than on other days or exhibited limited statistical significance. This is likely because, although heat waves and cold waves can restrict overall offline activity, heightened seasonal demand—discussed earlier—may have partially offset the negative impact of adverse weather conditions.

While the effect of precipitation on card spending is pronounced on Fridays and Saturdays, the impact of heat waves or cold waves shows little variation across days of the week.

Figure 10. Day of the week × heat waves → impact on card spending¹⁾

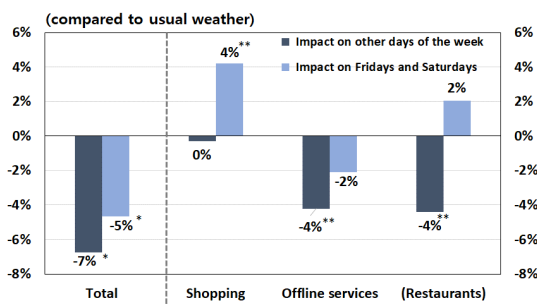


Figure 11. Day of the week × cold waves → impact on card spending¹⁾

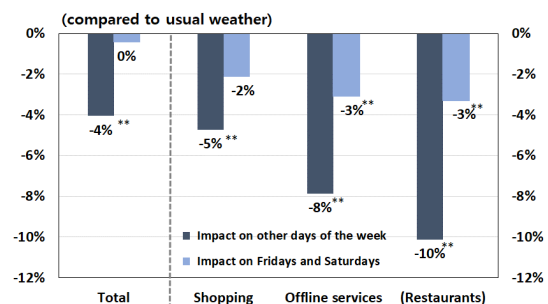
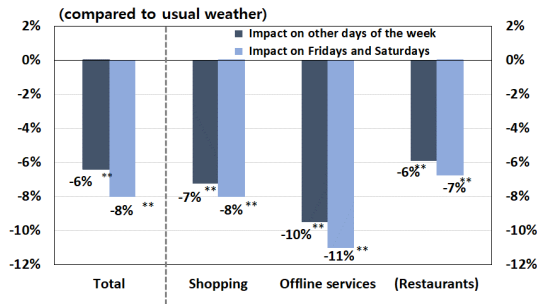


Figure 12. Day of the week × precipitation → impact on card spending¹⁾



Note: 1) ** and * indicate significance levels of 95% and 90%, respectively.
Source: authors' estimates.

10. Meanwhile, there is evidence of a pent-up effect, where planned spending is postponed during rainy weather and rebounds when conditions improve. Using the case analysis method shown in Table 3, spending patterns on weekends—which have similar consumption patterns—were examined. When it rains on a Saturday and clears up on a Sunday, card spending on that Sunday is found to be higher than on Sundays when the weather remains clear throughout the entire weekend. Typically, rain on Sundays results in a decline in offline consumption, contributing -0.6 percentage points to the overall card spending decrease of 1.0% compared to Sundays with clear weather (see Figure 13). However, if rain on Saturday is followed by clear skies on Sunday, card spending increases by 1.3%—primarily in offline expenditures—relative to weekends when the weather remains clear throughout. This demonstrates that the decline in consumption caused by precipitation can be partially offset by a pent-up effect once the weather improves.¹⁴

These findings confirm the intertemporal substitution effect on consumption driven by weather conditions, as noted earlier. When rain on Saturday is followed by clear weather on Sunday—as forecasted—the intertemporal (pent-up) effect on consumption can be substantial. Conversely, if rain occurs unexpectedly on Saturday or persists throughout the weekend, the magnitude of this substitution effect may be reduced.

Table 3. Case study: Pent-up effect after precipitation

① **Cases of different weather conditions on weekends**

Case A: Sunday with rainfall exceeding 20mm

Case B: Sunday with clear weather (no heat waves, cold waves, or precipitation)

Case C: Sunday with clear weather following a Saturday with rainfall exceeding 20mm

Case D: Sunday with clear weather on both Saturday and Sunday

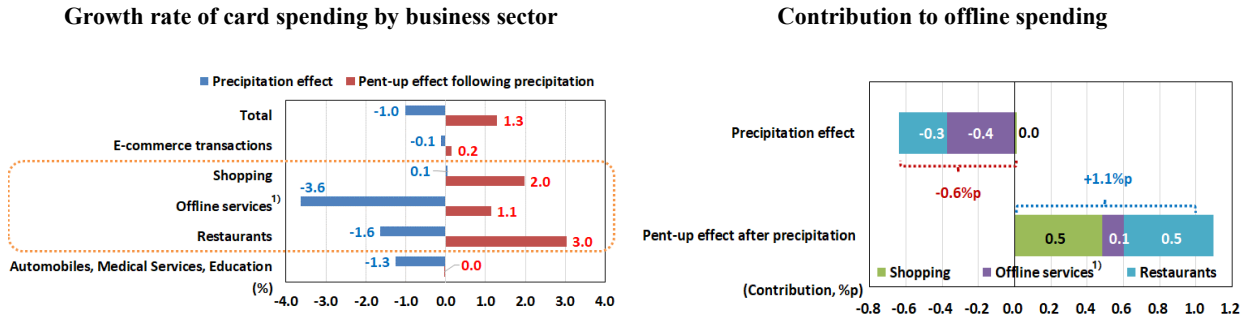
② The (1) **Precipitation Effect** and (2) **pent-up effect after precipitation** are calculated using **daily average card spending** for each case, as follows:

(1) Precipitation Effect = (Case A) / (Case B)

(2) Pent-up effect after precipitation = (Case C) / (Case D)

¹⁴ This study cases where rain on Saturday is followed by clear weather on Sunday, focusing on weekends when the pent-up effect is pronounced. However, the strength of the pent-up effect may vary considerably depending on factors such as weather predictability, the intensity and duration of adverse weather conditions, and differences in spending patterns across days of the week.

Figure 13. Impact of precipitation on Sunday spending and the pent-up effect



Note: 1) Excluding restaurants.
Source: authors' estimates.

III. Impact of Adverse Weather Conditions on Consumption This Year

11. Based on our analysis, we estimated the effects of major weather events on private consumption during specific periods this year. **The cold waves early in the year and the summer heat waves are estimated to have reduced the private consumption growth rate by approximately 0.18 percentage points.** However, the number of precipitation days during the same period this year was lower than in previous years (2023-2024), boosting consumption by 0.09 percentage points. **As a result, the overall impact of weather conditions on private consumption growth this year is estimated at -0.09 percentage points.**¹⁵

12. **First, adverse weather conditions—such as the cold wave during the first quarter—are estimated to have reduced this year’s private consumption growth rate by 0.02 percentage points** (see Figure 16). Early in the year, private consumption declined from the previous quarter, as persistent sluggish consumer sentiment from late last year was compounded by the cold wave. During the first quarter, the nationwide average number of days when daily high temperatures fell below zero was 6.5—significantly higher than in recent years (3.9 days in 2023 and 2.8 days in 2024). However, in terms of precipitation, although there was substantial snowfall, the nationwide average number of days with precipitation exceeding 20mm was only 0.6—lower than in recent years (1.1 days in 2023 and 2.0 days in 2024; see Figure 14).¹⁶ Considering these weather conditions, while the first quarter’s cold wave—which was more severe than in recent years—reduced annual private consumption growth by 0.03 percentage points, below-normal precipitation levels boosted it by 0.01 percentage points. Overall, early-year weather conditions are estimated to have reduced this year’s private consumption growth by 0.02 percentage points.

13. **Next, adverse weather conditions such as the record-breaking heat wave this summer (June through August) are estimated to have lowered the private consumption growth rate by approximately 0.07 percentage points.** The nationwide average number of heat wave days—defined as days with daily high temperatures exceeding 35°C—was 7.3, significantly higher than in recent years (1.4 days in 2023 and 3.8 days in 2024). However, the nationwide average number of days with daily precipitation above 20mm was 9.8—lower than in recent years (16.2 days in 2023

¹⁵ However, given that the confidence intervals of the estimates derived from earlier empirical analysis are relatively wide, the actual impact of weather on consumption may vary greatly depending on specific consumption conditions and overall economic circumstances. The 90% confidence interval for the estimates is -5% to -0.02% for cold waves, -12% to -2% for heat waves, and -7% to -5% for precipitation.

¹⁶ In the first quarter of this year, there were seven days in Seoul with snowfall exceeding 2cm—similar to the seven days recorded in 2024 and higher than the two days in 2023. Snowfall of 2cm is roughly equivalent to 2mm of precipitation; thus, days with precipitation above 20mm, as targeted in this study, refer exclusively to days of rain—not snow (see Footnote 6 on Page 4).

and 10.1 days in 2024; see **Figure 15**). Therefore, while an increase in the number of heat wave days reduced the private consumption growth rate by 0.15 percentage points, a decrease in the number of precipitation days raised it by 0.08 percentage points. Overall, the net effect on the private consumption growth rate is estimated at about -0.07 percentage points (see **Figure 16**).

More frequent cold waves and heat waves this year, compared to recent years, exerted downward pressure on consumption.

Figure 14. Average number of days with cold waves and precipitation in the first quarters of 2023-2025

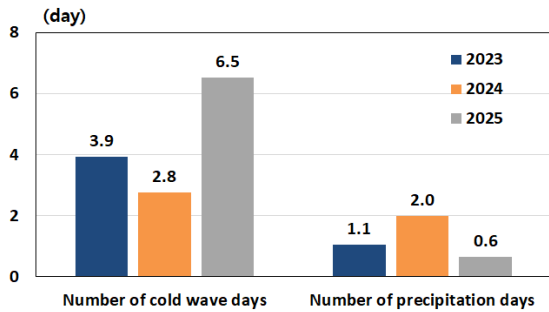


Figure 15. Average number of days with heat waves and precipitation in June-August, 2023-2025

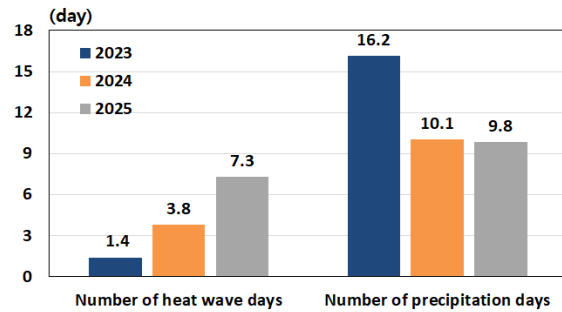
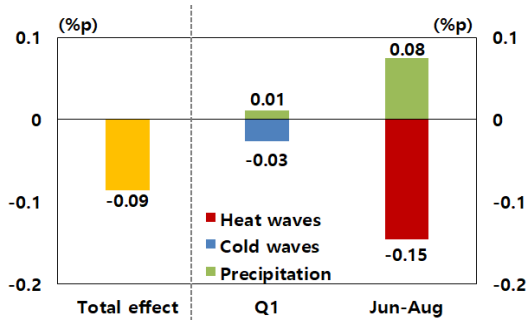


Figure 16. Impact of weather conditions on consumption in the first quarter and June-August in 2025.



Sources: Statistics Korea, authors' estimation.

IV. Assessment

14. This study demonstrates that both weather conditions and day of the week are important factors influencing the scale and composition of consumption. In the case of adverse weather, e-commerce transactions—such as online shopping, which are not influenced by weather conditions—showed no significant changes. However, offline spending, including offline shopping and dining out, declined compared to typical weather conditions, leading to a reduction in total card spending.

Moreover, both the scale and composition of consumption differed depending on the day of the week. On weekdays, expenditures related to automobiles, medical services, education, and online shopping—which typically occur on business days—were prominent. On Fridays and weekends, spending tended to concentrate on shopping at department stores and marts as well as dining out. In particular, when it rains on Fridays and Saturdays—periods with active offline spending—the decline in offline spending is more pronounced compared to other days of the week, as outdoor activities are restricted.

Meanwhile, the study also observed a pent-up effect where offline spending—temporarily restricted due to rain—partially rebounded after the weather cleared.

15. These findings offer valuable insights for predicting short-term consumption trends and identifying factors driving temporary fluctuations. Notably, the study confirmed that daily card spending data serves as high-frequency fundamental data, which enables prompt and accurate tracking of private consumption trends. Using card spending data, the quantitative impact of weather events—such as heat waves, cold waves, and precipitation—on consumption can be measured, enabling more effective distinction between underlying consumption trends and temporary fluctuations. Furthermore, when daily card spending data is analyzed in conjunction with weather forecasts and holidays, the accuracy of short-term consumption nowcasting can be further improved.

However, card spending data has certain limitations due to its inherent characteristics. The classification of merchants by business sector and region may differ from their actual categories, and it can be difficult to accurately identify business sectors and regions in e-commerce transaction data. Additionally, card spending data is based on approved transaction values and does not net out cancelled transactions. It also includes corporate card transactions, which are unrelated to private consumption. Therefore, caution is necessary when analyzing these data.

16. Looking ahead, as abnormal climate events become increasingly frequent, institutional changes in working hours and work arrangements—such as the adoption of remote work—may increase or sustain the volatility of consumption associated with weather conditions and day of the week. In response, ongoing efforts are needed to closely analyze changes in household consumption behavior and patterns using high-frequency data and further improve the accuracy of monitoring and forecasting consumption trends.

Change in Card Spending Before and After Temporary Holiday Designation

Card spending during two traditional holiday periods¹⁷ that were extended by temporary holidays—specifically, Chuseok in 2023 (October 2) and Lunar New Year’s Day in 2025 (January 27)—was analyzed and compared with spending during other traditional holiday periods (see methodology in Table A-1) to assess how consumption patterns change in response to the designation of temporary holidays. The analysis identified the following characteristics.¹⁸

First, when temporary holidays were designated, card spending before the extended holiday periods increased more than during other traditional holidays, but dropped again after the holidays ended. Compared to other traditional holidays, daily average card spending rose by more than 10% before these extended holiday periods and then decreased by 5% to 8% after these holiday periods ended. This phenomenon seems to be explained by an intertemporal substitution effect, as consumers executed their spending early in anticipation of longer-than-usual consecutive holidays.

Second, there was no significant change in daily average card spending during the four weeks¹⁹ before and after the consecutive holiday periods. As discussed above, given the consumption substitution before and after the holidays, the negative effect of fewer business days caused by the temporary holidays appears to have been offset by the positive effect of increased offline consumption during the holiday periods.

Third, card spending by business sector differed according to which temporary holiday was designated. During the 2023 Chuseok holiday, offline service consumption—such as dining out—during the consecutive holiday period rose by 4.4% compared to other traditional holidays. In contrast, during the 2025 Lunar New Year’s Day holiday, offline service spending declined slightly, both during the consecutive holiday period and in the weeks before and after it. This appears to be related to the fact that January 2025, which included the Lunar New Year’s Day holiday, saw a record number of outbound travelers. As a result, overseas travel increased sharply during the consecutive holiday period, which likely reduced domestic consumption during that period. Meanwhile, in business sectors other than offline services, card spending increased slightly compared to other traditional holidays. This may reflect a business day effect, since temporary holidays are not official legal holidays.

Table A-1. Method for comparing changes in card spending based on temporary holiday designation

- ① Traditional holiday periods with consecutive holidays from 2023 to 2025 are divided into a comparison group and control group.
 - **Comparison group: (1) Chuseok in 2023 and (2) Lunar New Year in 2025**, both of which were designated as temporary holidays
 - **Control Group:** Other traditional holidays, including Lunar New Year in 2023, Lunar New Year in 2024, and Chuseok in 2024
- ② **Daily average card spending** is calculated for both the comparison group and control group for each of the following periods: One week before the start of the consecutive holiday, the consecutive holiday period, one week after the end of the consecutive holiday, and the entire period spanning four weeks before and after the consecutive holiday (comprising four Mondays and four Sundays)
- ③ Card spending calculated as described in ② is **inflation-adjusted** using the consumer price index, and the averages are then **compared between the comparison group and control group**.

¹⁷ With the designation of Chuseok in 2023 and Lunar New Year’s Day in 2025 as temporary holidays, the total official consecutive holiday periods were extended from three or four days to six days.

¹⁸ There are limitations in assessing the effect of increased consumption resulting from the designation of temporary holidays. These limitations include: (1) an insufficient number of samples in the comparison and control groups, and (2) a lack of consideration for other control variables, such as economic conditions and weather during each period..

¹⁹ The analysis periods (four weeks) were defined to include four Mondays and four Sundays surrounding the consecutive holiday periods.

Figure A-1. Chuseok in 2023 (temporary holiday on October 2)¹⁾²⁾³⁾

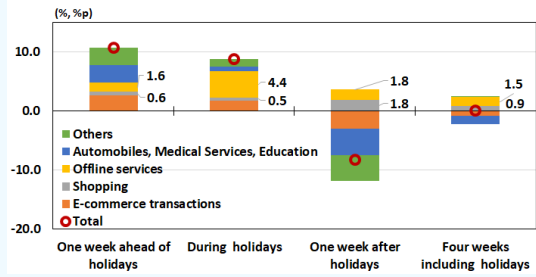
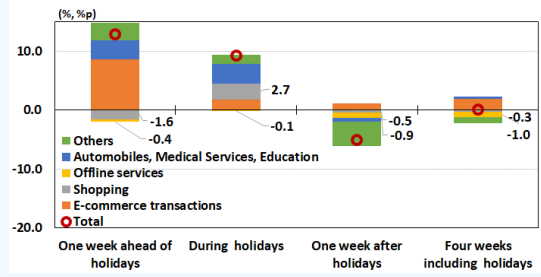


Figure A-2. Lunar New Year's holiday in 2025 (temporary holiday on January 27)¹⁾²⁾³⁾



Notes: 1) Comparison with average card spending on other traditional holidays from 2023 to 2025.

2) Contribution of each business sector to the total effect (%p).

3) Figures show the contributions from offline shopping (shown in gray) and offline services (shown in yellow).

Source: authors' estimation.

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