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Shifting Patterns in Payment Method Usage Before, During and After COVID-19: Insights from Maldives Transaction Data

FAEZA AHMED JAMEEL & MOHAMED IMTHINAN SAUDULLA

Maldives Monetary Authority

ABSTRACT *This study investigates shifts in payment method usage in the Maldives before, during, and after the COVID-19 pandemic using a Seemingly Unrelated Regression (SUR) framework. The analysis draws on aggregated quarterly transaction data from 2017 to 2024, obtained from the Maldives Monetary Authority (MMA), which includes ATM withdrawals (used as a proxy for cash), debit cards, cheques, and account transfers. Expenditure shares for each payment method are computed and analysed within the SUR framework. The model incorporates real income, inflation, pandemic and post-pandemic period dummy variables, and a time trend as explanatory factors. The results indicate a substantial and statistically significant decline in the use of cash and cheques during the pandemic, followed by further reductions in the post-COVID period. In contrast, account transfers exhibited a sustained and sharp increase. Debit card usage, however, showed no statistically significant change, suggesting limited behavioural substitution in that category. These findings identify the pandemic as a structural break that accelerated the adoption of digital payment methods in the Maldives. The evidence also points to a strong and lasting shift away from traditional payment methods toward digital alternatives in the Maldives. While such trends have been documented in larger economies, there is limited research on payment-dynamics in small island nations like the Maldives. This study contributed to the gap in literature by providing empirical evidence of how the pandemic catalysed a lasting transformation in payment practices in the Maldives—a small, tourism-dependent economy. The findings of the study underscore the need to strengthen digital financial infrastructure and ensure inclusive access during the ongoing transition.*

Keywords: Seemingly Unrelated Regression (SUR), Digital Payments, COVID-19, Payment Substitution

Introduction

The global coronavirus disease 2019 (COVID-19) pandemic resulted in an estimated 6.9 million deaths and was unprecedented in both magnitude and nature of its shock. In addition to the immediate health impacts, the economic implications of the global pandemic were profound, unemployment rates surged, trillions of dollars' worth of stock market were lost while the economic progress of several nations were impeded. Despite many global efforts, there are still many unresolved questions regarding the long term impact of the pandemic and the uncertain economic consequences which continue to challenge policymakers and economists.

Following the outbreak of COVID-19, a key area of focus among economists

has been the consumer response to the pandemic, particularly how consumers adjusted their spending habits and payment methods. Investigating consumption dynamics can inform policy decisions, promote market efficiency, and support sustainable economic development by revealing information about economic performance, consumer behaviour as well as societal repercussions (Fornaro & Wolf, 2020; Baldwin & Weder di Mauro, 2020). Existing research suggests that consumers typically reduce their expenditure in response to adverse shocks such as the pandemic, indicating heightened uncertainty, financial constraints, and diminished future confidence (Garret, 2008; Karlsson et al., 2014; Keogh-Brown et al., 2008; Rassy & Smith, 2013; Kostova et al., 2019; Correia et al., 2020; Fornaro & Wolf, 2020; Baldwin & Weder di Mauro, 2020a, 2020b).

While the majority of the existing studies focus on the magnitude of consumption declines, an emerging body of research also examines how the pandemic altered payment behaviours, with growing attention to the shift from cash to digital transactions. Studies in countries such as Denmark, France, the Netherlands, China, the United States (US), and the United Kingdom (UK) have leveraged transaction-level data to analyse changes in spending and payment methods. These studies report a shift from cash, largely driven by hygiene concerns and facilitated by improvements in digital infrastructure. Notably, although aggregate expenditure declined during lockdown periods, digital payment adoption increased, indicating a transformation not just in how much people spent, but also how they chose to pay.

This paper contributes to the growing literature by examining changes in consumer payment method usage in the Maldives, before, during, and after the COVID-19 pandemic, using transaction-level data. While prior studies largely centre on advanced economies with relatively robust digital ecosystems, less is known about how payment patterns evolved in smaller, island nations where payment systems are often concentrated and vulnerable to external shocks. The consumer response to the pandemic is distinctively pertinent, especially given the susceptibility of the Maldivian economy to external shocks such as the COVID-19 pandemic. The Maldivian economy suffered a significant contraction in 2020, with real gross domestic product (GDP) falling by 33.5% and household final consumption declining by 26.8%. Understanding how Maldivian consumers adapted to these unprecedented circumstances is essential for policymakers, financial institutions, and businesses seeking to improve economic resilience and digital inclusion. By identifying patterns in cash and digital payment usage, the study not only provides empirical evidence of the pandemic's role as a structural break in payment behaviour, but also extends new insights into how payment behaviour evolved in the context of small, island economies.

The primary objective of this paper is to investigate how the COVID-19 pandemic influenced the use of different payment methods in the Maldives and to determine whether these changes have persisted in the post-pandemic period. Specifically, the study addresses the following research questions: (i) How did the relative use of cash, cheques, debit cards, and account transfers change before, during, and after the pandemic? (ii) To what extent did macroeconomic factors such as real income and inflation, as well as pandemic-related shocks, drive shifts in payment behaviour? (iii) Does the pandemic represent a structural break that accelerated the adoption of digital payment methods in a

small island economy? By answering these questions, the paper aims to provide a comprehensive understanding of payment dynamics in a small, tourism-dependent economy, offering insights that can inform policy interventions to strengthen digital financial infrastructure and promote inclusive access.

Review of Literature

The COVID-19 pandemic significantly influenced consumer behaviour across various areas such as financial transactions, with the onset of the pandemic leading to a global shift in payment methods. Several studies documented how lockdowns, social distancing mandates, and health concerns related to handling cash spurred a rapid adoption of digital payment methods. These studies used granular transaction-level data from credit card and financial companies, which provided valuable insights into the consumer response to the pandemic and analysed consumption patterns and the shifts in consumer payment behaviour during the pandemic.

Bounie et al., (2020) employed transaction data from Groupment Carte Bancaires (CB) and Credit Mutuel Alliance Federale (CM) to analyse the evolution of consumption dynamics during the COVID-19 pandemic in France. The authors evaluated the expenditure dynamics across different payment methods and found that total credit card transactions including both CB and CM data series followed similar patterns—an initial decline during the lockdown, followed by a rebound once lockdown ended. However, CM series exhibited more volatility and showed credit card transactions exceeding the pre-pandemic levels post lockdown, whereas CB series displayed that credit card transactions remained below pre-pandemic levels.

Bounie et al., (2020) also found that both cheque payments and cash withdrawals declined more than credit card payments during the lockdown and continued to remain below the pre-pandemic level. This implies that, during the pandemic, customers shifted away from both cash and cheque transactions. Finally, the authors demonstrated that following an abrupt contraction due to the lockdown, overall spending recovered quickly, but continued to remain 2-3% lower than it would have been in the absence of the pandemic even after lockdown ended.

Akin to Bounie et al., (2020), several existing studies such as Andersen et al., (2020) and Carvalho et al., (2020) employed transaction data from banks to investigate consumption dynamics during the pandemic. Andersen et al., (2020) studied transaction level data from Danske Bank, which showed that during 2020, consumer expenditure in Denmark declined by roughly 27% relative to the forecasted trend (in the absence of the pandemic). The decline in consumption expenditure was significantly correlated with the stringency of government restrictions on economic activity and mobility between sectors and over time (Andersen et al., 2020). The authors also compared consumption expenditure across various categories and observed that cash withdrawals declined significantly more than overall expenditure, suggesting that consumers shifted away from cash-based payments. Andersen et al., (2020) proposed that this shift may have been driven by efforts to minimise health risks associated with handling physical currency such as coins and cash.

Greene et al., (2021) utilised data from a nationally representative survey conducted before and during the pandemic and found that by fall of 2020,

consumers had significantly reduced their use of cash for purchases and increased their reliance of electronic methods, particularly for person-to-person (P2P) payments. Notably, individuals working exclusively from home exhibited a higher propensity to make online or mobile payments and were less likely to use cash compared to those working in person, even after controlling for income and education levels (Greene et al., 2021). These changes were more pronounced than those observed between 2018 and 2019, suggesting that the pandemic accelerated existing trends toward digital payment adoption (Greene et al., 2021). In addition to this, Chetty et al. (2020) analysed anonymised private sector data on the consumption behaviour of US customers, which showed that the impact of COVID-19 on consumption varied significantly across regions and income groups. The authors also found that fiscal stimulus and policy changes have significantly influenced in shaping the consumption patterns during the pandemic.

In contrast, Baker et al., (2020) concluded a drastic increase in US credit card transactions as consumers borrowed to smooth consumption during the pandemic. The authors analysed de-identified transaction level data from a non-profit Fintech company that helps people maintain saving habits to examine household consumption during the pandemic. However, as the lockdown progressed, credit card spending gradually declined, although this decline was relatively smaller since credit cards can be used for online shopping despite social distancing (Baker et al., 2020).

Transaction data from a personal finance management application showed a significant decline in spending of British households during the COVID-19 pandemic (Chronopoulos et al., 2020; Surico et al., 2020). Surico et al., (2020) compared the average weekly spending data of UK households in 2020 with that of 2019, at 2020 prices, which indicated that spending decreased by 40-50% since the second week of March 2020. However, the most significant decline in consumption in the UK occurred prior to the implementation of both social distance policies and lockdown measures. Furthermore, Surico et al., (2020) noted that this decline was observed across all income levels, with low-income households experiencing a significantly higher reduction in the consumption.

The authors also noted that cash usage among UK customers has been declining significantly over the last two decades, and is projected to decrease further, due to the widespread adoption of contactless payments (Surico et al., 2020). In addition to this, the authors also examined the practice of cash hoarding during the pandemic and found that the onset of lockdown measures coincided with a significant increase in cash holdings. This can be attributed to heightened uncertainty, fears of losing access to bank accounts, potential failures in the payment system, or simply panic in response to the unprecedented situation (Surico et al., 2020).

Chen et al., (2020) adopted difference-in-differences approach and calculated specific regressions with interaction variables using card and mobile payment transaction data to investigate the impact of the pandemic on consumer behaviour across 214 cities in China. The analysis showed a rapid decline in offline consumption following the outbreak. Moreover, despite rebounding by the end of March 2020, consumption levels declined shortly after, amid concerns over a second wave of COVID-19 outbreak (Chen et al., 2020).

The authors also highlighted a key behavioural shift towards digital payment platforms such as mobile QR codes, as the pandemic prompted consumers to avoid physical cash due to hygiene concerns and social distancing norms.

Jonker et al., (2022) used different regression analyses and found a clear and persistent shift away from cash toward electronic payments during the COVID-19 pandemic in the Netherlands. The results also showed that the shift was not only driven by lockdown measures but also by long-term behavioural change, with safety concerns and digital readiness being key factors. The authors also noted that similar patterns were observed in Australia, Norway and Switzerland, where the pandemic has also led to increased usage of card payments at the expense of cash that are expected to last.

To summarize, studies conducted in several countries employed transaction-level data and found a decline in aggregate consumption during lockdown periods, with notable differences across sectors and income groups. This was followed by varying degrees of recovery across countries, reflecting both structural and policy-related differences. Moreover, the literature highlights a notable shift from cash to digital payment methods during the pandemic, largely driven by health concerns and supported by existing digital infrastructure. However, the permanence of this shift remains mixed and highly context specific. Despite a growing body of research on payment behaviour during the pandemic, there is limited empirical work using transaction-level data across a longitudinal timeline encompassing the pre-, during-, and post-COVID periods. Additionally, majority of the existing literature relies on consumer surveys or macro-level data. This creates a need for studies that analyse actual behavioural data to more accurately assess the permanence of payment method changes and their drivers.

Context of the Maldives

Several elements of the COVID-19 impact on the Maldives have been evaluated by different institutions. The Ministry of Economic Development and the United Nations Development Programme (UNDP) conducted a Rapid Livelihood Assessment on the Impact of COVID-19 Crisis in the Maldives and examined the impact on employment and Micro, Small and Medium Enterprises (MSME) as well as the broader socio-economic effects. They found that the impact on employment was immediate, spanning across all major sectors of the economy such as transport, wholesale and retail trade as well as construction, with employees in the tourism and food services sectors being most severely affected. The report also shows that the impact on employment was mostly in the form of job loss, no pay or reduced pay, with a significant 44%, 24% and 34% reporting redundancy or complete income loss, no pay leave and reduced pay, respectively (as per National Job Center data) (Ministry of Economic Development & UNDP, 2020).

The assessment also found that among the businesses that participated in the study, 81% of MSME businesses had to cease operations, with tourism sector and other related businesses being most severely impacted. It is likely that consumption expenditure will follow similar patterns across sectors as identified by this assessment. Employment shocks and income losses are expected to have triggered substantial consumption reductions. Moreover, reduced consumption

and employment may have led households to adopt cash-saving strategies or reduce ATM withdrawals. In addition, restricted mobility and consumer caution might have lead merchants and residents to rely more on digital banking or account transfers, especially for basic goods, accelerating the shift to non-cash transactions.

In line with these findings, a report on The Impact of COVID-19 Pandemic on Employment in the Maldives by the Ministry of Economic Development in 2021 affirmed that although the overall impact was limited as a result of the stimulus packages introduced by the Government, the pandemic has severely disrupted the labour market. The report also concluded that the gender impact of the pandemic was extremely heterogenous and that self-employed workers were drastically affected. In addition, many employees faced redundancy and salary deduction, and the immediate income losses were expected to impact consumption patterns of households directly (Ministry of Economic Development & UNDP, 2021).

Although an extensive study on the impact of COVID-19 on consumer dynamics in the Maldives has not been carried out yet, the Maldives Bureau of Statistics (MBS) conducted a rapid assessment of the impact of COVID-19 on Household Income, Expenditure and Employment (HIES) in 2021, which surveyed 486 informal workers. The report concluded that, by April 2021, more than 50% of the households that took part in the survey had to either curtail expenditure or utilise their savings in the face of the pandemic. However, it is noteworthy that representative spending surveys such as these do not precisely capture exact spending or income levels whereas the granularity offered by transaction-level data typically allow for a more accurate analysis of consumption and savings patterns. The use of real time insights from bank transaction data helps evaluate the magnitude of the economic hardship suffered by individuals and households, and the possible long-term implications on poverty, income inequality, and social welfare.

Data and Methodology

The empirical analysis in this study utilized quarterly transaction-level data from 2017 to 2024, sourced from the Maldives Monetary Authority (MMA), as reported by commercial banks. The dataset captured total transaction values across five payment methods: cheques, debit cards, credit cards, ATM withdrawals, and account transfers, without distinguishing between transactions made by households and those made by businesses.

The dependent variables are constructed as the share of total transaction value for four key payment types; cash (proxied by ATM withdrawals), debit cards, (In the regression analysis conducted in this study, transactions conducted via credit cards have been excluded given that the changes in credit card transactions may reflect shifts in lending standards or credit access rather than payment preferences–and accordingly, may distort the consumer behaviour analysis that is the focus of this paper) cheques, and account transfers. Explanatory variables include real income, inflation (CPI), a pandemic-period dummy (covering Q1-2020 to Q4-2021), a post-pandemic dummy (from Q1-2022 onward), and a linear time trend. Data on real income and inflation are obtained from the MBS via the Quarterly National Accounts (QNA) and Consumer Price Index (CPI) publications, respectively. Table S1 (Appendix) presents descriptive statistics for all the variables used in the

analysis.

The data used in this study are reliable and from official sources, providing a comprehensive record of transaction-level financial activity. Previous research studied transaction-level data to examine spending dynamics during COVID-19, highlighting the value of such data in capturing real-time, objective consumer payment behaviour that surveys may miss (Baker et al., 2020; Chen et al., 2020; Carvalho et al., 2020; Bounie et al., 2020; and Chronopoulos et al., 2020). This dataset is uniquely suited to examine shifts in payment behaviour in a small island economy such as the Maldives, where granular, high-quality data on financial transactions are scarce. Using these indicators ensures both reliability and relevance for addressing the research questions of the study, providing robust evidence of structural changes in consumer payment patterns in the pre-, during, and post-COVID periods.

In this regard, the main aim of this study is to understand the shifts in payment types before, during and after the COVID-19 pandemic. As such, this study initially computes the expenditure share for each payment type. More specifically, for each quarter, the share of total expenditure accounted for by each method is computed using the following formula:

$$Share_{i,t} = \frac{Value\ of\ Payment\ Method\ i\ in\ Quarter\ t}{\sum_i Value\ of\ Payment\ Method\ i\ in\ Quarter\ t} \times 100$$

where payment method "i" refers to ATM withdrawals, debit card transactions, credit card transactions, cheque transactions and account transfers.

Subsequently, to assess the determinants of each expenditure share and the evolution of each expenditure share across the different phases of the pandemic, a Seemingly Unrelated Regression (SUR) framework has been employed. The SUR framework, developed by Zellner (1962), is a multivariate regression framework designed to estimate multiple linear equations simultaneously when their error terms are believed to be correlated across equations. Each equation in a SUR system can have different explanatory variables and dependent variables, but the key distinguishing feature is the presence of contemporaneous correlation in the error terms. This approach uses the correlation to provide better estimates than if we ran separate Ordinary Least Squares (OLS) regressions for each equation.

The theoretical appeal of SUR lies in its ability to improve estimation efficiency without imposing structural constraints across equations. This method is particularly useful when the regressors differ across equations or are not perfectly collinear. By jointly estimating the system, SUR uses the full covariance structure of the errors to generate more precise coefficient estimates.

In the context of this study, where the dependent variables are the shares of total expenditure across different payment types, namely cash (ATM withdrawals), debit card usage, cheques, and account transfers, the use of SUR is highly appropriate. This is because SUR accounts for correlations between the error terms of these related equations, improving estimation efficiency and providing robust inference, even in longitudinal or smaller-sample datasets typical of small island economies (Zellner, 1962; Greene, 2008).

The payment methods are not chosen in isolation by economic agents. A decline in the use of cheques, for instance, could be accompanied by an increase in digital transfers or card payments, suggesting that the shifts across payment types are jointly determined. It is thus reasonable to expect that the error terms across these equations are contemporaneously correlated due to common unobserved factors like changes in policy, consumer preferences, or digital infrastructure. As a confirmation of this hypothesis, prior to implementing the SUR framework, a Breusch-Pagan Lagrange Multiplier (LM) test is conducted to assess whether residuals from the individual equations are significantly correlated, thereby justifying the use of the SUR model. Moreover, modelling the shares as a system aligns with the compositional nature of the data—where an increase in the share of one payment method may mechanically lead to a decline in others. One key advantage of the SUR framework is it provides a practical and flexible approach to account for these interdependencies without imposing rigid constraints. By using SUR, this study can also formally test whether the effects of key events—such as the COVID-19 pandemic and the post-COVID recovery period—are statistically different across payment methods. For example, it enables testing whether the increase in account transfers post-COVID is significantly larger than the change in card usage.

Furthermore, the dataset consists of quarterly observations across payment types over several years. Given the likely presence of macro-level shocks or seasonal behaviours that influence all payment modes simultaneously, SUR's allowance for correlated errors enhances the robustness and credibility of the results. This feature is particularly crucial when making policy-relevant inferences about consumer behaviour and digital transformation in a small island economy like the Maldives.

Finally, while a model such as a Vector Autoregressive Regression (VAR) would be more ideal to evaluate the dynamic interdependencies between the time series variables, such as how card usage this quarter impacts card usage in the next quarter as well as the usage of other payment methods dynamically, the limited sample frame implies that using a VAR in this study would lead to a potential overfitting and unreliable estimates. Accordingly, given the data limitations, the SUR framework is ideal for this study, as it allows for clear interpretation while also enabling robust hypothesis testing while accounting for interdependencies across the payment methods.

Apart from using SUR framework to understand the impact of the pandemic and post-pandemic on expenditure shares, this study also focuses on evaluating the importance of key factors in determining the expenditure shares, such as income, inflation and time trends.

Income was included as a core explanatory variable because payment behaviour is closely tied to economic activity and financial capacity. As household or aggregate income increases, individuals and businesses may shift their preferences toward more convenient or technologically advanced payment options, such as debit cards or transfers, while relying less on traditional modes like cash or cheques. Higher income levels may also signal greater access to banking infrastructure, enabling smoother transitions to digital payment systems. Thus, incorporating income captures the structural economic conditions that influence payment method choices over time.

Inflation is another critical macroeconomic variable that can alter the relative attractiveness and practicality of different payment methods. During periods of high inflation, people may prefer faster or electronic transactions to preserve purchasing power or to avoid the inconvenience of handling large volumes of cash. It may also prompt behavioural changes such as reduced use of cheques due to their processing delays. By including inflation in the model, we can isolate how broader price-level changes affect payment behaviour independently of income or policy shocks such as COVID-19.

The time trend captures any unobserved structural changes or gradual shifts in payment preferences that the other regressors fail to explain. For example, increased smartphone penetration, improvements in banking infrastructure, or changes in consumer attitudes toward digitalisation may evolve steadily over time. Including a linear time trend helps control for these latent temporal effects, ensuring that the coefficients on the pandemic-related dummies reflect deviations from an otherwise smooth transition in payment habits.

Finally, after factoring in the independent variables, the following system of equations is estimated simultaneously:

$$Share_{i,t} = \alpha_i + \beta_{1i} QNA_t + \beta_{2i} Inf_t + \beta_{3i} Pandemic_t + \beta_{4i} PostCOVID_t + \beta_{5i} Trend_t$$
$$+ \varepsilon_{i,t}$$

where:

- *QNA* is a proxy for income, as mentioned above, obtained using QNA data

- *Inf* is the year-on-year percentage change in CPI

- *Pandemic* is a dummy variable equal to 1 from Q1-2020 till Q4-2021

- *PostCOVID* is a dummy variable equal to 1 from Q2-2022 onwards

- *Trend* is a linear time variable to capture time trends in payment usage

- $\varepsilon_{i,t}$ represents the error term for payment method i

This study used anonymised, aggregated transaction-level data from the MMA, as reported by commercial banks, ensuring privacy and confidentiality. All data handling followed institutional guidelines, and no formal ethical approval was required. Potential researcher bias is minimized by relying on objectively reported data and employing established statistical techniques which reduce subjective interpretation in model specification.

As a complementary exercise to the analysis of payment method shifts, this study estimates the extent of aggregate consumption loss during the COVID-19 pandemic. Capturing changes in overall consumption levels provides essential context for interpreting observed shifts in payment behaviour, as such changes may reflect both substitution between payment instruments and broad-based contractions in spending.

To quantify the pandemic-induced decline in consumption, a normalised index was constructed based on monthly aggregate consumption data—a similar strategy

to that employed by Bounie et al. (2020). First, monthly aggregate consumption was computed as the sum of all the payment methods (debit and credit card transactions, ATM withdrawals, cheque transactions, and account transfers) for each month. Next, for each month in 2020, the ratio of consumption relative to the corresponding month in 2019 was computed. These raw ratios are then normalised by the average ratio observed during the pre-pandemic baseline period (January and February), under the assumption that early-year trends would have continued in the absence of the crisis. The resulting index captures deviations from a counterfactual consumption path that accounts for underlying growth dynamics. Specifically, the normalised consumption ratio for month t is defined as:

$$c_t = \frac{C_t^{2020} / C_t^{2019}}{\overline{C}_{Jan-Feb}^{2020} / \overline{C}_{Jan-Feb}^{2019}}$$

The loss in consumption for each month was then calculated as $Loss_t = 1 - c_t$. To estimate the total consumption shortfall during the peak disruption period, these monthly loss rates were then multiplied by the corresponding 2019 consumption values and summed. The aggregate was then expressed as a share of total annual consumption in 2019, yielding a measure of the proportion of yearly spending that was effectively lost due to the pandemic:

$$Share\ of\ annual\ consumption\ lost = \frac{\sum_{t \in disruption\ period} Loss \cdot C_t^{2019}}{\sum_{t=1}^{12} C_t^{2019}}$$

This method facilitates a meaningful estimate of lost consumption by controlling for pre-existing trends and seasonal patterns. By using 2019 consumption levels as a base and normalizing for trend growth, the approach avoids overestimating the impact of COVID-19 while still capturing the depth of the contraction. The resulting estimate serves as a relevant macroeconomic reference point and enhances the interpretation of behavioural responses reflected in payment method data during the crisis period.

Results

As mentioned above, prior to conducting the SUR estimations, the LM test has been done to ensure that the errors exhibit serial correlation. Accordingly, the Breusch-Pagan LM test statistic of 87.0955 (p < 0.001) supports the presence of cross-equation error correlations, confirming the SUR model's appropriateness.

Table 1 presents the results of the SUR estimations for each of the expenditure shares: debit card transactions, usage of cash proxied by ATM withdrawals, account transfers and cheque transactions.

Table 1. Results from SUR Analysis for Expenditure Shares (2017-2024)

| Variable	Debit Card	Cash	Account Transfers	Cheques
Intercept	0.034 (0.006) ***	0.084 (0.013) ***	0.433 (0.082) ***	0.442 (0.069) ***
QNA (Income)	-0.000 (0.000) **	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Inflation	0.038 (0.047)	-0.065 (0.103)	-1.022 (0.663)	1.047 (0.557)
Pandemic Dummy	-0.001 (0.003)	-0.016 (0.008)	0.189 (0.049) ***	-0.171 (0.041) ***
Post-COVID Dummy	-0.006 (0.005)	-0.024 (0.011) *	0.254 (0.071) **	-0.222 (0.059) **
Time Trend	0.001 (0.000) ***	0.000 (0.001)	0.009 (0.004) *	-0.010 (0.003) **

Standard errors are presented in the round brackets.
Significant levels: *** $P < 0.001$, ** $P < 0.01$, * $P < 0.05$

In the case of debit card transactions, the estimation results indicate that neither the pandemic nor the post-pandemic periods had a statistically significant impact on their expenditure share. This finding contrasts with existing literature, particularly from advanced economies, where a marked increase in card-based transactions was observed during the pandemic. Studies such as Bounie et al. (2020), Andersen et al. (2020), and Jonker et al. (2022) document a significant behavioural shift from cash to card usage, attributed to hygiene concerns, reduced physical contact, and increased availability of contactless payment options.

However, in the Maldivian context, debit card usage followed a steady, upward trajectory that predates the pandemic, with no significant deviation attributable to the crisis period (Figure 1). This suggests that the pandemic did not catalyse a structural break in consumer behaviour toward card payments. One possible explanation is the policy intervention by the Bank of Maldives (BML) in September 2020, which reduced the monthly limits on foreign transactions conducted via debit and credit cards—debit card transactions were capped at USD 250, and credit card transactions at USD 750—in response to escalating foreign currency pressures. While these limits were targeted at cross-border transactions, they may have discouraged card usage more broadly by constraining consumer expectations and limiting the perceived utility of cards, particularly in an economy where international purchases are common due to import dependence and tourism linkages.

Notwithstanding these constraints, an increase in local debit card usage might still have been expected, given the reduced reliance on cash during lockdowns and the shift to contactless payments observed globally. The lack of such a shift points to either infrastructural frictions—such as low point-of-sale (POS) penetration or limited merchant acceptance—or a stronger substitution toward alternative digital channels.

Figure 1. Share of Debit Card Transactions as a Percent of Total Expenditure 2017-2024 (in percentage)
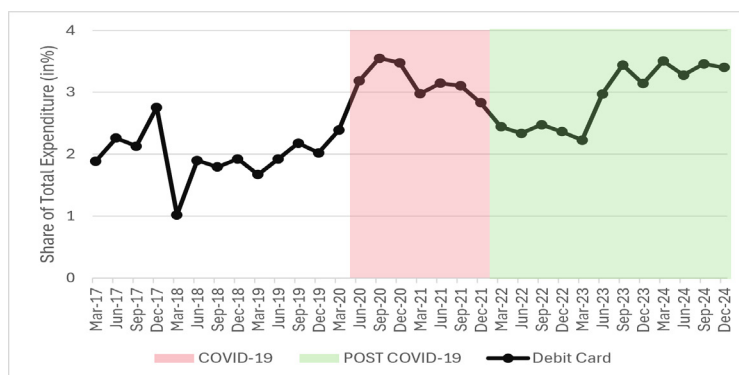
The estimation results for the share of cash usage as proxied by ATM withdrawals illustrate that while the pandemic had an impact on the share of cash usage, the post-pandemic period had a larger, more significant impact. For instance, the pandemic is expected to reduce the share of cash usage by 1.6%, which is significant at the 10% significance level, whereas the post-pandemic dummy has a coefficient of –2.4%, which is significant at the 5% significance level. These results suggest that while the initial behavioural response to the pandemic led to a reduction in cash usage, the structural shift away from cash deepened further after the crisis period, possibly reflecting increased comfort and institutional support for digital alternatives.

Notably, the time trend variable is not statistically significant in the regression for cash share, indicating the absence of a clear directional trend in ATM withdrawals prior to and following the pandemic. This suggests that changes in cash usage were largely event-driven—particularly tied to the pandemic and subsequent recovery period—rather than the result of a gradual or pre-existing transition. As illustrated in Figure 2, cash usage fluctuated over the sample period but does not display a consistent upward or downward trajectory outside the identified shock periods.

Figure 2. Share of Cash Transactions (ATM Withdrawals) as a Percent of Total Expenditure 2017-2024 (in percentage)
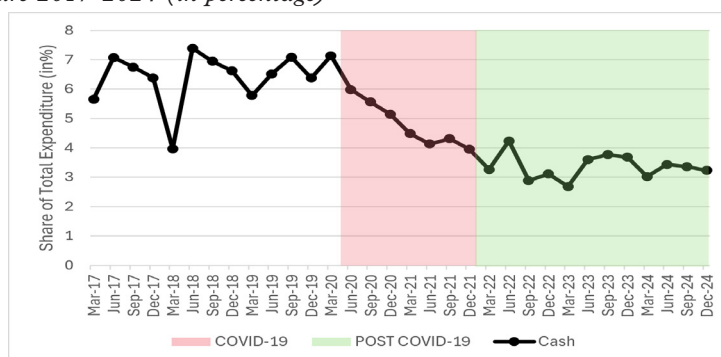
The results for the share of account transfers used by consumers and businesses illustrate the most significant behavioural impact resulting from the

pandemic and post-pandemic effects. The pandemic is expected to have resulted in increasing the share of account transfers in the overall economy by 18.9%, which is highly significant (p-value is less than 0.001), with the post-pandemic impact exerting an even higher pressure on the share of expenditure conducted via account transfers—the post-pandemic coefficient is a highly significant 25.4%. As Figure 3 indicates, prior to the pandemic, the share of account transfers as a total of aggregate expenditure was averaging at 45.0% with an increasing trend observed (as illustrated by the significant coefficient for time trend variable in the SUR regression for account transfers). This value jumped to an average of 74.7% during the pandemic and following the end of the pandemic, the share of account transfers has gone almost 12 percentage points higher.

Figure 3. Share of Account Transfers as a Percent of Total Expenditure 2017-2024 (in percentage)
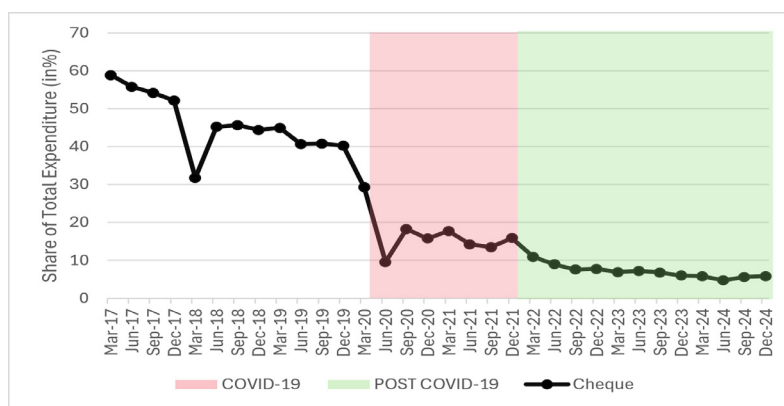

Note. The abnormal figure observed in March 2018 is attributed to a significant increase in the reported value of intrabank transactions by a specific bank during Q1-2018. This reporting anomaly resulted in a temporary spike in total transaction values for that quarter.

This pronounced rise likely reflects a broader behavioural shift toward digital payment methods, catalysed by pandemic-related disruptions and reinforced by structural and institutional factors. Unlike card payments, account transfers in the Maldives are widely accepted by businesses, including small merchants and service providers, and often preferred due to their cost advantages. Specifically, many businesses opt for account transfers over card payments to avoid the merchant discount fees typically charged by acquiring banks. This economic incentive, combined with rising consumer familiarity with mobile and internet banking platforms, has likely accelerated the adoption of account-based digital transactions. The persistence of this trend in the post-pandemic period suggests a more permanent transformation in payment preferences and points to a maturing digital payment ecosystem in the Maldives.

In contrast, the results for cheque usage indicate that cheque transactions experienced the most significant decline during and after the pandemic. The share of cheque usage fell by 17.1% during the pandemic and declined by an additional 5 percentage points in the post-pandemic period, both effects highly

indicating that each quarter the share of cheque transactions is expected to decline by 1 percentage point. As shown in the Figure 4, prior to the pandemic, the share of cheque transactions averaged at approximately 46.2% (albeit on a declining trend), which fell to 16.8% during the pandemic and is currently appearing to hover around 5-6%, illustrating the significant impact of the pandemic and post-pandemic effects.

Figure 4. Share of Cheque Transactions as a Percent of Total Expenditure 2017-2024 (in percentage)
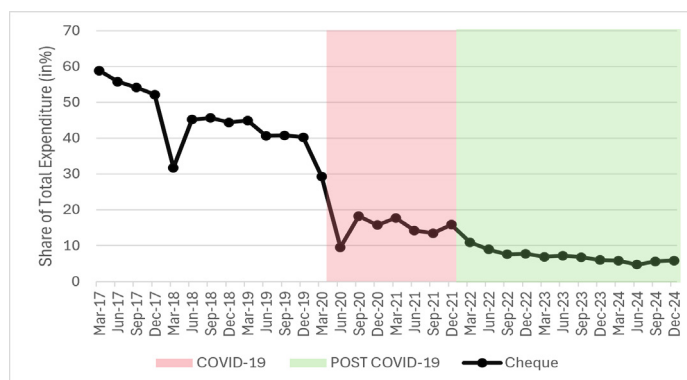
This pronounced shift from cheques to account transfers can be attributed to two key developments. Firstly, with MMA's strategic focus towards reducing the dependency on cash and cheques, an Action Plan on reducing the Usage of Cheques was initiated in the third quarter of 2020 (MMA, 2023). The Action Plan involved imposing value ceilings on cheques, such as imposing a value ceiling of MVR 100,000 and USD 5,000 on all cheques collected by government entities and state-owned enterprises (SOEs), encouraging banks to facilitate the use of digital modes of payment (MMA, 2023). Although some measures were postponed, initial phases successfully encouraged greater adoption of digital payment solutions, especially within government transactions.

Secondly, MMA successfully implemented the Maldives Instant Payment System (MIPS), Favara, in August 2023, which facilitated a new wave of instant digital banking in the Maldives. Favara enables instant, real-time payments across all islands and banks, promoting interoperability among banks and payment service providers with 24/7/365 availability (MMA, 2023). This infrastructure has further accelerated the shift toward digital banking, making instant payments accessible and convenient for consumers and businesses alike.

The results for the other independent variables show limited explanatory power overall. Income is a statistically significant predictor of the share of debit card transactions, although its coefficient is practically negligible. Inflation, meanwhile, is not significant in any of the SUR models.

As mentioned above, along with understanding the behavioural shifts in payment methods, it is also crucial to explore whether there are any significant contractions in the overall expenditure of the economy following crisis periods such as the COVID-19 pandemic. A complementary analysis in this study investigates

the extent of aggregate consumption loss during the pandemic and highlights several key findings.

To begin with, aggregate consumption remained relatively stable prior to April 2020. However, this changed markedly following the closure of international borders on 27th March 2020 and the implementation of the first national lockdown on 15th April 2020. As shown in Figure 5, aggregate consumption fell sharply, by nearly 40%, in the first month of the lockdown. This contraction persisted through to the end of July 2020. Notably, July 2020 marked a turning point, as the Maldivian government began easing major restrictions, including the reopening of borders to tourists on 15th July 2020.

While aggregate consumption rebounded to pre-crisis levels in August 2020, a second notable decline emerged from October 2020 onwards. Unlike the initial contraction, this subsequent downturn did not align with renewed lockdowns or mobility restrictions. Instead, it appears to be associated with the tightening of foreign transaction limits implemented in September 2020. As discussed earlier, these restrictions significantly curtailed consumers' ability to conduct international purchases using debit and credit cards and may have contributed to a renewed contraction in overall consumption within the economy.

Figure 5. Evolution of Monthly Aggregate Expenditure 2020
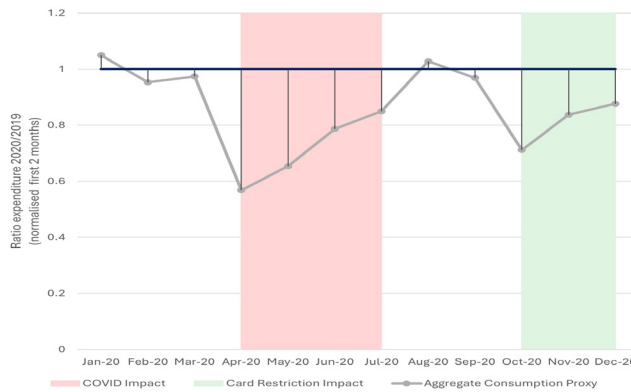
Note: The figure reports the evolution of monthly aggregate expenditure observed from data gathered by MMA. The graph plots $c_t = \frac{C_t^{2020}/C_t^{2019}}{\overline{C}_{Jan-Feb}^{2020}/\overline{C}_{Jan-Feb}^{2019}}$ where C_t^{2020} corresponds to aggregate expenditure in months t of 2020 and $\overline{C}_{Jan-Feb}^{2020}$ corresponds to average aggregate expenditure in the first 2 months of 2020. The normalised procedure deals with both seasonality in expenditures and the overall trend in expenditure over time. The graph therefore measures how expenditure deviates from its 2019 level, once accounting for the general trend that would have occurred between 2019 and 2020 absent the pandemic.

Cumulatively, the decline in aggregate spending between March and July 2020 is estimated to correspond to a 9.4% reduction in annual expenditure. Importantly, the effects of the pandemic in the Maldives extended beyond the lockdown period. Following the BML's policy change in September 2020 on card limits, a further

5.0% reduction in annual consumption was observed. Together, these losses amount to an estimated 14.4% decline in annual spending. In contrast to countries like France, where Bounie et al., (2020) found that consumption losses were largely confined to lockdown periods, the Maldivian case illustrates how both public health measures and financial sector policies jointly shaped economic outcomes. The combination of lockdowns, border closures, and foreign transaction limits significantly dampened aggregate demand and led to a prolonged contraction in consumption.

Limitations

While transaction-level data offers a rich source of empirical evidence, several limitations should be considered when interpreting the findings of this study.

Firstly, the dataset only captures five payment methods; credit and debit cards, account transfers, cheques and cash (proxied by ATM withdrawals). As a result, we cannot account for informal cash-based transactions, as ATM withdrawals serve only as a proxy and may not accurately reflect actual cash spending behaviour. For instance, cash withdrawals may be for cash hoarding purposes or withdrawal without spending, which could misrepresent the cash usage trends. As a result, the observed decline in cash-based transactions during the pandemic period may be exaggerated, and the true reduction in cash usage could be significantly smaller.

Second, while the study focuses on changes in the COVID-19 period, as mentioned previously, it is difficult to disentangle the effects of the pandemic from other concurrent influences such as regulatory interventions, policy changes, technological changes, or economic stimulus measures. For example, increased digital adoption could reflect greater merchant acceptance or improvements in digital infrastructure, rather than purely consumer-driven behaviour. These overlapping influences introduce uncertainty in attributing causality to the pandemic alone.

Finally, the post-pandemic period in this study begins from 2022 till 2024, providing only a short observation window. Some of the observed changes may therefore reflect short-term behavioural adjustments to the immediate aftermath of the pandemic rather than permanent structural shifts. Longer-term data would be required to determine the persistence of these changes and to assess whether the observed trends represent lasting transformations in payment behaviour.

Conclusion

The study employs Seemingly Unrelated Regression (SUR) method to explore the shifts in payment methods in the Maldives before, during and after the COVID-19 pandemic, using quarterly transaction-level data from 2017 to 2024. The findings show a decline in traditional payment methods such as cheques and cash, while digital alternatives such as account transfers increased.

As such, while cash usage remained relatively stable prior to the pandemic, both the pandemic and post-pandemic period observed statistically significant declines in cash usage, with a larger decline in the post-pandemic period. Additionally, cheque usage observed the sharpest decline during the pandemic, with an additional decline observed post-pandemic. The pre-existing downward trend in cheque usage prior to the pandemic was further accelerated by MMA's cheque

reduction initiatives and the launch of the Favara instant payment system in 2023. The sharp and ongoing decline in cheque usage suggests that policy measures aimed at phasing out cheques, such as limiting cheque values are effective and should be maintained or expanded.

Account transfers exhibited the most significant growth, observing a statistically significant increase in their share both during and the post-pandemic period. The significant increase in the use of account transfers, both during and after the pandemic underscores the need for sustained investment in digital payment infrastructure and awareness campaigns to encourage broader adoption. Additionally, continued support for platforms like Favara and further integration of government and utility payments into such systems could reinforce this shift. In contrast, share of debit card payments had no statistically significant impact in both the pandemic and post-pandemic periods. Nevertheless, debit card payments exhibited a consistent upward trend over time, suggesting that growth in debit card usage was driven by pre-existing trends. The lack of a strong pandemic-driven shift in debit card usage indicates that certain digital channels may require additional incentives, such as improved merchant acceptance. Moreover, reducing the exposure to fraud and cybercrimes is crucial to steer consumers towards the adoption of digital payment methods. As such, policy measures could be targeted towards strengthening legal and regulatory frameworks for cybersecurity and ensuring robust consumer protection mechanisms.

In addition to this, the paper investigated the magnitude of the aggregate consumption loss and found that aggregate spending fell sharply during the initial lockdown (April to July 2020), rebounding by August 2020 with borders reopening. However, a second contraction occurred following BML's foreign transaction limits on cards in September 2020. Overall, the pandemic led to an estimated 14.4% decline in annual consumption, highlighting that both public health measures and financial sector policies significantly shaped consumption patterns.

While the analysis offers insights into aggregate payment behaviour, several limitations warrant caution. Notably, the proxy used for cash (ATM withdrawals) may not accurately capture actual cash use behaviour. It is also challenging to isolate the effects of COVID-19 from other simultaneous factors like policy changes and technological advancements, making it difficult to attribute changes solely to the pandemic. Additionally, the short post-pandemic observation period may capture only temporary behavioural shifts rather than long-term changes, highlighting the need for extended data to assess the durability of these trends.

Despite certain limitations, the evidence highlights changes in the Maldivian payment system, with long-term implications for financial inclusion, banking practices, and monetary policy transmission. Further research could focus on disaggregating payment data by household and business segments to better understand behavioural differences across user groups. Further, the use of demographic level data characteristics would also allow for more granular insights into payment preferences and digital adoption barriers across income and population groups. Future studies could also explore the impact of financial literacy on digital payment uptake as well as investigate the role of merchant acceptance to provide an insight into the supply-side drivers.

Appendix

Table S1. Descriptive Statistics

Variables	Cheques	Debit Card	Credit Card	Cash	Account Transfer	Total Expenditure	(QNA) Income	Inflation
N	32	32	32	32	32	32	32	32
Mean	0.241	0.026	0.004	0.049	0.679	142360532.094	21183586445.931	0.011
Std. Dev	0.186	0.007	0.001	0.016	0.196	57625875.393	3697195198.116	0.019
Median	0.158	0.025	0.004	0.044	0.762	120374775.321	21631651368.527	0.008
Min	0.047	0.010	0.003	0.027	0.331	60873525.323	10857202241.178	-0.040
Max	0.588	0.035	0.007	0.074	0.881	252208607.130	27191154477.862	0.042
Skewness	0.504	-0.209	0.257	0.169	-0.477	0.357	-0.979	-0.408
Kurtosis	-1.427	-0.972	-1.000	-1.596	-1.455	-1.475	0.917	-0.142

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