

Consumer Spending Responses to the COVID-19 Pandemic: An Assessment of Great Britain

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ABSTRACT

Since the first death in China in early January 2020, the coronavirus (COVID-19) has spread across the globe, dominated the news headlines and led to fundamental changes in the health, social, political and economic landscape. In this paper, we examine consumer spending responses to the onset and spread of COVID-19, and subsequent government imposed lockdown in Great Britain, GB (England, Scotland, Wales). Our sample period spans January 1st 2020 to 7th April 2020. This allows us to observe consumer spending behavior from the initial incubation phase of the crisis. We partition the sample period into incubation (1st-17th January), outbreak (January 18th-February 21st), fever (February 22nd-March 22nd) and lockdown (March 23rd-7th April 2020) phases. Using a high frequency transaction level proprietary dataset comprising 98,796 consumers and 19.8 million transactions made available by a financial technology company, we find that discretionary spending declines during the fever period as the government imposed lockdown becomes imminent, and continues to decline throughout the lockdown period. There is a strong increase in groceries spending consistent with panic buying and stockpiling behaviour in the two weeks following the World Health Organisation (WHO) announcement describing COVID-19 as a pandemic. We also observe variations in the level and composition of consumer spending across nations and regions (particularly during the early stages of the outbreak period), and by age, gender and income level. Our results are of particular relevance to government agencies tasked with the design, execution and monitoring economic impacts arising from the spread of the virus and the public health measures imposed to mitigate the health costs of the crisis.

Keywords: Consumption, Coronavirus, COVID-19, Great Britain, Household Finance, Households, Pandemic.





1. INTRODUCTION

This study investigates the impact of the coronavirus (COVID-19) on consumer spending in Great Britain (GB). Since the first death in Wuhan, Hubei, China in early January 2020, the COVID-19 virus has spread across the globe and dominated the news headlines. The outbreak and initial spread of the virus was confined to China, but then spread through Asia, Europe and the rest of the world.² On March 11th 2020, the World Health Organization (WHO) declared COVID-19 as a global pandemic. By April 23rd 2020, the number of official cases exceeded 2.7 million and deaths exceeded 190,000.³ Beyond the health and social costs, the economic damage to households, firms and the wider economy resulting from the outbreak of COVID-19 are likely to be enormous.

In this paper, we present initial estimates of consumer spending responses to the onset and spread of COVID-19 in Great Britain, where the first documented cases of COVID-19 were reported in the city of York in late January 2020. The virus evolved quickly from a few isolated cases, to incidence across the country, and leading to the UK becoming one of the worst affected countries in the world. By the 22nd April, the number of official cases in the UK exceeded 140,000 and deaths exceeded 18,000. As the virus spread, the UK government and devolved administrations introduced successive public health measures aimed at curbing the spread of the virus. This culminated in late March 2020

² Unchecked the spread of COVID-19 (and indeed any virus) depends crucially on the rate of transmission across individuals, which is driven by the relative levels of: those open to contracting the virus; those currently infected by the virus; and those have contracted the virus and have either recovered or passed away. However, active public health intervention measures (nonpharmaceutical interventions, NPIs) can affect the evolution of the virus, and mitigate the negative impacts of the crisis on public health, public services and the wider economy. The public health interventions used to slow virus transmission vary across countries, and continue to evolve at the time of writing. These responses have ranged from compulsory quarantining of known cases; voluntary quarantining of households (where a member of the household) is exhibiting symptoms; social distancing and shielding of vulnerable individuals and those exceeding 70 years of age; social distancing across all age groups; and the closure of schools, universities and non-essential workplaces (Ferguson, 2020). The effectiveness of such measures in slowing the spread of the virus is still to be determined with any certainty (Agosto et al, 2020; Anderson et al, 2020; Atkenson, 2020; Ferguson, 2020; McKibbon & Fernando, 2020). However, the more extensive the public health intervention measures aimed at slowing the rate of infection are, the less significant the macroeconomic costs are likely to be (Gourinchas, 2020; Greenstone & Nigam, 2020). Koren and Peto (2020) present theory-based measures by industry and location of the extent to which US businesses rely on close human interaction human interaction, and thus which are most likely to be significantly affected by social distancing measures. See also Elgin et al (2020) for an early analysis of cross country economic policy responses.

³ Officially recorded COVID-19 global cases are updated daily by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University <u>https://coronavirus.jhu.edu/map.html</u>.



with: enforced closures of non-essential businesses; prohibition on large gatherings; cancellations of sporting events; extensive restrictions on freedom of movement; social distancing; and isolation of vulnerable individuals. Alongside, these health measures, the UK government introduced an extensive set of fiscal support measures for households and businesses in order to mitigate lost income and ensure stability in employment for millions of workers.⁴ In the medium term this is likely to have significant implications for public sector borrowing and debt (OBR, 2020).

Observing the impact of COVID-19 and government interventions on consumer spending presents significant challenges given that official statistics produced by government agencies come with a lag, and as such do not provide an accurate picture of current spending.⁵ For example, the *Family Spending in the UK Report* for April 2018 – March 2019 produced by the UK Office of National Statistics was published in March 2020.⁶ Fortunately, recent advances in information technology and financial applications that allow consumers to manage money more efficiently have allowed the real time collection of transaction level data via supermarkets, financial institutions and technology platforms. This enables researchers to conduct more granular analysis of patterns in consumer spending and saving as they occur (Gelman et al, 2014; Pistaferri, 2015; Aladangady et al, 2019; Kolsrud, 2019). Thus improving the accuracy of empirical testing and reducing potential problems inherent in using survey or experimental data (De Nicola & Gine, 2014; Karlan & Zinman, 2008)⁷ as well as providing up to date information to policymakers.

In order to assess the impact of the COVID-19 pandemic on consumer spending, we collect data from Money Dashboard. Money Dashboard is a popular personal finance application, which aggregates all transactions from linked bank accounts and credit or

⁴ These measures included: short-term funding to non-financial firms (Covid Corporate Financing Facility; Coronavirus Business Interruption Loan Scheme); tax deferrals and rates holidays; employer grants (Coronavirus Job Retention Scheme) and the self-employed.

⁵ Coronavirus outbreak will harm UK data collection and statistics, Financial Times, 2nd April 2020.

⁶ In March 2020, the UK Office for National Statistics (ONS) commenced collecting new experimental indicators on the UK economy and society. These indicators are constructed from novel data sources (including small scale surveys of approximately 4000 UK businesses and 1500 individuals) and experimental methods (such as scraping on-line prices data from supermarkets and other large shops), and include information regarding COVID-19.

⁷ Data is produced by financial service providers such as mint.com (US), Money Dashboard (UK) or Meniga (Iceland). Notable examples of recent papers using this type of data include Baker (2014), Gelman et al. (2014), Kueng (2015), Baker et al (2018), Carlin et al. (2017), Olafsson & Pagel (2018), Gelman et al (2020).



debit cards for users located throughout Great Britain (GB). Our sample contains 19.8 million transactions carried out by 98,796 individuals over the period January 1st, 2020 to April 7th, 2020. This allows us to observe consumer spending responses during the period from the incubation of COVID-19 in the UK. We partition our sample period into four phases or sub-periods, which are labelled *incubation, outbreak, fever* and *lockdown*. The *incubation* phase covers the period 1st to 17th January. *Outbreak* covers the period January 18th to February 21st. The *Fever* phase spans February 22nd to March 22nd Lockdown covers the period since March 23rd when Prime Minister Boris Johnson declared that every individual (barring non-essential workers) should stay at home (unless taking necessary exercise or trips to purchase essential food and medical items) and that non-compliance would be subject to police intervention and enforcement.

In order to conduct our analysis, we proceed as follows. First, we examine total discretionary spending (defined as the sum of spending in categories such as groceries, dining and drinking, alcohol, gambling, games and gaming, and other related items, which individuals can influence directly) at: GB level; nation level (England, Scotland and Wales); and regional level (East Midlands, East of England, London, North East, North West, Scotland, South East, South West, Wales). Second, we analyse specific spending categories such as groceries spending and going-out (dining and drinking) related expenses by nation and region to better understand heterogeneities in consumer spending responses across different locations.

By way of preview, our findings suggest at GB level, discretionary spending remains relatively stable throughout the *incubation, outbreak* and most of the *fever* phases of our sample period. As the government imposed lockdown becomes imminent, discretionary spending declines markedly. This decline continues throughout the *lockdown* period. By spending category, there is a strong increase in groceries spending for the two weeks following the announcement of COVID-19 as a pandemic by WHO. This is consistent with panic-buying and stockpiling behaviour reported widely by UK media outlets.⁸ Grocery spending declines considerably at the onset of the *lockdown* period. Spending on dining and drinking increases during the *outbreak* and early weeks of the *fever* period

⁸ See for example: 'Coronavirus: Supermarkets ask shoppers to be 'considerate' and stop stockpiling', BBC News, 15th March 2020, <u>https://www.bbc.co.uk/news/business-51883440;</u> 'Supermarkets take measures to control panic buying', Financial Times, 18th March 2020, <u>https://www.ft.com/content/737a9a24-68ea-11ea-a3c9-1fe6fedcca75;</u> and 'How panic buying is affecting supermarkets', Economist, 21st March 2020, <u>https://www.economist.com/britain/2020/03/21/how-panic-buying-is-affecting-supermarkets.</u>



before declining (with the exception of a slight increase around the time of the government lockdown announcement). Moreover, we observe some variation in consumer spending responses across nations. For example, consumers based in Scotland appear to adjust spending more markedly during the early stages of the outbreak period. These consumers also appear to reduce spending on dining and drinking before counterparts located in England and Wales. At regional level, we observe stark differences in discretionary spending between the incubation and fever period, with consumers based in the South East, South West, and especially London reducing discretionary spending faster than counterparts located in other regions. We also observe differences in groceries spending growth with individuals located in Scotland and the East Midlands appearing to spend more between the incubation and fever period, which could be indicative of early stockpiling. Utilising additional information regarding gender, age and income levels of the individuals in our sample, we find that males spend significantly more than females. Younger individuals spend more than older counterparts. High income individuals spend more that low income counterparts. A key difference when considering spending reactions is the observation that older individuals appear to keep increasing dining and drinking expenditure until week nine of our sample period, while younger individuals exhibit declines in this form of spending in week seven. Females increase spending on dining and drinking related items up to week nine, while males show little increase during the first weeks of the fever period.

Overall, our results suggest that consumer spending has declined dramatically since the onset of the COVID-19 outbreak. As such our results offer real-time insights on consumer responses to the onset and spread of COVID-19, and on the impacts of the compulsory lockdown policy introduced by the UK government in late March 2020 (which imposed significant restrictions on the movement and activities of individuals). Consequently, we augment and complement recent studies utilising official UK government data, where estimates suggest that the outbreak and spread of COVID-19 is having significant (albeit uneven) economic and social impacts on UK households, businesses and the wider economy (ONS, 2020a, 2020b; OBR, 2020).

Our study contributes to the general literature on consumer spending. This literature suggests that consumers respond to negative shocks by reducing spending. Prior evidence suggest that such declines occur due to the onset of increased uncertainty, financial constraints or declining expectations regarding future income prospects (Baker & Yannelis, 2017; Baker, 2018; Gelman et al., 2020; Garmaise et al., 2020). Our study



is closest in spirit to that of: Baker et al (2020a) who find that significant changes in US consumer spending across a broad change of product categories, which differs by age, gender and family structure following the onset and spread of the COVID-19 virus; and Carvalho et al (2020) who find significant changes in Spanish consumer spending following a government imposed lockdown limiting individual movement.⁹ The results of our study suggest that the onset and spread of COVID-19 led to overall declines in consumer spending, but this varies considerably by product category where in some cases panic buying and stockpiling behaviour led to significant increases in groceries spending prior to a government imposed lockdown. By utilising our granular regional data, we also find that strong differences seem to appear between rural and urban areas within GB. Especially our data on behaviour in London suggests that in some categories individuals in London were very quickly changing their spending patterns.

We also contribute to the established literature on the economic impacts of pandemics as well as the emergent literature on the economic impacts of COVID-19. This rapidly growing literature (which is reviewed in Section 2) suggests that epidemics impose substantial costs to the real economy, which vary substantially across households, firms, industries and countries. The results produced in this study suggest that COVID-19 has negatively impacted average consumer spending. However, this decline masks variations across product categories, as well as the location, gender, age and income levels of consumers.

The rest of the paper is structured as follows. Section 2 provide a selective review of relevant literature. In section 3 we discuss our data sources and present summary information on consumer spending by month and by demographic. We also present the results of a descriptive empirical analysis of discretionary consumer spending at aggregate and selected product level at GB, nation and regional level as well as by gender and age. Section 4 provides concluding remarks where we provide a summary of key findings, caveats regarding the composition of the dataset and avenues where we are currently developing our research further.

⁹ In contrast to Carvahlo et al (2020) who rely on merchants' transactions, our dataset (described in detail in Section 3) utilises both demographic and geographic information on individuals executing transactions.



2. LITERATURE

In this section we provide a brief overview of literature regarding the impact of epidemics on economics outcomes. We also provide a selective review of recent studies that provide useful evidence regarding the initial impacts of the COVID-19 pandemic on businesses, stock markets and households.

Prior Epidemics

Prior literature suggests that epidemics such as the Spanish Flu (Almond, 2006; Garret, 2008; Karlsson et al., 2014; Guimbeau et al, 2020), avian influenza (Bruns et al, 2006), SARS (Chou et al, 2004; Hiu et al, 2004; Lee & McKibbin, 2005; Liu et al, 2005; Brahmbhatt & Dutta, 2008; Keogh-Brown et al, 2008), swine flu (Rassy & Smith, 2013) and Ebola (Kostova et al, 2004) impose substantial costs on the real economy.¹⁰ The extent of these costs varies considerably, and depends upon the extent and timing of public health interventions (Meltzer et al., 1999; Brainerd & Siegler, 2003; Bootsma, & Ferguson 2007; Karlsson et al., 2014; Correia et al., 2020).¹¹

Macroeconomic Evidence

Early evidence suggests that COVID-19 is likely to transfer significant costs to the global economy due to disruptions to global supply chains, and temporary and permanent closures of businesses with resultant negative consequences for output and employment (Fornaro & Wolfe. 2020; OECD, 2020).¹² The overall negative impact on the economy is likely to depend on the extent of government investments in healthcare, particularly in less developed countries (McKibbon & Fernando, 2020a, 2020b). Barro et al (2020) utilise data from the Spanish Flu pandemic to estimate the potential impacts of the COVID-19 virus on economic activity. Based upon the two percent death rate observed during the Spanish Flu pandemic, the authors suggest that this would equate to 150 million deaths arising from COVID-19. If realised, such a death rate would result in global

¹⁰ Jorda et al (2020) provide a useful discussion of the long-run economic consequences of pandemics from the Black Death of 1347 to the present day.

¹¹ Bloom & Canning (2006, 2014), Bloom et al (2018) and Fan et al (2017, 2018) provide useful overviews of the links between population health and economic outcomes.

¹² Baldwin & Weder di Mauro (2020a, 2020b) provide a collection of essay from leading economists regarding the likely impacts of COVID-19 on trade, finance, travel and monetary policy among others.



GDP and consumption declines of six and eight percent respectively. Fernandes (2020) contends the economic structure and industry composition will lead to a differential impact across countries, with more service-oriented economies likely to be most affected. Stock market volatility, newspaper-based coverage of economic uncertainty, and subjective uncertainty in business expectation surveys have all increased markedly following the onset of COVID-19 (Baker et al., 2020b; Leduc & Liu, 2020). Using these aforementioned measures of uncertainty, Baker et al (2020b) estimate the likely impact of COVID-19 on the macro-economy. The authors estimate a decline in real US GDP of approximately 11 percent by the final quarter of 2020.

Impact on Businesses

Recent surveys suggest that business uncertainty has increased dramatically since the onset and spread of COVID-19 (Altig et al, 2020). Hassan et al (2020) develop textbased measures of the costs, benefits, and risks to listed firms in over 80 countries affected by COVID-19. The authors find that as COVID-19 spreads across countries during the first quarter of 2020, firms expressed significant concerns regarding a collapse in demand, heightened uncertainty and disruptions to supply chains and detriment to employee welfare. Firms operating in locations impacted previously by SARS or H1N1 (swine flu) expressed greater confidence in their likely ability to absorb the negative impacts of COVID-19. De Vito and Gomez (2020) investigate via a series of scenarios, the likely impact of COVID-19 on the liquidity of listed firms across 26 countries. The authors assess the extent to which firms' liquidity can withstand a decline in sales of 25%, 50% and 75%. They find that in the most extreme case (where sales decline by 75%), the average firm would exhaust liquidity in approximately 12 months - with around a third of firms becoming illiquid in less than six months. Bartik et al (2020) in a survey of 5800 US small and medium sized enterprises (SMEs) find that 43 percent were temporarily closed with a resultant decline in employment of 40 percent.

In the UK, an ONS survey of businesses suggests that 25% had temporarily ceased trading (for the period 23 March to 5 April 2020). Of businesses continuing to trade, 21% of the workforce had been furloughed (ONS, 2020a). A study by the British Chamber of Commerce (2020) suggests that 66% of firms have furloughed staff. Prasher et al (2020) compare business incorporations and dissolutions in the early part of 2020, with the same period in 2019, in order to provide initial insights as to the possible impacts of COVID-19. The authors find a 70% increase in the dissolutions in March 2020 relative to March 2019. Younger businesses as well as businesses in the wholesale and retail,



professional services, transport and construction are particularly affected. Joyce and Xu (2020) find that the impact of lockdown measures and enforced closures of non-essential business are likely to disproportionately affect employees under 25; low earners; and women.¹³

Stockmarket Responses

Stock markets have responded to the spread of COVID-19 as investors have adjusted expectations regarding future corporate earnings. Baker et al (2020c) note that news coverage of COVID-19 is the most significant driver of large daily US stock market movements since the end of February 2020. Ramelli and Wagner (2020a, b) assess stock market reactions to COVID-19. The authors partition their sample period into incubation (1st-17th January), outbreak (20th January - February 21st), and fever (February 24th - March 20th) sub-periods. They find that the overall stock price reaction varies by the extent of international trade exposure; firms with global value chains experiencing larger declines in value. Firms with high levels of debt also experience marked declines in value. Industry factors also played an important role, with firms located in telecommunications and food retailing experiencing increases in value for much of the sample period. However, the authors note that during the *fever* period most stocks decline as investors anticipated an economic recession. Gormsen and Koijen (2020) examine aggregate movements in the US S&P500 and the EU Euro Stoxx 50 index since the outbreak of COVID-19. The authors find that stock markets declined sharply as the virus spread to Italy, South Korea, and Iran around February 20th, and later in March upon announcements of travels restrictions by the US and successive EU member states. Alfaro et al (2020) find that day-to-day changes in forecasts of infectious disease during the SARS epidemic (in Hong Kong) and the COVID-19 pandemic (in the US) lead to significant changes in aggregate stock returns. For the UK covering the period 2nd January to 20th March, Griffith et al (2020) examine changes in share prices of listed firms (relative to the FTSE All-Share index). They find that firms located in tourism and leisure, fossil fuels production and distribution, insurance, non-food and non-drug retailers and several large manufacturing industries saw the largest declines in value,

¹³ Similarly, for the US, Alon et al (2020) suggest that employment losses arising from social distancing interventions has a larger impact on sectors with higher female employment shares.



while food and drug manufacturers, food retailers, utilities, high tech manufacturing and tobacco firms outperformed the market.

Impacts on Households

Evidence of household level responses to the onset of COVID-19 is emerging. Much of the evidence presented to date relies upon online surveys of consumer expectations. Chen, He et al (2020) assess the impact of the Wuhan, Hubei lockdown on the monthly sales of various products for sale on a major online platform in China. The authors find a significant decline in the sales of digital and electronic goods, and a significant increase in sales of groceries. Chen et al (2020) use daily transaction data in 214 cities over a 12 week period to study the impact of COVID-19 on consumption after China's outbreak in late January 2020. The authors utilise consumer spending transaction level data at offline merchants using bank cards and QR codes (captured by a large payment provider Point of Sale machines and QR scanners) to find that consumption declined by an average of 32% across Chinese cities. Spatial variation is observed with heavily exposed cities such as Wuhan experiencing more significant declines (70%) in consumer spending.

Dietrich et al (2020) assess the response of household expectations to the COVID-19 outbreak using an online survey of US consumers. From a sample of 1,600 responses, the authors find that consumers expect GDP to decline by six percent over a 12-month period and two per cent over 36 months. Binder (2020) conducts an online survey on US consumers on 5th and 6th March 2020, to solicit information regarding concerns and responses to the COVID-19. The results of the survey suggest that consumers are somewhat or very concerned regarding the effects of coronavirus on their financial and personal well-being as well as the wider economy. Of the consumers surveyed, 28% postponed travel, while 40% had purchased additional food supplies. Armantier et al (2020a, b) utilise the March and April 2020 Survey of Consumer Expectations (SCE) to find that between February and April 2020, the median expected year-ahead forecast of growth in income and spending declined dramatically across all genders, age groups, income level, race, and education level. Using US survey data collected on March 24th 2020, Adams-Prassl et al (2020a) find that 65% of workers engaged in less paid work, and expected to earn 39% less in the next four months. 11% of workers had lost employment, with a 40% chance of job loss within the next four months for those remaining employed. 56% of those surveyed reported likely problems in facing future bills. Variations are observed across both the age and income distribution with younger



and lower income individuals most affected. Baker et al (2020a) use transaction-level household financial data from a personal financial website to examine US consumer spending responses to the onset of the COVID-19. The authors observe a substantial increase in consumer spending (transactions increasing by 15%; average transaction value by 50%) as the rate of increases in COVID-19 cases increases, followed by a significant decline in general spending. Spending on grocery items remains at a higher level over a longer time period before declining. The authors also observe heterogeneity in spending responses across states (depending on the severity of the virus outbreak) the age distribution and structure of the family unit.

For Spain, Carvalho et al (2020) utilise a large high-frequency transaction data from a large commercial bank to investigate consumer expenditure during the COVID-19 pandemic. The authors find no significant change in consumer spending patterns prior to the lockdown measures. However, following the lockdown, large overall spending declines are observed, albeit significant variation exists across product categories with expenditures on drinking and dining, clothing and personal services exhibiting large declines, while food expenditure increased.

For the UK, Crawford et al (2020) use the ONS Living Costs and Food Survey, 2017 in order to predict which types of spending are likely to be most affected by the spread of COVID-19 and social distancing measures. The authors assert lower-income households find it more difficult to absorb income shocks and adjust relative to higherincome counterparts, given that these households spend a greater proportion of their income on essential items. Spending in higher income households are likely to decline more for areas (such as restaurant dining and drinking) prohibited or discouraged as a consequence of public health interventions. An ONS survey of UK households suggests that the well-being (53.1%) and household finances (22.9%) was negatively affected by the COVID-19 virus (ONS, 2020b). Using UK survey data collected on March 25th 2020, Adams-Prassl et al (2020b) find that 57% of workers engaged in less paid work, and expected to earn 35% less in the next four months. 8% of workers had lost employment, with a 33% chance of job loss within the next four months for those remaining employed. 49% of those surveyed reported likely problems in facing future bills. Variations are observed across both the age and income distribution with younger and lower income individuals most affected.



3. DATA & RESULTS

The empirical analysis in the present study is based on data provided by Money Dashboard, a popular personal financial technology company founded in 2010 and based in Edinburgh. Money Dashboard's application aggregates all transactions from linked bank accounts and credit or debit cards to provide users with a detailed view of how, when and where money is being spent. The service is aimed at individuals who have more than one bank account or several different credit cards. Once users sign up, Money Dashboard collects all available information from an individuals' online account. In the next step, Money Dashboard uses a machine learning algorithm to identify the type of transaction and automatically assigns each transaction to one of 270 expense and income tags. All data is anonymised prior to sharing with the authors of this study. A timestamp of the transaction and a merchant tag are also included. The user interface for the mobile and web based versions of the application are shown in Figure 1.



Figure 1: Money Dashboard Interface

Note: This figure illustrates the iOS and web interface of Money Dashboard. The example for the mobile phone interface shows the current balance across accounts and a chart summarising expenditures per category and the current status of three active budgets.



We focus our analysis on consumer spending behaviour from January 1st to April 7th 2020. We separate our analysis into four sub-periods comprising: *incubation* (1st-17th January), *outbreak* (20th January-February 21st), *fever* (February 24th-March 22nd), and *lockdown* (March 23rd to 7th April). In total, there are 98,796 individual users in our sample. For 96,488 of these information regarding age is available. We are able to match the location of 96,136 users to postcode level. For our analysis, we use those users where location can be identified. We are also able to identify, the income of a large number of users (38,772). Panel A, Table 1 provides summary statistics. Panels B to D present summary statistics for spending categories including discretionary, groceries and dining and drinking for each full month covered in our analysis.

Moreover, we also separate our analyses into nine distinct regions as defined by the Office for National Statistics. This serves the purpose of shedding light on possible heterogeneous responses to the pandemic in terms of spending patterns across different regions of GB. Table 2 reports the regional distribution of the users in our sample.



Table 1: Summary Statistics

	mean	median	sd	N	
Panel A: Demographics					
Income	3212.28	2333.24	3352.13	38,772	
Age	37.32	35.00	10.96	96,488	
Male	.6039	1.00	.4890	98,796	
Panel B: Monthly Sums January					
Total Discretionary	871.24	608.98	1,005.96	88,614	
Cash	279.75	100.00	602.61	51,909	
Dining & Drinking	135.22	85.41	155.55	73,921	
Home Improvement	153.77	46.69	326.34	40,954	
Fuel	104.68	78.99	91.04	47,826	
Gambling	72.00	20.00	259.76	17,547	
Groceries	270.13	191.93	256.57	77,942	
Panel C: Monthly Sums February					
Total Discretionary	752.91	490.79	976.28	82,656	
Cash	259.54	100.00	593.99	44,487	
Dining & Drinking	132.98	79.94	159.31	66,248	
Home Improvement	147.74	41.16	328.20	32,288	
Fuel	97.60	70.50	87.68	40,416	
Gambling	70.61	20.00	261.21	14,149	
Groceries	241.67	159.82	247.78	71,048	
Panel D: Monthly Sums Marc	ch				
Total Discretionary	550.27	306.22	802.41	67,423	
Cash	207.12	80.00	505.67	28,690	
Dining & Drinking	79.23	45.95	106.45	49,308	
Home Improvement	136.50	41.99	298.36	21,999	
Fuel	73.57	55.37	67.82	27,504	
Gambling	69.33	20.00	261.52	9,484	
Groceries	209.11	116.82	249.93	56,009	

Note: This table provides summary statistics for a sample of 96,136 consumers. Panel A of the table summarises key demographic indicators for the 2020 sample and income levels (winsorised at the 1% of the distribution). Panel B to D provide the monthly sums by spending category in the three months covering incubation, outbreak and fever.

Table 2: Regional Sample Distribution						
Region	Frequency	Percentage (%)	Cum. (%)			
East Midlands	5,442	5.66	5.66			
East of England	8,691	9.04	14.7			
London	23,967	24.93	39.63			
North East	2,380	2.48	42.11			
North West	8,337	8.67	50.78			
Scotland	7,867	8.18	58.96			
South East	16,323	16.98	75.94			
South West	8,426	8.76	84.71			
Wales	2,966	3.09	87.79			
West Midlands	5,907	6.14	93.94			
Yorkshire and The Humber	5,830	6.06	100			

Note: This table presents the number of users included in our sample distributed across Scotland, Wales and different regions of England as defined by the Office for National Statistics.



Discretionary spending

Figure 2 shows the evolution of total discretionary spending (measured as the sum of spending in a wide range of categories including groceries, dining and drinking, clothing, games and gambling, entertainment and other related items); groceries spending; and spending on dining and drinking at GB level over the sample period, which is partitioned into incubation, outbreak, fever and lockdown sub-periods. Figure 3, Figures 4a – 4c and Figures 5a-5c present this information at a disaggregated national level, demographic and regional level respectively. While the general trends are similar between the GB and the individual nations, some differences occur at key points during the sample period, especially at the regional level. The following sections summarise the key trends in the total discretionary, groceries and dining and drinking spending categories at GB, individual nation and regional level.

Panel A of Figure 2 suggests that at GB level, discretionary spending is largely flat throughout the first three (incubation, outbreak, fever) phases of the pandemic. The first significant change in overall discretionary spending occurs around week nine of the sample period. Here, a trend-change occurs, with average discretionary spending declining by 10.4% on a week-to-week basis (from an average of £307 to £275). This downward trend continues with declines of similar magnitudes throughout the remainder of the fever phase. The largest decline occurs during the first two weeks of the lockdown phase. In the first week after lockdown, discretionary spending is at an all-year low average spend of £233 (a decline of 15.2% compared to spending in the incubation period) before declining further to an average spend of £185 per week (a decline of 32.7% compared to £275) in week 10.

Discretionary spending differs significantly between demographic groups. Figure 4a illustrates differences in discretionary spending between males and females by applying a median split analysis for age (35), and monthly net income (£2,333). We find that females spend less than males in all phases. The average gap in weekly spending between males and females during the incubation and outbreak period is around £50. This spending gap decreases after female users start spending slightly more after week 9. One week before lockdown, spending differs by around £30. The spending gap is insignificant during lockdown. The spending gap is larger across younger and older individuals, ranging between £120 and £130 until the commencement of lockdown, after which the gap closes. In terms of changes in spending patterns, we observe very similar



increases and decreases in weekly spending for both age groups. We also find very similar results, when assessing differences across income groups.

There are some apparent differences in the way individuals located in England, Scotland and Wales react to the COVID-19 crisis. Panel A of Figure 3 suggests that while individuals from England and Wales exhibit relatively stable spending patterns throughout the first nine weeks of the crisis, Scottish consumers appear to react more dramatically to the announcements of the first COVID-19 cases in the UK. We observe a strong significant increase in the first two weeks of the outbreak period. In week five, individuals located in Scotland spent around 10% (£323 versus £291) more than English, and 18.9% more than Welsh (GBP 262) counterparts. However, after this week, spending in Scotland is at a similar level to the other two nations. Finally, while we see a disparity in the level of spending in the early weeks between Scotland and England on the one hand and Wales on the other hand, this difference disappears during lockdown where spending on discretionary spending is almost identical across the three nations.

While the discretionary spending patterns are relatively similar at national level, larger differences occur at the regional level. Figure 4a summarises change in average weekly spending across regions between the different phases of the COVID-19 pandemic. Changes from the incubation to the outbreak phase are largely similar for all regions. All regions experience single-digit growth in discretionary spending, albeit this growth is at low levels in the South East England, South West England and Wales (of between 2% and 3%). However, when comparing the figures for changes between the incubation and fever period, stark differences occur. It appears that the South East, South West, and especially London react more quickly in terms of discretionary spending reductions than other regions (with between 2.5% and 3.2% declines in spending). Increases in discretionary spending during this phase of the pandemic are observed for East-Midlands (plus 0.8%) and Scotland (plus 1.3%) only.

These recorded differences in the week-to-week spending appear to be driven by changes in groceries and dining and drinking spending. While we observe very strong increases in spending on grocery items, a strong decline in spending on dining and drinking and other discretionary items occurs. We explore these patterns in further detail below.



Groceries spending

According to Panel B of Figure 2, with the exception of seasonal spending in the first week of January, groceries spending remains relatively flat throughout the incubation period, and continues in this manner until the last week of the outbreak period. This is followed by elevated spending in the first part of the fever period. There is a strong increase in groceries spending for the two weeks following the WHO announcement on March 11, 2020, which designated COVID-19 as a pandemic. This is consistent with panic buying behaviour and stockpiling behaviour, which was widely reported by UK news media outlets. However, groceries spending declines considerably as the UK enters the lockdown phase.

As with discretionary spending, differences between the three nations in terms of groceries spending is also apparent. The results in Panel B of Figure 3 indicate that individuals in Scotland began to stockpile on grocery items much earlier than individuals located in Wales and England. Specifically, we can see that spending on groceries accelerates by 13.23% during the outbreak phase (from an average of £98.95 in week three to £112.05 in week seven). Individuals based in Scotland continue spending more on groceries than counterparts located elsewhere in GB until week 12, at which point individuals located in England exhibit the same average weekly spending patterns. This points to a stark increase in spending by individuals located in England in the two weeks prior to the announcement of a lockdown by the UK government. During this time, individuals located in England increased average weekly grocery spending by 18.5% (relative to spending in week three). Shortly after the announcement of the lockdown, groceries spending declines significantly to a level lower than that observed prior to the onset of the crisis. As in the case of discretionary spending, grocery spending shows considerable convergence across the three nations during the lockdown period.

In a similar manner to the analysis of overall discretionary spending, Figure 4b presents the differences in grocery spending by demographic indicators. As before, we see a trend of absolute differences in spending with male, older and wealthier individuals spending more than female, younger and lower income individuals.

Figure 5b summarises the results for changes in grocery spending at the regional level. As indicated previously, most regions show strong increase in week-to-week grocery spending between the incubation and outbreak period. In particular, the spending growth in grocery shopping of individuals located in Scotland (plus 4.8%) and the East Midlands

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(plus 5%) is indicative of early stockpiling. The effect becomes even stronger when comparing incubation to the fever period. In this case, individuals located in Scottish increased spending on groceries by more than 7%, which is nearly twice the increase observed for individuals located in other regions of GB. Individuals located in London and the North East only marginally increased spending between the incubation and fever periods. The figures comparing spending in the incubation to lockdown period suggest a rather strong divide between regions such as London (minus 5.2%) or the North West (minus 5.1%) and Wales (plus 4%) or the West Midlands (plus 6%).

Dining and Drinking

Similar to the patterns of overall discretionary and groceries spending, Panel C of Figure 2 shows a steady increase in spending on dining and drinking related items in the first eight weeks of the crisis. We observe an increase of more than 11% in spending between the first week and up to two weeks into the fever period. However, shortly after week 13, spending on these items declines by 47.1% within four weeks. Contrary to the advice of UK government and counterparts in devolved administrations to refrain from going out for non-essential activities, it appears that individuals actually spend slightly more around the time of the lockdown announcement than they did in the days leading up to it.

Two interesting patterns emerge when analysing the spending trends between the individual nations in Panel C of Figure 3. First, it appears that while all nations show an increasing trend in dining and drinking spending, Scottish individuals appear to reduce spending in this category in week nine, one week earlier than counterparts located in England and Wales. Secondly, the relative change in spending between the beginning and end of the fever period is very similar between the nations. England experiences a 42% reduction, Scotland a reduction of 45.2% and Wales of 46%.

Another pattern appears when considering at the differences in spending for dining and drinking in different age groups. We find that younger individuals start to spend less on dining and drinking than older users. Specifically, young individuals (below 35 years of age) exhibit their highest spending in week six of the sample period, while the upper age group continues to increase spending until week eight. This appears to suggest that younger individuals were quicker to react to news and public health announcements to avoid non-essential journeys and public gatherings. However, as before the gap between absolute spending figures diminishes over time, with older users exhibiting a significant change in spending in week nine.

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Figure 5c provides additional insights for dining and drinking spending patterns across the regions. Unsurprisingly, this category shows the strongest differences between the different phases. As before, we observe a strong increase in spending between the incubation and outbreak phase of around 9% to 12%. Only the North East exhibits slower growth of around 5% during this period. Larger differences are observable when comparing the incubation and fever phases. As in the groceries category, we see that especially London and the North East show slower growth rates (around 0.7%) compared to the East of England (with an increase of 4%). The largest declines in spending occur when comparing the incubation to the lockdown periods. Almost all regions exhibit a reduction exceeding 30% in dining and drinking spending. Only individuals based in Wales show slightly lower decreases, albeit spending declines in this category exceed 20%.





Note: Each panel shows the weekly average spending in pounds sterling (\pounds) per average individual for the respective expense category on the y-axis. The x-axis shows the week of the year, starting on Wednesday 1st of January. The period of analysis is separated in four phases: *incubation, outbreak, fever* and *lockdown*.





Figure 3. Average Weekly Spending per category: Nation Level

Note: Each panel shows the weekly average spending in pounds sterling (£) per average individual for the respective expense category on the y-axis. Spending is separated by country - England, Scotland and Wales. The x-axis shows the week of the year, starting on Wednesday 1st of January. The period of analysis is separated in four phases: incubation, outbreak, fever and lockdown.







Note: Each panel shows the weekly average spending in pounds sterling (£) per average individual for the respective expense category on the y-axis. Spending is separated by demographic characteristic – gender, age, income. The x-axis shows the week of the year, starting on Wednesday 1st of January. The period of analysis is separated in four phases: incubation, outbreak, fever and lockdown. All individuals with identifiable postcodes or monthly income in Great Britain are included.





Note: Each panel shows the weekly average spending in pounds sterling (\pounds) per average individual for the respective expense category on the y-axis. Spending is separated by demographic characteristic – gender, age, income. The x-axis shows the week of the year, starting on Wednesday 1st of January. The period of analysis is separated in four phases: incubation, outbreak, fever and lockdown. All individuals with identifiable postcodes or monthly income in Great Britain are included.







Note: Each panel shows the weekly average spending in pounds sterling (\pounds) per average individual for the respective expense category on the y-axis. Spending is separated by demographic characteristic – gender, age, income. The x-axis shows the week of the year, starting on Wednesday 1st of January. The period of analysis is separated in four phases: incubation, outbreak, fever and lockdown. All individuals with identifiable postcodes or monthly income in Great Britain are included.



Figure 5a. Change in weekly discretionary spending across sub-periods (incubation to outbreak; incubation to fever; incubation to lockdown) by region



Note: Each sub-figure shows the median relative change in average weekly discretionary spending between the four time periods: incubation, outbreak, fever and lockdown. The change is measured in comparison to the average weekly spending in the incubation phase. The y-axis is separated into the main nine regions of Great Britain as defined by the Office for National Statistics. The x-axis depicts the phase-to-phase change of weekly spending in percent. Included are all individuals who spent on dining and drinking items and whose postcode could be identified (as summarised in Table 2).

Figure 5b. Change in weekly groceries spending across sub-periods (incubation to outbreak; incubation to fever; incubation to lockdown) by region



Note: Each sub-figure shows the median relative change in average weekly grocery spending between the four time periods: incubation, outbreak, fever and lockdown. The change is measured in comparison to the average weekly spending in the incubation phase. The y-axis is separated into the main nine regions of Great Britain as defined by the Office for National Statistics. The x-axis depicts the phase-to-phase change of weekly spending in percent. Included are all individuals who spent on dining and drinking items and whose postcode could be identified (as summarised in Table 2).



Figure 5c. Change in weekly dining and drinking spending across sub-periods (incubation to outbreak; incubation to fever; incubation to lockdown) by region



Note: Each sub-figure shows the median relative change in weekly dining and drinking spending between the four time periods: incubation, outbreak, fever and lockdown. The change is measured in comparison to the average weekly spending in the incubation phase. The y-axis is separated into the main nine regions of Great Britain as defined by the Office for National Statistics. The x-axis depicts the phase-to-phase change of weekly spending in percent. Included are all individuals who spent on dining and drinking items and whose postcode could be identified (as summarised in Table 2).



4. CONCLUDING REMARKS

In the first quarter of 2020, the COVID-19 virus spread around the world to become a global pandemic. The virus has wreaked havoc on the health and well-being of individuals, and stretched health and social care systems to breaking point as governments scrambled to dampen its spread (via closures of non-essential businesses; prohibitions on large gatherings; and severe restrictions on freedom of mobility) and short term economic impacts (via short-term funding to non-financial firms, tax and rates deferrals and employer grants). Early evidence assembled in a variety of settings using: historical comparisons with prior epidemics; computer-based simulations; and surveys of businesses and households suggest that the spread of COVID-19 is having an unprecedented negative impact on the current and future prospects of households, businesses and the macro-economy.

In this study, we use Great Britain (England, Scotland, Wales) as a setting to examine initial consumer spending responses to the onset, and spread of COVID-19, and accompanying public health interventions (including social distancing and lockdown). Using proprietary data on 98,796 consumers and 19.8 million transactions collected from a popular personal finance application (which aggregates transactions from linked bank accounts and credit and debit cards), we find that consumer spending remains relatively stable in the early stages (incubation and outbreak periods) of the COVID-19 crisis. During the latter stages of the *fever* period when a government imposed lockdown becomes imminent, discretionary spending declines significantly, and continues to do so after the *lockdown* is announced. Spending responses vary across product categories, especially for groceries, where we observe large increases in spending (associated with panic-buying and stockpiling behaviour) prior to the onset of the lockdown period. Consumer spending responses also vary by location (across nations and regions) and demographic characteristics (age, gender and income level). These findings suggest that the COVID-19 virus and public health interventions instituted by the UK government are having significant impacts on the level and composition of consumer spending patterns across Great Britain. However, these impacts are not uniform with differential impacts observed across different nations, regions and demographic groups.

Our results are preliminary, and come with the caveat that our sample of consumers tends to be skewed toward younger individuals. Nevertheless, our results do provide a starting point for policymakers in understanding the real-time impacts of COVID-19 on



consumer spending. Our results also provide a basis for further in-depth investigations of consumer spending behaviour as the crisis evolves. Future research will extend this research to a formal regression-based analysis in order to observe the extent to which patterns observed represent transitory or more permanent changes in consumer spending across consumer location and demographic characteristics, as well as assessing the impacts of current government policy interventions regarding social distancing and lockdown.



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