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Show Me the Money: Tracking Consumer Spending with Daily Card Transaction Data During the Pandemic

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Show Me the Money**Tracking Consumer Spending with Daily Card Transaction Data During the Pandemic****Prepared by Serhan Cevik¹**

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Abstract

The COVID-19 pandemic has been an unprecedented shock to economic activity with abrupt and unexpected changes in household consumption behavior. This paper investigates how the spread of the pandemic and government interventions have affected consumer spending using daily card transaction data in the Baltics. The analysis shows significant effects on the amount and composition of debit and credit card transactions. First, the number of new COVID-19 infections or deaths has a strongly negative effect. Second, while public health measures designed to contain the spread of the pandemic has a negative effect, economic support measures designed to assist businesses and households have a stimulative effect. Third, there is heterogeneity across spending categories, but the drop is mostly concentrated in sectors that are restricted by lockdowns and the risk of infection. Fourth, the impact of government interventions, especially in terms of stimulating consumer spending, appears to be more pronounced on goods than services.

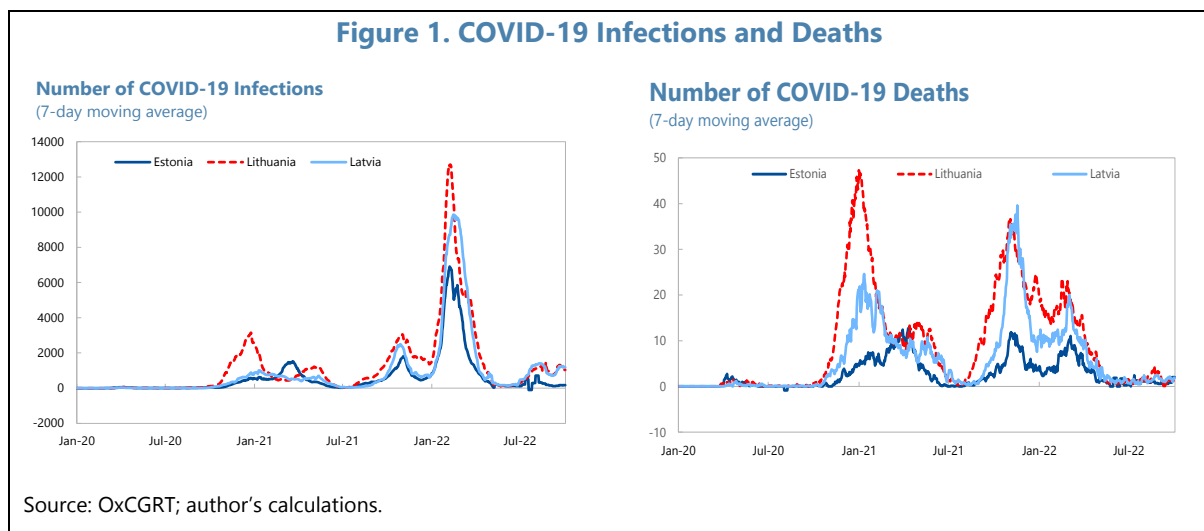
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I. INTRODUCTION

The COVID-19 pandemic has been an unprecedented shock to economic activity with abrupt and unexpected changes in household consumption behavior. Over the past two years, the number of COVID-19 cases has reached 638.7 million, resulting more than 6.6 million deaths across the world.² The extensive containment and mitigation measures designed to slow the spread of the coronavirus severely restricted mobility and economic activity and led to momentous shifts in consumption patterns. Global real GDP contracted by 3.1 percent in 2020, causing an unprecedented amount of economic loss and exacerbating poverty and inequality in many countries. Strong and coordinated policy response to the crisis, however, has set the stage for a robust and broad-based economic recovery, with private consumption becoming the leading engine of growth. This is why tracking consumer spending at high frequency can help better understand the continuing post-pandemic recovery on a timely basis and allow policymakers to properly calibrate policy measures. To this end, this paper investigates how the spread of the COVID-19 pandemic has affected consumer spending patterns using a panel dataset of daily debit and credit card transactions in the Baltics (Estonia, Latvia, and Lithuania) over the period January 1, 2020 to October 2, 2022, during which the number of COVID-19 cases and deaths moved in waves (Figure 1).

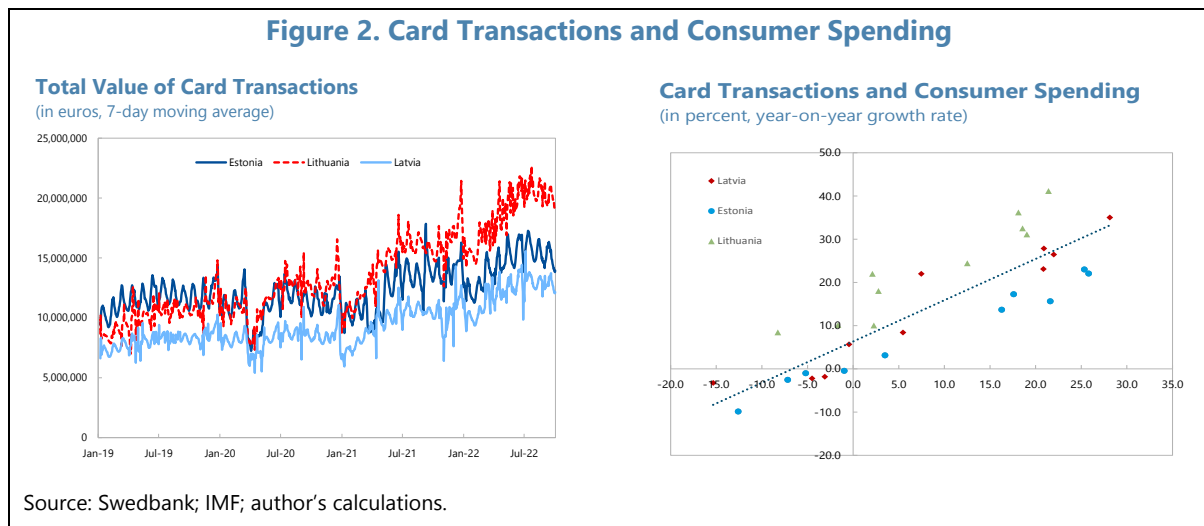
There is a recent strand of the literature using real-time data to evaluate the economic impact of the pandemic. There is a burgeoning literature on the economic and financial impact of infectious diseases including COVID-19 (Coibon, Gorodnichenko, Weber, 2020; Eichenbaum, Rebelo, and Trabandt, 2020; Fornaro and Wolf, 2020; Ludvigson, Ma, and Ng, 2020). While most of studies focus on the macro level, this paper belongs to a strand of the literature that analyzes the effects on firms and households (Hassan and others, 2020; Cevik and Miryugin, 2021). Alexander and Karger (2020) examine the effects of stay-at-home orders on travel and spending using data on cell phone usage and card transactions and find a significant reduction



² The latest figures can be found at John Hopkins University's Center for Systems Science and Engineering: <https://www.arcgis.com/apps/dashboards/bda7594740fd40299423467b48e9ecf6>.

in consumption during the pandemic. Lewis, Mertens, and Stock (2020) use a variety of weekly indicators and show that the pandemic led to an abrupt and significant downturn in economic activity. Baker and others (2020) and Chetty and others (2020) use transaction-level data in the U.S. and find that the initial phases of the COVID-19 pandemic resulted in an increase in spending on food items but a sharp decrease in overall consumer spending. Similarly, using transaction-level customer data in Denmark, Andersen and others (2020) analyze the impact of the pandemic on consumer spending and conclude that aggregate spending declined by more than one-quarter during the acute phase of the pandemic compared to the counterfactual level without the pandemic. A comparable pattern emerges in bank transaction data in Canada (Dahlhaus and Welte, 2021), China (Chen, Qian, and Wen, 2021), France (Bounie, Camara, and Galbraith, 2020), Latvia (Brinke and others, 2022), Mexico (Campos-Vazquez and Esquivel, 2021), the Netherlands (Kapetanios and others, 2022), Portugal (Cabral and others, 2021), Spain (Carvalho and others, 2020), Switzerland (Kraenzlin, Meyer, and Nellen, 2020), Turkey (Kantur and Özcan), the U.K. (Hacıoğlu, Känzig, and Surico, 2020), and the U.S. (Dunn and others, 2021).

This paper contributes to the literature along several dimensions, including a granular analysis of consumer spending during the pandemic at daily frequency. To halt the spread of COVID-19 infections, governments introduced containment measures such as mandatory lockdowns and mobility restrictions. These non-pharmaceutical interventions (NPIs) initially caused a severe contraction in activity throughout the Baltics and significantly altered consumption patterns. Although the most comprehensive source of information on private consumption is the national accounts data, this is not available until two months after the end of each quarter—too late to assess rapidly changing conditions and recalibrate policy responses. Therefore, to close this information gap and provide a real-time and granular assessment of household expenditures and activity, this paper uses daily point-of-sale (POS) debit and credit card transactions to estimate the impact of the COVID-19 pandemic on consumer spending. During the first phase of the pandemic in 2020, the total amount of card transactions in three Baltic countries declined by an average of 2.5 percent year-on-year in the second quarter, after growing at an annual rate of 10 percent in the first quarter. Afterwards, there has been an accelerating recovery in consumer spending, albeit with occasional dips and peaks due to the



waves of the pandemic and various policy measures introduced by the governments, but the growth pattern was not homogenous across the Baltics. While Estonia suffered a contraction of 4 percent in debit and credit card transactions in 2020, Latvia and Lithuania experienced an increase of 2 percent and 14.5 percent, respectively. There has also been considerable variation in the pace of recovery, with Lithuania taking the lead with 26.2 percent in 2021 compared to 17.9 percent in Latvia and 12.3 percent in Estonia. Overall, as illustrated in Figure 2, there is a strong correlation between card transactions and consumer spending in GDP. Contrary to earlier studies, this paper also covers the recovery phase in estimations and thereby sheds a brighter light on the impact of health and economic policies on post-pandemic developments.

The empirical analysis shows that the pandemic and government interventions have had significant effects on consumption expenditure in the Baltics. First, I find that the pandemic shock—as measured by the number of new COVID-19 infections or deaths—has a statistically significant negative effect on consumer spending as measured by debit and credit card transactions. A 1 percent increase in the number of new COVID-19 infections (or deaths) is associated with a decline of 0.052 percent (or 0.022 percent) in the total amount of card transactions. The estimated coefficient may seem small, but the cumulative impact grows larger as the number of cases (or deaths) increases over time. Second, I find that government policy responses to the pandemic—in the form of public health measures to contain the spread of the virus and economic support measures designed to assist businesses and households—have significant effects on the amount and composition of debit and credit card transactions. For example, while a 1 percent increase in the stringency index lowers card transactions by 0.171 percent, a similar increase in the economic support index brings an increase of 0.021 percent in card transactions. Third, I conduct a granular analysis of 33 consumption spending categories and find that there is heterogeneity across spending categories, but the drop is mostly concentrated in sectors that are directly restricted by lockdowns and the risk of infection. Fourth, the impact of government interventions, especially in terms of stimulating consumer spending, appears to be more pronounced on goods than services.

The remainder of this paper is structured as follows. Section II provides an overview of the data used in the empirical analysis. Section III describes the econometric methodology and presents the findings. Finally, Section IV summarizes and provides concluding remarks.

II. DATA OVERVIEW

The empirical analysis is based on a balanced panel dataset of daily observations of debit and credit card transactions, COVID-19 cases and deaths, and policy measures. The underlying data used to construct debit and credit card transactions are acquired from Swedbank—one of the largest retail banks in the Baltics accounting for about half of POS transactions. Disaggregate daily debit and credit card transaction data cover the period from January 1, 2020 to October 2, 2022 and include 33 spending categories in card transactions as presented in Table 6. POS transactions used in this paper exclude cash withdrawals, but cover both in-store and online purchases. The daily number of COVID-19 infections and deaths is drawn from the Oxford Covid-19 Government Response Tracker (OxCGRT) database. The

OxCGRT also systematically collects information on several different common policy responses governments have taken, records these policies on a scale to reflect the extent of government action, and aggregates these scores into a suite of policy indices (Hale and others, 2021). This paper uses the following composite policy indices: (i) stringency index; (ii) containment and health index; (iii) economic support index; and (iv) overall government response index. Each of these indices report a number between 0 to 100 that reflects the level of the government's response along certain dimensions. While the index is a measure of how many of the relevant indicators a government has acted upon, and to what degree, it cannot say whether a government's policy has been implemented effectively.

Summary statistics show considerable heterogeneity in card transactions and pandemic-related factors across the Baltics and over time. As presented in Table 1, the mean value of daily debit and credit card transactions is €13.3 million over the sample period, with a minimum of €602,157 and a maximum of €34.8 million. During the first phase of the pandemic in 2020, the total amount of card transactions in three Baltic countries declined by an average of 2.5 percent year-on-year in the second quarter, after growing at an annual rate of 10 percent in the first quarter. Afterwards, there was an accelerating recovery in consumer spending, albeit with occasional dips and peaks due to the waves of the pandemic and various policy measures introduced by the governments. The total amount of debit and credit card transactions in the Baltics increased by an average of 8.9 percent in the third quarter and 0.9 percent in the fourth quarter of 2020. The recovery gained momentum from a growth rate of 0.3 percent in the first quarter of 2021 to an average of 24.6 percent in the remainder of the year and to 27.8 percent in the first three quarters of 2022. The growth pattern during the COVID-19 pandemic was not homogenous across the Baltics: while Estonia suffered a contraction of 4 percent in debit and credit card transactions in 2020, Latvia and Lithuania experienced an increase of 2 percent and 14.5 percent, respectively. There was also variation in the pace recovery, with Lithuania taking the lead with 26.2 percent in 2021 compared to 17.9 percent in Latvia and 12.3 percent in Estonia. The breakdown of consumer spending appears to be a contributing factor. Goods purchases account for about 68.5 percent of card transactions on average in the Baltics during the sample

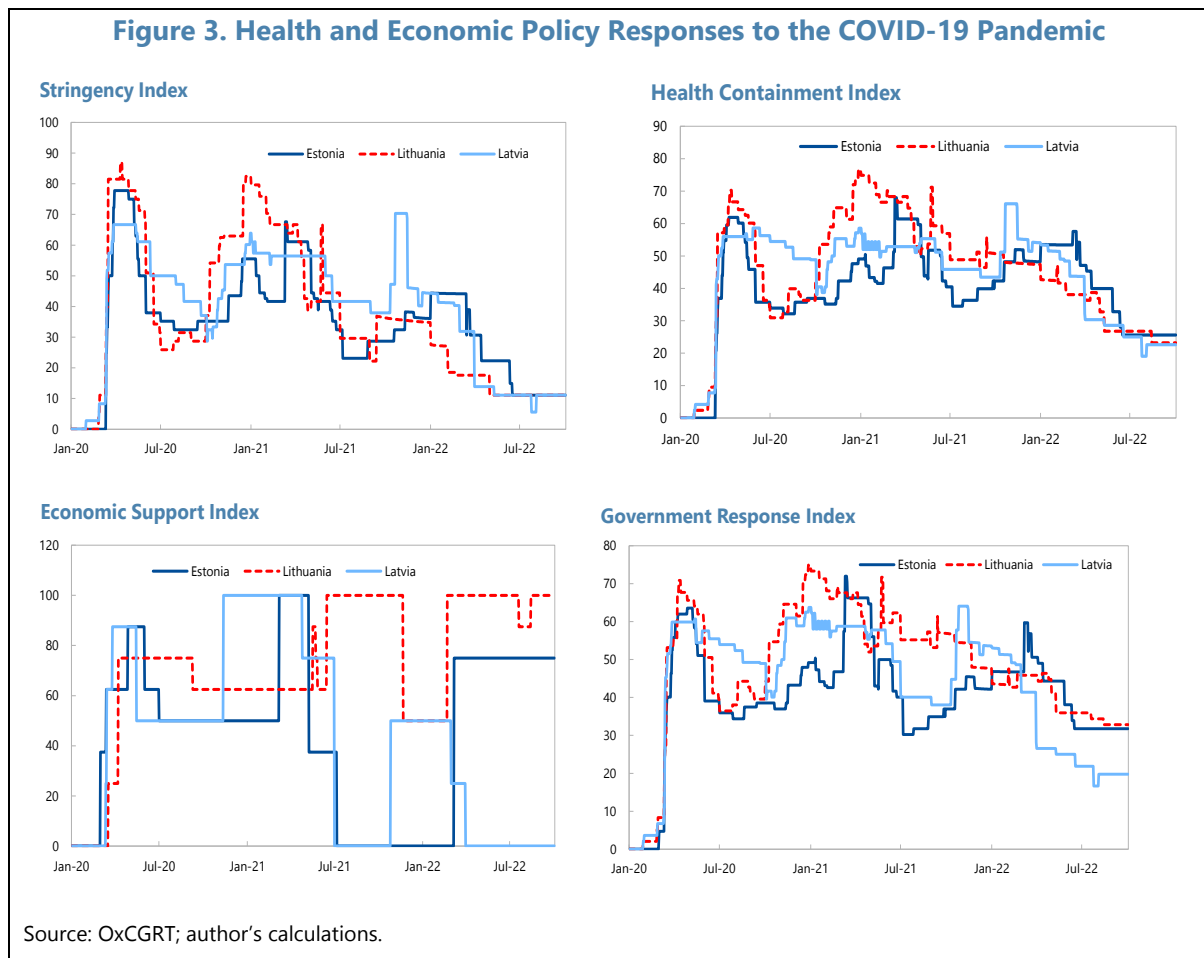
Table 1. Summary Statistics

Variable	Observations	Mean	Std. dev.	Minimum	Maximum
Debit and credit card transactions (€)					
Total	3,018	13,300,000	4,836,900	602,157	34,800,000
Goods	3,018	9,121,104	3,202,769	485,225	25,100,000
Services	3,018	4,142,733	1,781,970	102,460	11,600,000
COVID-19					
Infections	3,018	923	1,828	0	15,412
Deaths	3,018	6	9	0	79
Stringency index	3,018	36.6	20.7	0.0	87.0
Containment and health index	3,018	42.4	16.4	0.0	76.7
Economic support index	3,018	53.0	35.7	0.0	100.0
Government response index	3,018	43.7	16.5	0.0	74.9

Source: Swedbank; OxCGRT; author's calculations.

period, with purchases of services constituting the rest. The mean values of daily card transactions for goods and services are €9.1 million and €4.1 million, respectively, with goods showing greater cross-country variation than services.

The number of new COVID-19 cases varies from a minimum of 0 to a maximum of 15,412, with a mean value of 923 during the sample period. Compared to many other countries, the number of new deaths caused by COVID-19 was limited to 6 in the Baltics, with a minimum of 0 and a maximum of 79. While there is significant variation among three Baltic countries, the rise and fall of COVID-19 infections and deaths have followed a similar pattern, which is also the case if it is measured as a share of population. Policy variables used in the empirical analysis tend to move in tandem with some variation across three countries and over the sample period: (i) the mean value of the stringency index of NPIs is 36.6, with a minimum of 0 and a maximum of 87; (ii) the mean value of the containment and health index is 42.4, with a minimum of 0 and a maximum of 76.7; (iii) the mean value of the economic support index is 53, with a minimum of 0 and a maximum of 100; and (iv) the mean value of the overall government response index is 43.7, with a minimum of 0 and a maximum of 74.9. As shown in Figure 3, although Baltic governments have responded to the pandemic in similar ways, there are still significant differences in the extent and design of policy measures, especially in providing economic support. Finally, to avoid spurious estimation results, it is necessary to analyze the time-series properties of the data by



conducting panel unit root tests. I check the stationarity of all variables by applying the Im-Pesaran-Shin (2003) procedure, which allows for cross-country heterogeneity and is widely used in the empirical literature. The test results, available upon request, indicate that the variables are stationary in levels after logarithmic transformation.

III. EMPIRICAL STRATEGY AND RESULTS

The objective of this paper is to provide a real-time granular analysis of consumer spending patterns during the pandemic in a panel of three Baltic countries. The effects of the COVID-19 pandemic and policy responses on consumer spending is investigated in a panel setting according to the following baseline specification:

$$\log(card_{i,t}) = \beta_1 \log(covid_{i,t}) + \beta_2 X_{i,t} + \eta_i + \mu_t + \varepsilon_{i,t}$$

where $card_{i,t}$ denotes a spending category of debit and credit card transactions in country i and time t ; $covid_{i,t}$ represents the number of new COVID-19 cases or deaths; and $X_{i,t}$ is a vector of health and economic policy measures introduced as a response to the pandemic, including the stringency index, the containment and health index, the economic support index, or the overall government response index. The η_i and μ_t coefficients denote the time-invariant country-specific effects and the time effects controlling for common shocks that may affect consumer spending across all countries in a given period, respectively. $\varepsilon_{i,t}$ is an idiosyncratic error term. To account for possible heteroskedasticity, robust standard errors are clustered at the country level. The model is estimated for aggregate consumption categories (total, goods and services) as well as for the breakdown of 33 spending categories in debit and credit card transactions. This disaggregate approach captures heterogeneity across subsectors and thereby provides a granular analysis of household consumption patterns.

Empirical results present a coherent picture of how the pandemic and government interventions have shaped household consumption in the Baltics. The baseline analysis, presented in Tables 2-3, shows that the pandemic shock—as measured by the number of new COVID-19 infections and deaths—has a strongly negative effect on the total amount of debit and credit card transactions across all specifications. I also find that government interventions—in the form of public health measures to contain the spread of the virus and economic support measures designed to assist businesses and households—have the expected effects on consumer spending as measured by debit and credit card transactions. The baseline specification in this analysis displayed in the column [5] of the tables include the prevalence of COVID-19, the stringency index, and the economic support index. These results indicate that a 1 percent increase in the number of new COVID-19 infections (or deaths) is associated with a decline of 0.052 percent (or 0.022 percent) in consumer spending as measured by the amount of debit and credit card transactions. The estimated coefficient may seem small, but the cumulative impact on card transactions grows larger as the number of cases (or deaths) increases over time.³ With regards to the effects of government policy responses to the pandemic, I find that (i) the

³ In the case of Lithuania, for example, the number of cases during the first wave of the COVID-19 pandemic increased from 353 in March to 1,748 by the end of June.

stringency of NPIs is associated with a significant decline in debit and credit card transactions; and (ii) the economic support index is associated with an increase in debit and credit card transactions. A 1 percent increase in the stringency index lowers the amount of card transactions

Table 2. COVID-19 Infections and Card Transactions: Total

	Total				
	[1]	[2]	[3]	[4]	[5]
COVID-19 infections	-0.040*** [0.041]	-0.041*** [0.040]	-0.055*** [0.045]	-0.039*** [0.040]	-0.052*** [0.042]
Stringency index	-0.114*** [0.021]				-0.171*** [0.020]
Containment and health index		-0.159*** [0.035]			
Economic support index			0.053*** [0.064]		0.021*** [0.012]
Government response index				-0.026*** [0.045]	
Number of observations	2,581	2,581	2,083	2,586	2,078
Number of countries	3	3	3	3	3
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Adj R ²	0.80	0.79	0.79	0.79	0.80

Note: The dependent variable is the logarithm of daily debit and credit transactions. Robust standard errors clustered at the country level are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.
Source: Author's estimations.

Table 3. COVID-19 Deaths and Card Transactions: Total

	Total				
	[1]	[2]	[3]	[4]	[5]
COVID-19 deaths	-0.020*** [0.021]	-0.017*** [0.022]	-0.037*** [0.045]	-0.025*** [0.024]	-0.022*** [0.025]
Stringency index	-0.108*** [0.036]				-0.166*** [0.055]
Containment and health index		-0.200*** [0.035]			
Economic support index			0.042*** [0.085]		0.011*** [0.015]
Government response index				-0.019*** [0.020]	
Number of observations	1,846	1,846	1,463	1,846	1,463
Number of countries	3	3	3	3	3
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Adj R ²	0.86	0.85	0.87	0.85	0.88

Note: The dependent variable is the logarithm of daily debit and credit transactions. Robust standard errors clustered at the country level are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.
Source: Author's estimations.

by 0.171 percent, whereas a similar increase in the economic support index brings an increase of 0.021 percent in card transactions. Estimating the baseline model with the number of COVID-19 deaths broadly similar coefficients as presented in Table 3. These aggregate estimates, however, may hide heterogeneous effects of the pandemic and government interventions on consumption subcategories.

The drop consumer spending is mostly concentrated in services and goods that are restricted by lockdowns and the risk of infection. To obtain a more detailed assessment of the impact of the COVID-19 pandemic on consumer spending as measured by the amount and composition of debit and credit card transactions, I estimate the model separately for goods and services. Since the baseline results indicate a similar pattern of impact for the new number of COVID-19 infections and deaths, the disaggregate estimations are based on the number of infections for brevity. These results, displayed in Tables 4 for goods and Table 5 for services, show that the spread of the pandemic has a statistically significant negative effect on both goods and services. It is interesting to observe that the magnitude of the coefficient on the COVID-19 infections is slightly larger for goods than services, which may reflect shifts in the composition of services during the pandemic. On the other hand, while the stringency of NPIs dampens the amount of card transactions on both goods and services, the economic support index only matters for goods with no significance for services. In other words, the stimulative impact of economic support measures introduced by governments during the pandemic is statistically significant for card transactions on goods, but not on services, which generally tend to be more contact-intensive.

The disaggregate analysis of 33 spending categories in card transactions reveals heterogeneity in the pandemic effect across subsectors. I investigate the change in consumption patterns by conducting a granular analysis of 33 spending categories in debit and credit card transactions in the Baltics. These estimations, presented in Table 6, confirm significant heterogeneity across consumption categories. The spread of the pandemic and the containment measures have significant negative effects on travel-related expenditures, such as airlines, other types of transportation and hotels. Contact-intensive sectors, such as restaurants and beauty and spa services, also show significant vulnerability to an increase in the number of new COVID-19 infections and the stringency of NPIs as expected. But this is not the case for all services. For example, the spread of the pandemic is associated with an increase in services provided by financial institutions and the government, which helps explain the smaller coefficient on the COVID-19 variable when we estimate the model for services as a whole.

Table 4. COVID-19 Infections and Card Transactions: Goods

	Goods				
	[1]	[2]	[3]	[4]	[5]
COVID-19 infections	-0.041*** [0.042]	-0.042*** [0.045]	-0.059*** [0.053]	-0.040*** [0.040]	-0.055*** [0.054]
Stringency index	-0.112*** [0.045]				-0.170*** [0.028]
Containment and health index		-0.156*** [0.036]			
Economic support index			0.060*** [0.064]		0.027*** [0.010]
Government response index				-0.020*** [0.045]	
Number of observations	2,581	2,581	2,083	2,586	2,078
Number of countries	3	3	3	3	3
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Adj R ²	0.75	0.74	0.75	0.74	0.76

Note: The dependent variable is the logarithm of daily debit and credit transactions on goods. Robust standard errors clustered at the country level are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

Table 5. COVID-19 Infections and Card Transactions: Services

	Services				
	[1]	[2]	[3]	[4]	[5]
COVID-19 infections	-0.037*** [0.010]	-0.037*** [0.010]	-0.046*** [0.012]	-0.036*** [0.009]	-0.042*** [0.010]
Stringency index	-0.112*** [0.034]				-0.166*** [0.027]
Containment and health index		-0.155*** [0.035]			
Economic support index			0.002 [0.010]		0.004 [0.025]
Government response index				-0.046*** [0.045]	
Number of observations	2,581	2,581	2,083	2,586	2,078
Number of countries	3	3	3	3	3
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Adj R ²	0.86	0.85	0.85	0.85	0.85

Note: The dependent variable is the logarithm of daily debit and credit transactions on services. Robust standard errors clustered at the country level are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's estimations.

Table 6. COVID-19 Infections and Card Transactions: Consumption Categories

	Consumer Spending Categories																
	Airports and Airlines	Travelling and Transportation	Hotels	Telecommunications	Sports Services	Restaurants and Catering	Security Services	Religion and Charity	Photos	Music	Office Supplies	Legal Services	Insurance	Financial Institutions	Luxury	Health Services	Government
COVID-19 infections	-0.070*** [0.320]	-0.074*** [0.382]	-0.075*** [0.022]	-0.057*** [0.325]	-0.076*** [0.378]	-0.087*** [0.156]	-0.010 [0.019]	-0.046 [0.057]	-0.075 [0.037]	-0.054 [0.028]	0.006 [0.012]	0.001 [0.004]	-0.144 [0.085]	0.070 [0.047]	-0.023*** [0.006]	-0.031 [0.016]	0.049 [0.028]
Stringency index	-0.128*** [0.345]	-0.205*** [0.468]	-0.417*** [0.072]	-0.279*** [0.566]	-0.822*** [0.245]	-0.424*** [0.114]	-0.100 [0.052]	-0.237 [0.056]	-0.318 [0.166]	-0.022 [0.040]	-0.418*** [0.015]	-0.051 [0.055]	-0.139** [0.046]	0.191** [0.053]	-0.667 [0.239]	-0.160*** [0.014]	-0.318*** [0.035]
Economic support index	0.026 [0.032]	0.042 [0.054]	0.072 [0.012]	0.009 [0.028]	0.049 [0.121]	0.050 [0.017]	0.063 [0.079]	0.057 [0.063]	0.100 [0.126]	0.007 [0.032]	0.285 [0.186]	-0.022 [0.078]	0.038 [0.016]	0.013 [0.063]	0.023 [0.106]	0.070 [0.056]	-0.149 [0.095]
Number of observations	2,072	2,078	2,078	2,078	2,078	2,078	2,048	2,018	2,078	2,078	2,074	2,022	2,060	2,068	2,077	2,078	2,071
Number of countries	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R ²	0.84	0.85	0.91	0.79	0.62	0.87	0.79	0.68	0.74	0.87	0.78	0.86	0.69	0.55	0.83	0.88	0.47

	Fuel	Food	Flowers and Gardening	Electronics	Construction and Real Estate	Home Building and Furnishings	Education and Hobbies	Beauty and Spa	Books and Periodicals	Business Services	Casinos and Betting	Cleaning Services	Clothing	Community Agencies	Vehicle Stores and Services	Accessories
	COVID-19 infections	-0.071*** [0.035]	-0.066 [0.056]	-0.079 [0.041]	-0.056 [0.026]	0.015 [0.030]	-0.036* [0.005]	-0.048 [0.022]	-0.097*** [0.005]	-0.062 [0.027]	-0.009*** [0.003]	-0.008 [0.059]	-0.021 [0.008]	-0.038 [0.014]	-0.010 [0.006]	-0.069*** [0.320]
Stringency index	-0.297*** [0.033]	-0.196*** [0.060]	-0.558*** [0.077]	-0.213*** [0.079]	-0.071 [0.063]	-0.590*** [0.181]	-0.637*** [0.160]	-0.464*** [0.119]	-0.310 [0.141]	-0.019 [0.030]	0.515*** [0.077]	-0.101*** [0.019]	-0.451*** [0.150]	-0.148* [0.054]	-0.123*** [0.345]	-0.322*** [0.109]
Economic support index	0.070 [0.026]	0.050*** [0.016]	0.096*** [0.018]	0.037*** [0.045]	0.104 [0.093]	0.081 [0.080]	0.022 [0.108]	0.068 [0.027]	0.001 [0.083]	0.011 [0.013]	0.029 [0.015]	0.009 [0.056]	0.052 [0.101]	0.042 [0.050]	0.049 [0.083]	0.093 [0.101]
Number of observations	2,078	2,078	2,078	2,078	2,076	2,078	2,078	2,078	2,078	2,078	2,078	2,078	2,078	2,078	2,078	2,077
Number of countries	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R ²	0.79	0.64	0.65	0.77	0.81	0.78	0.76	0.84	0.82	0.80	0.53	0.83	0.82	0.61	0.87	0.74

Note: The dependent variable is the logarithm of daily debit and credit transactions on consumption spending categories listed in the table. Robust standard errors clustered at the country level are reported in brackets. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Source: Author's estimations.

IV. CONCLUSION

The COVID-19 pandemic has truly been a global public health crisis, with more than 638.7 million infections and 6.6 million deaths across the world. The introduction of strict lockdowns and other public health measures aimed at containing the spread of the coronavirus forced the closure of many contact-intensive businesses and altered consumer spending patterns. While the initial phases of the pandemic resulted in an unprecedented amount of economic loss with global real GDP contracting by 3.1 percent in 2020, strong and coordinated policy response to the crisis has set the stage for a robust and broad-based economic recovery with household consumption becoming the leading engine of growth. This is why tracking consumer spending at high frequency is necessary to better understand the post-pandemic recovery on a timely basis and enable governments to properly calibrate policy interventions. To this end, this paper investigates how the spread of the pandemic has affected the amount and composition of consumer spending using daily debit and credit card transaction data in the Baltics and identify the impact of containment measures and economic support schemes in stabilizing aggregate economic activity.

The empirical analysis shows that the pandemic and government interventions have had significant effects on consumption expenditure in the Baltics. First, I find that the pandemic shock—as measured by the number of new COVID-19 infections and deaths—has a strongly negative effect on consumer spending as measured by debit and credit card transactions. A 1 percent increase in the number of new COVID-19 infections (or deaths) is associated with a decline of 0.052 percent (or 0.022 percent) in the total amount of debit and credit card transactions. The estimated coefficient may seem small, but the cumulative impact grows larger as the number of cases (or deaths) increases over time. Second, I find that government policy responses to the pandemic—in the form of public health measures to contain the spread of the virus and economic support measures designed to assist businesses and households—have significant effects on the amount and composition of debit and credit card transactions. For example, while a 1 percent increase in the stringency index lowers the amount of card transactions by 0.171 percent, a similar increase in the economic support index brings an increase of 0.021 percent in card transactions. Third, I conduct a granular analysis of 33 consumption spending categories and find that there is heterogeneity across spending categories, but the drop is mostly concentrated in services and goods that are directly restricted by lockdowns and the risk of infection. Fourth, the impact of government interventions, especially in terms of stimulating consumer spending, appears to be more pronounced on goods than services.

There is an unambiguous impact of the pandemic on consumer behavior, but it should be noted that the risk of infection might have also altered payment habits. The analysis presented in this paper provides a robust assessment of the pandemic's impact on consumer spending as measured by debit and credit card transactions. However, there is empirical evidence from previous pandemics that consumers tend to change payment habits and reduce the use of cash during infectious diseases (Cevik, 2020). The extent and intensity of the COVID-19

pandemic may have resulted in consumers switching from cash transactions to card payments, which might increase the amount of debit and credit card transactions without a corresponding increase in consumer spending. Nevertheless, monitoring consumer spending on a daily basis with alternative sources of information such as payment transaction data is extremely valuable for policymakers to track the pace and composition of economic activity in real time and respond more effectively and timely to shocks.

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