

The Effect of COVID-19 on Cashless Payments

Dmitry Ganzha

University of Applied Sciences Burgenland, Burgenland, Austria

The outbreak of the SARS-CoV-2 coronavirus (COVID-19) has impacted the whole world. To stop the virus's spread, governments enforced regulations requiring face masks and social isolation and also promoted social seclusion, hand-washing, and other hygienic measures. People's movements and consumption were significantly reduced as a result of government-imposed lockdowns, with internet purchasing overtaking in-store purchasing in a particularly noticeable way. Most importantly, people's habits during times of restrictions and lockdowns seemed to reduce overall desire to do cash transactions. Cashless transactions became the most preferred option for daily payment as it helped reduce contact with others and prevent them from becoming infected. These factors contribute to future intentions to eliminate cash payments once the pandemic is ended as well as the choice of payment methods currently in use. Even after the pandemic, people are using digital cashless payments for their daily transactions. This study investigates the impact of the coronavirus on consumer demand for cash and cashless payments during the COVID-19 crisis and beyond. This study utilizes the secondary research method by employing the annual statistical report of European Central Bank (ECB) (2021). The data were extracted from the warehouse of ECB, and rigorous analysis was performed to assess the intentions of customers for using digital transactions for payments. In the study, a regression analysis shows that a greater increase in the number of cards used for payment per year occurred during the COVID-19 pandemic than before the pandemic. The study demonstrates that there was a significant correlation between the adoption of cashless payment systems and the restrictions imposed on consumers because of the pandemic. Customers prefer cashless transactions when there is a higher danger of infection while handling cash.

Keywords: cashless payments, COVID-19 pandemic, cash, digital payments, regression analysis

Introduction

The sudden surge of the COVID-19 pandemic influenced the whole world due to its high infectiousness and deadly nature. People around the world became desperate and had to change their lifestyles due to this pandemic. The government even enforced laws and regulations requiring citizens to stay at home. People were required to maintain social distance from others to avoid becoming infected with COVID-19. This epidemic has altered the way of life around the world. People have had to adapt to this situation and make adjustments to how they live their lives. One of the major changes in habits has been seen in terms of payment systems due to the COVID-19 pandemic. Concern over a potential connection between using real money and COVID-19 infections has unexpectedly increased (Auer, Cornelli, & Frost, 2020). The COVID-19 epidemic has enforced changes in a variety of company strategies and economic sectors, as well as in customer habits across a variety

Dmitry Ganzha, MSC, PhD student, International Economic Relations and Management, University of Applied Sciences Burgenland, Burgenland, Austria.

of industries, including regular payment habits (Popkova, DeLo, & Sergi, 2021). Most of the citizens of 20 selected European countries preferred a cashless digital payment method for their daily payments in the time of the COVID-19 pandemic because the exchange of physical cash between people increased the chance of getting infected. In times of COVID-19, people's movements and consumption were significantly reduced as a result of government-imposed lockdowns, with internet purchasing overtaking in-store purchasing in a particularly noticeable way (Bounie, Camara, & Galbraith, 2020). According to a survey by European Central Bank (2021), around 38% of respondents from European countries believed that touching banknotes and physical cash could lead to infection by the COVID-19 virus. This belief significantly reduced the use of cash payments. Surveys by the Federal Reserve System (Kim, Kumar, & O'Brien, 2020) and the Bank of Canada (Chen et al., 2020), which also found that some risk-averse retailers stopped accepting cash as a form of payment altogether, reached similar conclusions. Jonker, van der Crujisen, Bijlsma, and Bolt (2021) conducted a study of demographic and transaction-specific behaviors, using a Dutch payment diary data, and they found that payment habits transitioned from cash to cashless payments due to COVID-19. Notably, both more general statistics and the words of specific respondents showed how the epidemic has affected the transactional utility of currency. Studies in Switzerland (Kraenzlin, Meyer, & Nellen, 2020), Italy (Ardizzi, Nobili, & Rocco, 2020), and France (Bounie, Camara, & Galbraith, 2020) that focused on data of national payment schemes, retail systems, or specific banks found that the utilization of digital payments has accelerated quickly in spite of a reduction in overall consumption. Huterska, Piotrowska, and Szalacha-Jarmużek (2021) investigated the payment behaviors of people during times of extreme conditions like COVID-19. They concluded that the fear of SARS-CoV-2 infection, and the restrictions regarding government-imposed lockdowns, have changed the financial payment behaviors of the people. They also emphasized the importance of cashless digital payments during the time of COVID-19 and other epidemic situations.

The pandemic has changed the behavior of people in many ways and payment behavior is one of the most prominent. Even after the peak of the pandemic, people have become familiar with easier and smoother digital payment systems. The current study investigated the impact of the coronavirus on consumer demand for cash and digital payments in the time of the COVID-19 crisis as well as after the pandemic. The number of cards will therefore be analyzed which leads to more cashless transactions if there is an increase in the number of cards. This work describes the adoption of digital payment systems from the onset of COVID-19 to the present. The outcome of this study will help various stakeholders make strategic decisions about payment methods for their organizations.

Literature Review

Several studies have been conducted by various authors around the globe on the topic of COVID-19 and cashless payments, with the main concern being the possible transmission of the virus through the exchange of physical money between people. Research on the transmission of infectious diseases by using currency first appeared in the 1970s (Abrams & Waterman, 1972). SARS-CoV-2 can persist on surfaces, which increases the risk that the virus might spread through currency (Chin et al., 2020). The COVID-19 coronavirus can still be detected on paper notes and polymer 28 days after infection. The amount of time needed for viral decay in coins may vary depending on the metal used in their production. For copper, it seems to take eight hours, whereas for stainless steel it takes 48 hours. The transition from physical cash to cashless payments can

eliminate the risk of spreading the virus through the exchange of cash. Because SARS-CoV-2 may remain alive for seven days on the surfaces of plastic (Chin et al., 2020), users of pin pads and payment card terminals may be in danger. However, due to the epidemic, contactless payment limits were increased in several countries, and MasterCard made pin codes unnecessary for the vast majority of point-of-sale transactions. The huge numbers of financial transactions that were carried out online or through mobile banking also prevented interaction with potentially infectious objects. Therefore, it is possible to claim that altering one's payment practices may lower the chance of infection. It became somewhat unclear how money issuers felt about the subject of compromised public health. The way that central banks reacted to information regarding the potential harm that cash posed varied. However, studies showed that objects including banknotes and coins, which are continuously touched and change hands fairly often, may be a breeding nest for the virus, as it can survive on these surfaces at 22 °C for eight hours and at 37 °C for four hours (Harbourt et al., 2020). The virus stayed stable on banknotes for an hour, according to a study by the Bank of England, before the concentration of it was dramatically reduced to barely 5% of its initial level over the course of the next five (Caswell, Smith, Learmonth, & Pearce, 2020). The *Westdeutsche* newspaper (2020) reported that the FED even quarantined US-Dollars coming from overseas, especially from Asia, for up to 10 days before releasing them for usage to the general public.

The risk of getting infected still prevails. For this reason, people have started to adopt various types of cashless digital payment systems such as cash card, debit card, credit card and e-money. Bhavya and Hebbar (2021) conducted a case study on Mangalore City to investigate the effect of COVID-19 on cashless payments. Most of the people of Mangalore City believed that utilization of online payments could reduce the spread of COVID-19 significantly. Ho, Nguyen, and Quach assessed the major influencing factors to adopt cashless payment systems by people in two big cities of Vietnam (Ho et al., 2022). Their findings indicated that fear of spreading COVID-19 was one of the major considerations for transitioning to cashless payments. Kotkowski and Polasik (2021) conducted a research survey on the people of European countries regarding the impact of COVID-19 on cashless payments. Their study was focused on the results of a survey that had over 5,000 participants from 22 different nations in Europe. It demonstrated that customers who were already using cashless payment methods before the surge of the pandemic have become even more likely to continue doing so since the epidemic first started. On the other hand, despite being provided additional payment choices, customers who had always paid in cash have regularly done so, nevertheless. The same authors have also conducted a survey to investigate how the COVID-19 epidemic impacted consumers' payment behavior in Europe (Polasik & Kotkowski, 2021). They discovered that the number of cashless payments increased substantially during the COVID-19 period.

Most of the existing research, such as Wisniewski, Polasik, Kotkowski, and Moro (2021) and Kotkowski and Polasik (2021), has focused on people's perceptions of the effect of COVID-19 on the adoption of cashless payments. They did not show the actual representation of data that could illustrate the real scenario of the growth of digital payments. This study investigates and summarizes the recent statistical report of ECB 2021 to show the effect of COVID-19 on the growth of cashless digital transactions in European countries.

Methodology

The main aim of this study was to investigate the influence of COVID-19 on payment behaviors of people of European countries. This study adopted a secondary research method to determine the influence of

COVID-19 on payment behavior of European countries. Secondary research, often known as desk research, is a method of studying that makes use of information that has already been gathered. Existing data are collated and summarized to enhance the overall efficiency of research. Secondary research refers to studies that build upon and expand upon prior studies that have been published in research reports or other similar articles. You may find some of these items in public libraries, internet databases, previously conducted polls, etc. Some non-profit and government agencies also maintain databases with research-worthy information. Since secondary research uses data that have already been collected rather than gathering new information from scratch, secondary research is more cost-effective than primary research. The secondary research method is very popular all over the world. Many studies using secondary research have been conducted by various authors around the world. Warchlewska (2020) conducted a research study using secondary data to investigate the impact of cashless payments on senior citizens. Singhal and Gupta (2021) also conducted a secondary study, considering a previously published article, to investigate the impact of COVID-19 on digital payment services at towns and villages.

This study utilized the annual statistical report (2021) of European Central Bank (ECB) as a secondary source of data. The ECB has collected data around various major criteria. It has performed major investigations and surveys on the people and organizations of European countries to collect information regarding banking, payments and other business functions. This study focused on the topic of payment methods such as card, credit transfer, direct debit transfer and e-money. The data were extracted from the statistical report to align with the investigation of this study. Then, regression analysis was performed after collecting the data. The regression coefficient depicts the rate of change of behavior of European people in their payment methods. Additionally, the data were extracted and plotted in various graphs and tables to show the change in financial behavior of European people for their daily payments. This research also considered published articles and books from other sources as secondary sources of data to represent the objectives clearly.

Results and Discussion

Trends of Digital Payments in Europe

This study utilized the statistical data of ECB to conduct further analysis for pointing out the major impact of COVID-19 on the nature of financial transactions. Figure 1 represents the payment methods of choice from 2001 to 2021. The horizontal axis represents the year of transactions, and the vertical axis represents the number of transactions in billions. It is clear from Figure 1 that there are five types of non-cash payment systems available in Europe, including card payments, credit transfers, direct debits, cheques and e-money. From Figure 1, it is also evident that use of non-cash payment is increasing at a very high rate. The growth rates, or the slope of the curves, are the smallest in earlier years, while the largest and steepest growth rates are from recent years. From the COVID-19 period to present (2019-2022), the use of non-cash payments has increased significantly. Financial transactions through cards show the highest growth rate among other payment systems. Non-cash payments in the Eurozone, which include all kinds of payment services, climbed in 2021 by 12.5% to 114.2 billion, with an equivalent total value rise of 18.6% to €197.0 trillion, compared to the previous year. Payments made using credit cards accounted for 49% of all transactions, while credit transfers accounted for 22%, and direct debits accounted for 20% of all transactions. Furthermore, the use of cheques for financial transactions and payments is decreasing.

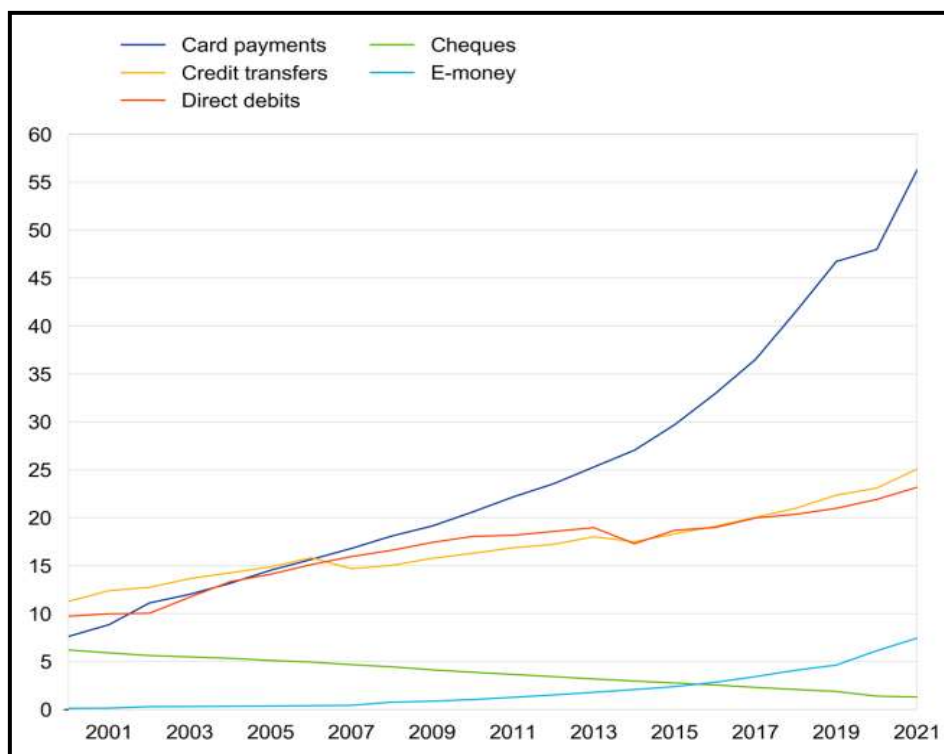


Figure 1. Trends of payment systems in Europe (Prepared by author, based on data from the ECB data warehouse).

Number of Issued Cards with a Cash Function

There are various types of cards which can be used for payment online and offline (Yu, Hsi, & Kuo, 2002). These cards are classified according to their usefulness and nature. Figure 2 represents the number of issued cards with a cash payment in various countries of Europe from the years 2013 to 2021. A cash card is a reloadable e-wallet that may be used to make a variety of different kinds of payments (Upadhayaya, 2012). Bank debit cards, pre-loaded debit cards, gift and payroll cash cards are all examples of cash cards. There are no credit cards included in the list because credit cards are a kind of debt rather than cash. Cardholders can conveniently make electronic payments using cash cards. All retailers who accept the network processor usually also accept standard-branded cash cards. The most prevalent sort of regular cash card is a bank debit card. It is common for these cards to be connected to a bank account at a financial institution, and one may use them to make electronic withdrawals from their bank account. It is also possible to withdraw money from a bank account using a standard cash card. A bank-operated or connected ATM will not charge you any fees if you use a cash card that is linked to a checking account.

From Figure 2, it is evident that the number of cash cards is increasing year by year. If we look at Spain, for example, it can be seen that the number of cash cards is increasing continuously as a way to make daily payments. In 2013, the number of cash cards was 69.75 million. However, in 2021, it increased to 88.46 million. This is likely because COVID-19 infected Spain very severely. That's why the people of Spain have adopted digital cashless payment systems for their daily needs. Even after the end of the pandemic, they have continued to use cash cards for their daily payments. Germany also has shown a significant amount of increase in the use of cash cards. The number of cash cards has increased around 22.63 million from 2013 to 2021. The highest number of cash card users was counted around 161.71 million during the COVID-19 period in 2020. In a

nutshell, it can be concluded that the overall adoption of cash cards for digital and electronic payments has increased significantly in European countries. It can be predicted that this trend of cash card and digital payments will continue in the foreseeable future. People will utilize cash cards more often for their daily needs.

Number of Payment Cards with a Debit Function

Figure 3 represents the number of payment cards with a debit function for various European countries from 2013 to 2021. It functions as a bank debit card for the payment of any transaction. Debit cards are linked directly to a person's bank account, so when one is used to make a transaction, the money is withdrawn straight out of that account. These cards may be used to buy goods and services, but they can also be used to withdraw cash from an ATM or to receive cash back while making a purchase at certain stores. They are also known as "check cards" or "bank cards". The number of people using debit cards is increasing continuously in European countries. For example, in Italy, it is clear that more people are using debit cards to make daily payments. There were 44.22 million debit cards in use in 2013. But in 2021, it increased to 60.94 million. Italy was severely affected by the COVID-19 infection. For their daily necessities, Italian citizens have adopted digital and cashless payment methods. Even after the peak of the epidemic was over, people continued to use cash cards for daily payments. Likewise, Germany has exhibited a large increase in the use of cash cards. Between 2013 and 2021, there were an additional 15.74 million debit cards issued. Around 121.33 million people used debit cards at their greatest level during the COVID-19 era in 2020-2021. In summary, it can be said that debit cards have been widely accepted for digital and electronic payments in European nations.

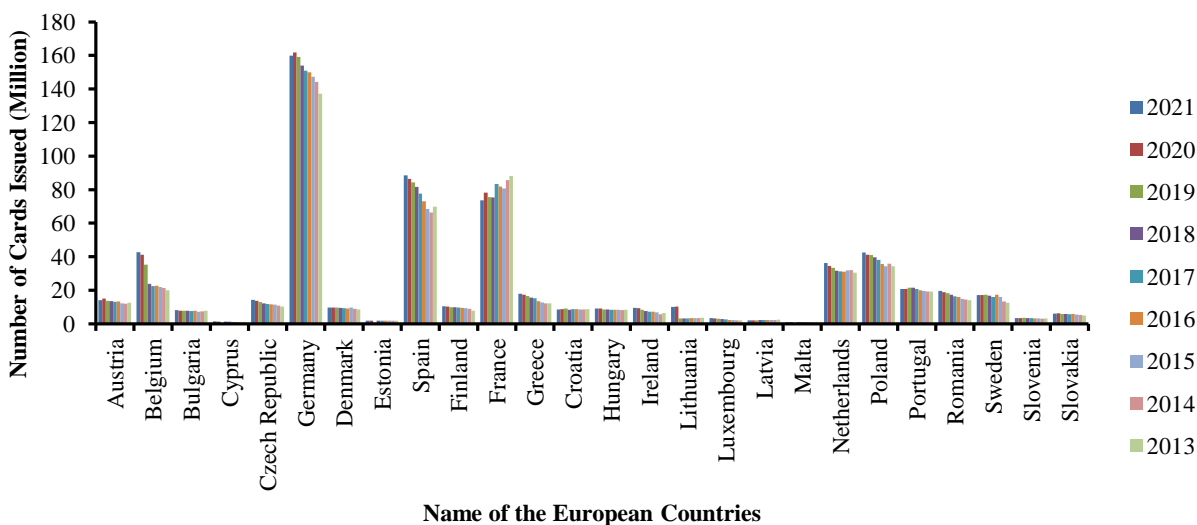


Figure 2. Number of issued cards with a cash function (Prepared by author, based on data from the ECB data warehouse).

Number of Payment Cards with All Functions Such as Cash, Debit, Credit, E-money and Credit with Delayed Debit

There are several types of digital payment systems such as cash card, debit card, credit card, e-money and credit with delayed debit. Previously, this study discussed the major digital payment methods of cash and debit card. This section has combined all types of digital payment systems. Figure 4 shows the total number of digital payment systems used in various countries over the past 9 years. This section shows the same results as previously. The adoption of digital payment systems by various European countries has increased continuously

over 2013-2021. The COVID-19 pandemic has accelerated the adoption and growth rate of digital payment methods significantly since 2020. That is the reason why the growth is greater in 2020 and 2021 than in prior years. Figure 5 represents the percentage of growth rate in the number of cards with a payment. This growth rate is calculated in terms of percentage. This growth rate means the rate of adoption of payment cards from the previous year. For example, the growth rate of 2021 indicates the amount of change from the condition of 2020. The positive sign of change indicates that the adoption of digital payment cards is increasing continuously, while a negative sign indicates that the adoption of digital payment cards is decreasing continuously. Most of the countries have shown a positive growth rate each year. Austria, Belgium, Denmark, Croatia and Portugal have shown negative growth at some points during past years. However, all countries have shown a positive growth rate of digital payments during the COVID-19 period. There are, however, some countries that show a negative growth rate just after COVID-19. Austria shows a -6% negative growth rate just after the pandemic was over. By observing all the data, it can be predicted that digital payment systems will predominate cash payments soon.

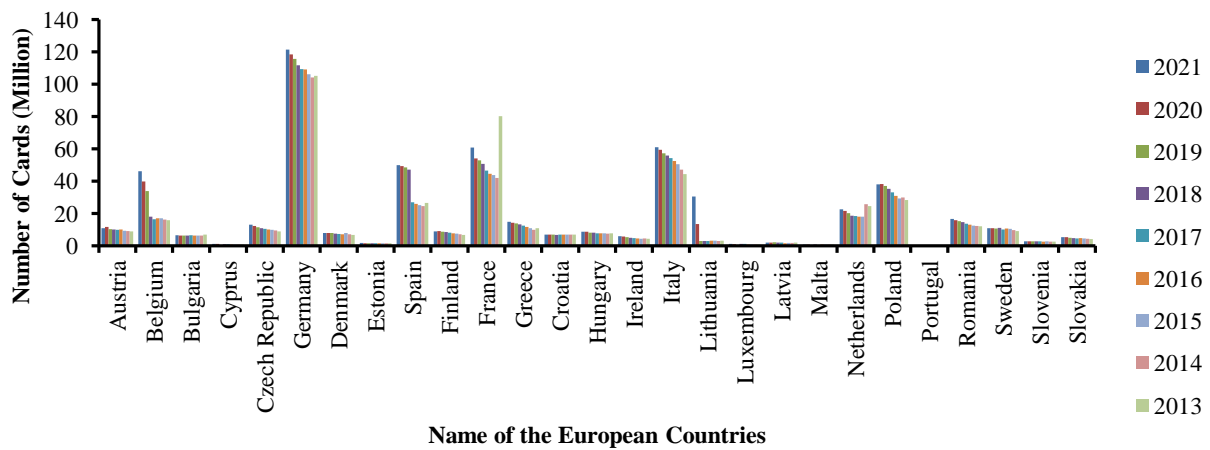


Figure 3. Number of payment cards with a debit function (Prepared by author, based on data from the ECB data warehouse).

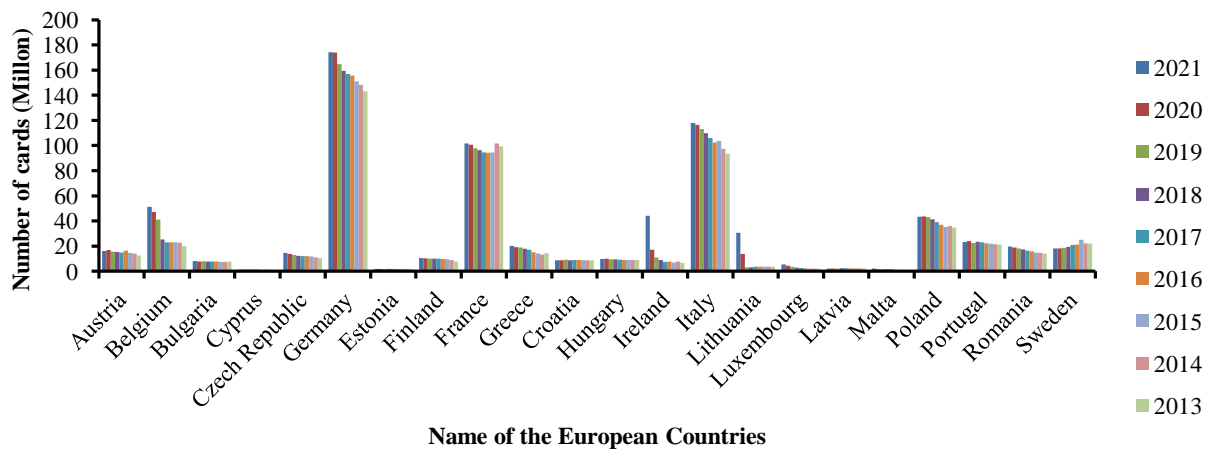


Figure 4. Number of payment cards with all functions such as cash, debit, credit, e-money and credit with delayed debit (Prepared by author, based on data from the ECB data warehouse).

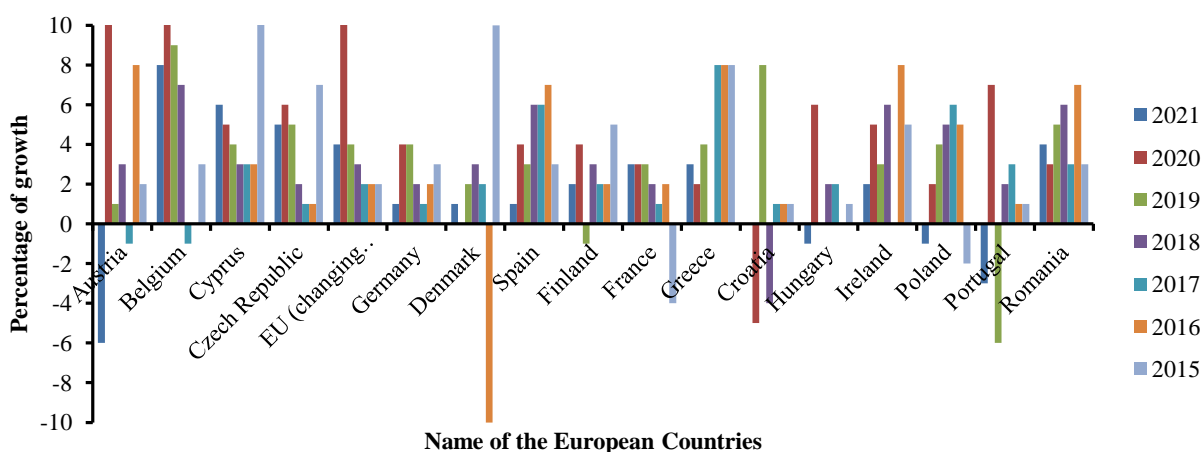


Figure 5. Percentage of growth rate in number of cards with a payment (Prepared by author, based on data from the ECB data warehouse).

Regression Analysis

This study conducted a regression analysis to show whether the use of cards was predicted by year, before and during the pandemic. We divided the number of cards between 2 segments. The first segment denotes the number of cards before the pandemic considering the years from 2013 to 2017. The second segment denotes the number of cards including the pandemic period year (2018-2021). The data for regression analysis were collected from the statistics of ECB 2021. The total number of various types of issued cards for digital payment was collected from the statistics of ECB 2021. ECB has published its statistics for each individual European country. This research has summed up the number of issued cards in each country. The total card number represents the total number of issued cards in the European zone. For this analysis, we used an alpha level of 0.01 to indicate significance. In this regression analysis, the year is considered as the independent variable (x) and the number of total cards in European countries (including all European countries) is considered as the dependent variable (y). Figure 6 represents the regression analysis of the total number of cards before the COVID-19 pandemic. The regression model was $y = 102.3x - 200529$. From Figure 6 and the regression model, we can see that the regression coefficient was 102.3, which indicates that the total number of cards was increased by 102.3 million per year before the pandemic. The mean square-R value was 0.957 which is very high. The P-value of the regression model was 0.004 which is less than 0.01, indicating that this regression model was statically significant. On the other hand, Figure 8 represents the regression analysis of the total number of cards during the COVID-19 pandemic. The regression model was $y = 432.54x - 200529$. From Figure 8 and the regression model, we observe that the regression coefficient was 432.54, which indicates that the total number of cards was increased by 432.54 million per year during the pandemic. The mean square-R value was 0.9875 which is again very high, and the P-value was 0.0062, indicating that the model was significant. By comparing the regression coefficient of the total number of cards before COVID-19 and the total number of cards during COVID-19, it is evident that people used more cards in the time period of the pandemic than before the pandemic. It can be stated that the COVID-19 pandemic increased the use of cards for digital cashless payments.

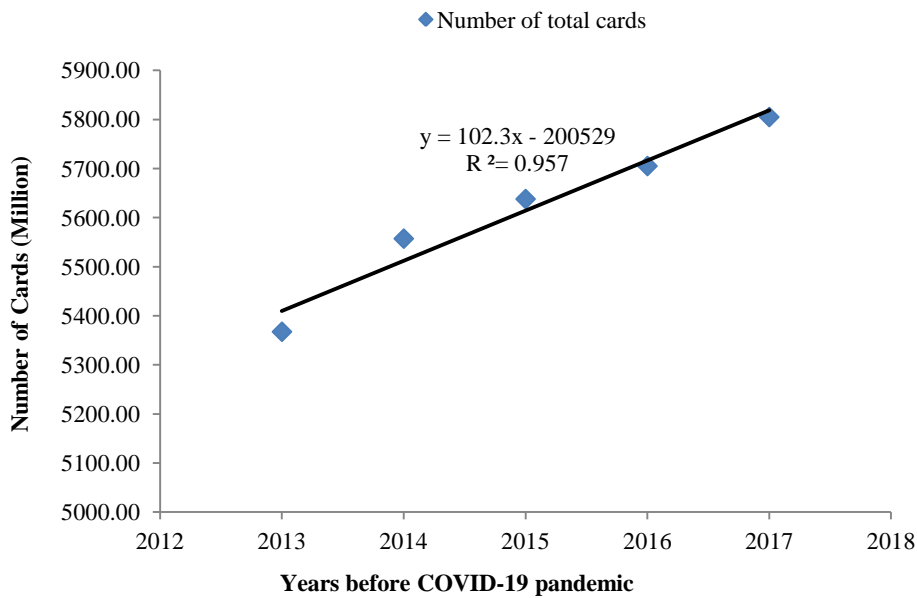


Figure 6. Regression analysis of number of cards before COVID-19.

| SUMMARY OUTPUT (Before COVID 19) | | | | | | | | |
|----------------------------------|---------------------|-----------------------|---------------|----------------|-----------------------|------------------|--------------------|--------------------|
| <i>Regression Statistics</i> | | | | | | | | |
| Multiple R | 0.97824153 | | | | | | | |
| R Square | 0.956956491 | | | | | | | |
| Adjusted R Square | 0.942608654 | | | | | | | |
| Standard Error | 39.6133204 | | | | | | | |
| Observations | 5 | | | | | | | |
| <i>ANOVA</i> | | | | | | | | |
| | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>Significance F</i> | | | |
| Regression | 1 | 104661.8167 | 104661.8 | 66.69692 | 0.0038402 | | | |
| Residual | 3 | 4707.64546 | 1569.215 | | | | | |
| Total | 4 | 109369.4621 | | | | | | |
| | <i>Coefficients</i> | <i>Standard Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> | <i>Lower 95.0%</i> | <i>Upper 95.0%</i> |
| Intercept | -200528.8622 | 25241.57233 | -7.94439 | 0.00416 | -280858.811 | -120198.914 | -280858.811 | -120198.914 |
| X Variable 1 | 102.304358 | 12.52683182 | 8.166818 | 0.00384 | 62.43838837 | 142.1703276 | 62.43838837 | 142.170328 |

Figure 7. Regression analysis parameters of number of cards before COVID-19.

Figure 7 represents the regression analysis parameters of the number of issued cards predicted by years before the outbreak of COVID-19. The standard error of the x variable in this analysis is 12.53. The standard error measures the distance of observed data from the predicted data on the regression line. The average distance between the observed values and the regression line is shown by the standard error of the regression, which is sometimes referred to as the standard error of the estimate. Utilizing the units of the response variable, it is informative of how consistent the regression model is. Better values are smaller ones since they show that the observations more closely parallel the predictions of the fitted line. The prediction of card numbers fluctuates around 12.53 million from the real amount using this model. On the other hand, Figure 9 represents the regression analysis parameters of the number of issued cards predicted by years during the outbreak of

COVID-19. The standard error of x variable in this analysis was 34.45. The regression model during the COVID-19 period will provide wrong data from the actual condition with a fluctuation around 34.45 million. By comparing the two regression models, $y = 102.3x - 200529$ can provide more accurate results than $y = 432.54x - 200529$. The P value can be considered as another parameter to evaluate within the regression models. The P value should be less than 0.01 to be statistically significant. The P value of the $y = 102.3x - 200529$ regression model was 0.00384, which is less than 0.01. On the other hand, the P value of the $y = 432.54x - 200529$ regression model is 0.0062, which is again less than 0.01. In this case, it can be concluded that both the first model, $y = 102.3x - 200529$, and the second model, $y = 432.54x - 200529$, were statistically significant. However, the $y = 432.54x - 200529$ model had a greater regression co-efficient than $y = 102.3x - 200529$. This phenomenon indicates that the increase in COVID-19 infections resulted in an increased number of cards for cashless digital payments.

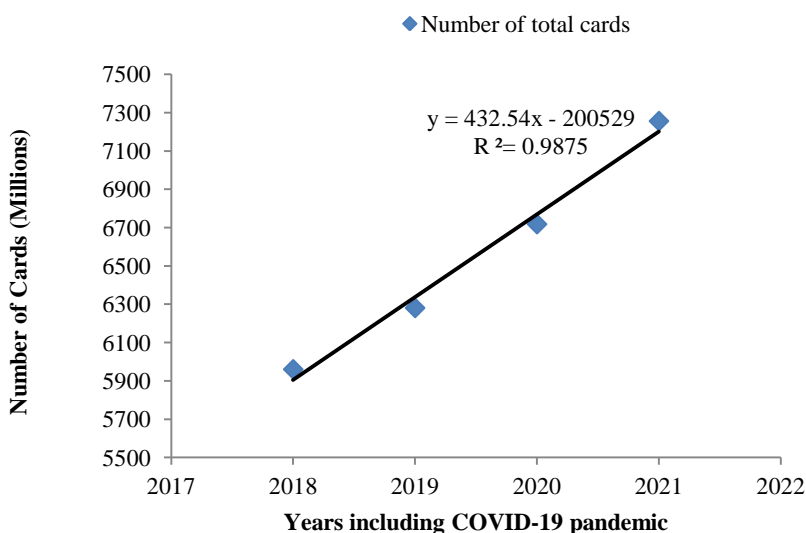


Figure 8. Regression analysis of number of cards during COVID-19.

| SUMMARY OUTPUT (during Covid-19) | | | | | | | | |
|----------------------------------|---------------------|-----------------------|---------------|----------------|-----------------------|------------------|--------------------|--------------------|
| <i>Regression Statistics</i> | | | | | | | | |
| Multiple R | 0.993714317 | | | | | | | |
| R Square | 0.987468144 | | | | | | | |
| Adjusted R Square | 0.981202215 | | | | | | | |
| Standard Error | 77.04520333 | | | | | | | |
| Observations | 4 | | | | | | | |
| <i>ANOVA</i> | | | | | | | | |
| | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>Significance F</i> | | | |
| Regression | 1 | 935467.9047 | 935467.9 | 157.5933 | 0.006285683 | | | |
| Residual | 2 | 11871.92671 | 5935.963 | | | | | |
| Total | 3 | 947339.8314 | | | | | | |
| | <i>Coefficients</i> | <i>Standard Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> | <i>Lower 95.0%</i> | <i>Upper 95.0%</i> |
| Intercept | -866967.5601 | 69583.22088 | -12.4594 | 0.00638 | -1166360 | -567575.125 | -1166360 | -567575.125 |
| X Variable 1 | 432.543155 | 34.4556624 | 12.55362 | 0.006286 | 284.2924051 | 580.7939049 | 284.2924051 | 580.793905 |

Figure 9. Regression analysis parameters of number of cards during COVID-19.

Conclusions

The spread of the coronavirus shifted the direction of our lives and established a constant feeling of anxiety. The COVID-19 pandemic has influenced the lifestyles of people negatively. People have had to cope with this virus by adopting new social life standards. Due to government-imposed lockdowns and fear of becoming infected with the coronavirus, people had to maintain social distance from others. This phenomenon has altered the traditional financial transactions of physical cash. People preferred to use cashless and digital payment systems because they believed cash payment might cause infection of coronavirus from others. This study investigated the impact of COVID-19 on cashless digital payment methods. This study used a secondary research strategy by collecting documents from legitimate sources of already-collected data. This study considered the statistics of European Central Bank (ECB) (2021) as secondary sources of data for interpreting the impact of COVID-19 on digital cashless payments.

The analysis of the data reveals that the number of online payment systems has been increasing continuously over time. But, in the time during the pandemic, the adoption of online payment systems accelerated a lot. People have adopted online payment systems significantly for their daily needs. The data also represent that the adoption of online payment systems has been high even after the end of the COVID-19 pandemic. People have become accustomed to the new digital payment systems. It is also clear from the results that because of COVID-19 the number of cards issued increased more rapidly which led to more cashless transactions overall. It can also be predicted that the utilization of digital payments will continue to rise in the near future and have an impact on society and the way financial transactions and payments are conducted. With a more digital environment, people will have to adapt. It remains to be seen if the continuing transition to new payment methods will be smooth and easy.

References

- Abrams, B. L., & Waterman, N. G. (1972). Dirty money. *Jama*, 219(9), 1202-1203.
- Ardizzi, G., Nobili, A., & Rocco, G. (2020). A game changer in payment habits: Evidence from daily data during a pandemic. Bank of Italy Occasional Paper No. 591.
- Auer, R., Cornelli, G., & Frost, J. (2020). Covid-19, cash, and the future of payments. BIS Bulletin No. 3, Bank for International Settlements.
- Bhavya, M., & Hebbar, C. (2021). Customers perception on cashless banking: (With relation to public sector bank) A case study with reference to Mangalore City. *EPRA International Journal of Research & Development (IJRD)*, 6(7), 694-698.
- Bounie, D., Camara, Y., & Galbraith, J. W. (2020). Consumers' mobility, expenditure and online-offline substitution response to COVID-19: Evidence from French transaction data. CIRANO Working Papers 2020s-28, CIRANO.
- Caswell, E., Smith, M. H., Learmonth, D., & Pearce, G. (2020). Cash in the time of Covid. Bank of England Quarterly Bulletin 2020 Q4.
- Chen, H., Engert, W., Huynh, K., Nicholls, G., Nicholson, M., & Zhu, J. (2020). Cash and COVID-19: The impact of the pandemic on the demand for and use of cash. Bank of Canada Staff Discussion Paper.
- Chin, A., Chu, J., Perera, M., Hui, K., Yen, H.-L., Chan, M., Peiris, M., & Poon, L. (2020). Stability of SARS-CoV-2 in different environmental conditions. *The Lancet Microbe*, 1(1), e10.
- European Central Bank. (2021). *ECB annual report 2020*. Retrieved from <https://www.ecb.europa.eu/pub/pdf/annrep/ar2020~4960fb81ae.en.pdf>
- Harbourt, D. E., Haddow, A. D., Piper, A. E., Bloomfield, H., Kearney, B. J., Fetterer, D., Gibson, K., & Minogue, T. (2020). Modeling the stability of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on skin, currency, and clothing. *PLOS Neglected Tropical Diseases*, 14(11), e0008831.
- Ho, C. H. P., Nguyen, K. T., & Quach, T. D. (2022). *Factors affecting the choice of cashless payment in Vietnam*. Retrieved from <https://assets.researchsquare.com/files/rs-1439247/v1/2184347c-a1d3-46a9-aed1-b355e343645c.pdf?c=1647443946>

- Huterska, A., Piotrowska, A. I., & Szalacha-Jarmużek, J. (2021). Fear of the COVID-19 pandemic and social distancing as factors determining the change in consumer payment behavior at retail and service outlets. *Energies*, 14(14), 4191.
- Jonker, N., van der Crujisen, C., Bijlsma, M., & Bolt, W. (2021). *Effect of COVID-19 on payment patterns: A policy perspective*. Retrieved from <https://european-economy.eu/2021-1/effect-of-covid-19-on-payment-patterns-a-policy-perspective/>
- Kim, L., Kumar, R., & O'Brien, S. (2020). *2020 findings from the diary of consumer payment choice*. Retrieved from <https://www.frbsf.org/wp-content/uploads/sites/7/2020-findings-from-the-diary-of-consumer-payment-choice-july2020.pdf>
- Kotkowski, R., & Polasik, M. (2021). COVID-19 pandemic increases the divide between cash and cashless payment users in Europe. *Economics Letters*, 209, 110139.
- Kraenzlin, S., Meyer, C., & Nellen, T. (2020). COVID-19 and regional shifts in Swiss retail payments. *Swiss Journal of Economics and Statistics*, 156(1), 1-20.
- Polasik, M., & Kotkowski, R. (2021). Temporary panic or fundamental change in payment habits in Europe? Lesson from COVID-19 pandemic shift towards cashless payments. SUERF Policy Brief, No. 230.
- Popkova, E., DeLo, P., & Sergi, B. S. (2021). Corporate social responsibility amid social distancing during the COVID-19 crisis: BRICS vs. OECD countries. *Research in International Business and Finance*, 55, 101315.
- Riddell, S., Goldie, S., Hill, A., Eagles, D., & Drew, T. W. (2020). The effect of temperature on persistence of SARS-CoV-2 on common surfaces. *Virology Journal*, 17, 145.
- Singhal, R., & Gupta, A. (2021). Impact of COVID-19 on digital payment services at towns and villages. *International Journal of Creative Research Thoughts (IJCRT)*, 9(5), 585-594.
- Upadhayaya, A. (2012). Electronic commerce and e-wallet. *International Journal of Recent Research and Review*, 1(1), 37-41.
- Warchlewska, A. (2020). Will the development of cashless payment technologies increase the financial exclusion of senior citizens? *Acta Scientiarum Polonorum. Oeconomia*, 19(2), 87-96.
- Westdeutsche Zeitung. (2020). Schweizer Experte warnt vor Coronavirus-Übertragung über Geldscheine. March 11, 2020.
- Wisniewski, T. P., Polasik, M., Kotkowski, R., & Moro, A. (2021). Switching from cash to cashless payments during the COVID-19 pandemic and beyond. NBP Working Paper No. 337.
- Yu, H.-C., Hsi, K.-H., & Kuo, P.-J. (2002). Electronic payment systems: An analysis and comparison of types. *Technology in Society*, 24(3), 331-347.