Preliminary Review of the Impact of COVID-19 on Cash in Greece and Cyprus

Petros Lois[1], **Spyros Repousis**[2]

Abstract

The purpose of this paper is to carry out a preliminary review of the existing literature about cashless society and the impact of COVID-19 on cash in Greece and Cyprus. A 'war on cash' will soon take place, as cash is thought of as a curse, and paper money is thought of as being unsanitary due to the coronavirus outbreak. Coins and paper currencies are considered a risk for public health, although transmission probability is low, compared with other more commonly touched objects. Data about the use of cash are being analysed.

The ratio of cash to GDP in Greece and Cyprus from 2010 to 2020 increased rather than decreased and is above other countries. Cash is a convenient method of payment for low-value payments. Ratio is lower in Cyprus than in Greece and both countries have a high cash to GDP ratio in comparison with other digitalised countries, such as Sweden, while the number of confirmed cases and deaths from the coronavirus for Greece and Cyprus until the end of May 2021 were lower than expected. The population in Greece and Sweden is about the same (10.38 million people in Sweden and 10.42 million people in Greece). In the future, technological developments about payments will have an impact on cash usage all over the world. The coronavirus pandemic will increase the need to support cash and, at the same time, call for digital currencies from a central bank.

Keywords: coronavirus, COVID-19, SARS-CoV-2, cashless society, paper money, digital money, Greece, Cyprus

Introduction

In just a few weeks, the coronavirus (or COVID-19 or SARS-CoV-2), began in China and then spread worldwide. Many described it as an unpredictable and very rare event but with extremely bad and severe consequences.

[1] Professor and Head of the Department of Accounting, School of Business, University of Nicosia.
[2] Adjunct Faculty, School of Business, University of Nicosia.

According to the World Health Organization (WHO) Dashboard about the coronavirus disease (COVID-19) , there had been 169,118,995 confirmed cases and 3,519,175 deaths all over the world until 29May 2021. According to the same COVID-19 Dashboard, the USA was the first country with the highest number of confirmed cases and the highest number of deaths (Table 1).

Table 1. COVID-19 Dashboard in selected countries

Country		Confirmed cases	Deaths
USA	(29th May 2021)	32,891,410	587,549
India	(29th May 2021)	27,729,247	322,512
Brazil	(29th May 2021)	16,342,162	456,674
Germany	(29th May 2021)	3,675,296	88,350
China	(29th May 2021)	110,263	4,924
Sweden	(29th May 2021)	1,068,473	14,451
Greece	(29th May 2021)	398,898	11,995
Cyprus	(29th May 2021)	72,159	357

Source: World Health Organization

Economic policy will need to shift[3] from its current status and focus on efficiency, sustainability and a more centralised governance to address public-health matters. Europe is capable of establishing a centre for the prevention of large-scale risks.

With specific reference made to payment services, the European Banking Authority (EBA)[4] encourages all parts, consumers and companies to undertake all necessary sanitary precautions when using point of sales (POS) terminals, Personal Identification Numbers (PIN) or make calls on payment services providers to support measures that can reduce the spread of the coronavirus and, to that end, facilitate contactless payments. Additionally, the EBA encourages to increase the transaction limit up to a maximum of EUR 50 per transaction.

[3] Andrea Renda, Rosa J. Castro, 'Chronicle of a Pandemic Foretold' (March 2020) 5 *CEPS*..

[4] European Banking Authority, 'Statement on Consumer and Payment Issues in Light of COVID19' (25 March 2020, available at: https://eba.europa.eu/sites/default/documents/files/document_library/News%20and%20Press/Press%20Room/Press%20Releases/2020/EBA%20provides%20clarity%20to%20banks%20and%20consumers%20on%20the%20application%20of%20the%20prudential%20framework%20in%20light%20of%20COVID-19%20measures/Statement%20on%20consumer%20protection%20and%20payments%20in%20the%20COVID19%20crisis.pdf (last accessed 27 March 2020).

But why are we discussing coronavirus and cash? The purpose of this paper is to examine the literature review on cashless society and the coronavirus, as well as the use of cash in Greece and Cyprus. In the next section, a preliminary literature review will be presented, an analysis about the use of cash in Greece and Cyprus will follow, then conclusions will be drawn accordingly, and lastly, limitations and future research will be discussed.

Preliminary Literature Review

Money has taken many different forms throughout history. Some early societies valued goods in terms of cattle, shells, salt and precious metals like gold and silver for their use as money. But how did goods like these become money in the first place? Money arose from a need to address the inefficiency of barter, which requires the double coincidence of needs.

In the 19th century, the British economist Henry Thornton observed that coined money was valued more as a measure of the value of other goods than for its inherent value as a precious metal. Therefore, it was more efficient for societies to convert to paper notes to track the value of exchange.

In the 1970s, information technology (IT) entered the stage and marked the beginning of the digital revolution. Its advent meant that banking was no longer confined to the traditional way of recording and managing money and credit. The beginning of the digital revolution was followed by the rise of shadow banking, which is used to describe the variety of financial institutions and networks outside the traditional banking sector. At the outset of the financial crisis of 2007-2008, shadow banking was more important than traditional banking.[5]

Electronic cash-management services has been a critical element in the services of any financial institution for decades.[6] Today, politicians, academics and people working in finance are currently engaged in a 'war on cash'.[7] Also, arguments support that cash is technologically outdated and that limiting its use would lead to more efficient payment transactions.

[5] Jonathan McMillan, *The End of Banking: Money, Credit and the Digital Revolution* (Zurich, Switzerland: Zero/One Economics GmbH, 2014).

[6] Floyd E. Egner, *The Electronic Future of Banking* (Illinois, USA: Financial Sourcebooks, 1991).

[7] Erwin Gladisch, 'The Use of Cash in Germany: Status and Outlook' in: Frank Rövekamp, Moritz Bälz, Hans Günther Hilpert (eds), *Financial and Monetary Policy Studies 44: Cash in East Asia* (Springer, 2017).

The American economist Kenneth Saul Rogoff[8] advocates a move toward a society with less cash in his book The Curse of Cash. The book concludes there are benefits from a reduced use of cash since it discourages tax evasion and crime and enables governments and central banks to handle economic crises more effectively.

Cash plays a starring role in a broad range of criminal activities, including drug trafficking, racketeering, extortion, corruption of public officials, human trafficking, money laundering, and illegal immigration problems.[9] At the end of 2015, 1.34 trillion US dollars was being held outside banks and 80% of it was in one-hundred-dollar bills.[10]

Another important reason to have less cash is that financial policies would no longer be limited by the zero lower bound (ZLB) interest rate. Cash makes it difficult to operate at interest rates below zero, because investors can turn to cash instead of investing in bonds with negative interest rates. Illegal activities such as organised crime, illegal immigration, and tax evasion cause serious problems to society and could be avoided or at least made less prominent if cash disappears.

Although cash is legal tender, it is a breeding ground for illegal practices due to its mobility and the difficulty of supervised transactions, while only deposits are legal tender. Cash, that is, physical currency, implies a ZLB on nominal interest rates.

Willem Buiter presented three solutions for implementing negative nominal interest rates.[11] All three solutions depend on reducing and finally eliminating free use of banknotes. The first solution is to ban banknotes as an outlaw. Money would consist only in bank deposits, and they would be 'registered instruments', as opposed to 'bearer instruments'. The second solution is leaving coins and banknotes in circulation, but marking them periodically (stamped or taxed) to obtain negative interest rates. The last solution is about the attempt to separate the function of money as 'numéraire' from the function of money as a medium of exchange. So, existing money can be withdrawn from circulation and kept as legal tender only for monetary-calculation purposes, while new money would be denoted and introduced as a means of exchange. As far as money in circulation is concerned, ZLB

8 Kenneth Rogoff, *The Curse of Cash* (New Jersey: Princeton University Press, 2016).

9 Ibid.

10 Ibid.

11 Willem H. Buiter, 'Is Numérairology the Future of Monetary Economics?' (2007) 18(2) *Open Economies Review* 127-156; Id., 'Negative Nominal Interest Rates: Three Ways to Overcome the Zero Lower Bound' (2009) 20(3) *The North American Journal of Economics and Finance* 213-238; Willem H. Buiter, Nikolaos Panigirtzoglou, 'Overcoming the Zero Bound on Nominal Interest Rates with Negative Interest on Currency: Gesell's Solution' (2003) 113(490) *The Economic Journal* 723-746.

would still cause problems and limit policy, but for old money in circulation there it would now be possible to implement negative nominal interest rates.[12]

Rogoff[13] presents a top-down driven plan about the way central banks and governments can address the trend toward a cash-free economy and society. The first step is to phase out large value bills until only small bills or even coins remain. The second step is about developing policies ensuring financial inclusion for all, as a situation promoting digital divide and financial exclusion is simply not acceptable. The last step is to enforce a regulatory framework that will ensure integrity and privacy in electronic payments. Money and payment methods are based on trust, and making electronic payments must also be based on trust, privacy, and integrity. The last step therefore lies on the development of appropriate infrastructure, such as clearing and settlement systems, that enables real-time payments or close to real-time payments. Rogoff accepts that stopping cash entirely is a slow and gradual process with no clear aim.

Also, nowadays a strong substitution of cash is taking place. Mobile payment methods and services such as Swish or iZettle, can replace cash payments, meaning that the use of cash is rapidly decreasing. The value of cash in circulation in Swedish crowns dropped about 50% between its peak in 2007 and the low figures of 2018.[14] Sweden became the country with the lowest use of cash in the world. A cashless economy and digital money must, first and foremost, persuade the community to use it and win people's trust.

Now, banks are even reducing the services offered for cash handling. By 2016, more than 50% of bank retail offices had stopped providing cash handling services.[15] Past studies show that banks may earn significant profits on electronic-payment services such as card payments, but they do not make much profit on cash-based services.[16]

The Electronic Funds Transfer (EFT) system did not do any money creating; it merely moved around what was already there in bank accounts in deposit form, but

[12] Buiter,'Negative Nominal Interest Rates: Three Ways to Overcome the Zero Lower Bound (no 9).

[13] Rogoff (no 6).

[14] Niklas Arvidsson , *Building a Cashless Society: The Swedish Route to the Future of Cash Payments* (Switzerland: Springer, 2019).

[15] Länsstyrelserna, 'Bevakning av grundläggande betalningstjänster 2016' ('Rapport') (Falun: Länsstyrelseni Dalarna, 2016) (in Swedish).

[16] Gabriela Guiborg, Björn Segendorf, 'A Note on the Price- and Cost Structure of Retail Payment Services in the Swedish Banking Sector 2002' (2007) 31 *Journal of Banking and Finance* 2817–2827.

much faster. EFT gave us 'fast money flows' and, eventually, 'virtual money'.[17] With EFT travel, the money in bank deposits doesn't change; it simply moves around a little differently. The new cyber money rests outside the usual bank deposit or cash niches. Electronic money has a shadow existence of its own and may take many forms; some bank offered, some not.

Clearly, electronic money has no physical presence, so cash is excluded. People can readily distinguish between cash and electronic cash. Cash is legal tender, but electronic cash has not reached the point of legal tender status yet from the perspective of legislature . The former has a physical presence; the latter is without it. When returned to the banking system, cash is part of a reserve base; electronic money is certainly quite apart from anything either esteemed as a monetary standard

Most people react about the same way when they first start thinking about digital money and a cashless, paperless, and coinless economy. They go through a sort of Kubler-Ross model: stage one is disdain, stage two is skepticism, stage three is curiosity, stage four is crystallisation, and stage five is acceptance[18]

The issue of financial privacy is potentially explosive. As long as digital money and cards are less than one hundred percent secure, sensitive financial and other information could be plundered by cyberpirates.[19] A cashless society also is also exposed to dangers and potential negative effects, such as the proliferation of underground financing through the hawala system and organised criminal channels, the increased use of Bitcoin, the more difficult task of tracking currency through bank-reporting requirements, and the potential effect of increasing other crimes which are harder to track.[20]

Especially when addressing corruption, money laundering and bribery, there is a need for banks to implement a code of conduct and a code of ethics for staff, staff training, signature verification, control over dormant accounts, asking employees

[17] Elinor H. Solomon, *Virtual Money: Understanding the Power and Risks of Money's High-Speed Journey into Electronic Space* (New York: Oxford University Press, 1997).

[18] Vigna P., M. J. Casey, *Cryptocurrency: How Bitcoin and Digital Money are Challenging the Global Economic Order* (London: Bodley Head, 2015).

[19] Jack M. Kaplan, *Smart Cards: The Global Information Passport* (New York: International Thomson Computer Press, 1996).

[20] Joseph W. Rivera, 'Potential Negative Effects of a Cashless Society: Turning Citizens into Criminals and Other Economic Dangers' (2019) 22(2) *Journal of Money Laundering Control* 350-358.

for their opinions on the bank and the way they feel about it, conducting surprise audits, and using a hotline for whistleblowing.[21]

Over the past decade, the media have regularly reported on the imminent 'death' of cash amidst rapid innovation in payment technologies. Study supports that cash-based transactions have been losing in popularity due to the high cost associated to maintaining the cash system and due to its numerous risks.[22] Also, it seems that the difference between the overestimation of the cost of cash and the actual cost of card payments is not as big as it seems.[23] Economists have a stronger rationale in terms of managing interest rates. The strengths of those arguments vary, and what is really missing is the transition phase, the consumers' ability to change payment methods, and a risk analysis.

Generally speaking, academics are rooting for the abolition of cash, stating that cash is a curse,[24] and that money is dirty.[25] Banknotes can be laden with harmful bacteria, such as methicillin-resistant Staphylococcus aureus, bacillus cereus, influenza viruses, yeast, fungi, human excreta, mold, and even cocaine and heroin. [26]COVID-19 has raised public concerns concerning its transmission through cash. Coronavirus can persist for three hours in the air, 24 hours on cardboard and survive even longer on other hard surfaces.[27]

If associated with the simultaneous handling of food coins and paper currency may be a risk for public health and could lead to the spread of nosocomial infections. Banknotes recovered from hospitals may be highly contaminated with Staphylococcus aureus, Salmonella species, and Escherichia coli, which are commonly isolated in banknotes from food outlets.[28] Laboratory simulations revealed that methicillin-resistant S aureus can easily survive on coins, whereas E. coli, Salmo-

[21] Petros Lois, Spyridon Repousis, Varvara Veli, 'An Investigation of the Fraud Risk and Fraud Scheme Methods in Greek Commercial Banks' (2019) 22(1) *Journal of Money Laundering Control* 53-61.

[22] Zaheer Allam, 'The Forceful Reevaluation of Cash-Based Transactions by COVID-19 and Its Opportunities to Transition to Cashless Systems in Digital Urban Networks' (2020) *Surveying the Covid-19 Pandemic and its Implications* 107-117.

[23] Eric De Putter, 'Cashless Society – Really?' (2016) 10(3) *Journal of Payment Strategy* 245-252.

[24] Rogoff (no 6).

[25] Zura Kakushadze, Jim K-S. Liew, 'Coronavirus: Case for Digital Money?'(2020) 21(1) *World Economics*, available at: https://ssrn.com/abstract=3554496 (last accessed 30 March 2020).

[26] Ibid.

[27] Neeltje van Doremalen et al., 'Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1', (17 March 2020) *The New England Journal of Medicine*.

[28] Emmanouil Angelakis et al., 'Paper Money and Coins as Potential Vectors of Transmissible Disease (2014) 9(2) *Future Microbiology* 249-261.

nella species, and viruses, including the human influenza virus, Norovirus, Rhinovirus, hepatitis A virus, and Rotavirus, can be transmitted through hand contact. Large-scale 16S rRNA, metagenomic studies and culturomics have the capacity to dramatically expand the known diversity of bacteria and viruses on money and fomites. The review[29] summarises on the potential of paper currency and coins to serve as sources of pathogenic agents.

Another study examined 1,280 banknotes exclusively obtained from food outlets in ten different countries and their bacterial content was enumerated.[30] Presence of bacteria on banknotes was found to be influenced by the material of the notes, while there was a strong correlation between the number of bacteria per square centimetre and a series of indicators of economic prosperity among the various countries. Paper money was screened for the presence of a range of pathogens, and the results showed that pathogens can only be isolated after enrichment, while their mere presence does not appear to be alarming. Hence, handling food and money must be physically separated.

In the USA, banknotes in circulation are contaminated with cocaine.[31] Several theories have been offered to explain this finding, including contamination due to cash handling during drug deals and the use of rolled up bills for snorting. The drug is then transferred from one contaminated bill to the other, and so on and so forth, during counting in financial institutions.

In another study, one-dollar bills were collected from the general community in western Ohio to carry out a survey on bacterial contamination.[32] Pathogenic or potentially pathogenic organisms were detected in 94% of the bills. These results suggest a high rate of bacterial contamination in one-dollar bills. The fibrous surfaces of US currency provide ample crevices for bacteria to make themselves at home[33] and the longer any of that money stays in circulation, the more likely it is for it to

[29] Ibid

[30] Frank Vriesekoopet al., 'Dirty Money: An Investigation into the Hygiene Status of Some of the World's Currencies as Obtained from Food Outlets' (2010) 7(12) *Foodborne Pathogens and Disease* 1497-1502.

[31] A.J., Jenkins, 'Drug Contamination of US Paper Currency' (2001) 121(3) *Forensic Science International* 189-193.

[32] Theodore Pope et al., 'Bacterial Contamination of Paper Currency' (2002) 95(12) *Southern Medical Journal* 1408-1410.

[33] Dina Fine Maron, 'Dirty Money: The Public Health Case for a Cashless Society' *Scientific American* (3 January 2017), available at: https://www.scientificamerican.com/article/dirty-money/ (last accessed 31 March 2020).

become contaminated. Lower-denomination bills are used more often, so studies suggest our ones, fives and tens are more likely to be teeming with disease-causing bacteria. Some of these pathogens are known to survive for months, according to a recent review of 'dirty money' studies. The carrier of cash is therefore not protected against pathogens such as COVID-19 possibly lurking on the surfaces of banknotes.

Forecasting of the epidemic outbreak and the number of deaths was not good. But epidemic forecasting has a dubious track-record, and its failures became more prominent with COVID-19. Poor data input, wrong modelling assumptions, high sensitivity of estimates, lack of incorporation of epidemiological features, poor past evidence on effects of available interventions, lack of transparency, errors, lack of determinacy, looking at only one or a few dimensions of the problem at hand, lack of expertise in crucial disciplines, groupthink and the bandwagon effect, as well as selective reporting are some of the causes of these failures.[34]

Central banks have resorted to quarantining physical bills and some are even going as far as to burn banknotes.[35] South Korea's central bank, the Bank of Korea, has implemented a quarantine policy for physical notes that come in from local banks. Banknotes are kept in a safe for up to two weeks, given "that the [SARS-CoV-2, which causes the COVID-19 disease] virus usually dies in nine days'.

As early as 15 February, Chinese lenders were asked by the government to both disinfect bills and keep them in a safe for up to 14 days, depending on what region they came from. The Federal Reserve has also begun setting aside US dollar banknotes from Asia for 7-10 days before re-circulating them into the economy. The Bank of England has acknowledged that banknotes in circulation can hold 'bacteria and viruses' and recommended that people wash their hands after handling money. This is why, among other reasons, China is so rigorous about hand washing as a way to reduce infections in general. Regular handwashing reduces respiratory diseases, such as colds, in the general population. As a matter of fact, the People's Bank of China announced the implementation of a new strategy to contain the virus: deep cleaning and destroying potentially infected cash.[36] All Chinese banks must launder

[34] John P.A. Ioannidis, Sally Cripps, Martin A. Tanner, 'Forecasting for COVID-19 has failed'(published online ahead of print, 25 August 2020) *International Journal of Forecasting,* doi: 10.1016/j.ijforecast.2020.08.004.

[35] Roger Huang, 'WHO Encourages Use Of Contactless Payments Due To COVID-19', (*Forbes,* 9 March 2020), available at : https://www.forbes.com/sites/rogerhuang/2020/03/09/who-encourages-use-of-digital-payments-due-to-covid-19/#1d3090ef41eb (last accessed 30 March, 2020).

[36] Jessie Yeung, 'China is Disinfecting and Destroying Cash to Contain the Coronavirus' *CNN Business* (17 February 2020) available at: https://edition.cnn.com/2020/02/17/asia/china-is-disinfect-

their cash by disinfecting it with ultraviolet light and high temperatures and then storing it for up to two weeks before releasing it to customers.

Because of this concern of COVID-19 potentially spreading infection through physical banknotes, a spokesperson of WHO has reportedly told the Telegragh that 'people should use contactless [payment] technology where possible'.[37]

But, since the discussion is revolving around health, it is interesting to note that another aspect that arose from cashless payments is the reduced attention to decision risks and shoppers spending more money on unhealthy food (i.e. highly palatable food with health risks).[38]

Another study[39] discusses the advantags of adapting government-issued digital currencies as well as a supranational digital, namely iCurrency. One such advantage is to get rid of paper money (and coinage), a ubiquitous medium for spreading germs, as highlighted by the recent coronavirus outbreak. The researchers set forth three policy recommendations for adapting mobile devices as new digital wallets: (i) regulatory oversight of sovereign digital currencies, (ii) user data protection and (iii) a supranational digital iCurrency for facilitating international digital monetary linkages.

Scientific evidence suggests that the probability of the transmission of virus via banknotes is low when compared with other frequently touched objects, such as credit-card terminals or PIN pads.[40] To bolster trust in cash, central banks are actively communicating, urging continued acceptance of cash and, in some instances, sterilising or quarantining banknotes. Some encourage contactless payments.

While the economic shutdowns and increased use of online retailing are currently diminishing the traditional function of cash as a medium of exchange, it seems that it is offset by panic-driven hoarding of banknotes.[41] However, cash in circulation has actually been growing strong in many counties. Due to the COV-

ing-cash-coronavirus-intl-hnk-scli/index.html (last accessed 29 March 2020).

[37] Huang (no 31).

[38] Joowon Park, Clarence Lee, Manoj Thomas, 'Why Do Cashless Payments Increase Unhealthy Consumption? The Decision-Risk Inattention Hypothesis' (2020) 6(1) *Journal of the Association for Consumer Research* 21-32.

[39] Kakushadze, Liew (no 22).

[40] Raphael Auer, Giulio Cornelli, Jon Frost, 'Covid-19, Cash, and the Future of Payments' (3 April 2020) 3 *Bank for International Settlements Bulletin*.

[41] Charles Goodhart, Jonathan Ashworth,, 'Coronavirus Panic Fuels a Surge in Cash Demand' (2020) Discussion Paper 14910, *Centre for Economic Policy Research*.

ID-19 pandemic, consumer spending declined significantly across all methods of payment such as cash, debit, credit, etc.[42]

On the other hand, research shows that outstanding cash in Canada increased sharply from March through September 2020 and the pandemic significantly increased the demand for bank notes, while this has also been the case in other advanced economies, including Australia, Germany, New Zealand, the United Kingdom and the USA.[43] This suggests that store of value was an important factor in these developments.

Use of Cash in Greece and Cyprus

As Constantinescu (2019).[44] reports, share of the worldwide transactions with cash has reduced to 77% in the past five years. Also, share of credit and debit cards usage has increased to about 9% from a 5%. During 2019, banknotes and coins in circulation in Europe outside banks accounted to 1,231.47 billion Euros (Table 2).

Table 2. Money stock available for payments in Europe

(Euro billions, end of year)	2014	2015	2016	2017	2018	2019
Banknotes and coins (or currency) in circulation outside banks	980.63	1,048.93	1,087.49	1,123.21	1,175.44	1,231.47

Source: Bank for International Settlements, (2020), T2: Stock of money available for payments

During the next five years, a downward trend of cash usage worldwide will be more emphasised due to the push toward real-time payments, the wide variety of payment options, and the evolution of digital commerce. In 2017, 66% of adults in Cyprus used electronic payments versus above 95% of adults in the top-10 ranked countries, such as Norway (99%), New Zealand (96%) and Canada (97%).[45] Similar-

[42] Heng Chen et al., 'Cash and COVID-19: The Effects of Lifting Containment Measures on Cash Demand and Use' (2 March 2021) Staff Discussion Paper, *Bank of Canada*.

[43] Ibid.

[44] Constantinescu, P., 'Cash Payments Cash in Today's World – The Times They Are A-Changin' (2019) in European Payments Council , *The PayPers: Insights into Payments, Payment Methods Report 2019*, 73-76 .

[45] International Monetary Fund, 'Cyprus: Selected Issues' (December 2019) 2019(363) *International Monetary Fund,* available at: https://www.elibrary.imf.org/view/IMF002/28553-9781513522067/28553-9781513522067/28553-9781513522067_A002.xml?redirect=true (last accessed 5 April 2020).

ly, only 8% of adults in Cyprus have used mobile payment, contrary to above 25% of adults in the top-10 ranked countries, such as Australia (27%), the USA (28%), and Sweden (30.5%).

The ratio of cash to Gross Domestic Product (GDP) could serve as an indicator of the extent to which cash is used.[46] Although there is a talk of a 'cashless society' over the last decades, cash is still here and is far from gone. The cash to GDP ratio has noticeably increased in Greece during the last decade from 9.09% in 2010 to 19.07% in 2020, and the reason is not only that the GDP reduced but also that cash in circulation increased even during the COVID-19 pandemic period of 2020 and is still rising in 2021 (Table 3).

Table 3. Cash to GDP ratio in Greece (end of year, in million Euros)

Year	Cash in Circulation (Mo)	Gross Domestic Product (GDP in current prices)	Cash to GDP ratio
2010	20,383	224,124	9.09%
2011	21,370	203,308	10.51%
2012	21,820	188,389	11.58%
2013	23,366	179,616	13.01%
2014	26,050	177,349	14.69%
2015	27,828	176,110	15.80%
2016	28,966	174,237	16.62%
2017	30,070	177,152	16.97%
2018	31,761	179,727	17.67%
2019	28,353	183,413	15.46%
2020	31,620	165,830	19.07%
End February 2021	31,753	N/A	N/A

Source: Data from Bank of Greece and Hellenic Statistical Authority, 2021

Also, the demand for cash increased as a safety precaution due to capital controls (June 2015), the risk of Greece exiting the Eurozone, and as a privacy motive. At the same time the number of ATMs machines in Greece decreased from 7,072 in

[46] Masaaki Shirakawa, 'The Use of Cash in Europe and East Asia' in Frank Rövekamp, Moritz Bälz M., Hans Günther Hilpert (eds), *Financial and Monetary Policy Studies 44: Cash in East Asia,* Springer, 2017).

2010 to 5,625 by the end of 2018[47] (Hellenic Bank Association, 2020). Cash in circulation in Greece during 2018 accounted to 2.70% of European cash circulation.

Cash in circulation varies in Cyprus. The cash to GDP ratio increased during 2013-2015 due to the economic crisis in Cyprus, a 'haircut' in bank deposits above 100,000 Euros, and increased fears about the stability of the financial system (Table 4). Citizens were not confident that using their bank accounts was always a safe and available option on the occasion of extreme events.

The experience of the Cypriot bank bailins improved liquidity and capital adequacy of banks but left citizens feeling that a financial system without an alternative means of exchange for bank deposits is not robust enough. Therefore, depositors preferred to shift and withdraw cash outside Cypriot banks. Cash in circulation in Cyprus during 2018 accounted only to 0.21% of European cash in circulation. In any case, the ratio of cash to GDP is lower in Cyprus than in Greece.

Table 4. Cash to GDP ratio in Cyprus (end of year, in million Euros)

Year	Cash in Circulation (Mo)	Gross Domestic Product (GDP in current prices)	Cash to GDP ratio
2010	1,607	19,410	8.28%
2011	1,696	19,803	8.56%
2012	1,739	19,440	8.95%
2013	1,787	17,995	9.93%
2014	2,127	17,430	12.20%
2015	2,252	17,883	12.59%
2016	2,225	18,929	11.75%
2017	2,313	20,119	11.50%
2018	2,432	21,432	11.35%
2019	2,566	22,287	11.51%

Source: Data from Central Bank of Cyprus and CEICData/IMF

The ratio cash to GDP demonstrated a close relationship between cash and citizens of the sample countries. It raises some interesting questions for future research about the role of cash and *why* cash usage is increasing rather than decreasing. The declining interest rate and the negative rate in Greece and Cyprus have increased the demand for cash because the opportunity cost of holding cash has

[47] Hellenic Bank Association, 'Greek Banking System Structure/ATM Network' (Athens: HBA, 2020). website: www.hba.gr

decreased significantly. Cash cannot be hacked, it is still convenient for small payments (such as person-to-person transactions), it doesn't rely on POS technological developments, and it is user friendly and accessible, popular, trusted and reliable. Also, unofficial payments in cash causes tax gaps and great costs. Although cash is still king, it is increasingly seen as a way to store value rather than make payments.

Conclusions

Money and the monetary system are an important form of the infrastructure of economies and societies. The purpose of this paper was to review the existing literature about cashless society and the coronavirus, as well as the use of cash in Greece and Cyprus. A 'war on cash' will soon take place ,as cash is considered a curse and paper money is seen as being dirty. Coins and paper currencies are thought to be a risk for public health, although transmission probability is low compared with other frequently touched objects. Perhaps countries with a high cash to GDP ratio may face more problems related to the coronavirus.

The ratio of cash to GDP increased rather than decreased in Greece and Cyprus during 2010-2020 and is above other countries, despite popular talk of the 'advent of cashless society'. Both countries have high cash to GDP ratio in comparison with other digitalised countries, such as Sweden, and the number of confirmed cases and deaths from the coronavirus were lower. More coronavirus-related problems were expected in countries with a higher cash to GDP ratio, but this is not the case in Greece and Cyprus.

Today, cash all over the world is still the main payment method at the checkout , even if there is a tendency to shift from cash to cards and electronic wallets. Technological developments regarding payments will surely have a great impact to cash usage. This may cause a divide in the access to payments instruments, with a negative impact on older and unbanked consumers. The coronavirus pandemic may not only amplify calls to defend the role of cash but also encourage calls for digital currencies regulated by a central bank.

Limitations and Future Research

The practical implications arising from this study are important in helping society and policy makers better understand the impact of COVID-19 on cash, and especially so in Greece and Cyprus in comparison with other countries such as Sweden, which is a more digitalised country. An important limitation of this study is that the COVID-19 pandemic is an ongoing situation and results may vary in future. Also,

more data from more countries are necessary to better analyse the impact of COVID-19 on cash worldwide.

Scientific, business and various social circles have been concerned with the discussion about a cashless society for a long time[48] However, due to unavoidable incidents disrupting financial and health regularity, it is vital to be reminded of the ethical and societal factors when applying monetary strategies. The societal factors used as both a cause and an effect will aid in alleviating negative but justified reactions of citizens and legal entities. Furthermore, it is evident that multifactor solutions that ensure the administration of distributive as well as compensatory justice should be chosen. Future research that includes sociological, legal, and ethical factors could highlight a different approach which is closer to fair financial strategies based on the interests of citizens and businesses alike.

References

Angelakis E. et al., 'Paper Money and Coins as Potential Vectors of Transmissible Disease' (2014) 9(2) *Future Microbiology* 249-261.

Allam Z., 'The Forceful Reevaluation of Cash-Based Transactions by COVID-19 and Its Opportunities to Transition to Cashless Systems in Digital Urban Networks' (2020) *Surveying the Covid-19 Pandemic and its Implications* 107-117.

Arvidsson N.,*Building a Cashless Society: The Swedish Route to the Future of Cash Payments*, (Switzerland: Springer,2019).

Auer, R., G. Cornelli, J. Frost, 'Covid-19, Cash, and the Future of Payments' (3 April 2020) 3 *Bank for International Settlements Bulletin*.

Bank of Greece, *Annual Reports 2009, 2010, 2011, 2012, 2013* (in Greek language). Website: www.bankofgreece.gr

Bank for International Settlements, 'T2: Stock of Money Available for Payments' (2020), available at: https://stats.bis.org/statx/srs/table/T2?c=XM (last accessed 6 April 2020).

Buiter W. H., 'Is Numérairology the Future of Monetary Economics?' (2007) 18(2) *Open Economies Review* 127-156.

Buiter, W. H., 'Negative Nominal Interest Rates: Three Ways to Overcome the Zero Lower Bound' (2009) 20(3) *The North American Journal of Economics and Finance* 213-238.

[48] Goodin R., 'Compensation and Redistribution' in J. Chapman (ed.), *Compensatory Justice: Nomos XXXIII* (New York; London: NYU Press, 1991) 143-177, available at: http://www.jstor.org/stable/j.ctt9qfzn3.10 (last accessed 20 May 2021).

Buiter W. H., N. Panigirtzoglou, 'Overcoming the Zero Bound on Nominal Interest Rates with Negative Interest on Currency: Gesell's Solution' (2003) 113(490) *The Economic Journal* 723-746.

Constantinescu P., 'Cash Payments Cash in Today's World – The Times They Are A-Changin', in European Payments Council, *The PayPers: Insights into Payments, Payment Methods Report 2019* 73-76.

Chen H. et al., 'Cash and COVID-19: The Effects of Lifting Containment Measures on Cash Demand and Use' (2 March 2021) Staff Discussion Paper, *Bank of Canada*.

Dias, (2020), *The Payment system* website: www.dias.com.gr

Doremalen N et al., 'Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1' (17 March 2020) *The New England Journal of Medicine*.

Egner F., *The electronic Future of Banking* (Illinois, USA: Financial Sourcebooks 1991).

European Banking Authority, 'Statement on Consumer and Payment Issues in Light of COVID19' (25 March 2020), available at: https://eba.europa.eu/sites/default/documents/files/document_library/News%20and%20Press/Press%20Room/Press%20Releases/2020/EBA%20provides%20clarity%20to%20banks%20and%20consumers%20on%20the%20application%20of%20the%20prudential%20framework%20in%20light%20of%20COVID-19%20measures/Statement%20on%20consumer%20protection%20and%20payments%20in%20the%20COVID19%20crisis.pdf (last accessed 27 March, 2020).

European Central Bank's Statistical Data Warehouse, (2020a), *Reports: Payments statistics, Greece*. Website: https://sdw.ecb.europa.eu/reports.do?node=100000845

European Central Bank's Statistical Data Warehouse, (2020b), *Reports: Payments statistics, Cyprus*. Website: https://sdw.ecb.europa.eu/browse.do?node=bbn1004

Goodhart C., J. Ashworth, 'Coronavirus Panic Fuels a Surge in Cash Demand' (2020) Discussion Paper 14910 *Centre for Economic Policy Research*..

Goodin R., 'Compensation and Redistribution' in J. Chapman (ed.), *Compensatory Justice: Nomos XXXIII* (New York; London: NYU Press, 1991) 143-177, available at: http://www.jstor.org/stable/j.ctt9qfzn3.10 (last accessed 20 May 2021).

Gladisch E., 'The Use of Cash in Germany: Status and Outlook' in F. Rövekamp, M. Bälz, H. Hilpert (eds), *Financial and Monetary Policy Studies 44: Cash in East Asia* (Springer, 2017).

Guiborg G., B. Segendorf, 'A Note on the Price- and Cost Structure of Retail Payment Services in the Swedish Banking Sector 2002' (2007) 31 *Journal of Banking and Finance*2817–2827.

Hellenic Bank Association 'Greek Banking System Structure/ATM Network' Athens: HBA, 2020).

Huang R., 'WHO Encourages Use Of Contactless Payments Due To COVID-19' (*Forbes,* 9 March 2020), available at: https://www.forbes.com/sites/rogerhuang/2020/03/09/who-encourages-use-of-digital-payments-due-to-covid-19/#-1d3090ef41eb (last accessed 30 March 2020).

International Monetary Fund, 'Cyprus: Selected Issues' (December 2019) 2019(263) *International Monetary Fund*, available at: https://www.elibrary.imf.org/view/IMF002/28553-9781513522067/28553-9781513522067/28553-9781513522067_A002.xml?redirect=true (last accessed 5 April 2020).

Ioannidis J. P.A, S. Cripps, M. Tanner, 'Forecasting for COVID-19 has failed' (published online ahead of print, 25 August 2020), *International Journal of Forecasting*, doi: 10.1016/j.ijforecast.2020.08.004.

Jenkins A., 'Drug Contamination of US Paper Currency' (2001) 121(3) *Forensic Science International*189-193.

Kakushadze Z., J. K-S. Liew, 'Coronavirus: Case for Digital Money?' (2020) 21(1) *World Economics,* available at:https://ssrn.com/abstract=3554496 (last accessed 30 March 2020).

Kaplan J., *Smart Cards: The Global Information Passport* (New York: International Thomson Computer Press, 1996).

Länsstyrelserna, 'Bevakning av grundläggande betalningstjänster 2016' ('Rapport') (Falun: Länsstyrelseni Dalarna, 2016) (in Swedish)..

Lois P., S. Repousis, V. Veli, 'An Investigation of the Fraud Risk and Fraud Scheme Methods in Greek Commercial Banks' (2019) 22(1) *Journal of Money Laundering Control* 53-61.

Maron D.F., 'Dirty Money: The Public Health Case for a Cashless Society' *Scientific American* (3 January 2017), available at: https://www.scientificamerican.com/article/dirty-money/ (last accessed 31March 2020).

McMillan J., *The End of Banking: Money, Credit and the Digital Revolution* (Zurich, Switzerland: Zero/One Economics GmbH, 2014)..

Park J., C. Lee M. Thomas, 'Why Do Cashless Payments Increase Unhealthy Consumption? The Decision-Risk Inattention Hypothesis' (2020) 6(1) *Journal of the Association for Consumer Research* 21-32.

Pope T., Ender P., Woelk W., Koroscil M., and Koroscil T., 'Bacterial Contamination of Paper Currency' (2002) 95(12) *Southern Medical Journal* 1408-1410.

Putter E., 'Cashless Society – Really?' (2016) 10(3) *Journal of Payment Strategy and Systems* 245-252.

Renda A., R. Castro, 'Chronicle of a Pandemic Foretold' (March 2020) 5 *CEPS*.

Rivera J., 'Potential Negative Effects of a Cashless Society: Turning Citizens Into Criminals and Other Economic Dangers' (2019) 22(2) *Journal of Money Laundering Control* 350-358.

Rogoff K., *The Curse of Cash* (New Jersey: Princeton University Press, 2016).

Shirakawa M., 'The Use of Cash in Europe and East Asia' in F. Rövekamp, M. Bälz, H. Hilpert H. (eds), *Financial and Monetary Policy Studies 44: Cash in East Asia,* , (Springer, 2017).

Solomon E. H., '*Virtual Money: Understanding the Power and Risks of Money's High-Speed Journey into Electronic Space'* (New York: Oxford University Press, 1997).

Vigna P., M. J. Casey, *Cryptocurrency: How Bitcoin and Digital Money are Challenging the Global Economic Order* (London: Bodley Head, 2015).

Vriesekoop F. et al., F 'Dirty Money: An Investigation into the Hygiene Status of Some of the World's Currencies as Obtained from Food Outlets' (2010) 7(12) *Foodborne Pathogens and Disease* 1497-1502.

World Health Organization, 'Coronavirus disease (COVID-19) Dashboard', available at: https://covid19.who.int/table (last accessed 3 September 2020).

Yeung J., 'China is Disinfecting and Destroying Cash to Contain the Coronavirus' *CNN Business* (17 February 2020), available at: https://edition.cnn.com/2020/02/17/asia/china-is-disinfecting-cash-coronavirus-intl-hnk-scli/index.html (last accessed 29 March 2020).