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Working Paper No. 166

Institutional hostility to cash and COVID-19

by

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Universität Rostock

Wirtschafts- und Sozialwissenschaftliche Fakultät

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Institutional hostility to cash and COVID-19

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Abstract

By “hostility to cash” we refer to the recent trend of incentivizing individuals towards a (privately managed) digital payment system driven by banking and financial sectors and supported by Governments. COVID-19 has on the one hand boosted this movement, with false messages about banknotes spreading the virus as a new instrument of convincement. On the other, the enduring flight to cash shows that this “relic” is even more essential in bad economic times. Restricting or eliminating cash is synonymous of welfare losses due to increased monopoly power of the financial and technology industry, reduced privacy, and threatened financial stability as a public good. As a consequence, financial exclusion and social discrimination would increase, adding to the impact of the COVID-19 crisis on inequality. By means of a logical-analytical approach combined with the newest statistical evidence and never-published comparative tables, the paper demonstrates why banknotes and coins are – all the more, in uncertain times due to SARS-CoV-2 – not otherwise substitutable, but rather a public good to be safeguarded.

Keywords

Banknotes and coins; COVID-19; digital payments; financial inclusion; money; payments system.

Classification (JEL) codes

E42; E44; G21; G41.

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1. Introduction and methodological approach

There is a significant amount of economic literature investigating the hostility to cash or “war on cash” – among others, Beretta (2005, 2007), Deutsche Bundesbank (2017), Jain (2017) and Scott (2013) – by which banking and financial sectors supported by local Governments have tried to discourage individuals from using (publicly-issued) physical means of payments and to convince them to progressively move to digital (privately-issued) ones. In fact, “[b]anks in particular have a considerable interest in cutting the costs of intermediate transactions and moving directly to electronic payment systems” (Spar, 2003). The term “war” might well sound like “a polemical exaggeration” (Rogoff, 2017), because behavioral economics has often described this phenomenon as if it would have been driven by emerging needs of individuals (Schreft, 2006). However, there are little doubts about how intense the “persuasion work” by several economic subjects has been (Nagata, 2019). According to Scott (2020), in a “bankful society” banks or platforms built on top of them like PayPal intermediate even between small-size payments. This business model consolidates and expands the influence of banking systems, provides an increasing amount of data on consumers’ behaviors, and facilitates remunerative agreements with technology platforms (“The banks began to quicken the pace of automation in the late 1950s and 1960s in response to a number of pressures. These included larger numbers of customers, more transactions and a rise in the relative cost of clerical staff” (National Consumer Council, 1983)).

The COVID-19 pandemic has given this trend toward digitization an additional boost through physical lockdowns, while the (private) banking and financial sector is taking this opportunity to extend its market influence. Maybe exaggeratedly formulated, “[f]ar more hi-tech than anything we have seen during previous disasters, the future that is being rushed into being [...] treats our past weeks of physical isolation not as a painful necessity to save lives, but as a living laboratory for a permanent – and highly profitable – no-touch future. [...] It’s a future that [...] accepts no cash or credit cards (under guise of virus control)” (Klein, 2020a). It therefore has to be urgently investigated whether COVID-19 has been also used as an instrument to push this top-down driven hostility to cash, because scientific literature on this issue is missing so far. While several contributions to academic research have long doubted that banknotes and coins are replaceable by alternative means of payments (Belke and Beretta, 2020c; Drehmann et al., 2002; Von Kalckreuth et al., 2014)², in the light of the ongoing pressure for digitization, an in-depth scientific discussion has become even more important. In order to close this research gap, the paper deals with the growing cash-aversion pushed by the banking and financial system on the one hand and Governments on the other prior to the pandemic and how the approach has in the meantime evolved. By means of a logical-analytical approach combined with the newest statistical evidence allowing to strip down the topic to its very essence, the paper highlights in an innovative manner why cash should not lose its systemic relevance. All the more in times of an unprecedented exogenous global economic crisis.

More precisely, we argue that cash has been unjustifiably accused of facilitating illicit transactions (despite being the legal tender and publicly issued money subject to regulations) and that the SARS-CoV-2 pandemic has been also (mis)used to push economic subjects away from banknotes and coins. Cash is – even more, in troubled economic times – not otherwise substitutable, but rather a welfare-enhancing public good to be safeguarded. The paper proceeds as follows. Section 2 presents a critical review of (less explored) “instruments of convincement” – among others: *de-iure* and *de-facto* demonetization, promotional campaigns and “nudges” towards cashless payments as well as cash payment limitations – used before the outbreak of the current pandemic. In parallel to this critical review, we take also the opportunity to prove that large-size banknotes

² If cash and demand deposits would really serve as means of payment in all situations, it would be difficult to reliably estimate the demand for both separately. For the USA in the period before 1970, Goldfeld (1973) shows that the differences in the use of these means of payments have been indeed large enough to reliably estimate the demand for cash and the demand for demand deposits separately (Hellwig, 2018).

do not – at least, in the period before and after the legal introduction of the Euro – incentivize the shadow economy, as instead claimed so far by parts of the economic literature. Section 3 shows that after COVID-19 the hostility to cash is continued with the same aims, but different approaches. In the meantime, currency in circulation (and demand for it) is continuously soaring and raising the hypothesis that in times of severe crises cash moves from means of payments to a store of value – no matter how digitized payment methods might have meanwhile become. While banknotes and coins might be less used to settle transactions, their role as “anchor of stability” in uncertain economic times has grown over time. The SARS-CoV-2 pandemic is another proof for this matter of fact, with demand for cash having soared as soon as lockdowns have been announced in March/April 2020. Therefore, Section 4 concludes with an explanation why cash remains essential. Certainly, the present paper does not aim at just reviewing the arguments in favor of (or against) cash or assessing the ongoing debate in general, but at analyzing some less reviewed policies to push individuals away from cash and showing which further approaches have been developed from the SARS-CoV-2 pandemic onwards.

2. A critical assessment of (less explored) “instruments of convincement” before COVID-19 to abandon cash.

In order to contextualize the whole debate on cash (and the growing hostility against it) we could simply refer to the most commonly studied arguments against – for instance, money laundering and financing of terrorism (Passas, 2003) because of its limited traceability – or in favor of cash – for instance, practicality, better control of expenses, immediate finalization of settlement (i.e. “final settlement” (Committee on Payments and Market Infrastructures, 2020)) and better data protection (Mai, 2019). However, this would be no added-value approach to an enduring scientific debate, which will soon also have also to deal with the potential impact on payment behaviors during (and, especially, after) SARS-CoV-2. The present paper is, on the one hand, a proactive attempt to identify the new “instruments of convincement” – especially, hygiene- and health-related arguments – the financial and banking sector is using (with the diffuse support of Governments) to further push the digital payments system. On the other, it introduces the readers to some less discussed methods used so far (i.e. before the pandemic) to reduce cash’s influence in daily lives. In this specific regards, the paper shows that a “mixed” payments system made of digital and physical means of settlements is still up-to-date with cash representing the epitome of store of value (excluding gold).

2.1 *De-iure* and *de-facto* demonetization.

The growing trend of institutional aversion to cash has become particularly evident in India when the local Government degraded its cash system during the so-called “demonetisation” (Pankaj and Jain, 2017) or, from June to October 2019, in Kenya (“From a total of 217,047,000 pieces of the KSh 1,000 notes on June 1, [the Central Bank of Kenya] had received 209,661,000 pieces at the end of the demonetisation period on September 30. Thus, 7,386,000 pieces of the older KSh.1,000 notes, worth KSh.7.386 billion, were rendered worthless at the end of demonetisation. A significant proportion of this amount would represent cash that was held by individuals who were unable or unwilling to subject themselves to the robust checks in place” (Central Bank of Kenya, 2019)). Obviously enough, central banks and Governments are unlikely mentioning demonetization aims among the reasons for withdrawing entire or parts of banknote series. Hence, demonetization might not be explicitly (i.e. *de iure*) declared but somehow (i.e. *de facto*) pursued still by policymakers. Let us analyze *Table 2*, which compares the Swiss, Euro-Area and US policy in terms of newer and older currency in circulation. For instance, while Switzerland will withdraw its eighth banknote series within a couple of months after its announcement in 2021 (and, *de facto*, demonetize a part of the currency in circulation), the Euro Area is still issuing the second series. In the contrary, US banknotes – no matter how old they are, provided that they have been issued from 1914 onwards – remain legal tender. Certainly, this is a particularly

democratic approach, which is often neglected by those who look at the United States solely as an example for payment digitization.

Table 1

	Banknote series	Year	Banknote sizes	Comments
Switzerland	First	1907	CHF50, 100, 500 and 1,000	Withdrawn and invalid.
	Second	1911	CHF5, 10, 20, 40, 50, 100, 500 and 1,000	
	Third	1918	CHF20 and 100	
	Fourth	1938	CHF50, 100, 500 and 1,000	
	Fifth	1956	CHF10, 20, 50, 100, 500 and 1,000	
	Sixth	1976	CHF10, 20, 50, 100, 500 and 1,000	Recalled but still exchangeable.
	Seventh	1984	CHF10, 20, 50, 100, 500 and 1,000	Reserve series (never put into circulation and duly destroyed).
	Eighth	1995	CHF10, 20, 50, 100, 200 and 1,000	In circulation. Since the ninth banknote series has been completed on September 12, 2019 after the release of the CHF100- note, the recall of the banknotes from the eighth series will be announced two months before and, in any case, in the first half of 2021. This banknote series will still be legal tender and usable as well as exchangeable without restrictions. However, after the recall will have been completed, the banknote series will lose its status as legal tender and be exchangeable at the Swiss National Bank only.
	Ninth	2016	CHF10, 20, 50, 200 and 1,000	
Euro Area	First	2002	€5, 10, 20, 50, 100, 200 and 500	In circulation.
	Second	2013	€5, 10, 20, 50, 100 and 200	
USA	-	-	\$1, 2, 5, 10, 20, 50 and 100	Periodical redesign of Federal Reserve notes. However, all designs remain legal tender, regardless of when they have been issued (i.e. from 1914 onwards).

Source: own elaboration based on European Central Bank (2020a), Swiss National Bank (2020a, 2020b) and U.S. Currency Education Program (2020)

As the paper will duly highlight in *Table 5*, while “[t]he use of credit cards originated in the United States during the 1920s, when individual firms, such as oil companies and hotel chains first credit card” (Britannica, 2020), only European countries have decided to legally limit transactions settled in cash. This is however another fact, which is often glossed over. The relevant conclusion of Section 2.1 is that – in the same way as the International Monetary Fund (2020a) distinguishes between *de-iure* and *de-facto* exchange arrangements based on the actual exchange rate fluctuations and central banks’ interventions – demonetization can be conducted explicitly (i.e. *de iure*) or rather implicitly (i.e. *de facto*). New banknote series combined with a near-term deadline to exchange them before losing their status of legal tender are, for sure, a subtle but frequent approach to absorb a part of circulating cash. Obviously enough, no matter if deriving from illicit transactions or legal ones.

2.2 Promotional campaigns, “nudges” towards cashless payments and shutdowns of ATMs: why seigniorage matters.

Movements against cash have also taken more explicit forms – Visa has for example launched a campaign called “Cashfree and proud” (Payment Week, 2016) in order to “continue to persuade British consumers that contactless was better than cash” (Jon Ashwell Creative, 2020) – amidst a subtle drive to make cash increasingly inconvenient. At the same time, people are told to be dodgy if they do not wish to “spontaneously” comply with new ways of paying digitally (The Economic Times, 2020). Cash is displayed as a “barbarous relic” (Financial Times, 2015) as compared to more advanced payment instruments. Shutting down ATMs has been another (though less used) approach since “[r]egulators seek to safeguard consumer access to cash as branches and free-to-use ATMs disappear” (Makortoff, 2020). As shown in *Table 2*, at the global level (which includes data for low-and-middle-income countries with limited, but rapidly increasing numbers of ATMs) there is not yet a pronounced trend towards shutting them down. In the contrary, this has been the case in selected advanced countries.

Table 2

	Automated teller machines (ATMs) per 100,000 adults, 2004-2018								Change (in percentage)
	2004	2006	2008	2010	2012	2014	2016	2018	
Euro Area	77.7	80.1	89.5	90.3	84.5	90.5	88.4	68.1	-12.4
European Union	59.4	67.2	79.9	78.5	72.9	65.1	70.0	66.3	+11.6
OECD countries	68.2	76.9	87.5	83.6	79.2	76.5	75.1	69.5	+1.9
Sweden	36.5	37.5	42.2	42.8	43.0	40.2	34.8	-	-4.5
United Kingdom	-	120.9	125.6	122.0	125.9	129.5	129.6	115.7	-4.3
USA	165.8	167.2	168.0	-	-	-	-	-	+1.3
World	18.3	19.3	27.2	29.2	31.9	36.0	38.9	40.1	+119.1

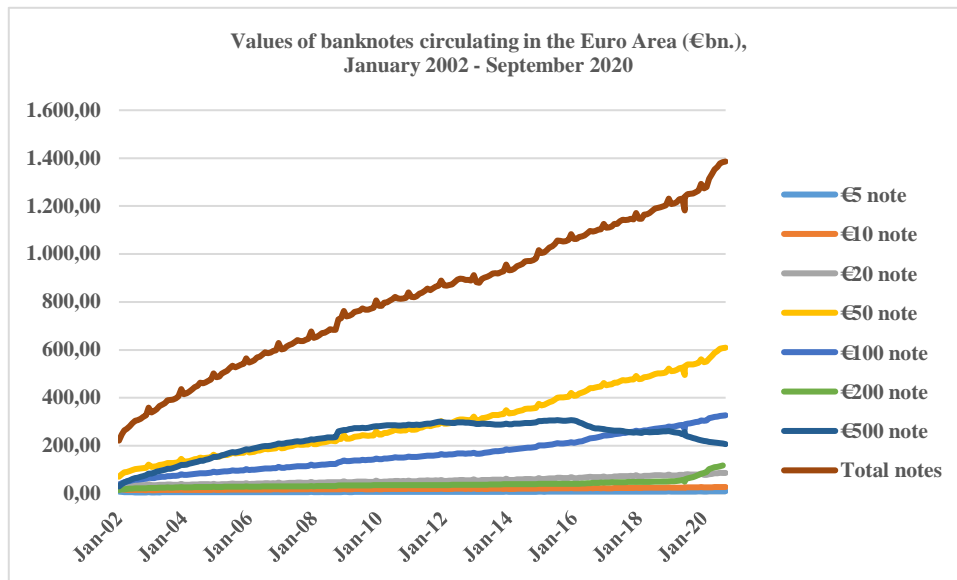
Source: own elaboration based on The World Bank (2020a)

However, there still is a remarkable tendency to “nudge” consumers towards digital (payment) services (Scott, 2016). In fact, banknotes and coins are a public utility, which cannot be used by private actors of the banking and financial sector to earn profits, but are even likely to generate so-called “costs of handling” (for instance, 9 percent of retail cash receipts in 2017 and from 5 to 10 percent of bank operating costs in 2018 (G4S Retail Cash Solutions, 2020)). It is the Government, which instead gains from the supply of fiat-money, since “[s]eigniorage encompasses both the global social gain of substituting paper money for commodity money, through a saving of real resources, and the gains to a particular monetary authority from exercising monopoly power over money issuance” (Bergsten, 1996). A practical, emblematic example suffices: the Swiss National Bank (2020c) has in this specific regard declared that “[t]he cost of producing Swiss banknotes depends on the note’s size (denomination) and on the production volume, and generally averages around 40 centimes”. Since the local maximum note’s nominal value is CHF1,000, the seigniorage per CHF1,000-banknote might even reach CHF999.60 and imply a profit margin of 99.96 percent. Therefore, from a mere entrepreneurial perspective, it is understandable that private financial actors – among others, commercial banks – are interested in pushing consumers towards private digital money. In order to achieve this result smoothly, individuals should be convinced that they are “choosing” (i.e. “preferring”) digital payments. This approach also resembles how several supermarkets inspire young consumers to “choose” sweet and/or unhealthy food by placing it at eye level by the checkout counters (Aydogan and Van Hove, 2015). Once an adaptation process has begun, compliance becomes the most likely outcome.

2.3 Currency in circulation (i.e. the only form of State money): a not-to-be-stopped trend.

Despite these “nudges” driving individuals towards technological advanced financial and banking solutions, total values of circulating banknotes issued by the European Central Bank are still (significantly) growing (*Figure 1*). While from 2002 to 2019 Euro Area’s GDP at market prices based on constant local currency has cumulatively increased by 21.63 percent (The World Bank, 2020b) the total value of circulating banknotes has increased by 475.63 percent (European Central Bank, 2020b).

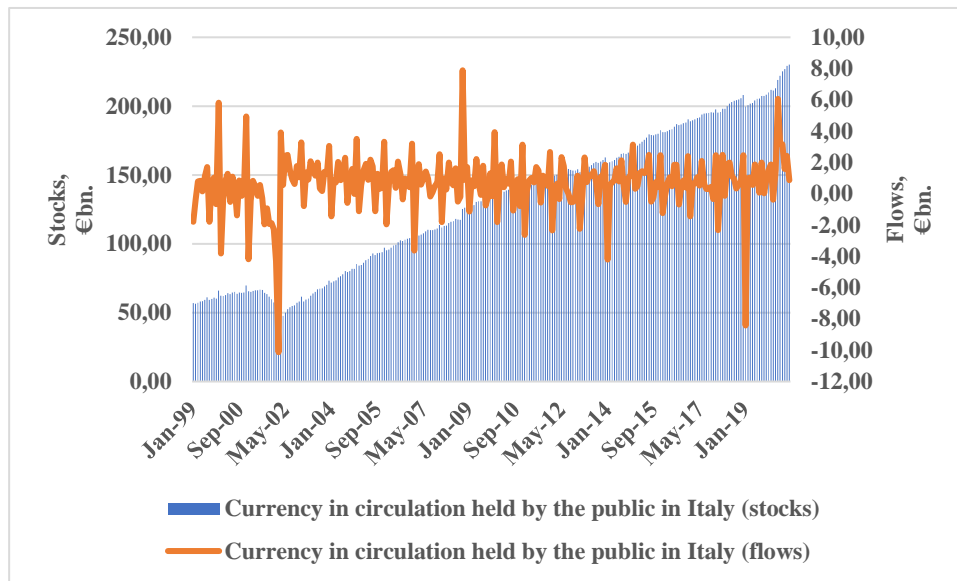
Figure 1



Source: own elaboration based on European Central Bank (2020b)

This result can be interpreted in two different ways: on the one hand, it can be argued that the local central bank has over-issued means of payments, although *Figure 2* alone would not be sufficient to prove this argumentation. On the other, the behavior of the European Central Bank can be seen as a response to a strong demand for the legal tender. In this respect, our hypothesis is that cash remains an inclusive, privacy-preserving, public means of settlement while digital payments further privatize the banking and financial system gentrifying payments too. Cash remains a strategically relevant public good as highlighted in *Figure 2*, which displays, for Italy in March 2020, the sudden increase of currency in circulation held by the public by €6.1 bn. (Banca d’Italia, 2020a) just before the first SARS-CoV-2-related lockdown of a European country ever occurred.

Figure 2



Source: own elaboration based on Banca d'Italia (2020a; 2020b)

If we push the Euro-Area-related example even further, banknotes issued by the European Central Bank are the only form of legal tender, i.e. with mandatory acceptance and no levying of additional fees permitted (Merish, 2018). Banknotes and coins have been also defined as “safe, sound or stable money [...], plain money (J. Huber / J. Robertson), pure money (R. Striner), chartal money (derived from chartalism), state money (R. Werner), public money (K. Yamaguchi, M. Melior), constitutional money (R. Morrison) and, specifically in the United States, U.S. money (S. Zarlenga)” (Huber, 2020). While e-cash is still in the works, because of its characteristics – especially, its missing physicality –, it will not represent a perfect substitute (Belke and Beretta, 2020c). At the same time, central bank digital money might even increase inflationary money issues due to shrinking production (and maintenance) costs. As shown in *Table 3*, the United States have paid printing costs of banknotes equal to \$0.72 bn. in 2020, which is admittedly not particularly significant at first sight. If physical cash would be replaced by central bank digital money, printing costs would however shrink to almost zero and increase the potential seigniorage benefit for the central bank too. At the same time, this might add up to any further potential source of excess (i.e. inflationary) liquidity, which also includes the over-issue of money in its physical as well as digital form. E-cash might therefore propel (inflationary) over-lending while exposing the central bank – if it should also take deposits from the general public – to risks deriving from the need to comply with the principles of “know your customer” (KYC) and “anti-money-laundering” (AML) as emphasized by Pundrik (2009) and Verhage (2011).

Table 3

Denomination	Number of notes ordered in 2020 (bn. of pieces)	Face value (\$ bn.)	Printing cost per note (\$ €)	Printing cost of notes ordered in 2020 (\$ bn.)
\$1 note	1.57	1.57	7.7	0.12
\$2 note	0	0	7.7	0
\$5 note	0.74	3.68	15.5	0.11
\$10 note	0.46	4.61	15.9	0.07
\$20 note	1.24	24.83	16.1	0.20
\$50 note	0.08	3.84	16.1	0.01
\$100 note	1.08	107.84	19.6	0.21
Total	5.17	146.37	-	0.72

Source: own elaboration based on Board of Governors of the Federal Reserve System (2020a; 2020b)

As highlighted by Mersch (2020) who indirectly confirms the argumentation carried out so far, “[s]ome 76% of all transactions in the euro area are carried out in cash, amounting to more than half of the total value of all payments. The demand for cash in the euro area currently outstrips the rate of nominal GDP growth. In crisis times, the demand for cash surges even higher. At mid-March this year, the weekly increase in the value of banknotes in circulation almost reached the historical peak of €9 billion”. The tangibility of banknotes and coins remains, in fact, the fundamental reason why they are considered so safe and are correspondingly demanded in crisis times. At the same time, it has already been investigated that “holding cash physically does significantly change subjects’ behaviors by way of decreasing their likelihood of participating in an investment experiment and their investment amount when they do participate” (Shen and Takahashi, 2017). Besides, funds deposited in bank accounts at commercial banks are IOUs promising savers to get access to public money, which is itself a “spontaneous acknowledgement of debt” (Cencini, 2002) but at least one backed by economic wealth (“The dollar is nothing more than an IOU, and only has value if both parties in an exchange verbally or contractually accept it as payment for goods and services while remaining under the illusion (or blind faith) that the government or institution which issues this paper has the power, wealth, and credit to back up this currency” (Goodbaudy, 2011)). As further confirmed by the Federal Reserve Bank of New York (2013), “[b]ecause banks pay the Fed for cash by having their reserve accounts debited, the level of reserves in the nation’s banking system drops when the public’s demand for cash rises”. Since commercial banks pay the central bank for getting cash while transferring part of the customers’ deposits in private money, banknotes and coins are the only form of publicly-issued money and intrinsically different from digital money created by private commercial banks. At the same time, it is essential that commercial banks have claims for cash at the central bank and that the central bank can always meet these claims. Furthermore, by homogenizing each issuance of digital private bank money, “[c]entral bank money [...] plays the role of the common denominator between bank monies issued within a country” (Cencini, 2005). From an accounting perspective, *Figure 3* illustrates what happens at the bank level as soon as an individual withdraws a certain amount (e.g. 100) from his/her bank account: customer deposits (i.e. private money) will be replaced by cash (i.e. public money), thus shortening the balance sheet of both the commercial bank and the central bank by the same amount.

Figure 3

Central bank of the country			
<i>Assets</i>		<i>Liabilities</i>	
Receivable from commercial bank	100	Cash	100

Commercial bank of the country			
<i>Assets</i>		<i>Liabilities</i>	
Cash	100	Customer deposits	100

Source: own elaboration based on Cencini (2008)

The reciprocal indebtedness of the commercial on the one side and central bank on the other stands for the perfect substitutability of money issued by the same banking system. In fact, the central bank homogenizes each issuance of commercial money by means of its common denominator (i.e. central bank money represented by banknotes and coins). Each time savers make use of ATMs to withdraw cash they are, therefore, leaving the digital banking system. On the one hand, in order to boost its influence in payment and settlement processes, the private payments industry needs to “convince” people that public cash systems (competing with them) are less efficient, although there is still some margin of scientific disagreement on this conclusion too. For instance, “[c]ash is still widely used, as it is more efficient (e.g., processing times, costs)” (Van der Kroft and Zijp, 2019). On the other, “Governments [...] discourage cash transactions with the intention to fight tax evasion and money laundering” (Brunnermeier and Niepelt, 2019). This alleged causal nexus has been criticized by Beretta (2007), because “illicit transactions in globalized economies need to be untraceable; at the same time [...] they need to be immediately transferable. Neither of these conditions is guaranteed by physical payment methods for medium-large transactions”. However, this equally relevant requirement is often glossed over in the current debate, which is almost exclusively centered on the lack of traceability. Hence, “[p]hysical cash has [...] disadvantages. It is bulky and difficult to move. [...] The physical movement of large quantities of cash is the money launderer’s biggest problem” (Molander et al., 1998). Otherwise stated, “[c]oins and banknotes are anonymous and therefore transactions based on either are not traceable. [...] Still coins and banknotes represent the base money issued by governments while bank deposits are created by banks. [...] However, banknotes which are issued by the state represent the numeraire of money” (Focardi, 2018). Even at the bank level, we can conclude that banknotes and coins are not just an alternative way of holding funds, but the only means of owning State-issued money.

2.4 The myth of facilitating the shadow economy: an innovative, Euro-Area-related counterproof.

There is a further analytical intuition notably formulated by Rogoff (2017) according to whom “[p]aper currency has always facilitated tax evasion and crime [...]. The \$100-bill and the €500-note, for example, are relatively unimportant in everyday retail transactions. Yet they dwarf small bills in their share of currency supplies in the United States and Europe”. It therefore has to be explored whether a large-denomination note like the €500 one has somehow facilitated what is generally called the “shadow economy”. By comparing the largest-size notes circulating in the Euro Area member countries before the issue of the €500 one, *Table 4* clearly shows that there is neither a causal nexus nor a correlation between large-denomination banknotes and the size of the shadow economy defined as “all economic activities which are hidden from official authorities for monetary, regulatory, and institutional reasons. Monetary reasons include avoiding paying taxes and all social security contributions, regulatory reasons include avoiding governmental bureaucracy or the burden of regulatory framework, while institutional reasons include corruption law, the quality of political institutions and weak rule of law” (Medina and Schneider, 2018).

Table 4

	Euro- notes circulating since ...	Largest- size note in local currency before Euro- notes	Countervalue	Shadow economy (from 1991 to introduction of Euro- notes) (percentage of GDP)	Shadow economy (from introduction of Euro- notes to 2015) (percentage of GDP)	Change in terms of shadow economy (percentage of GDP)	Compared to largest- size notes before Euro- notes €500-note is ...
Austria	2002	öS1,000	€72.67	9.36	8.59	Decrease	Larger
Belgium	2002	Fr.10,000	€47.89	22.18	19.31	Decrease	Larger
Cyprus	2008	€20	€4.17	30.23	32.17	Increase	Larger
Estonia	2011	kr500	€31.96	22.05	18.40	Decrease	Larger
Finland	2002	mk1,000	€168.19	15.02	12.29	Decrease	Larger
France	2002	Fr.500	€76.22	15.43	13.01	Decrease	Larger
Germany	2002	DM1,000	€11.29	13.69	10.63	Decrease	Smaller
Greece	2002	Δργ10,000	€29.35	28.31	26.08	Decrease	Larger
Ireland	2002	IR€100	€26.97	16.03	12.20	Decrease	Larger
Italy	2002	€500,000	€58.23	25.66	24.40	Decrease	Larger
Latvia	2014	Ls500	€711.44	19.87	16.27	Decrease	Smaller
Lithuania	2015	Lt500	€144.81	22.45	18.65	Decrease	Larger
Luxembourg	2002	F5,000	€123.95	11.01	10.41	Decrease	Larger
Malta	2008	Lm20	€16.59	29.93	8.54	Decrease	Larger
Netherlands	2002	f1,000	€53.78	12.17	9.67	Decrease	Larger
Portugal	2002	\$10,000	€49.88	22.91	21.07	Decrease	Larger
Slovakia	2009	Sk5,000	€165.97	14.40	12.09	Decrease	Larger
Slovenia	2007	SIT10,000	€41.7	23.16	21.12	Decrease	Larger
Spain	2002	Pta 10,000	€60.10	26.06	23.32	Decrease	Larger

Source: own elaboration based on European Commission (2020), Medina and Schneider (2018) and Pratscher (2020)

Although the €500-banknote is by far larger in size than most of the previously circulating largest-size notes, the shadow economy (as a percentage of GDP) has significantly decreased. This may be explained in two different, though comparable ways: either the €500-banknote does not significantly contribute to tax evasion and/or money laundering or its impact on illegal activities is sufficiently irrelevant to be compensated by a common, stricter monetary regulation framework like the European one. In both cases, this never-used counterproof does not confirm the alleged link between large-seize note and the “shadow economy”.

2.5 Cash payment limitations in epoques of (deregulated) mining of cryptocurrencies: a counterintuitive trend.

An increasingly private payments system is also exposed to “modern monetary Middle Ages” (Belke and Beretta, 2020b) resembling the status quo before the establishment of central banks, which have been the very first “modern” regulators of seigniorage and money issue rights in general (“An important function of the central bank is to control money supply in the economy” (Das and Basu, 2016)). Granting potentially everyone the “right” to mint private monies *à la* cryptocurrencies “out of thin air” (i.e. nominally) in order to pay real-terms purchases reflects a particularly threatening trend of deregulation. How can a “non-value” like money – no matter if publicly as well as privately issued (digital) currencies – settle *per se* any real-term transaction? In fact, “[m]oney’s value is purely derivative; money has no value of its own. [...] The entire economy is the backing of the currency” (Parsson, 2011), because “nobody can create wealth or positive purchasing power by a stroke of a pen, but just excess (and, therefore, inflationary) liquidity. Otherwise stated, the increased frequency of attempts to avoid the monopoly of issuance of the central bank can be compared to a “modern Middle Age” in monetary terms when seigniorage still ruled” (Belke and Beretta, 2020a). While *de facto* tolerating such partial breakup of the Governmental money monopoly, European States have from the recent global financial and economic crisis onwards (2007-) introduced cash payments restrictions. Paradoxically enough,

while cryptocurrencies are mined *ex nihilo* (i.e. with no real backing), traded and even used to settle (where accepted) real-terms transactions, States are regulating and limiting the legal use of the legal tender itself. In fact, “[t]here are clear signs that the use of cash is being increasingly restricted inside the European Monetary Union (EMU). [...] Even statutory rules have been passed to prohibit the use of cash exceeding a certain, albeit rather low, limit” (Siekmann, 2017). *Table 5* analyzes this trend by exploring, if countries limiting cash payments by law are on the one hand prone to use banknotes and coins in daily transactions and, on the other, if policymakers of precisely these nations have meanwhile introduced some form of taxation (i.e. regulation) of cryptocurrencies too.

Table 5

Cash payment limitations		Taxation of cryptocurrencies	Percentage of transactions settled in cash in 2018
Belgium	€3,000 (for goods/services)	-	63
Bulgaria	Lw 9,999 (≈ €5,110)	Taxes have to be paid on gains from sales of cryptocurrencies.	-
Croatia	€15,000	-	-
Czech Republic	CZK350,000 per day (≈ €14,000)	-	-
France	€1,000 (for taxpayers based in France and foreign salesmen)	€15,000 (for non-resident taxpayers)	68
Greece	€1,500	-	88
Italy	€1,999.99	-	86
Poland	€15,000 (≈ PLN62,220)	Income from transactions with cryptocurrencies is subject to income tax – respectively, to a tax rate of 18 and 32 percent –, while sales or purchases of digital currencies are considered a transfer of property rights subject to a 1-percent-levy on the transaction value.	-
Portugal	€1,000 (for goods and services between consumers and traders)	-	81
Romania	RON10,000 per person per day (≈ €2,260)	Income from transactions with cryptocurrencies is taxable.	-
Slovakia	€5,000 (for B2B-, C2B- and B2C-payments)	€15,000 (for natural person acting for purposes outside their trade)	78
Spain	€2,500 (for residents)	€15,000 (for non-residents)	87
		Profits from transactions with cryptocurrencies are taxable. However, the General Directorate on Taxation has decided that operations with Bitcoins are exempt from VAT.	

Source: own elaboration based on European Consumer Centre France (2020), G4S Global Cash Solutions (2018) and Law Library of Congress (2020)

While in some European nations cryptocurrencies are neither regulated nor taxed, in others Governments have instead taken the opportunity to levy taxes on their use. No matter how the readers might look at it: both approaches are equally wrong. While the absence of regulation and taxation further enables that the right to issue money is reduced to a mere formality, taxing what has no intrinsic value (because of having been created from scratch) does not make sense too. The existence of cash payments restrictions despite the dominance of transactions still settled in cash (e.g. last column of *Table 5*) also confirm the top-down-approach hypothesis formulated at the beginning of the paper. At the same time, as explained in Beretta (2015), the regularly evoked taxation of intangible financial assets (e.g. the proposal of a “Financial Transaction Tax” (FTT)

³) in combination with bank accounts potentially subject to haircuts (as happened in the Cyprus banking crisis in 2012-2013) is not a coherent strategy in support of a cashless society too.

3. How hostility to cash has evolved after COVID-19: same aims, but different approaches.

In the wake of the SARS-CoV-2 pandemic banknotes and coins have begun to be even analyzed from a health-related perspective. Are they safe or may they carry viruses? From an economic perspective, this Section shows that – if there are some legitimate concerns – they should be also transposed to cashless payments, which imply the touching of surfaces too. The fact that payments settled in cash due to physical lockdowns may be shrinking should not let us gloss over the (especially in times of severe crises) increasing relevance of banknotes and coins as stores of values. Otherwise stated, the coexistence of movements towards continuous digitization of payment methods and physical means of payments (functioning also as stores of wealth) is not a scenario to fight against.

3.1 Does cash carry viruses? Maybe, but no more nor less than other payment instruments.

With the onset of the SARS-CoV-2 pandemic, the argument that cash is “dirty” has become visceral. This criticism is not new, since Maritz et al. (2017) have already pointed out that “[s]hotgun metagenomics identified eukaryotes as the most abundant sequences on money, followed by bacteria, viruses and archaea”. After the outbreak of COVID-19, mass-consumption stores like supermarkets have however openly suggested people to switch from a (public) cash system to a (private) cashless payments system. A survey conducted in Switzerland in April 2020 about payment methods in times of COVID-19 has shown that “over one-third of respondents have increased the number of digital payments or contactless payments with debit cards at supermarkets” (Egerth, 2020). Especially for big corporates, this is an opportunity to consolidate and extend their contractual and economic power, since many of them are already systemically important payments systems (SIPS), namely “[a] payment system which has the potential to trigger or transmit systemic disruptions” (Bank for International Settlements, 2020). According to preliminary studies, “[e]ven after lockdowns lift, [...] many consumers will continue to favor online shopping rather than returning to physical stores. Once consumer behavior changes, it tends to stick. [...] The move to a cashless society [...] has been accelerated by the perceived risk of infection via hard currency” (Thomalla and Schnippe, 2020). There is, therefore, no doubt that global tech players have massively expanded their power during the SARS-CoV-2 pandemic (Klein, 2020a). For instance, Amazon.com (2020) recently announced that its “[o]perating cash flow increased 56% to \$55.3 billion for the trailing twelve months [while n]et sales increased 37% to \$96.1 billion in the third quarter”. Obviously enough, the digital payments industry aims at achieving synergies with technologically advanced and automatized sectors too. In this specific regard, “cash doesn’t play well with Amazon’s desire for fully automated systems. The digital payments industry tries to present cash as the horse-drawn carriage of payment methods” (CQ Researchers, 2019).

From this perspective, the pandemic has – at least, for now – massively changed the way individuals interact with each other (“Gestures involving touch, usually understood to convey affection or warmth, get replaced by distance – which, in its own way, conveys care” (Fetters, 2020)). Although there is no precise scientific evidence – in fact, the “risk posed by handling a banknote is not greater than touching any other common surface, such as handrails, doorknobs or credit cards” (Bank of England, 2020) –, banknotes and coins have been accused to carry viruses.

³ The European Commission has counterintuitively proposed a FTT corresponding to 0.1 percent for shares and bonds while to 0.01 percent for equity-linked, interest-rate linked and currency-linked derivatives (Directorate-General for Taxation and Customs Union, 2012). As long as purely speculative or even harmful financial transactions are allowed, a FTT levied on them would be a suitable “second-best” instrument to increase financial stability and economic welfare.

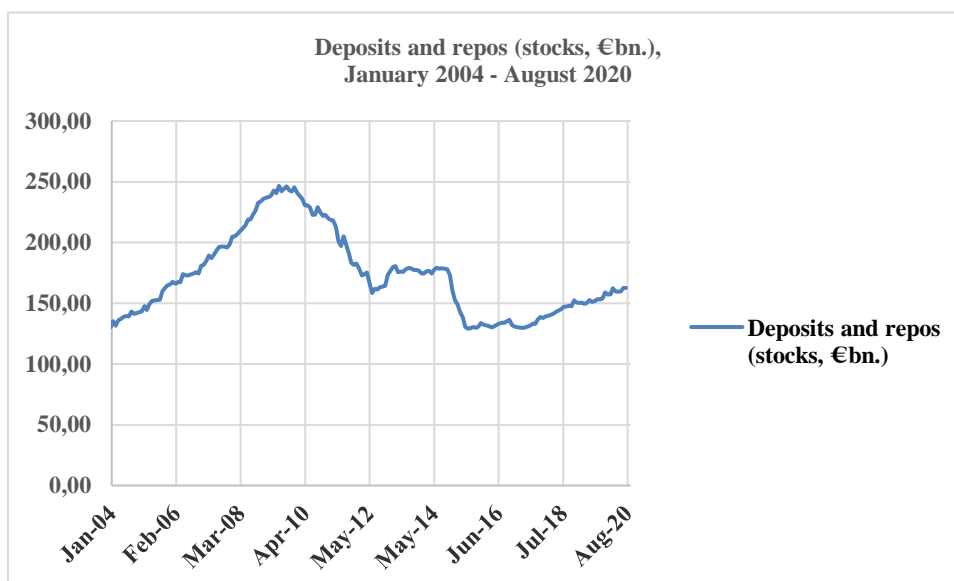
However, it is obvious that anything touchable (i.e. almost everything) might transmit bacteria and viruses, but this is also true for credit/debit cards, ATM cards and contactless payment methods – yes, for them too –, since the smartphone used might well become “contaminated” during the settlement process. Paying something (often) includes carrying something physical away, meaning that smartphones could become a “new driver” of diseases (“As possible breeding grounds for microbial organisms, [mobile phones] constitute a potential global public health risk for microbial transmission” (Olsen et al., 2020)). The relevant principle is, therefore, the same for banknotes, coins, “plastic money” and cashless payment methodologies: it is not *how* people pay something to pose a risk, but it is *what* they do afterwards with their hands. Somehow exaggeratedly, though explicitly formulated, “[w]hen I forwarded that study [i.e. that banknotes could help spread a future plague] to a friend at the Centers for Disease Control, she was unimpressed. “Are the researcher sucking on banknotes or inserting them in their noses?” she asked. Without a perfect storm of transmission conditions – someone sneezes on a banknote, doesn’t allow it to dry, stores it someplace dark and humid, doesn’t rub it on other material like a leather wallet or pants pocket – maybe, and only maybe, enough viral particles could survive to infect the next person handling those bills” (Wolman, 2013). More recently, the Commonwealth Scientific and Industrial Research Organisation (2020) has also claimed that “[a]t 20 degrees Celsius, which is about room temperature, [...] the virus was extremely robust, surviving for 28 days on smooth surfaces such as glass found on mobile phone screens and plastic banknotes”. Hence, since both cash and mobile phones (i.e. the new cashless payments methodology) can be easily contaminated, hygiene is at risk independently from the payment methods, but dependently from people’s (potentially unhygienic) behaviors.

Despite that, as already pointed out, the German Savings Banks Finance Group – we are referring to one of the most influential group of banks employing more than 300,000 workers and running 385 bank branches (Sparkasse, 2020) – is actively promoting its contactless payment methods at prime-time hours by promoting them with the so-called *Mainzelmännchen*, namely a comic figure having an almost iconic status in Germany. The underlying symbolism is evident. But, even before, articles surfaced claiming that “[d]irty banknotes may be spreading the coronavirus, WHO suggests” (The Telegraph, 2020), which prompted Fadela Chaib, a spokesperson of the World Health Organization, to issue a statement specifying that “[w]e did NOT say that cash was transmitting coronavirus” (MarketWatch, 2020). However, in the meantime, the banking industry in the UK was taking advantage of such uncertainty and increasing the contactless payments limit (“From today [1 April 2020] the spending limit for contactless card payments has increased from £30 to £45 across the country” (UK Finance, 2020)).

3.2 Banknotes and coins in crisis times: from means of payments to stores of value.

Despite marketing efforts by of the financial and banking system in general in support of cashless payment methods, statistics clearly show that cash withdrawals and “currency in circulation ha[ve] actually surged in a number of countries” (Ashworth and Goodhart, 2020; The Economist, 2020) just before lockdowns. This confirms once again that, especially during severe crises, cash is valued more than in usual times. In fact, this is what happened when fears about the future of the Euro as a common currency (and a potential “Grexit”) have arisen in the middle of the European debt crisis before Mario Draghi’s (2012) “whatever it takes”.

Figure 4



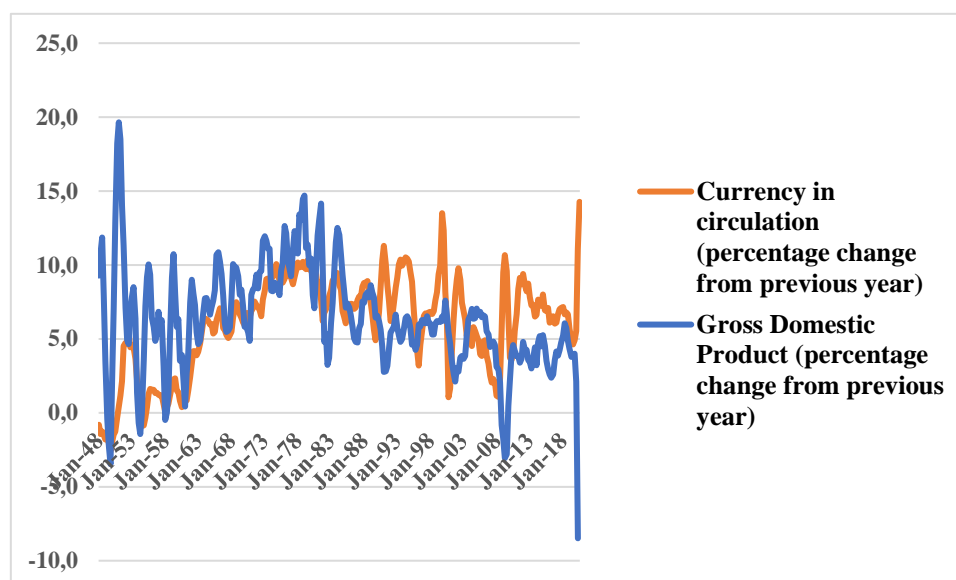
Source: own elaboration on the basis of Bank of Greece (2020)

As highlighted in *Figure 4*, the stock of deposits and repos in Greece plummeted by more than €100 bn. during the acute phase of the European debt crisis (and has not significantly recovered since then). Therefore, people use cash to “leave” an unstable banking system, which is why they tend to increasingly withdraw it before an impending hurricane, war or also after large shocks caused by epidemics (Goodell, 2020). By using a terminology typical for central banks, this represents a “precautionary demand for cash” due to “uncertainty as the prime motive for the holding of money by consumers” (Plessner and Reid, Jr., 1980). Of course, it might be well argued that without banknotes and coins there would be less bank-run episodes during crises, since savers would no longer have the possibility to physically withdraw their deposits. If this way of reasoning should be true – in fact, it depends on whether individuals would replace “traditional” bank runs with “digital” ones (“The head of the Deutsche Bundesbank has warned of the risks to financial stability should central banks issue their own virtual currencies, including from a potential “digital bank run”” (Pinsent Masons, 2018)) –, it would tantamount to saying that the general public would lose an efficient way to rescue part of their savings. Otherwise stated, financial and banking crises would endanger even more social and economic wealth than they already do. This is not much different – making use of a parallelism – from what happened in the wake of an unexpected, catastrophic event like the attacks on September 11, 2001 when “airlines with lower levels of cash and equivalents to total assets were penalized most, suggesting the market was concerned about the airlines’ ability to survive a prolonged downturn in air travel” (Carter and Simkins, 2004). Now the catastrophe is represented by COVID-19 while cash (i.e. liquidity) maintains its role of anchor of stability in uncertain times.

The major difference between the European debt crisis occurred in the most-affected countries (2009-) and the SARS-CoV-2 pandemic (2020) is, however, that the first one has been endogenous to the banking and financial system while the latter is exogenous. Evidently enough, if banknotes and coins have been perceived during the European debt crisis as more spendable than funds deposited in banks exposed to liquidity and/or insolvency risks, in times where individuals are less able to leave their homes due to lockdowns cashless payment methods become “an obliged choice”. Certainly, “[c]ontactless card payments may have replaced a certain share of cash payments permanently. However, the new payment mix [...] will not become fully

apparent until consumer habits normalise after the pandemic” (Mai, 2020). But even if payments settled in banknotes and coins should (further) decrease due to the SARS-CoV-2 pandemic, it would be wrong to draw strong conclusions about the future. Cash is, in fact, not only a means of payment – this role might well be shrinking, as statistics often highlight –, but also (and perhaps more importantly) a store of value. This additional characteristic is particularly relevant in economic systems detached from any backing by precious metals. Otherwise stated, cash has increasingly become the “new gold” to which paper money has been itself convertible before August 15, 1971 (i.e. the demonetization of gold by US President Richard Nixon). Banknotes and coins are by far not a barbarous relic, if we compare historical data about their circulation. For instance, in 1918 circulating US cash corresponded to \$4.37 bn. while in 1938 it was still at \$6.51 bn. The big increase started right during World War II (\$12.68 bn. in 1942), became even more pronounced after the demonetization of gold (\$58.07 bn. in 1971) and reached in 2019 \$1,745.10 bn. (Federal Reserve Bank of St. Louis, 2020a), meaning that circulating (or hoarded) amounts of banknotes and coins have increased by 39,833.6 percent within a century. Therefore, an increase of digital payments is not in contradiction with the increasing relevance of cash as an epitome of means of payments and store of wealth.

Figure 5



Source: own elaboration on the basis of Federal Reserve Bank of St. Louis (2020a, 2020b)

This is also proven by *Figure 5*, which depicts the increase/decrease of the amount of currency circulating in the United States as compared to GDP variations. From the 1990s onwards (which represent a decade of pronounced financialization worldwide), the demand for currency has surged more than economic growth. Equally interestingly, the 2010s have been even more characterized by significant increases of currency in circulation, but it is the year 2020 which truly highlights what has been claimed so far. Banknotes and coins have become – especially, in such troubled economic times – an “anchor of stability”, which might be less used in the payment processes but is also increasingly appreciated because of its function of store of value. This matter of fact is not astonishing in digital societies, since physicality and tangibility will forever be an irreplaceable characteristic becoming even more essential in bad economic times. And, given the fact that “stores of value” (i.e. wealth) are traditionally greater in amount than “means of payments” (i.e. net income), the role of banknotes and coins is not at risk because of individuals’ behaviors. It might instead be because of policymakers’ decisions, which might artificially (i.e.

by means of a top-down approach) reduce its usability. However, by doing so, the stability of the global economic and financial system would be threatened since individuals (i.e. savers) would have no “true” alternative to digital money and bank deposits held immaterially.

4. Concluding remarks. Why cash remains essential – even more in COVID-19 times.

Any attempt to restrict or eliminate cash, namely a (monetary) public good issued by central banks, results in welfare losses due to the increased monopoly power of the (private) banking and financial system. Otherwise stated, “money [...] constitutes a pure public good: money creates trust between people who do not know each other. The state establishes and supports the trust in legal tender and the official currency, making this trust a “pure public good” – non-excludable and non-rivalrous” (Felber, 2017). At the same time, any partial or complete privatization of money tends to increase financial exclusion and social discrimination, adding to the dramatic impact of the COVID-19 crisis on inequality (Stiglitz, 2020). In fact, according to Access to Cash Review (2019), “around 17% of the UK population – over 8 million adults – would struggle to cope in a cashless society. For many people in the UK, using cash is not a matter of choice, but of necessity. Digital payment options just don’t yet work for everyone. [...] For a start, poverty is the biggest indicator of cash dependency, not age”. The pandemic has also set in motion a major economic downturn – the International Monetary Fund (2020b) forecasts a drop in world output by at least 4.4 percent – and banks are likely to react by adopting more conservative lending policies (Goodell, 2020). Among the most penalized economic subjects there are those often called “the unbanked” (where “cash has remained the preferred method of payment in most of the unbanked world” (King, 2014)) and “the underbanked”, who have instead “limited access to services, but they do not use them on a regular basis. For instance, an individual may have an open bank account, but he or she may, in fact, be using predominantly cash” (Wherry and Schor, 2015).

It is also no coincidence at all that, like every disaster, the pandemic is acting as a magnifier and intensifier of social discrimination (Klein, 2020b). By accelerating digitalization – for instance, retail sales via mail order houses or Internet have soared in the European Union from 166.4 (March 2020) to 185.2 (September 2020) with 2015=100 (Eurostat, 2020) –, it uncovers the digital divide in several social groups resulting from lack of access to the Internet or insufficient digital literacy. This divide also concerns access to financial services in some advanced countries where physical bank branches are closed to increase cost efficiency and profitability (Conrad *et al.*, 2019). Combined with lockdowns, this new trend (if enduring) will have a further negative impact on physical retail stores, which are already struggling to cope with their digital (24-hours-a-day-running) competitors. At the same time, although the present paper has on purpose not dealt with this often-discussed aspect, a cash-free commerce is likely to obliterate people’s privacy and also entrench racial and gender discrimination. In fact, “[a]ny person or company with access to the bank statement of the consumer can learn a lot of information about his/her financial and personal life by analysing their payment transactions, for example about the consumer’s political and religious affiliation, sexual orientation, health conditions, personal relationships” (Bureau européen des unions des consommateurs AISBL, 2019). In sum, COVID-19 must (and should) not become a war on cash. There is simply no need to create further “tension” between cashless and physical means of payments, since both have proven to be useful depending on the situation. At the same time, banknotes and coins bear an additional function being also stores of value whose role becomes even more relevant during crisis times. This is also something not easily replaceable in gold-detached systems whose “anchor of stability” is (physical) cash.

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6. Bibliographic references

- Access to Cash Review, 2019. Final report – March 2019. Available at <http://www.accesstocash.org.uk/media/1087/final-report-final-web.pdf>.
- Amazon.com, 2020. Press release – Amazon.com announces third quarter results (October 29, 2020 at 4:01 PM EDT). Available at <http://press.aboutamazon.com/news-releases/news-release-details/amazoncom-announces-third-quarter-results>.
- Ashworth, J., & Goodhart, C., 2020. Coronavirus panic fuels a surge in cash demand. Available at <http://voxeu.org/article/coronavirus-panic-fuels-surge-cash-demand>.
- Aydogan, S., Van Hove, L., 2015. Nudging consumers towards card payments: a field experiment, in: Deutsche Bundesbank (Ed.), The usage, costs and benefits of cash – revisited. Deutsche Bundesbank, Frankfurt am Main, pp. 589. 630.
- Banca d'Italia, 2020a. [BAM_AGGM.M.1020001.AM01.3.941.EMUBI4.SBI138.1000] Currency in circulation held by the public. Available at http://infostat.bancaditalia.it/inquiry/home?spyglass/taxo:CUBESET=/PRINC_IND_00&ITEMSELEZ=PRINC_IND_03:false&OPEN=false/&ep:LC=EN&COMM=BANKITALIA&ENV=LIVE&CTX=DIFF&IDX=1&/view:CUBEIDS=BAM_AGGM.M.1020001.AM01.3.941.EMUBI4.SBI138.1000/×tamp=1604069794296.
- , 2020b. [BAM_AGGM.M.1010001.AM01.0.101.WRDBI2.S0.EUR] Currency in circulation held by the public. Available at http://infostat.bancaditalia.it/inquiry/home?spyglass/taxo:CUBESET=/PRINC_IND_00&ITEMSELEZ=PRINC_IND_08:false&OPEN=true/&ep:LC=EN&COMM=BANKITALIA&ENV=LIVE&CTX=DIFF&IDX=1&/view:CUBEIDS=BAM_AGGM.M.1010001.AM01.0.101.WRDBI2.S0.EUR/×tamp=1604071878528.
- Bank for International Settlements, 2020. Systemically important payment system (SIPS). Available at <http://www.bis.org/cpmi/publ/d00b.htm?&selection=148&scope=CPMI&c=a&base=term>.
- Bank of England, 2020. Questions about guidelines for handling old and mutilated banknotes during the Covid-19 pandemic. Available at <http://www.bankofengland.co.uk/freedom-of-information/2020/questions-about-guidelines-handling-old-and-mutilated-banknotes-covid-19-pandemic>.
- Bank of Greece, 2020. Deposits and repos of non MFIs in MFIs in Greece (excluding the Bank of Greece) – outstanding amounts at end of period. Available at http://opendata.bankofgreece.gr/datasetFile.ashx?fileName=BoG_DepositStock_en_2020-08-27.xls&folderName=STATISTIKI.
- Belke, A., & Beretta, E. (2020a). From cash to central bank digital currencies and cryptocurrencies: a balancing act between modernity and monetary stability. *Journal of Economic Studies*, 47(4), 911-938.
- (2020b). From cash to private and public digital currencies. The risk of financial instability and “modern monetary Middle ages”. *Economics and Business Letters*, 9(3), 189-196.
- (2020c). Not the time for central bank digital currency. Why cash is still irreplaceable. *Credit and Capital Markets – Kredit und Kapital*, 53(2), 147-158.
- Beretta, E. (2007). Cash restrictions, alias the EU's brake on growth: new analytical and empirical evidence. *Currency News*, 15(7), 7-7.
- (2005). Europe's new but wrong approach to cash. *Currency News*, 13(4), 5-8.

- Bergsten, F., 1996. Dilemmas of the Dollar: the economics and politics of United States international monetary policy. Second edition, Council on Foreign Relations, Armonk and London.
- Board of Governors of the Federal Reserve System, 2020a. Currency and coin services – 2020 Federal Reserve note print order. Available at http://www.federalreserve.gov/paymentsystems/2020_currency_print_orders.htm.
- , 2020b. FAQs – How much does it cost to produce currency and coin?. Available at http://www.federalreserve.gov/faqs/currency_12771.htm.
- Britannica, 2020. Credit card. Available at <http://www.britannica.com/topic/credit-card>.
- Brunnermeier, M.K., & Niepelt, D. (2019). On the equivalence of private and public money. *Journal of Monetary Economics*, 106, 27-41.
- Bureau européen des unions des consommateurs AISBL, 2019. Cash versus cashless. Consumers need a right to use cash. Available at http://www.beuc.eu/publications/beuc-x-2019-052_cash_versus_cashless.pdf.
- Carter, D.A., & Simkins, B.J. (2004). The market's reaction to unexpected, catastrophic events: the case of airline stock returns and the September 11th attacks. *The Quarterly Review of Economics and Finance*, 44, 539-558.
- Cencini, A., 2008. *Elementi di macroeconomia monetaria*, CEDAM, Padova.
- , 2002. *Monetary theory: national and international*, Routledge, London and New York.
- , 2005. *Macroeconomic foundations of macroeconomics*, Routledge, London and New York.
- Central Bank of Kenya, 2019. Press release – Conclusion of demonetisation exercise. Available at http://www.centralbank.go.ke/uploads/press_releases/735017284_Press%20Release%20-%20Conclusion%20of%20Demonetisation%20Exercise.pdf.
- Committee on Payments and Market Infrastructures, 2020. Final settlement. Available at <http://www.bis.org/cpmi/publ/d00b.htm?&selection=30&scope=CPMI&c=a&base=term>.
- Commonwealth Scientific and Industrial Research Organisation, 2020. CSIRO scientists publish new research on SARS-COV-2 virus 'survivability'. Available at <http://www.csiro.au/en/News/News-releases/2020/CSIRO-scientists-publish-new-research-on-SARS-COV-2-virus-survivability>.
- Conrad, A., Neuberger, D., Peters, F., & Rösch, F. (2019). The impact of socio-economic and demographic factors on the use of digital access to financial services. *Credit and Capital Markets – Kredit und Kapital*, 52(3), 295-321.
- CQ Researchers, 2019. *Global issues 2020 edition: selections from CQ Researcher*, CQ Press, Washington, D.C.
- Das, A., Basu, K., 2016. *S. Chand's ICSE economic applications – Book II for class X*, S. Chand Publishing, New Delhi.
- Deutsche Bundesbank, 2020. Cash poses no particular risk of infection for public. Available at <http://www.bundesbank.de/en/tasks/topics/cash-poses-no-particular-risk-of-infection-for-public-828762>.
- , 2017. *International Cash Conference 2017. War on cash: is there a future for cash?*, Deutsche Bundesbank, Frankfurt am Main.
- Directorate-General for Taxation and Customs Union, 2012. FTT – additional analysis of impacts and further clarification of practical functioning – 4 May 2012. Available at http://ec.europa.eu/taxation_customs/sites/taxation/files/docs/body/technical_fiches.pdf.
- Draghi, M., 2012. *Verbatim of the remarks made by Mario Draghi – Speech by Mario Draghi, President of the European Central Bank at the Global Investment Conference in London*, 26 July 2012. Available at <http://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html>.
- Drehmann, M., Goodhart, C., & Krueger, M. (2002). The challenges facing currency usage: Will the traditional transaction medium be able to resist competition from new technologies?. *Economic Policy*, 17(34), 193–227.

- Egerth, K., 2020. Cash is no longer king in times of COVID-19. Raining on cash's reign. Available at <http://www2.deloitte.com/ch/en/pages/consumer-industrial-products/articles/cash-is-no-longer-king-in-times-of-covid19.html>.
- European Central Bank, 2020a. Banknotes. Available at <http://www.ecb.europa.eu/euro/banknotes/html/index.en.html>.
- , 2020b. Banknotes and coins circulation. Available at http://www.ecb.europa.eu/stats/policy_and_exchange_rates/banknotes+coins/circulation/html/index.en.html.
- European Commission, 2020. What is the euro area?. Available at http://ec.europa.eu/info/business-economy-euro/euro-area/what-euro-area_en.
- European Consumer Centre France, 2020. Cash payment limitations. Available at <http://www.europe-consommateurs.eu/en/consumer-topics/financial-services-insurance/banking/means-of-payment/cash-payment-limitations>.
- Eurostat, 2020. Turnover and volume of sales in wholesale and retail trade – monthly data [sts_trtu_m]. Retail sale via mail order houses or via Internet. Available at <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>.
- Federal Reserve Bank of New York, 2013. How currency gets into circulation. Available at <http://www.newyorkfed.org/aboutthefed/fedpoint/fed01.html>.
- Federal Reserve Bank of St. Louis, 2020a. Currency in circulation. Available at <http://fred.stlouisfed.org/series/CURRCIR>.
- , 2020b. Gross Domestic Product. Available at <http://fred.stlouisfed.org/series/GDP>.
- Felber, C., 2017. Money – The new rules of the game, Springer, Cham.
- Fetters, A., 2020. When keeping your distance is the best way to show you care. The norms of politeness and affection get inverted during an epidemic. Available at <http://www.theatlantic.com/family/archive/2020/03/how-coronavirus-caused-hug-and-handshake-hiatus/607762>.
- Financial Times, 2015. The case for retiring another 'barbarous relic'. Available at <http://www.ft.com/content/159b17ca-47f3-11e5-b3b2-1672f710807b>.
- Focardi, S.M., 2018. Money: what it is, how it's created, who gets it, and why it matters, Routledge, Abingdon and New York.
- G4S Global Cash Solutions, 2018. World cash report 2018. Available at <http://cashesentials.org/app/uploads/2018/07/2018-world-cash-report.pdf>.
- G4S Retail Cash Solutions, 2020. Exceptional value within G4S. Available at http://www.g4s.com/-/media/g4s/corporate/files/investor-relations/2020/rcs_exceptional_value_for_g4s.ashx.
- Goldfeld, S.M. (1973). The demand for money revisited. *Brookings Papers on Economic Activity*, 4(3), 577-646.
- Goodbaudy, T., 2011. You don't want to read what this man has to say!, PDXdzy, Portland.
- Goodell, J.W. (2020). COVID-19 and finance: Agendas for future research. *Finance Research Letters*, 35, 101512.
- Hellwig, M., 2018. Bargeld, Giralgeld, Vollgeld: Zur Diskussion um das Geldwesen nach der Finanzkrise. Available at <http://www.bundesbank.de/resource/blob/723728/1bad30182ce1b8b4162c37a736c33f8c/mL/bargeldsymposium-2018-hellwig-data.pdf>.
- Huber, J., 2020. What is sovereign money?. Available at <http://sovereignmoney.site/what-is-sovereign-money>.
- International Monetary Fund, 2020a. Annual report on exchange arrangements and exchange restrictions 2019, International Monetary Fund, Washington, D.C.
- , 2020b. World Economic Outlook update, October 2020. A long and difficult ascent. Available at <http://www.imf.org/en/Publications/WEO/Issues/2020/09/30/world-economic-outlook-october-2020>.
- Jain, K. Ca (Dr.), 2017. The war on cash. Demonetisation, Educreation Publishing, New Delhi.

- Jon Ashwell Creative, 2020. Cashfree and proud. National integrated campaign that continued to help everyday Britons kick their cash habit. Available at <http://jonashwellcreative.weebly.com/visa-cashfree--proud.html>.
- King, B., 2014. *Breaking banks: the innovators, rogues, and strategists rebooting banking*, Wiley, Singapore.
- Klein, N., 2020a. How big tech plans to profit from the pandemic. Available at <http://www.theguardian.com/news/2020/may/13/naomi-klein-how-big-tech-plans-to-profit-from-coronavirus-pandemic>.
- , 2020b. We must not return to the pre-Covid status quo, only worse. Available at http://www.theguardian.com/books/2020/jul/13/naomi-klein-we-must-not-return-to-the-pre-covid-status-quo-only-worse?CMP=share_btn_link.
- Law Library of Congress, 2020. Regulation of cryptocurrency around the world. Available at <http://www.loc.gov/law/help/cryptocurrency/world-survey.php>.
- Mai, H., 2020. Paying in times of crisis. Coronavirus, cards and cash. Available at http://www.dbresearch.com/PROD/RPS_EN-PROD/PROD0000000000508511/Paying_in_times_of_crisis%3A_Coronavirus%2C_cards_and_.pdf?undefined&reaload=huyfalE2j4Njznb5x6k2kRTBwsKC1CFkSLYOp6D2NFb/vfn~jibxfj6IS8HY4yD6E8pt8E3aiwh9qVC2mq5N6g.
- , 2019. Cash empowers the individual through data protection. Available at http://www.dbresearch.de/servlet/reweb2.ReWEB?rwnode=NAVIGATION&rwsite=RPS_EN-PROD&rwobj=ReDisplay.Start.class&document=PROD0000000000495958.
- Makortoff, K., 2020. UK banks may have to flag up plans to shut branches or cash machines. Available at <http://www.theguardian.com/business/2020/jul/16/uk-banks-may-have-to-flag-up-plans-to-shut-branches-or-cash-machines>.
- Maritz, J.M., Sullivan, S.A., Prill, R.J., Aksoy, E., Scheid, E. & Carlton, J.M. (2017). Filthy lucre: A metagenomic pilot study of microbes found on circulating currency in New York City, *PLOS ONE*, 12(4), e0175527.
- MarketWatch, 2020. World Health Organization: ‘We did NOT say that cash was transmitting coronavirus’. Available at <http://www.marketwatch.com/story/who-we-did-not-say-that-cash-was-transmitting-coronavirus-2020-03-06>.
- Medina, L. and Schneider, F. (2018). Shadow economies around the world: what did we learn over the last 20 years?. *IMF Working Paper*, 18(17), 1-76.
- Mersch, Y., 2020. An ECB digital currency – a flight of fancy?. Available at <http://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200511~01209cb324.en.html>.
- , 2018. The role of euro banknotes as legal tender. Available at <http://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180214.en.html>.
- Molander, R.C., Mussington, D.A., Wilson, P.A., 1998. *Cyberpayments and money laundering: problems and promise*, RAND, Santa Monica and Washington, D.C.
- Nagata, K., 2019. Can a tax rebate persuade Japan’s mom-and-pop stores to shift to cashless payments?. Available at <http://www.japantimes.co.jp/news/2019/09/01/business/tax-rebate-small-retailers-cashless-payments/#.XOPyWzObEwA>.
- National Consumer Council, 1983. *Banking services and the consumer*, Routledge, Abingdon, Oxon and New York.
- Olsen, M., Campos, M., Lohning, A., Jones, P., Legget, J., Bannach-Brown, A., McKirdy, S., Alghafri, R., & Tajouria, L. (2020). Mobile phones represent a pathway for microbial transmission: A scoping review. *Travel Medicine and Infectious Disease*, 35, 101704.
- Pankaj, P., Jain, S., 2017. *The demonetization phenomenon*, Bloomsbury Prime, London, New Delhi, New York, Oxford and Sydney.
- Parsson, J.O., 2011. *Dying of money*, Dog Ear Publishing, Indianapolis.
- Passas, N., 2003. *Informal value transfer systems, terrorism and money laundering – A report to the National Institute of Justice*. Available at <http://www.ncjrs.gov/pdffiles1/nij/grants/208301.pdf>.

- Payment Week, 2016. Visa Europe: cashfree and proud, complete with celebrities. Available at <http://paymentweek.com/2016-3-23-visa-europe-cashfree-and-proud-complete-with-celebrities-9989>.
- Pinsent Masons, 2018. 'Digital bank run' a risk should central banks issue their own virtual currency, says Weidmann. Available at <http://www.pinsentmasons.com/out-law/news/digital-bank-run-a-risk-should-central-banks-issue-their-own-virtual-currency-says-weidmann>.
- Plessner, Y., & Reid, Jr., J.D. (1980). The precautionary demand for money. A rigorous foundation. *Journal of Monetary Economics*, 6(3), 419-432.
- Pratscher, S., 2020. The former currencies of the Eurozone. Available at http://webs.schule.at/website/European_Currencies/old_eu_currencies_en.htm.
- Pundrik, M., 2009. Sales management. Keys to effective sales, Global India Publications PVT Ltd, New Delhi.
- Rogoff, K.S., 2017. *The curse of cash: how large-denomination bills aid crime and tax evasion and constrain monetary policy*, Princeton University Press, Princeton and Oxford.
- Schreft, S.L. (2006). How and why do consumers choose their payment methods?. FRB of Kansas City Working Paper, 6(4), 1-19.
- Scott, B., 2020. Cash, kisses and karaoke: why the war on Covid must not become a war on cash. Available at <http://alteredstatesof.money/cash-and-covid>.
- , 2013. *The heretic's guide to global finance: hacking the future of money*, Pluto Press, London.
- , 2016. The cashless society is a con – and big finance is behind it. Available at <http://www.theguardian.com/commentisfree/2018/jul/19/cashless-society-con-big-finance-banks-closing-atms>.
- Shen, J., & Takahashi, H. (2017). The tangibility effect of paper money and coin in an investment experiment. *Economics and Business Letters*, 6(1), 1-5.
- Siekman, H., 2017. Restricting the use of cash in the European Monetary Union: legal aspects, in: Rövekamp, F., Bälz, M., Hilpert, H.G. (Eds.). *Cash in East Asia*. Springer, Cham, pp. 153. 178.
- Spar, D.L., 2003. *Managing international trade and investment: casebook*, World Scientific Publishing Company, London.
- Sparkasse, 2020. Die Sparkassen-Finanzgruppe als Arbeitgeber. Available at <http://www.sparkasse.de/karriere/unternehmen.html>.
- Stiglitz, J., 2020. Conquering the Great Divide. Available at <http://www.imf.org/external/pubs/ft/fandd/2020/09/COVID19-and-global-inequality-joseph-stiglitz.htm>.
- Swiss National Bank, 2020a. All SNB banknote series. Available at http://www.snb.ch/en/iabout/cash/history/id/cash_history_overview#t4.
- , 2020b. Announcement regarding recall of banknotes from eighth series. Available at <http://www.snb.ch/en/iabout/cash>.
- , 2020c. Costs. Available at http://www.snb.ch/en/iabout/cash/cash_lifecycle/id/cash_lifecycle_costs.
- The Economic Times, 2020. How cash turned suspicious under COVID-19. Available at <http://economictimes.indiatimes.com/news/international/world-news/how-cash-turned-suspicious-under-covid-19/cash-no-longer-king/slideshow/75843842.cms>.
- The Economist, 2020. Daily chart. Why cash has been piling up during the pandemic. Available at <http://www.economist.com/graphic-detail/2020/08/13/why-cash-has-been-piling-up-during-the-pandemic>.
- The Telegraph, 2020. Dirty banknotes may be spreading the coronavirus, WHO suggests. Available at <http://www.telegraph.co.uk/news/2020/03/02/exclusive-dirty-banknotes-may-spreading-coronavirus-world-health>.
- The World Bank, 2020a. Automated teller machines (ATMs) (per 100,000 adults). Available at <http://data.worldbank.org/indicator/FB.ATM.TOTL.P5>.

- , 2020b. GDP growth (annual %). Available at <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2019&start=1961>.
- Thomalla, S., Schnippe, M., 2020. How COVID-19 is reshaping retail payments in Europe. The pandemic has seen people spending less, shunning cash and shopping online for everyday basics. How can payments players adapt?. Available at http://www.ey.com/en_gl/banking-capital-markets/how-covid-19-is-reshaping-retail-payments-in-europe.
- U.S. Currency Education Program, 2020. The seven denominations. Available at <http://www.uscurrency.gov/denominations>.
- UK Finance, 2020. Contactless limit in UK increases to £45 from today. Available at <http://www.ukfinance.org.uk/press/press-releases/contactless-limit-uk-increases-£45-today>.
- Van der Kroft, J., Zijp, A., 2019. Will slow payment systems put the brakes on economic growth?. Available at http://www.ey.com/en_gl/banking-capital-markets/will-slow-payment-systems-put-the-brakes-on-economic-growth.
- Verhage A., 2011. The anti money laundering complex and the compliance industry, Routledge, London and New York.
- Von Kalckreuth, U., Schmidt, T., & Stix, H. (2014). Choosing and using payment instruments: evidence from German microdata. *Empirical Economics*, 46, 1019-1055.
- Wherry, F.F., Schor, J., 2015. *The SAGE Encyclopedia of Economics and Society*, SAGE Publications Los Angeles, London, New Delhi, Singapore and Washington D.C.
- Wolman, D., 2013. *The end of money: counterfeiters, preachers, techies, dreamers – and the coming cashless society*, Da Capo Pres, Boston.