Switching from Cash to Cashless Payments during the COVID-19 Pandemic and Beyond[1]

Tomasz Piotr Wisniewski [2]
The Open University
Faculty of Business and Law
Walton Hall
Milton Keynes, MK7 6AA, UK
E-mail: tomasz.wisniewski@open.ac.uk

Michal Polasik
Nicolaus Copernicus University
Faculty of Economic Sciences and Management
Gagarina 13a
87-100 Torun, Poland
E-mail: michal.polasik@umk.pl

Radoslaw Kotkowski
Narodowy Bank Polski
Świętokrzyska 11/21
00-919 Warszawa, Poland
E-mail: radoslaw.kotkowski@nbp.pl

Andrea Moro
Cranfield University
Cranfield School of Management
College Road
Cranfield, MK43 0AL, UK
E-mail: andrea.moro@cranfield.ac.uk

[1] This work was funded by the National Science Centre in Poland, project no. 2017/26/E/HS4/00858. The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of Narodowy Bank Polski.
[2] Corresponding author

Switching from Cash to Cashless Payments during the COVID-19 Pandemic and Beyond

Abstract

Using a survey of 5,504 respondents from 22 European countries, we examine preferences regarding cash and cashless payments at the point of sale (POS) during the COVID-19 crisis. Consumers favor cashless transactions when they believe that handling cash presents a higher risk of infection. Moreover, the habits they develop during periods of restrictions and lockdowns appear to further diminish their appetite for transacting in cash. Not only do these factors affect current choice of payment method, but also influence declared future intentions to move away from cash after the pandemic is over.

JEL Codes: E41, E42, I12, I18

Keywords: *COVID-19; SARS-CoV-2; Cash; Cashless payments; Payment behavior; Habit change; Fear*

1. Introduction

The highly contagious coronavirus disease 2019 (COVID-19) was declared a pandemic on March 11, 2020 (World Health Organization, 2021). Up to January 2021, it infected more than 96 million people and claimed over 2 million lives[3]. The mental, social and economic lives of virtually everyone around the globe were affected by this health risk, profoundly changing people's habits and behaviors. In an attempt to limit the spread of the virus, governments enforced rules pertaining to social distancing and face masks, advocated self-isolation, handwashing, and other types of hygienic measures. Partially due to government-imposed lockdowns, a significant reduction in peoples' mobility and consumption was observed, with a substitution from in-store to online shopping becoming particularly prominent (Bounie, Camara and Galbraith, 2020).

At the same time, an unprecedented outpour of speculation about the possible link between handling physical money and COVID-19 infections has emerged (Auer, Cornelli and Frost, 2020). Research regarding this phenomenon indicated that a significant fraction of the population reduced their transactional use of cash in response to the pandemic. In its IMPACT study, the European Central Bank (2020) showed that about 40% of respondents in the euro area curtailed their use of cash and 38% of them declared that the main stimulus for their changed payment behavior was the possibility of being infected through handling banknotes. Surveys conducted by the Federal Reserve System (Kim, Kumar and O'Brien, 2020) and the Bank of Canada (Chen *et al.*, 2020) reached similar conclusions, noting further that some risk-averse merchants ceased to accept cash as a means of payment. Using the Dutch payment dairy data, Jonker *et al.* (2020) shed more light on demographic and transaction-specific drivers that influence the change in payment habits due

[3] https://ourworldindata.org/coronavirus

to COVID-19. Notably, the effect of the pandemic on the transactional utility of cash is manifest not only in declarations of individual respondents, but also in more aggregate statistics. The studies focusing on data from retail systems, national payment schemes or particular banks in Switzerland, Italy, and France, revealed a rapid increase in the adoption of cashless payments, despite a decline in the level of general consumption (see Kraenzlin *et al.* (2020), Ardizzi *et al.* (2020), Bounie *et. al.* (2020)).

In this paper we further probe the utility of cash during the COVID-19 crisis. Using a unique dataset, we can model respondents' inclination to switch from cash to cashless instruments. The richness of our data source permits us to disentangle two critical pandemic-related factors that drive underlying behaviors. Firstly, there is the direct impact of individual's perception of viral transmission risk associated with touching banknotes and coins. Secondly, and equally importantly, this global health emergency has changed habits related to shopping, human interaction, mobility, health regimens and ways of working. Entrenchment of these habits could have an indirect but lasting influence on payment method preferences. By extricating these direct and indirect influences, we are able to document that both fear of contagion and altered habits play a prominent role in the decision to abandon cash for transactional purposes.

Several aspects distinguish our work from existing studies. The analysis of cash usage by the European Central Bank (2020) performed during the pandemic period reports only aggregated figures, without attempting to link COVID-19 responses to the selection of payment method at an individual level. Although Jonker *et al.* (2020) overcame this shortcoming by explicating changes in the payment behavior of Dutch consumers, our analysis is on a much larger scale – we examine 22 European countries rather than one. What is more, to the best of our knowledge, this is the first study empirically linking magnitude of fear of viral contagion with choice of payment instrument.

Similarly, the fact that changes in other habits could have a domino-like effect on peoples' payment choices has hitherto not been considered in the literature. To add further depth to our inquiry, we consider not only historical preferences towards cashless payments, but also interrogate individuals' declarations about their future payment intentions after the COVID-19 pandemic is over. Our empirical model controls for a wide range of factors including perceptions of different payment instruments, experience of using them, stances on privacy, general technical literacy, a variety of socio-demographic factors and country-level variables such as the number of COVID-related deaths and size of the shadow economy.

The remainder of the paper is organized as follows. Section 2 presents a literature review, which embodies three important themes. It starts by reviewing the evidence on SARS-CoV-2 survival on banknotes and coins, moving subsequently to consideration of consumer payment behavior and closing with a reflection on the practical importance of widespread movement away from cash for different parties embedded in the payment system. Section 3 outlines our methodological approach, while Section 4 provides description of the dataset, definitions of variables and a set of summary statistics. Our main empirical results and their interpretation are included in Section 5. The paper ends with concluding remarks and reflections on practical implications.

2. Literature Review

2.1. Methods of Payment and Infections Disease Transmission

Studies examining the spread of pathogens through the use of cash date back to the 1970s (see, for instance, Abrams, 1972). In absence of disinfection, various types of microbes could adhere to the surface of currency, leading to the transmission of communicable diseases. A study of Vriesekoop *et al.* (2016) exploring bacterial survival concluded that microbial persistence is greater on paper

banknotes than on polymer bills and coins. According to the estimates of Pope *et al.* (2002) about 94% of one-dollar bills are contaminated with pathogenic or potentially pathogenic bacteria. This statistic reaches 100% for currency notes in Ghana (Tagoe *et al.*, 2009). Bills could also potentially harbor fungi and yeast (Basavarajappa, Rao and Suresh, 2005), parasites (Uneke and Ogbu, 2007) and viruses (Maritz *et al.*, 2017). The literature review conducted by Angelakis *et al*. (2014) concludes that banknotes retrieved from hospitals may carry antibiotic-resistant *MRSA*, while those from food outlets may be tainted with *Salmonella* and *E. coli*.

While the existence of monetary microbiome is well documented in the medical literature, one may wonder to what extent this message reverberated through broader society prior to the COVID-19 crisis. The reaction to the study of Gedik *et al.* (2013) epitomizes the attitudes of the bygone era. Their insightful analysis examined bacterial survival on banknotes from different countries. For their work, the authors received a satirical Ig Nobel Prize for economics in 2019. One year later, the escalating death toll from coronavirus caused a sea change in general attitudes towards this problem.

Discovery of durability of SARS-CoV-2 on surfaces (Chin *et al.*, 2020; van Doremalen *et al.*, 2020) posed a question as to whether the virus could be transmitted via cash. Having put a droplet of the virus on a banknote, Chin *et al.* (2020) observed that the note remained infectious for a period of 4 days. Harbourt *et al.* (2020) investigated the persistence of SARS-CoV-2 on US banknotes produced from a blend of linen and cotton. At a temperature of 4ºC the virus was detectable for 96 hours on $1 bills and for 72 hours on $20 notes. Surface stability however reduced with ambient temperature, with the virus being viable for eight hours at 22ºC and for four hours at 37ºC. A study commissioned by the Bank of England (Caswell *et al.*, 2020) found that the virus maintained its stability on banknotes for one hour, with its presence being dramatically reduced to about 5% of

its initial level over the subsequent five hours. Those are a very low estimates compared to that of Riddell *et al.* (2020), who claim that the coronavirus causing COVID-19 is still detectable on polymer and paper notes 28 days following inoculation. With regard to coins, the time to complete virus decay may depend on the metal used to mint the coin. For instance, this duration appears to be 8 hours for copper and 48 hours for stainless steel (van Doremalen *et al.*, 2020). At the time of writing, there are still many questions as to whether cash is indeed a fomite and the exact severity of risks involved. Assertions about direct causality may be premature. Notwithstanding these reservations, WHO has recommended that people wash their hands after coming in contact with notes and coins (Pal and Bhadada, 2020).

The question arises as to whether the dangers posed by cash can be circumvented by switching to cashless payments. Afterall, SARS-CoV-2 can remain stable on plastic surfaces for 7 days (Chin *et al.*, 2020), which in itself could endanger users of payment card terminals and pin pads. However, limits on contactless payments were increased in many countries during the pandemic (Mastercard, 2020), obviating the need to input a pin code for most transactions at the point of sale. The vast majority of transactions conducted online or via mobile banking also do not require contact with potentially contaminated surfaces. Consequently, one may argue that changing one's payment habits may reduce the risk of infection.

The stance of money issuers vis-à-vis the problem of jeopardized public health proved to be somewhat confusing. Central banks differed markedly in terms of their response to information about potential threat posed by cash. Some central banks (such as the European Central Bank and those of the United Kingdom, Germany, Austria, Sweden and South Africa) either stressed that the risk of SARS-CoV-2 transmission through cash is minimal compared to other frequently touched objects or refused to acknowledge the possibility of contagion altogether. But a few other nations

took different approaches. For instance, central banks in the United States, China, South Korea, Kuwait, Hungary and Poland started to quarantine and disinfect cash (Auer *et al.*, 2020; King and Shen, 2020). Regional branch of the People's Bank of China proceeded to destroy banknotes that had circulated in hospitals, wet markets and on buses (Yeung, 2020). The central banks of Georgia and India started to promote cashless payments while, at the other end of the spectrum, monetary authorities in Canada, Portugal and Poland appealed to retailers who stopped accepting cash to discontinue such practices. Their pleas were motivated by concerns over those who are financially excluded.

2.2. Consumer payment behavior

Consumer payment behavior has been a burgeoning field of research since the 1980s, starting with the seminal work of Boeschoten and Fase (1989). Nowadays, country-specific inquiries into this topic are primarily carried out by central banks. US Fed has been conducting an annual Survey of Consumer Payment Choice since 2008 (Foster *et al.*, 2020) and a Diary of Consumer Payment Choice since 2015 (Greene and Stavins, 2020). In a similar vein, studies regarding Dutch payment behavior have been undertaken by De Nederlandsche Bank since 2010 (see De Nederlandsche Bank, 2020). A number of other countries, including Australia, Canada, Denmark, Sweden, Germany, Poland and Norway, also endeavor to run similar surveys at regular intervals. Going beyond national level, the European Central Bank performed its pan-euro area study in 2016 (see Esselink & Hernández, 2017) and 2019 (European Central Bank, 2020). Taken together, the evidence gathered reveals a pattern of steady decline in the share of retail transactions conducted using cash. In the US this share fell from about 30% in 2009 to 21.5% in 2019 (Foster, Greene and Stavins, 2020). This downward sloping trend is mirrored in the UK with a decline from about 80% in 1990 to 23% in 2019 (Caswell *et al.*, 2020) and in the euro area where the proportion of cash

POS and P2P payments decreased from 79% to 73% between 2016 and 2019 (European Central Bank, 2020).

Personal payment choice is an outcome of myriad variables, both intrinsic and extrinsic to a given individual. Internal aspects embrace perceptions of different payment instrument characteristics such as perceived speed of payment, security, ease of use or budget control (Koulayev *et al.*, 2016; Schuh and Stavins, 2016) or stances on issues like privacy and trust (Png and Tan, 2020). External influences could incorporate, for instance, socioeconomic and socio-psychological factors (Stavins, 2001; van der Cruijsen and van der Horst, 2019). It is worth noting that the characteristics of transactions could be also important in terms of influencing the outcome. Such characteristics encompass the transaction amount (Wang, 2016; Arango-Arango *et al.*, 2018), possibility of paying in the way one desires (Bagnall *et al.*, 2016; Bounie, François and Van Hove, 2017), steering mechanisms used by merchants (Arango, Huynh and Sabetti, 2015; Stavins and Shy, 2015), rewards offered by issuers of cashless payments (Bolt, Jonker and van Renselaar, 2010; Simon, Smith and West, 2010), or costs associated with transaction (Arango-Arango *et al.*, 2018).

Ours is a paper that focuses specifically on how the context of the COVID-19 pandemic affected intentions to use cash. In our exploration we distinguish two important mechanisms through which such intentions could be affected. First, individuals may exhibit varying degrees of subjective fear attributable to dealing with currency that could potentially be virally contaminated. Such fears would be a direct stimulus steering consumers towards cashless transactions, insofar as cashless transactions are perceived as a lower contagion risk. Second, there could be an indirect effect arising from the fact that the pandemic has profoundly altered ways of life. Bound by government restrictions and by the commonsensical avoidance of jeopardy, individuals showed a stronger preference for online shopping (Bounie, Camara and Galbraith, 2020; Watanabe and Omori, 2020),

reduced their mobility and consumption (Bounie *et al.*, 2020; Carvalho *et al.*, 2020; Mínguez *et al.*, 2020), modified their working practices (Bick, Blandin and Mertens, 2020; Brynjolfsson *et al.*, 2020), and moved their social interactions into cyberspace (Nabity-Grover, Cheung and Thatcher, 2020). Such lifestyle transformations could have serious ramifications for personal preferences over payment methods.

A question arises as to whether these lifestyle changes have become habitual and therefore enduring. We need to bear in mind that focal attention and consciousness of choice feature prominently when an action is performed for the first time. The more an activity is repeated in a stable context, the more automatic the cognitive processes become, thereby permitting speedy action (Shiffrin and Schneider, 1977; Carden and Wood, 2018). Lally *et al.* (2010) examined changes in daily routines in order to gauge how long it would take an individual to develop a new habit. In their research, the participants' median time to reach a 'plateau of automaticity' was 66 days. The duration of the pandemic has exceeded this estimate by a substantial margin, allowing sufficient time for habit formation. Arguably, the context could be also viewed as stable in the sense that the possibility of infection was ubiquitous and ever-present. However, there is a fair amount of uncertainty as to how people would behave if the context were to change. For instance, the epidemic could be eradicated through a program of mass vaccination. In response to this, some individuals may remain entrenched in the habits they acquired, while others may devote more attention to accommodating the altered landscape in their decision-making. Any persistence of COVID-induced habits could affect general attitudes towards using cash in the long-run. Our questionnaire deliberately asks respondents which of their behavioral changes are likely endure one year after the COVID-19 pandemic is over.

2.3. Ramifications of an En Masse Move Towards Cashless Payments

The first sphere that could be affected by a collective switch to cashless transactions is the shadow economy. Although this term is fairly broad and constantly evolving, it encompasses unreported income obtained from production of goods and services, which if declared, would be taxable (Schneider and Enste, 2000). For many years, the shadow economy was perceived to be closely linked to cash transactions (Gordon, 1990). In his book titled "The Curse of Cash", Rogoff (2016) argues that eliminating high denomination banknotes could have a discouraging effect on tax evasion and criminal activities. Indeed, empirical studies that followed seem to substantiate this claim. Zhang *et al.* (2019) finds that an increase in the use of cashless payments helps to shrink and transform the shadow economy, while Schneider (2019) estimates that complete elimination of cash would decrease its size by 20.1%. With respect to tax compliance, two studies focusing on Greece and the euro area by Hondroyiannis and Papaoikonomou (2017, 2020) showed that that an increase in the share of card payments in private consumption led to a corresponding growth in VAT revenues. For Greece, 1 percentage point rise in this share was estimated to augment the VAT receipts by somewhere between 1% (Hondroyiannis and Papaoikonomou, 2017) and 1.4% (Danchev *et al.*, 2020). Studies exploring this issue from the perspective of the whole European Union (most notably Immordino and Russo (2018) and Madzharova (2020)) cohere with the conclusion that cashless payments tend to reduce VAT tax evasion.

A drift towards a cashless economy could also affect the profitability of the banking sector, as payment services are an enduring element embedded in the core operations of commercial banks (Rambure and Nacamuli, 2008). Historically, banks derived most of their revenues from acting as intermediaries that take deposits and lend money, earning net interest spread in the process (DeYoung and Rice, 2004). However, over time, noninterest income (that is income arising from

sources unconnected to the collection of interest payments (Haubrich and Young, 2019)) became increasingly important. DeYoung and Rice (2004) show that the share of noninterest income of US commercial banks in the aggregate banking industry operating income climbed from 20.31% in 1980 to 42.20% in 2001. Among the noninterest revenue streams are those attributable to processing and clearing payment transactions for various parties (Radecki, 1999). According to McKinsey & Company (2020b), global payments revenues accounted for about 39% of all the global banking revenues in 2019.

What is more, adoption of electronic payment instruments bestows additional benefits upon banks in the form of reduced operating expenses, because the cost of electronic payment equals about one-third to one-half of the paper-based equivalent (Humphrey *et al.*, 2006). Electronic payments are subject to economies of scale, which play a significant role in the unit costs of transactions incurred by banks (Khiaonarong, 2003; Bolt and Humphrey, 2007; Beijnen and Bolt, 2009). These bank incentives are evinced by the rise of cashless branches in which withdrawals, deposits or cheque cashing services are unavailable (Engert and Fung, 2019). Emergence of such bank offices is especially conspicuous in Sweden where about 60% of branches had become cashless by 2016, forcing an even greater reduction in cash usage (Engert, Fung and Segendorf, 2020).

FinTech firms (that is innovative, technological companies providing financial services) represent another group of entities profoundly affected by trends in payment habits. Global consultancy firm KPMG (2020) estimates that $361 billion was invested in FinTechs during the 2017-2019 period and 58 of those companies hit a valuation of more than $1 billion, becoming so called “unicorns” (McKinsey & Company, 2020a). The momentous rise of FinTechs and their impact on transforming the financial industry’s landscape is undisputed (Gomber *et al.*, 2018; Thakor, 2020). Interestingly, about $144.4 billion of the abovementioned total investment was channeled to

companies providing payment services. These companies are referred to as PayTechs and compete with banks for noninterest revenue streams. The population of PayTechs is growing continuously, with the number of companies that obtained regulatory licenses to provide such services in the EU soaring from 350 in 2017 to 1,475 in 2020 (Polasik *et al.*, 2020).

Evidence also seems to point to a surge in demand for products offered by FinTech and PayTech companies during the COVID-19 crisis. According to McKinsey & Company (2020b), 6% of US consumers opened an overall banking FinTech account during the pandemic, while Fu and Mishra (2020) report a significant rise in downloads of finance mobile apps from Google and Apple app stores during this period. Interestingly, the epidemic-induced uptick in FinTech solutions was not uniformly distributed across countries, with a number of players in the sector struggling to raise funds and balancing precariously on the edge of insolvency (see for instance Kelly (2020), Kodoth (2020) or Chernova (2019)).

Changes in how people pay are also critical for central banks, as these institutions are sole issuers of money and play a key role in its distribution. In terms of strict monetary policymaking, the emphasis has shifted from monetary aggregates to interest rates (Masuch, Nicoletti Altimari and Rostagno, 2003; Woodford, 2008), with Woodford (2000) arguing that effectiveness of monetary policy would not be significantly undermined by the absence of transaction-driven demand for base money.[4] Nevertheless, cash and payment habits are of great importance to the monetary system as a whole. Even if, as shown in subsection 2.2, the share of cash payments in retail transactions has declined worldwide, proclamations that a cashless economy may be nigh are premature. Money demand is driven by a multitude of motives (Sriram, 1999) and evidence suggests that appetite for

[4] That is cash in circulation with cash physically held in commercial banks, with commercial banks reserves held withing central bank (Goodhart, 1987).

cash has increased following the 2008-2009 bank crisis (Bech *et al.*, 2018). This is partially attributable to the fact that an environment of near-zero interest rates and low inflation reduces the opportunity cost of holding cash and encourages its use as a store of value (Ashworth and Goodhart, 2020).

Whatever the demand, central banks need to be ready to provide an adequate supply of physical money at all times, in addition to performing their role as monetary authorities and safeguarding the financial system (Restoy, 2020). This issuing obligation is especially important during times of distress, such as the COVID-19 pandemic, which has had a rather complex influence on the demand for money. Although transactional use of cash has declined due to suppressed consumer spending and the possibility of SARS-CoV-2 transmission through banknotes, this was eclipsed by precautionary hoarding of cash, which led to an increase in the overall demand for money (see, for instance, Caswell *et al.* (2020), Chen *et al.* (2020), and Goodhart and Ashworth (2020)). Should transactional motives prevail over the impulse to hoard in the future, central banks may be forced to withdraw and redeem some of the cash that is currently in circulation (Snellman, Vesala and Humphrey, 2001).

The pandemic-induced reduction in transactional usage of cash also affects merchants and consumers, who collectively form a 'two-sided market' (Rochet and Tirole, 2002; Rysman, 2009), which can be defined as a market populated by distinct groups of users sharing a common platform and interacting with each other in an influential way (Rochet and Tirole, 2003, 2006). The platform is provided by acquirers (service provider for merchants), issuers (service provider for consumers), and payment organizations (companies that set the rules and pricing, e.g. Visa and Mastercard). It is recognized that payments services are subject to indirect network externalities (Van Hove, 1999; Verdier, 2006), meaning that the utility of a platform increases with the number of parties on the

opposite side. For instance, a rise in the number of customers using cards is beneficial to merchants accepting cashless payments, and *vice versa.*

In their decision to accept payment cards, merchants are driven primarily by two motives which can be labelled as 'wanna take' and 'must take' (Bounie, François and Van Hove, 2016). The 'wanna take' motive embraces benefits such as lower exposure to theft and counterfeit banknotes, reduction in costs of secure cash storage, faster customer throughput (compared to cash, offline contactless card transactions without paper slips result in shorter transaction times (Polasik *et al.*, 2013)), lower merchants' costs for medium and large transactions (Arango and Taylor, 2009)[5], or decreased costs of cash handling (Bounie, François and Van Hove, 2016). The 'must take' motive captures the concern that business may be lost to competitors accepting cashless payments or reduced due to limitations imposed on customers by cash. Such limitations, which can lead to outright resignation from shopping, include budgetary constraints due to fixed cash holdings or liquidity constraints that could be circumvented by the use of credit cards (Chakravorti and To, 2007; Bourguignon, Gomes and Tirole, 2014; Runnemark, Hedman and Xiao, 2015). On the other side of the market, a rise in the number of merchants adopting cashless payment technologies and the consequent growth in cashless transaction volume imply augmentation of acquirers' revenues. Just in the US, revenues from handling transactions and associated services rose from $18.7 billion in 2017 to $23.7 billion in 2019 (McKinsey & Company, 2020c).

3. Methodology

Since our dependent variables measuring whether a respondent switched or intends to switch to cashless payments are binary in nature, our analysis relies on traditional logit regressions (Hosmer

[5] In the European Union reduction of costs associated with payment cards might been significant due to the *Interchange Fee Regulation* (see e.g. Górka (2018)).

and Lemeshow, 2013). Consequently, we estimate the probability of the act or intention to switch by employing the following empirical model:

$$P(Y_{jk}^{i} = 1|H_{jk}, E_k, C_{jk}) = \frac{1}{1+e^{-\left(\alpha+\beta\left(H_{jk}\right)+\varphi(E_k)+\gamma\left(C_{jk}\right)\right)}} \quad [1]$$

Two variants ($i \in \{1, 2\}$) of the dependent variable Y^i are used in our analysis. They record whether respondents started to use more cashless payments due to the COVID-19 pandemic (*Cashless switch*) and whether they declare an intention to use cashless payments more often after the pandemic is over (*Cashless intention*). Depending on the value of *i*, the outcome $Y^i = 1$ indicates that the person either switched to cashless payments or wishes to do so in the future, H_{jk} is the vector that measures the characteristics, perceptions and confidence in using technology of person *j* living in country *k*; E_k is a vector of specific characteristics of country *k*, while C_{jk} is our core vector of Covid-19-induced fears and changes in the behavior of person *j* living in country *k*.

Our sampling uses stratification by age, gender and size of locality, and the survey spans 22 European countries. However, the sample size in each of the nations is not necessarily proportional to its population of internet users. To remedy this issue methodologically, we proceed to calculate the actual proportions of internet users for each country and, in our estimation, we weight each observation by the inverse of its probability of being sampled. In other words, the higher the weighting, the higher the observation's contribution to the residual sum of squares. Such an approach is commonly used in the literature (see, for instance, Moro *et al.* 2020). We note in passing that unweighted estimation results lead to identical conclusions regarding the processes being modelled.

Since the standard variance-covariance matrix is no longer appropriate, we use a sandwich (White, 1980) estimator to compute it. Robust estimation of standard errors is relied upon to deal with

heteroskedasticity issues. When fitting the regressions, we take necessary precautions to avoid multicollinearity problems. This is accomplished by performing factor analysis that aggregates cognate questionnaire items into a construct. Most notably, we consider two factors representing the change in habits related to the COVID-19 epidemic, which have the potential to explain the curbed appetite for cash and transcend purely fear-based rationalization.

4. Data

Collection of the data used in this study was supported by a research grant awarded by the Polish National Science Centre and was implemented by a research agency Interactive Research Center. The source data was obtained from consumers through a survey based on computer-assisted web interviews (CAWI), which utilized an interactive internet questionnaire. Internet users were recruited through a large and esteemed pan-European internet panel Dynata. They were invited to register their interest in participating through e-mail and advertising campaigns. Those who volunteered collected points which were redeemable for prizes. Survey respondents were then selected through stratified sampling from the pool of registrants. Such a data collection approach permitted us to obtain a large sample in a relatively cost-effective manner. The interactive nature of the survey afforded us the opportunity to incorporate additional clarifications and definitions of the technical terms that could be accessed by respondents without the need to exit the web page. CAWI also allowed participants to pause and save the answers that have already been submitted, facilitating thereby the process of consulting external information sources whenever needed.

The data collection exercise was preceded by a pilot study involving 230 respondents from 22 countries. The overriding aim of this undertaking was to verify whether respondents understand and interpret the questionnaire items correctly. Minor irregularities that were identified in the questionnaire were subsequently rectified and there was no need to conduct a second pilot study.

The final sample, collected during the period spanning July to August 2020, includes 5,504 respondents from 22 European countries (Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden). According to Eurostat (2020), the number of internet users in those countries accounted for 96% of all internet users in the European Union in 2019. Stratified random sampling was employed, with age, gender and size of the respondent's locality acting as stratification factors.

The stratification factors of gender, age and size of locality are also used as controls in our regressions. Another control variable employed is the attitude towards privacy, which was quantified through a questionnaire item stating: "I prefer payments for shopping to be anonymous, so that no one can see what I bought and when". The possession of a card, mobile or wearable that could be used at the point of sale is captured by a dummy variable *Cards & Mobile.* Individuals who are lacking such items face higher costs of switching to cashless technologies, in that they may be forced to open a bank account or acquire the requisite device. We also consider eight other variables that measure the respondents' perceptions, experience, technological literacy and habits and that are built up as constructs using principal component factor analysis (Hair *et al.*, 2013). Each of these constructs includes many highly correlated items that cannot be modelled separately due to collinearity problems.

The first set of factors examines the assessment of alternative cashless payment methods, namely contactless (NFC) payments, Google Pay, Apple Pay, QR code payments, contactless payments with wearables (smartwatches, smartbands). Each payment method is assessed across several dimensions using a five-point Likert scale and one factor for each of the dimensions is subsequently extracted. These factors are labelled as *Convenience of cashless payments*, *Safety of cashless*

payments, Popularity of cashless payments, Ease of use of cashless technologies, and *Control over finance with cashless payments.* Familiarity with technologies was encapsulated in additional three factors. The first one called *Literacy in using apps* is based on five items assessing how confident the surveyed person is in using mobile apps for transport (e.g. Uber, Bolt, Freenow), food delivery, buying tickets on public transport, paying parking fees, and tracking fitness activity. Moreover, we measure experience in using payment technologies such as Apple Pay, Google Pay, Amazon Pay, Alipay, MoneyGram, Samsung Pay, Wechat Pay, Western Union, Revolut, cryptocurrencies and HCE (mobile contactless in a card issuer app). Principal component analysis suggests extraction of two factors (eigenvalues of 2.91 and 1.18) that are subsequently rotated using Varimax rotation. The items that load clearly in one factor measure *Experience in using computer payments*, while the second factor captures *Experience in using mobile payments*.

Furthermore, our questionnaire comprised a series of items pertaining to habit formation during the pandemic. These items were prefaced by a request to provide an assessment of how the respondent's life will change one year after the COVID-19 pandemic is over, as compared to the time before it started. Responses to these questions were recorded on a 5-point Likert scale. The first variable measured the impact of the pest on working habits ("I will work more remotely"), while the second one was designed to capture a possible increase in online activity as a substitute for physical contact ("I will meet people online more frequently"). We also endeavored to explore a shift in travelling patters ("I will travel less in my country") and ("I will travel less abroad"), as well as dining habits ("I will eat at home more frequently"). Finally, we evaluated whether COVID-19 affected personal perception of health ("I will be more focused on my health") and shopping preferences ("I will buy more online"). Two factors with eigenvalues of 2.97 and 1.01 are extracted from these predictions of future habits. The items that load clearly on the first factor capture *Change*

in habits related to physical contact, while the second one clearly gauges *Change in online habits*.

All of the eight abovementioned factors created for the purpose of this study underwent a rigorous process of verification with respect to internal consistency and sampling adequacy. Statistics related to this verification are reported in Table I. By default, each of the constructs has an eigenvalue above unity. Reassuringly, the Cronbach's alphas are consistently above the recommended threshold of 0.60. The Keiser-Meyer-Olkin test does not detect any sampling inadequacy requiring remedial action and the proportion of variance explained by the factors appears to be satisfactory.

[Insert Table I about here]

Moving away from factors, we explore another measure that is critical to our investigation. It intends to capture individual fear related to the possibility of contracting the disease through contact with cash. However, one needs to bear in mind that measurement must be done in relative terms. Respondents will be deterred from using cash for transitional purposes only if they perceive its infection risk to be higher than that for cashless instruments. For this reason, there was a need to include two items in the questionnaire which read "I am afraid of contracting COVID-19 due to the usage of cash in physical stores" and "I am afraid of contracting COVID-19 as a result of operations with cashless payments in a physical stores". By taking the difference between the responses to these two questions, we construct a variable called *Net fear of cash*. Since the original items were measured on a 5-point scale, the resultant net fear variable ranges from -4 to +4.

Finally, we utilize two variables that are measured at country level. We include the cumulative number of COVID-19 deaths (in thousands) that occurred prior to July 2020 in order to consider the general impact that the pandemic had in a given country. Furthermore, estimated size of the shadow economy in 2016 (as a percentage of GDP) was considered as an explanatory variable for

cash preferences arising from tax evasion and illegal activities. These estimates were sourced from (Kelmanson *et al.*, 2019).

[Insert Table II about here]

[Insert Table III about here]

Table II provides definitions of all the variables used in the study, while Table III reports the corresponding summary statistics. Evaluation of these statistics paints a picture of the individuals involved in our survey. An average respondent resided in a city with less than 100,000 inhabitants and was 47 years of age. The latter figure was influenced by the fact people under the age of 18 were not invited to participate. Women constituted 52% of the sample, which is representative of the broader population in the countries of interest. Despite the fact that those who were surveyed showed, on average, a slight preference towards payment anonymity, 90% of them held a cashless payment instrument. Notably, 41% of people declared that they use cashless payments more often during the COVID-19 crisis, while 47% stated that they will use cashless payments more frequently after the pandemic is over. An average respondent believed that the risk of contracting the coronavirus is slightly higher for cash than the cashless alternatives. When analyzing Table III, one needs to bear in mind that, by construction, all the constructs created through factor analysis have a mean of zero and a standard deviation of one.

5. Empirical Results

Table IV presents the results of weighted logit regressions estimating the likelihood of an immediate increase in the frequency of cashless payments in response to the COVID-19 pandemic. The first specification focuses on the fear of contagion via cash, while the second one considers the impact of changing habits. Regression (3) subsumes both these determinants as well as a full

set of controls, making it the most comprehensive model amongst the considered alternatives. With respect to the key explanatory variables, our empirical findings cohere with *a priori* predictions. *Net fear of cash* is positively signed and exhibits a strong statistical significance. Clearly, individuals who believe that handling cash poses a relatively serious health hazard tend to enthusiastically embrace cashless instruments. The *t*-statistics associated with the variable *Change in habits related to physical contact* exceed the value of 10, making it another strong predictor of payment behavior. In other words, respondents who declared an intention to alter their routines in the physical world were *ceteris paribus* more likely to use cashless payment methods at the point of sale. *Change in online habits* appears to be a further important explanatory factor, albeit the magnitude of its coefficient and its explanatory power pale in comparison to the *Change in habits related to physical contact.* One may therefore argue that, when it comes to choices of payment technologies, habits in the physical sphere are of greater gravity than those in the virtual realm.

[Insert Table IV about here]

[Insert Figure I about here]

While the statistical significance of fear and habits is unequivocal, the question arises as to the economic significance of our results. To probe this issue, we plot predictive functions in Panel A of Figure I. More specifically, these plots show the expected probability of *Cashless switch* = 1 when one key independent variable is varied, and the remaining regressors are kept constant at the sample average value. When interpreting the values on the horizontal axis, one needs to remember that *Net fear of cash* was derived from a differencing two 5-point Likert scales, while a unitary move across they x-axis for the habit variables denotes a change equivalent to one standard deviation. Clearly, probabilities are increasing monotonically with all three of the variables considered in Panel A, with the increase being remarkably steep for *Net fear of cash* and *Change*

in habits related to physical contact. Judging from the plots, these two factors were decisive for many respondents in their decision to abandon cash payments at POS during the COVID-19 crisis.

The influence of statistically significant control variables warrants further discussion. Females and those who are literate in using mobile apps showed greater proclivity to embrace cashless technologies. Unsurprisingly, those without access to cashless instruments remained dependent on banknotes and coins during the COVID crisis. Since older individuals face higher SARS-CoV-2 fatality rates (O'Driscoll *et al.,* 2021), their health risk arising from engagement in cash-based transactions is graver. Cognizant of this reality, older people relinquished payments with physical currency more readily. Apprehension over anonymity issues and influence of the shadow economy thwarted individuals' transition towards cashless transacting. Respondents with no concerns over safety of digital payment technologies were more likely to use them frequently, which mirrors the argument of Ostlund (1974) that the perceived risk of an innovation hinders its diffusion. Furthermore, in line with the theoretical predictions of the Technology Acceptance Model of Davis (1989), perceived ease of use of cashless instruments correlated positively with their adoption. Lastly, the number of COVID-related deaths in the respondent's country of residence was a factor contributing to the abandonment of cash. The number of deaths captures general concern over the pandemic, which goes beyond change in habits and fear of using cash captured by other variables in the model.

[Insert Table V about here]

Table V reports weighted logit estimates for models considering the intention to use more cashless transactions after the COVID-19 pandemic is over. The results indicate that COVID-induced fear of cash may have a long memory and is likely to extend into the distant future. Once again, *Change in habits related to physical contact* exhibits stronger statistical significance and has larger

marginal effect than *Change in online habits* (see Panel B of Figure I). Juxtaposition of the results with those contained in Table IV reveals similar patterns of significance across control variables. A slight discrepancy that could be noted is the weaker explanatory power of *Age* and *Shadow economy*. It appears that older people, who are in the highest risk group, may be tempted to revert back to their baseline payment behavior after the health perils have dissipated. The diminished statistical significance of the shadow economy could reflect anticipation of its decreasing role in the future. Workers in informal economy, where formalized contracts are absent, were particularly badly hit during the pandemic in terms of their job security and inability to benefit from furlough schemes (Webb, McQuaid and Rand, 2020). It is conceivable that these individuals desire to migrate to the official economy in the future, which would reduce their propensity to pay cash at the point of sale.

To confirm the validity of the story presented here, we have performed further tests and robustness checks. First, we re-estimated all the regressions using probit models and, reassuringly, our conclusions remained unchanged. Second, we partitioned our sample based on two potentially relevant Hofstede national culture indicators. The first split was into countries with high and low power distance, as the degree to which hierarchical order is accepted within society could affect trust in institutions and, consequently, use of cashless technologies. Another split was based on the uncertainty avoidance dimension, which could be potentially insightful in light of COVID-induced uncertainty. However, broadly speaking, the results from these four sub-samples are similar to those obtained from the full sample. The only notable difference was that the *Change in online habits* variable occasionally lost its statistical significance, which could have been attributed to the smaller sample size used in estimations. We also isolated Scandinavian countries from our data set, as they are already characterized by a very high level of electronic payments (Armelius, Claussen

and Reslow, 2020; Engert, Fung and Segendorf, 2020). Unsurprisingly, the probability of using cashless payments more frequently in these nations proved to be less responsive to the *Net fear of cash* because the amount of residual transactions that are still conducted via physical currency is limited. Finally, instead of amalgamating our 7 questionnaire items measuring habits into two factors, we inserted them individually into separate regressions. We could not bundle them together into one specification, as this would have led to a multicollinearity problem. All these habits proved to be individually highly significant, corroborating the conclusion that the routine ways in which we structure our life is of great importance to our payment behavior.

6. Conclusions

The coronavirus epidemic instilled a widespread sense of apprehension and changed the trajectories of our lives. In this paper we examined how the disease outbreak affected consumer choices regarding payment method at the point of sale. The results clearly indicate that those who believed that cash poses a relatively high risk of viral transmission opted for cashless alternatives. Payment behavior was also indirectly transmuted though the impact that the pandemic had on the patterns of our daily activities. Especially, our altered habitual conduct in physical spaces exerted a powerful influence, steering individuals towards cashless transactions. The drift away from physical currency was also attributable to changes in online behavior, albeit to a lesser degree. Interestingly, the possibility of contagion through cash and transformed habits not only drove the contemporaneous switch between the payment instruments, but also imprinted themselves on respondents' future intentions to transact in a cashless manner, even after the COVID pandemic has been contained.

While the impact of the virus on payment preferences seems to be unequivocal, we also note that several factors anchor individuals to cash. Preference for anonymity or the need to conceal one's

transactions are incompatible with the notion of switching to digital payments. Those who are employed in the shadow economy and receive their salary in physical currency are forced to expend it, regardless of the COVID-19 situation. Furthermore, lack of literacy in using mobile apps proved to be another obstacle to utilization of cashless instruments.

Our findings have several practical implications relevant to every link in the chain of payment transaction processing as well as the broader society. Banks, acquirers, FinTechs and payment organizations must be aware that COVID-like events can drastically increase the volume and value of processed transactions. While this may bring a much-needed revenue stream, it also puts a strain on available resources. Failure to meet the surge in demand could heighten reputational risk. Similarly, merchants need to show flexibility in times perturbed by fear of disease contagion and dynamically evolving consumer habits. Preferred payment options should be offered to paying patrons to alleviate their anxiety. Furthermore, central banks should carry out further studies on the epidemiological safety of different payment instruments. This topic was not sufficiently integrated in the monetary debate prior to the COVID-19 pandemic and the mixed voices raised amongst the world's central banks during the public health crisis only exacerbated the angst within the population. Finally, the COVID-induced speedy move towards digital payments has the potential to disadvantage those who are financially excluded, particularly immigrants, elderly, unemployed, or disabled people. This area of concern warrants further scientific inquiry in the future.

References

Abrams, B. L. (1972) "Dirty Money." *JAMA: The Journal of the American Medical Association*, 219(9), 1202–1203.

Angelakis, Emmanouil, Esam I. Azhar, Fehmida Bibi, Muhammad Yasir, Ahmed K. Al-Ghamdi, Ahmad M. Ashshi, Adel G. Elshemi, and Didier Raoult. (2014) "Paper money and coins as potential vectors of transmissible disease." *Future Microbiology*, 9(2), 249–261.

Arango-Arango, Carlos A., Yassine Bouhdaoui, David Bounie, Martina Eschelbach, and Lola Hernandez. (2018) "Cash remains top-of-wallet! International evidence from payment diaries." *Economic Modelling*, 69, 38–48.

Arango, Carlos, Kim P. Huynh, and Leonard Sabetti. (2015) "Consumer payment choice: Merchant card acceptance versus pricing incentives." *Journal of Banking & Finance*, 55, 130–141.

Arango, Carlos, and Varya Taylor. (2009) "Merchants' costs of accepting means of payment: Is cash the least costly?." *Bank of Canada Review*, (Winter 2008-2009), 15–23.

Ardizzi, Guerino, Andrea Nobili, and Giorgia Rocco. (2020) "A game changer in payment habits: evidence from daily data during a pandemic." Banca d'Italia Occasional Paper 591.

Armelius, Hanna, Carl Andreas Claussen, and André Reslow. (2020) "Withering Cash: Is Sweden ahead of the curve or just special?" Sveriges Riksbank Working Paper 393.

Ashworth, Jonathan, and Charles A.E. Goodhart. (2020) "The Surprising Recovery of Currency Usage." *International Journal of Central Banking*, 16(3), 239–277.

Auer, Raphael, Giulio Cornelli, and Jon Frost. (2020) "Covid-19, cash, and the future of payments." *BIS Bulletin*, (3).

Bagnall, John, David Bounie, Kim P. Huynh, Anneke Kosse, Tobias Schmidt, Scott Schuh, and Helmut Stix. (2016) "Consumer Cash Usage: A Cross-Country Comparison with Payment Diary Survey Data." *International Journal of Central Banking*, 12(4), 1–59.

Basavarajappa, K.G., P.N. Sridhar Rao, and K. Suresh. (2005) "Study of bacterial, fungal, and parasitic contaminaiton of currency notes in circulation." *Indian Journal of Pathology & Microbiology*, 48(2), 278–279.

Bech, Morten, Umar Faruqui, Frederik Ougaard, and Cristina Picillo. (2018) "Payments are a-changin' but cash still rules." *BIS Quarterly Review*, (March), 67–80.

Beijnen, Christine, and Wilko Bolt. (2009) "Size matters: Economies of scale in European payments processing." *Journal of Banking & Finance*, 33(2), 203–210.

Bick, Alexander, Adam Blandin, and Karel Mertens. (2020) "Work from Home After the COVID-19 Outbreak." CERP Discussion Paper 15000.

Boeschoten, W.C., and M.M.G. Fase. (1989) "The Way We Pay with Money." *Journal of Business & Economic Statistics*, 7(3), 319–326.

Bolt, Wilko, and David B. Humphrey. (2007) "Payment network scale economies, SEPA, and cash replacement." *Review of Network Economics*, 6(4), 453–473.

Bolt, Wilko, Nicole Jonker, and Corry van Renselaar. (2010) "Incentives at the counter: An empirical analysis of surcharging card payments and payment behaviour in the Netherlands." *Journal of Banking & Finance*, 34(8), 1738–1744.

Bounie, David, Youssouf Camara, and John W. Galbraith. (2020) "Consumers' Mobility, Expenditure and Online- Offline Substitution Response to COVID-19: Evidence from French Transaction Data." CIRANO Working Paper 2020S–28.

Bounie, David, Abel François, and Leo Van Hove. (2016) "Merchant Acceptance of Payment Cards: "Must Take" or "Wanna Take"?" *Review of Network Economics*, 15(3), 117–146.

Bounie, David, Abel François, and Leo Van Hove. (2017) "Consumer Payment Preferences, Network Externalities, and Merchant Card Acceptance: An Empirical Investigation." *Review of Industrial Organization*, 51(3), 257–290.

Bourguignon, Hélène, Renato Gomes, and Jean Tirole. (2014) "Card surcharges and cash discounts: Simple economics and regulatory lessons." *Competition Policy International*, 10(2), 12–27.

Brynjolfsson, Erik, John J. Horton, Adam Ozimek, Daniel Rock, Garima Sharma, and Hong-Yi TuYe. (2020) "COVID-19 and Remote Work: An Early Look at US Data." NBER Working Paper 27344.

Carden, Lucas, and Wendy Wood (2018) "Habit formation and change." *Current Opinion in Behavioral Sciences*, 20(3), 117–122.

Carvalho, Vasco M., Juan Ramón García, Stephen Hansen, Álvaro Ortiz, Tomasa Rodrigo, Sevi Rodriguez Mora, and Pep Ruiz. (2020) "Tracking the COVID-19 Crisis with High-Resolution Transaction Data." CEPR Discussion Papers 14642.

Caswell, Ellen, Miranda Hewkin Smith, David Learmonth, and Gareth Pearce (2020) "Cash in the time of Covid." *Bank of England Quarterly Bulletin*, (Q4).

Chakravorti, Sujit, and Ted To. (2007) "A theory of credit cards." *International Journal of Industrial Organization*, 25(3), 583–595.

Chen, Heng, Walter Engert, Kim P. Huynh, Gradon Nicholls, Mitchell W. Nicholson, and Julia Zhu. (2020) "Cash and COVID-19: The impact of the pandemic on the demand for and use of cash." Bank of Canada Staff Discussion Paper 2020–6.

Chernova, Yuliya. (2019) "Fintech Startups Face Tough Exit Options." *The Wall Street Journal*, 30 December.

Chin, Alex W.H., Julie T.S. Chu, Mahen R.A. Perera, Kenrie P.Y. Hui, Hui-Ling Yen, Michael C.W. Chan, Malik Peiris, and Leo L.M. Poon. (2020) "Stability of SARS-CoV-2 in different environmental conditions." *The Lancet Microbe*, 1(1), e10.

Danchev, Svetoslav, Georgios Gatopoulos, and Nikolaos Vettas. (2020) "Penetration of Digital

Payments in Greece after Capital Controls: Determinants and Impact on VAT Revenues." *CESifo Economic Studies*, 66(3), 198–220.

Davis, Fred D. (1989) "Perceived usefulness, perceived ease of use, and user acceptance of information technology." *MIS Quarterly*, 13(3), 319–340.

DeYoung, Robert, and Tara Rice. (2004) "How Do Banks Make Money? the Fallacies of Fee Income." *Economic Perspectives*, 28(4), 34–51.

Engert, Walter, and Ben S.C. Fung. (2019) "Cashless Bank Branches in Canada." Bank of Canada Staff Analytical Note 2019–29.

Engert, Walter, Ben S.C. Fung, and Björn Segendorf. (2020) "A Tale of Two Countries: Cash Demand in Canada and Sweden." In International Cash Conference 2019. Cash in the age of payment diversity, pp. 365–425. Frankfurt am Main, Germany: Deutsche Bundesbank.

Esselink, Henk, and Lola Hernández. (2017) "The use of cash by households in the euro area." ECB Occasional Paper 201.

European Central Bank (2020) "Study on the payment attitudes of consumers in the euro area (SPACE)." Available at: https://www.ecb.europa.eu/pub/pdf/other/ecb.spacereport202012~bb2038bbb6.en.pdf

Foster, Kevin, Claire Greene, and Joanna Stavins. (2020) "The 2019 Survey of Consumer Payment Choice: Summary Results." Federal Reserve Bank of Atlanta Research Data Report 20–3.

Fu, Jonathan, and Mrinal Mishra. (2020) "The global impact of COVID-19 on fintech adoption." *Covid Economics: Vetted and Real-Time Papers*, (12), 158–191.

Gedik, Habip, Timothy A Voss, and Andreas Voss. (2013) "Money and transmission of bacteria." *Antimicrobial Resistance and Infection Control*, 2(22).

Gomber, Peter, Robert J. Kauffman, Chris Parker, and Bruce W. Weber. (2018) "On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services." *Journal of Management Information Systems*, 35(1), 220–265.

Goodhart, Charles. (1987) "Monetary Base." In The New Palgrave Dictionary of Economics, edited by Palgrave Macmillan. London, UK: Palgrave Macmillan UK.

Goodhart, Carles A., and Jonathan Ashworth. (2020) "Coronavirus panic fuels a surge in cash demand." CEPR Discussion Papers 14910.

Gordon, James P.F. (1990) "Evading taxes by selling for cash." *Oxford Economic Papers*, 42(1), 244–255.

Górka, Jakub. (2018) Interchange Fee Economics: To Regulate or Not to Regulate? Cham, Switzerland: Palgrave Macmillan.

Greene, Claire, and Joanna Stavins. (2020) "The 2019 Diary of Consumer Payment Choice." Federal Reserve Bank of Atlanta Research Data Report 20–4.

Hair, Joseph F., William C. Black, Barry J. Babin, and Rolph E. Anderson. (2013) Multivariate Data Analysis. 7th edn. Pearson.

Harbourt, David E., Andrew D. Haddow, Ashley E. Piper, Holly Bloomfield, Brian J. Kearney, David Fetterer, Kathleen Gibson, and Timothy Minogue. (2020) "Modeling the stability of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on skin, currency, and clothing." *PLOS Neglected Tropical Diseases*, 14(11), e0008831.

Haubrich, Joseph G., and Tristan Young. (2019) "Trends in the Noninterest Income of Banks." *Economic Commentary*, Federal Reserve Bank of Cleveland, issue September.

Hondroyiannis, George, and Dimitrios Papaoikonomou. (2017) "The effect of card payments on vat revenue: New evidence from Greece." *Economics Letters*, 157, 17–20.

Hondroyiannis, George, and Dimitrios Papaoikonomou. (2020) "The effect of card payments on VAT revenue in the euro area: evidence from a panel VECM." *Journal of Economic Studies*, 47(6), 1281–1306.

Hosmer, David W, and Stanley Lemeshow. (2013) *Applied Logistic Regression*. 3rd edn. John Wiley & Sons.

Humphrey, David B., Magnus Willesson, Göran Bergendahl, and Ted Lindblom. (2006) "Benefits from a changing payment technology in European banking." *Journal of Banking & Finance*, 30(6), 1631–1652.

Immordino, Giovanni, and Francesco Flaviano Russo (2018) "Cashless payments and tax evasion." *European Journal of Political Economy*, 55, 36–43.

Jonker, Nicole, Carin van der Cruijsen, Michiel Bijlsma, and Wilko Bolt. (2020) "Pandemic payment patterns." DNB Working Paper 701.

Kelly, Jemima. (2020) "The virus has crushed the challenger bank dream." *Financial Times*, 2 November.

Kelmanson, Ben, Koralai Kirabaeva, Leandro Medina, Borislava Mircheva, and Jason Weiss. (2019) "Explaining the shadow economy in Europe: size, causes and policy options." IMF Working Paper WP/19/278.

Khiaonarong, Tanai. (2003) "Payment systems efficiency, policy approaches, and the role of the central bank." Bank of Finland Discussion Paper 1/2003.

Kim, Laura, Raynil Kumar, and Shaun O'Brien. (2020) "Consumer Payments & the COVID-19 Pandemic: A supplement to the 2020 Findings from the Diary of Consumer Payment Choice." Federal Reserve Bank of San Francisco FedNotes.

King, Rachael, and Alice Shen. (2020) "Will cash survive Covid-19?" *Central Banking*, 20 March.

Kodoth, Vyshakh. (2020) "Party's Over: A Maturing FinTech Industry Faces Its Reckoning." *Forbes*, 15 December.

Koulayev, Sergei, Marc Rysman, Scott Schuh, and Joanna Stavins (2016) "Explaining adoption

and use of payment instruments by US consumers." *RAND Journal of Economics*, 47(2), 293–325.

KPMG. (2020) "Pulse of Fintech H1'2020." Available at: https://home.kpmg/xx/en/home/insights/2020/09/pulse-of-fintech-h1-20-global.html

Kraenzlin, Sébastien, Christoph Meyer, and Thomas Nellen. (2020) "COVID-19 and regional shifts in Swiss retail payments." *Swiss Journal of Economics and Statistics*, 156.

Lally, Phillippa, Cornelia H. M. van Jaarsveld, Henry W. W. Potts, and Jane Wardle. (2010) "How are habits formed: Modelling habit formation in the real world." *European Journal of Social Psychology*, 40(6), 998–1009.

Madzharova, Boryana. (2020) "Traceable Payments and VAT Design: Effects on VAT Performance." *CESifo Economic Studies*, 66(3), 221–247.

Maritz, Julia M., Steven A. Sullivan, Robert J. Prill, Emre Aksoy, Paul Scheid, and Jane M. Carlton. (2017) "Filthy lucre: A metagenomic pilot study of microbes found on circulating currency in New York City." *PLOS ONE*, 12(4), e0175527.

Mastercard. (2020) "Mastercard enables Contactless limit raise across 29 countries; and champions permanent increase." Available at: https://newsroom.mastercard.com/eu/press-releases/mastercard-enables-contactless-limit-raise-across-29-countries-and-champions-permanent-increase/

Masuch, Klaus, Sergio Nicoletti Altimari, and Massimo Rostagno. (2003) "The Role of Money in Monetary Policymaking." BIS Paper No. 19.

McKinsey & Company. (2020a) "Detour: An altered path for European fintechs." Available at: https://www.mckinsey.com/industries/financial-services/our-insights/detour-an-altered-path-to-profit-for-european-fintechs

McKinsey & Company. (2020b) "How US customers' attitudes to fintech are shifting during the pandemic." Available at: https://www.mckinsey.com/industries/financial-services/our-insights/how-us-customers-attitudes-to-fintech-are-shifting-during-the-pandemic

McKinsey & Company. (2020c) "The 2020 McKinsey Global Payments Report." Available at: https://www.mckinsey.com/~/media/mckinsey/industries/financial%20services/our%20insights/accelerating%20winds%20of%20change%20in%20global%20payments/2020-mckinsey-global-payments-report-vf.pdf

Mínguez, José González, Alberto Urtasun, and Miguel Pérez García de Mirasierra. (2020) "Consumption in Spain during the state of alert: An analysis based on payment card spending." Banco de España Economic Bulletin 3.

Moro, Andrea, Daniela Maresch, Matthias Fink, Annalisa Ferrando, and Claudio Piga. (2020) "Spillover effects of government initiatives fostering entrepreneurship on the access to bank credit for entrepreneurial firms in Europe." *Journal of Corporate Finance*, 62, 101603.

Nabity-Grover, Teagen, Christy M.K. Cheung, and Jason Bennett Thatcher. (2020) "Inside out

and outside in: How the COVID-19 pandemic affects self-disclosure on social media." *International Journal of Information Management*, 55, 102188.

De Nederlandsche Bank (2020) "Shift of cash to debit card continues." *DNBulletin*, 20 April.

O'Driscoll, Megan, Gabriel Ribeiro Dos Santos, Lin Wang, Derek A.T. Cummings, Andrew S. Azman, Juliette Paireau, Arnaud Fontanet, Simon Cauchemez, and Henrik Salje. (2021) "Age-specific mortality and immunity patterns of SARS-CoV-2." *Nature*, 590(7844), 140–145.

Ostlund, Lyman E. (1974) "Perceived Innovation Attributes as Predictors of Innovativeness." *Journal of Consumer Research*, 1(2), 23–29.

Pal, Rimesh, and Sanjay K. Bhadada. (2020) "Cash, currency and COVID-19." *Postgraduate Medical Journal*, 96(1137), 427–428.

Png, Ivan P. L., and Charmaine H.Y. Tan. (2020) "Privacy, Trust in Banks, and Use of Cash." *MAS Macroeconomic Review*, XIX(1), 109–116.

Polasik, Michał, Jakub Górka, Gracjan Wilczewski, Janusz Kunkowski, Karolina Przenajkowska, and Natalia Tetkowska. (2013) "Time efficiency of Point-of-Sale payment methods: Empirical results for cash, cards and mobile payments." In Lecture Notes in Business Information Processing 141 edited by José Cordeiro, Leszek A. Maciaszek and Joaquim Filipe pp. 306–320. Berlin, Germany; Heidelberg, Germany: Springer Berlin Heidelberg.

Polasik, Michał, Agnieszka Huterska, Rehan Iftikhar, and Štěpán Mikula (2020) "The impact of Payment Services Directive 2 on the PayTech sector development in Europe." *Journal of Economic Behavior & Organization*, 178, 385–401.

Pope, Theodore W., Peter T. Ender, William K. Woelk, Michael A. Koroscil, and Thomas M. Koroscil (2002) "Bacterial Contamination of Paper Currency." *Southern Medical Journal*, 95(12), p. 1408-1410.

Radecki, Lawrence J. (1999) "Banks' Payments-Driven Revenues." *Economic Policy Review*, 5(2), 53–70.

Rambure, Dominique, and Alec Nacamuli. (2008) Payment systems. From the Salt Mines to the Board Room. Basingstoke: Palgrave Macmillan.

Restoy, Fernando. (2020) "Central banks and financial stability: A reflection after the Covid-19 outbreak." FSI Occasional Paper 16.

Riddell, Shane, Sarah Goldie, Andrew Hill, Debbie Eagles, and Trevor W Drew. (2020) "The effect of temperature on persistence of SARS-CoV-2 on common surfaces." *Virology Journal*, 17, p. 145.

Rochet, Jean-Charles, and Jean Tirole. (2002) "Cooperation among competitors: Some economics of payment card associations." *RAND Journal of Economics*, 33(4), 549–570.

Rochet, Jean-Charles, and Jean Tirole. (2003) "Platform competition in two-sided markets." *Journal of the European Economic Association*, 1(4), 990–1029.

Rochet, Jean-Charles, and Jean Tirole. (2006) “Two-sided markets: a progress report.” *RAND Journal of Economics*, 37(3), 645–667.

Rogoff, Kenneth S. (2016) The Curse of Cash. Princeton, NJ, USA: Princeton University Press.

Runnemark, Emma, Jonas Hedman, and Xiao Xiao. (2015) “Do consumers pay more using debit cards than cash?.” *Electronic Commerce Research and Applications*, 14(5), 285–291.

Rysman, Marc. (2009) “The economics of two-sided markets.” *Journal of Economic Perspectives*, 23(3), 125–143.

Schneider, Friedrich. (2019) “Restricting or abolishing cash: An effective instrument for eliminating the shadow economy, corruption and terrorism?.” In Cash on Trial, mk II: Economics, Technology and Institutions edited by Urs Birchler, Ernest Gnan, Jens Carl-Christoph and Ulbrich Hedrich, pp. 53–70. Vienna & Frankfurt: SUERF – The European Money and Finance Forum.

Schneider, Friedrich, and Dominik H. Enste. (2000) “Shadow Economies: Size, Causes, and Consequences.” *Journal of Economic Literature*, 38(1), 77–114.

Schuh, Scott, and Joanna Stavins. (2016) “How do speed and security influence consumers’ payment behavior?.” *Contemporary Economic Policy*, 34(4), 595–613.

Shiffrin, Richard M., and Walter Schneider. (1977) “Controlled and automatic human information processing: II. Perceptual learning, automatic attending and a general theory.” *Psychological Review*, 84(2), 127–190.

Simon, John, Kylie Smith, and Tim West. (2010) “Price incentives and consumer payment behaviour.” *Journal of Banking & Finance*, 34(8), 1759–1772.

Snellman, Jussi S., Jukka M. Vesala, and David B. Humphrey. (2001) “Substitution of noncash payment instruments for cash in Europe.” *Journal of Financial Services Research*, 19(2), 131–145.

Sriram, Subramanian S. (1999) “Survey of Literatureon Demand for Money: Theoretical and Empirical Work with Special Reference to Error-Correction Models.” IMF Working Paper WP/99/64.

Stavins, Joanna. (2001) “Effect of conumer characteristics on the use of payment instruments.” *New England Economic Review*, (3), 19–31.

Stavins, Joanna, and Oz Shy. (2015) “Merchant steering of consumer payment choice: Evidence from a 2012 diary survey.” *Journal of Behavioral and Experimental Economics*, 55(13), 1–9.

Tagoe, D., S. Baidoo, I. Dadzie, and D. Ahator. (2009) “A study of Bacterial Contamination of Ghanaian Currency Notes in Circulation.” *The Internet Journal of Microbiology*, 8(2).

Thakor, Anjan V. (2020) “Fintech and banking: What do we know?.” *Journal of Financial Intermediation*, 41, 100833.

Uneke, C.J., and O. Ogbu. (2007) “Potential for Parasite and Bacteria Transmission by Paper

Currency in Nigeria." *Journal of Environmental Health*, 69(9), 54–62.

van der Cruijsen, Carin. and Frank van der Horst. (2019) "Cash or Card? Unravelling the Role of Socio-Psychological Factors." *De Economist*, 167(2), 145–175.

van Doremalen, Neeltje, Trenton Bushmaker, Dylan H. Morris, Myndi G. Holbrook, Amandine Gamble, Brandi N. Williamson, Azaibi Tamin, *et al*. (2020) "Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1." *New England Journal of Medicine*, 382(16), 1564–1567.

Van Hove, Leo. (1999) "Electronic money and the network externalities theory: lessons for real life." *NETNOMICS: Economic Research and Electronic Networking*, 1(2), 137–171.

Verdier, Marianne. (2006) "Retail payment systems: What can we learn from two-sided markets?." *Communications & Strategies*, (61), 37–59.

Vriesekoop, Frank, Jing Chen, Jenna Oldaker, Flavien Besnard, Reece Smith, William Leversha, Cheralee Smith-Arnold, *et al.* (2016) "Dirty Money: A Matter of Bacterial Survival, Adherence, and Toxicity." *Microorganisms*, 4(42).

Wang, Zhu. (2016) "Price cap regulation in a two-sided market: Intended and unintended consequences." *International Journal of Industrial Organization*, 45(2016), 28–37.

Watanabe, Tsutomu, and Yuki Omori. (2020) "Online Consumption During the COVID-19 Crisis: Evidence from Japan." *Covid Economics: Vetted and Real-Time Papers*, (32), 208–241.

Webb, Aleksandra, Ronald McQuaid, and Sigrid Rand. (2020) "Employment in the informal economy: implications of the COVID-19 pandemic." *International Journal of Sociology and Social Policy*, 40(9–10), 1005–1019.

White, Halbert. (1980) "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." *Econometrica*, 48(4), 817–838.

Woodford, Michael. (2000) "Monetary policy in a world without money." *International Finance*, 3(2), 229–260.

Woodford, Michael. (2008) "How Important Is Money in the Conduct of Monetary Policy?." *Journal of Money, Credit and Banking*, 40(8), 1561–1598.

World Health Organization. (2021) "Coronavirus diesease (COVID-19) pandemic." Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019.

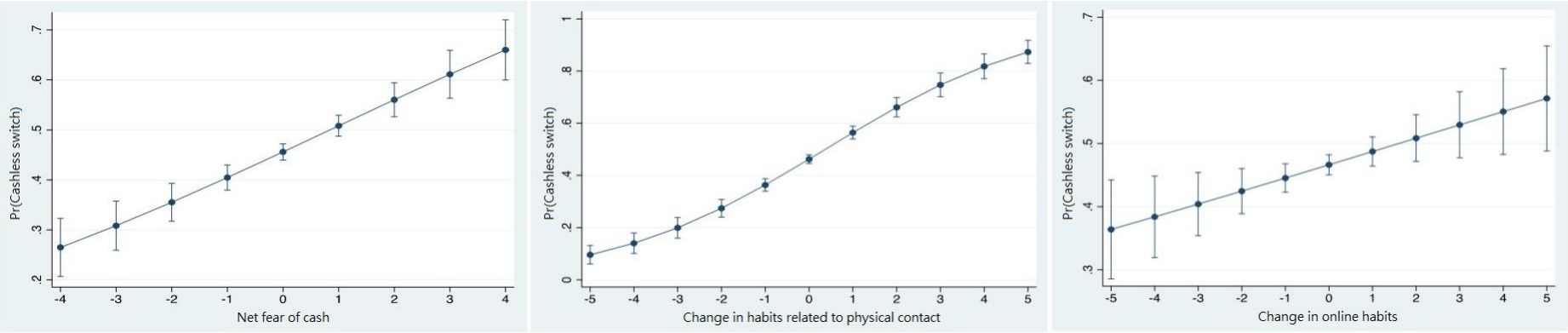
Yeung, Karen. 2020. (2020) "China central bank branch to destroy banknotes from coronavirus-hit sectors." *South China Morning Post*, 16 February.

Zhang, Yanying, Gaiyan Zhang, Liuling Liu, Tania De Renzis, and Heiko Schmiedel (2019) "Retail payments and the real economy." *Journal of Financial Stability*, 44, 100690.

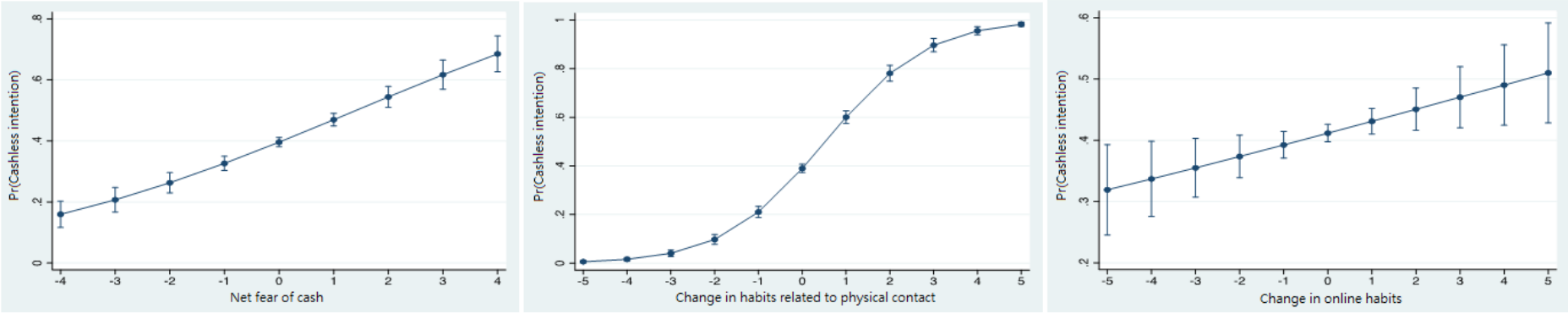
Figure I

Marginal Effects for the Key Explanatory Variables

Panel A. Estimates from the *Cashless switch* model



Panel B. Estimates from the *Cashless intention* model



Note: The plots show a prediction of probability that either *Cashless switch = 1* (Panel A) or *Cashless intention = 1* (Panel B) when one of the key explanatory variables is changed, while the remaining explanatory variables are kept constant at the sample average level. The vertical bars represent confidence intervals. The graphs in Panel A are derived based on logit regression (3) in Table IV, while Panel B relied on regression (3) in Table V.

Table I

Characteristics of Factors Used in the Study

Factor	***Eigenvalue***	***Cronbach's alpha***	***Proportion of variance explained***	***Kaiser-Meyer-Olkin measure***
Convenience of cashless payments	3.6510	0.8665	0.7302	0.8751
Safety of cashless payments	3.9730	0.9346	0.7945	0.8897
Popularity of cashless payments	3.7631	0.9161	0.7526	0.8735
Ease of use of cashless technologies	3.8451	0.9236	0.7690	0.8774
Control over finance with cashless payments	4.1703	0.9495	0.8341	0.8968
Literacy in using apps	2.3729	0.7208	0.4746	0.7818
Experience in using computer payments	2.1871	0.6027	0.3701	0.8265
Experience in using mobile payments	1.9133			
Change in habits related to physical contact	2.9795	0.7722	0.5710	0.8265
Change in online habits	1.0172			

Table II

Definitions of Variables

Variable	*Definition*
Cashless switch	A binary variable capturing the response to the questionnaire item "During the COVID pandemic, I pay more often cashless" (1= yes, 0 = no)
Cashless intention	Dummy variable measuring respondent's agreement with the statement "After the pandemic I will use cashless payments more often" (1= yes, 0 = no)
Gender	Dummy variable capturing respondent's gender (1 if female, 0 otherwise)
Location size	Response to a question regarding size of the location (including suburbs) where the respondent lives. Responses are coded on a 6-point scale: 1 – Rural area 2 – City with less than 50,000 inhabitants 3 – City between 50,000 and 100,000 inhabitants 4 – City between 100,000 and 500,000 inhabitants 5 – City between 500,000 and 1,000,000 inhabitants 6 – City over 1,000,000 inhabitants
Age	Age of the respondent in years
Cards & mobile	A dummy variable measuring the possession of any card, mobile or wearable applicable at the point of sale (1 = yes, 0 = no)
Anonymity	Degree of agreement with a statement "I prefer payments for shopping to be anonymous, so that no one can see what I bought and when" measured on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree)
Convenience of cashless payments	A factor aggregating assessments of convenience of five different cashless payment technologies (contactless (NFC) payments, Google Pay, Apple Pay, QR code payments, contactless payments with wearables)
Safety of cashless payments	A factor combining perceptions of safety of five different cashless payment technologies
Popularity of cashless payments	A factor aggregating assessments of how widespread five different cashless payment instruments are
Ease of use of cashless technologies	A factor extracted from evaluations of how widespread five cashless payment technologies are
Control over finance with cashless payments	A factor constructed from an assessment of how much control over personal finance is afforded by five different cashless payment technologies
Literacy in using mobile apps	A factor aggregating five items assessing how confident the surveyed person is in using mobile apps for transport (e.g. Uber,

	Bolt, Freenow), food delivery, buying tickets on public transport, paying parking fees, and tracking fitness activity.
Experience in using computer payments	First factor extracted from the items measuring respondent's experience in using payment technologies such as Apple Pay, Google Pay, Amazon Pay, Alipay, MoneyGram, Samsung Pay, Wechat Pay, Western Union, Revolut, cryptocurrencies and HCE. The items that load clearly relate to computer-based payments.
Experience in using mobile payments	Second factor extracted from the items measuring respondent's experience in using payment technologies such as Apple Pay, Google Pay, Amazon Pay, Alipay, MoneyGram, Samsung Pay, Wechat Pay, Western Union, Revolut, cryptocurrencies and HCE. The items that load clearly relate to mobile-based payment technologies.
Change in habits related to physical contact	First factor extracted from items "I will work more remotely", "I will meet people online more frequently", "I will travel less in my country", "I will travel less abroad", "I will eat at home more frequently" and "I will be more focused on my health" after the COVID-19 crisis is over. The items that load heavily are related to physical contact.
Change in online habits	Second factor extracted from items "I will work more remotely", "I will meet people online more frequently", "I will travel less in my country", "I will travel less abroad", "I will eat at home more frequently" and "I will be more focused on my health" after the COVID-19 crisis is over. The items that load heavily are related to online habits.
Net fear of cash	A variable constructed by taking the difference in responses to two questionnaire items: "I am afraid of contracting COVID-19 due to the usage of cash in physical stores" and "I am afraid of contracting COVID-19 as a result of operations with cashless payments in a physical stores". Higher values of this variable indicate relatively high fear of cash, as compared to cashless transactions.
COVID deaths	Total number of COVID-19 deaths (in thousands) for the country in which the respondent resides
Shadow economy	Size of the shadow economy as a percentage of GDP in the respondent's country of residence

Table III

Summary Statistics

Variable	*Mean*	*Standard deviation*	*Minimum*	*25th Percentile*	*Median*	*75th Percentile*	*Maximum*
Cashless switch	0.4100	0.4901	0.0000	0.0000	0.0000	1.0000	1.0000
Cashless intention	0.4671	0.4999	0.0000	0.0000	0.0000	1.0000	1.0000
Gender	0.5158	0.4998	0.0000	0.0000	1.0000	1.0000	1.0000
Location size	2.7698	1.5745	1.0000	1.0000	2.0000	4.0000	6.0000
Age	47.0358	16.3105	18.0000	33.0000	47.0000	62.0000	100.0000
Card & mobile	0.9001	0.3000	0.0000	1.0000	1.0000	1.0000	1.0000
Anonymity	3.2807	1.1155	1.0000	3.0000	3.0000	4.0000	5.0000
Convenience of cashless payments	0.0000	1.0000	-2.0538	-0.4539	-0.0559	0.6747	1.9426
Safety of cashless payments	0.0000	1.0000	-2.2912	-0.2061	-0.0197	0.7972	1.8791
Popularity of cashless payments	0.0000	1.0000	-2.3727	-0.3576	-0.1390	0.5573	2.0948
Ease of use of cashless technologies	0.0000	1.0000	-2.5949	-0.4494	-0.0704	0.6233	1.6960
Control over finance with cashless payments	0.0000	1.0000	-2.3564	-0.2896	-0.2896	0.7438	1.7771
Literacy in using mobile apps	0.0000	1.0000	-0.8844	-0.8855	-0.3121	0.5154	2.4248
Experience in using computer payments	0.0000	1.0000	-1.3594	-0.2036	-0.2036	-0.2036	9.6584
Experience in using mobile payments	0.0000	1.0000	-2.9746	-0.5205	-0.5205	0.4337	5.9000
Change in habits related to physical contact	0.0000	1.0000	-2.9273	-0.5275	-0.0200	0.6068	2.5595
Change in online habits	0.0000	1.0000	-3.6399	-0.5854	0.1649	0.6778	3.1936
Net fear of cash	0.2407	1.0142	-4.0000	0.0000	0.0000	0.0000	4.0000
COVID deaths	8.4880	5.1846	2.4680	4.9890	6.2470	11.4780	20.9830
Shadow economy	21.9808	7.1796	9.6000	16.7000	20.3000	27.8000	37.8000

Note: Definitions of the variables can be found in Table I. The number of observations for each of the variable listed above is 5,504.

Table IV

Modelling the Switch to Cashless Payments During the Pandemic

	(1)	(2)	(3)
Gender	0.1760**	0.1527**	0.1595**
	(0.0762)	*(0.0774)*	*(0.0778)*
Location size	0.0273	0.0151	0.0192
	(0.0249)	*(0.0253)*	*(0.0255)*
Age	0.0047*	0.0066**	0.0063**
	(0.0025)	*(0.0026)*	*(0.0026)*
Card & mobile	0.6775***	0.7445***	0.7319***
	(0.1322)	*(0.1331)*	*(0.1334)*
Anonymity	-0.0577*	-0.1231***	-0.1089***
	(0.0335)	*(0.0346)*	*(0.0349)*
Convenience of cashless payments	0.0043	-0.0264	-0.0225
	(0.0533)	*(0.0558)*	*(0.0559)*
Safety of cashless payments	0.1191**	0.1245**	0.1141*
	(0.0594)	*(0.0598)*	*(0.0604)*
Popularity of cashless payments	0.0241	-0.0431	-0.0363
	(0.0534)	*(0.0547)*	*(0.0551)*
Ease of use of cashless technologies	0.1534**	0.1708***	0.1607***
	(0.0600)	*(0.0616)*	*(0.0617)*
Control over finance with cashless payments	0.0134	-0.0208	-0.0234
	(0.0529)	*(0.0536)*	*(0.0543)*
Literacy in using mobile apps	0.3797***	0.3657***	0.3642***
	(0.0466)	*(0.0469)*	*(0.0472)*
Experience in using computer payments	0.0632*	0.0166	0.0218
	(0.0361)	*(0.0369)*	*(0.0373)*
Experience in using mobile payments	0.0381	0.0169	0.0180
	(0.0440)	*(0.0459)*	*(0.0457)*
COVID deaths	0.0261***	0.0175**	0.0188**
	(0.0072)	*(0.0075)*	*(0.0075)*
Shadow economy	-0.0113**	-0.0191***	-0.0194***
	(0.0057)	*(0.0058)*	*(0.0059)*
Net fear of cash	0.2791***		0.2422***
	(0.0388)		*(0.0398)*
Change in habits related to physical contact		0.4750***	0.4537***
		(0.0421)	*(0.0422)*
Change in online habits		0.0982**	0.0987**
		(0.0392)	*(0.0394)*
Constant	-1.0287***	-0.6401**	-0.7289**
	(0.2770)	*(0.2829)*	*(0.2853)*
Observations	5,504	5,504	5,504
chi2	343.2	391.1	429.7
p-value	0	0	0
McFadden's pseudo R-squared	0.088	0.108	0.117

Note: This table reports results of weighted logit regressions in which *Cashless switch* acts as a dependent variable. Variable definitions can be found in Table II. Robust standard errors are shown in parentheses. ***, **, * denote statistical significance at 1%, 5% and 10%, respectively.

Table V

Modelling the Intention to Use More Cashless Payments After the Pandemic is Over

	(1)	(2)	(3)
Gender	0.1980**	0.1620*	0.1779**
	(0.0787)	*(0.0829)*	*(0.0843)*
Location size	0.0257	0.0064	0.0119
	(0.0252)	*(0.0270)*	*(0.0272)*
Age	0.0023	0.0054*	0.0046
	(0.0026)	*(0.0029)*	*(0.0029)*
Card & Mobile	0.5755***	0.7383***	0.7210***
	(0.1431)	*(0.1422)*	*(0.1438)*
Anonymity	0.0084	-0.1305***	-0.1108***
	(0.0346)	*(0.0384)*	*(0.0391)*
Convenience of cashless payments	0.0693	0.0298	0.0339
	(0.0555)	*(0.0613)*	*(0.0620)*
Safety of cashless payments	0.2487***	0.2759***	0.2705***
	(0.0629)	*(0.0692)*	*(0.0699)*
Popularity of cashless payments	0.0518	-0.0860	-0.0775
	(0.0569)	*(0.0637)*	*(0.0650)*
Ease of use of cashless technologies	0.1904***	0.2312***	0.2122***
	(0.0636)	*(0.0706)*	*(0.0717)*
Control over finance with cashless technologies	0.1219**	0.0646	0.0680
	(0.0542)	*(0.0591)*	*(0.0605)*
Literacy in using mobile apps	0.1522***	0.1234**	0.1159**
	(0.0468)	*(0.0507)*	*(0.0514)*
Experience in using computer payments	0.1187***	0.0364	0.0470
	(0.0396)	*(0.0411)*	*(0.0427)*
Experience in using mobile payments	0.0686	0.0379	0.0401
	(0.0457)	*(0.0481)*	*(0.0486)*
COVID deaths	0.0287***	0.0147*	0.0171**
	(0.0074)	*(0.0077)*	*(0.0078)*
Shadow economy	0.0108*	-0.0039	-0.0041
	(0.0059)	*(0.0062)*	*(0.0063)*
Net fear of cash	0.4405***		0.3981***
	(0.0437)		*(0.0472)*
Change in habits related to physical contact		1.0011***	0.9808***
		(0.0545)	*(0.0550)*
Change in online habits		0.1050**	0.1085**
		(0.0441)	*(0.0453)*
Constant	-1.8311***	-1.1559***	-1.2961***
	(0.2850)	*(0.2998)*	*(0.3069)*
Observations	5,504	5,504	5,504
chi2	395.7	533.7	546.5
p-value	0	0	0
McFadden pseudo R-squared	0.123	0.204	0.223

Note: This table reports results of weighted logit regressions in which *Cashless intention* acts as a dependent variable. Variable definitions can be found in Table II. Robust standard errors are shown in parentheses. ***, **, * denote statistical significance at 1%, 5% and 10%, respectively.