Determinants of non-cash payments in the Eurozone: Culture matters[1]

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Summary: Retail shops incentive contactless transactions during the current COVID-19 pandemic. Customers are asked to pay cashless to prevent contagion. Traditionally, there are large differences in the extent and acceptance of non-cash payments among nations. This paper analyzes empirically the determinants of the payment behavior in the member states of the Eurozone asking how to explain these traditional differences in non-cash payment preferences. Our basic hypothesis is that culture makes the difference across nations matter.

The paper adds to the existing literature not only by focusing on the determinants of preferences for non-cash payments from a macroeconomic perspective but also by analyzing cultural factors. The payment data is gathered with the European Central Bank (ECB) and Eurostat. We examine the impact of culture on payment preferences by the means of the Hofstede indicators. Our empirical results show the importance of cultural issues to understand the acceptance of non-cash payments. In particular, the results suggest that a higher degree of uncertainty avoidance goes in line with more non-cash payments.

Zusammenfassung: Im Zuge der Corona-Pandemie hat der Einzelhandel den Einsatz von non-cash Einzelhandel vorangetrieben. Um eine Covid-Ansteckung zu verhindern, werden Kund*innen gebeten bargeldlos zu zahlen. Tatsächlich es gibt zwischen einzelnen Volkswirtschaften große Unterschiede in der Verwendung von Bargeld und bargeldlosen Zahlungen. Im Beitrag wird empirisch der Frage nachgegangen, welche Faktoren hinter diesen Unterschieden stehen. Die zentrale Hypothese ist, dass Kultur eine große Rolle spielt.

Dieses Paper analysiert auf der Grundlage der vorhandenen empirischen Literatur den Einfluss kultureller Faktoren auf den Einsatz von bargeldlosen Zahlungen. Dazu werden nicht nur makroökonomische Daten von der Europäischen Zentralbank und Eurostat, sondern auch die Hofstede Indikatoren herangezogen. Die Ergebnisse zeigen, dass insbesondere die kulturelle Dimension „Uncertainty Avoidance" die nationalen Differenzen der gesellschaftlichen Akzeptanz erklären kann. Volkswirtschaften mit einer höheren „Uncertainty Avoidance" setzen stärker auf non-cash.

→ JEL classification: E42, G29, G41
→ Keywords: Payment systems, cashless payments, culture

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1 Introduction

The COVID-19 shock to the economy affects the payment systems in several dimensions. The COVID-19 pandemic has not only triggered innovation and digitalization but also increased uncertainty all around the globe. The uncertainty is linked to economic risk, which is a basic feature of financial transactions. An important characteristic of the financial transactions is the payment method. Different payment methods such as cash or non-cash payments offer different risk and cost structures. The results of early studies on modern non-cash payment methods suggest that cash is superior because it is the cheapest payment instrument (Humphrey & Berger, 1990). In contrast to these early findings, Garcia et al. (2006) explain that a move towards a cashless society increases welfare.

Until now, both payment methods – cashless and cashed based – seem to compete in several aspects. Over the last years, non-cash payments gained importance and internationally, during the last decades, a trend towards a higher degree of non-cash-payment is reported. The speed, the spread and the coverage of e-payment systems as an example of non-cash payment are driven by the ongoing digitalization. Nowadays, even central banks consider and discuss the introduction of digital currencies. In addition, tech firms such as Google, Amazon, Facebook are promoting and offering non-cash payment systems. Non-cash payment systems are an important part of modern FinTech products. While the non-cash technology is available all around the world, the acceptance of this technology differs widely. Some nations seem to be very reluctant to accept non-cash payments.

Seminal work on the characteristics and use of cash/non-cash-payment methods was conducted by Humphrey et al. (Humphrey, et al., 1996). According to them, not only standard liquidity demand theory but also institutional factors, technological development and habit formation might explain the decision for non-cash payments (Snellman, et al., 2001). Recent studies often use micro-economic data, which were typically gathered only for the purpose of the single study (Bagnall, et al., 2014). Several of these studies address the substitution of cash by non-cash instruments. Another set of recent studies include a broader field of alternative money such as cryptocurrencies. The common result of these studies is that there is a high degree of heterogeneity between analyzed countries. In addition, the results of the empirical studies support the idea that there is a general trend towards cashless transactions. Nevertheless, important research questions remain open. In autumn 2020, the IEEE touched this topic during the 2020 IEEE European Symposium on Security and Privacy Workshops (Busse, et al., 2020). By the means of a survey, Busse et al. come to the result, that trust is crucial for the acceptance of non-cash payment instruments such as credit or debit cards.

The current paper, as a part of the international conference jointly organized in summer 2020 by DIW Berlin and the research cluster "dynamics, tensions and xtreme events" at Hochschule Bremen, analyzes the payment habits among Eurozone member states. The main hypothesis is that the decision for non-cash payment can be explained by economic and cultural factors. Thus, in this paper, we follow a specific empirical approach by linking the economic data set to cultural dimensions. We focus on the Eurozone because the member states agreed to a single monetary policy. Our data is from Eurostat, from the European Central Bank (ECB) and from Hofstede data base on cultural dimensions. According to the Hofstede approach culture can be interpreted as a national club good or as the value set of the peer group (Minkov & Hofstede, 2012). Hofstede distinguishes several cultural dimensions, which may influence economic decisions. In the context

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of the of non-cash payments the cultural dimension "uncertainty avoidance" is considered as to be relevant.

The paper is organized as follows. The section 2 provides a literature review. The section 3 describes the data sample and the section 4 presents the empirical results. The last section summarizes and gives some ideas for future research.

2 Literature Review

Non-cash payment systems are part of the important innovations in the financial sphere. They are often considered as a substitution for cash transactions. Seminal work on the usage of both, cash and non-cash payment systems was conducted by Humphrey et al. in the 90ies of the last century. Humphrey and Berger developed a concept about the social costs of a certain country specific payment system (Humphrey & Berger, 1990). The concept of social costs is linked to welfare and comes close to the idea of financial transaction costs and their impact on growth (King & Levine, 1993). Humphrey et al. use a set of 14 so-called developed countries to analyze the usage of different payment instruments empirically (Humphrey, et al., 1996). The general idea of this cross-country study was to analyze financial transactions data and to explain the usage of electronic payments. The authors explain:

> "... cost can be markedly reduced when paper-based payments are replaced by electronic payments, since the social cost of an electronic payment may only be from one-third to one-half that of a paper-based transaction." (p. 935)

In line with the study of Humphrey et al., Snellman et al. analyze the substitution of cash payments by non-cash transactions in Europe (Snellman, et al., 2001). In general, it can be assumed that the demand for cash and non-cash payments is governed by similar factors (Snellman, et al., 2001). The authors show that not only non-cash transactions per person but also cash holdings increased over time (1987–1996). The existing financial infrastructure in an economy plays an important role, too. The acceptance of non-cash payments at the point of sale (POS) is an important precondition for card usage. The authors argue:

> "Simply put, the current level of technological development of a country's payment system explains its current phase in the cash substitution process. (...) The current shares of cash in total point-of-sale payment values are estimated to range between approximately 60% in Belgium, Finland, France, and Denmark to 95% in Germany and Italy, which may expect to see a substantial reduction in cash use over time." (p 142)

Accordingly, large differences are reported among the European countries. Nevertheless, social factors behind these enormous discrepancies concerning the technological acceptance are widely neglected and usually, cultural issues are not addressed explicitly in these studies. In their microeconomic study on cash usage in Europe Bagnall et al. mention that the decision between different payment instruments might be influenced by habits (Bagnall, et al., 2014). They explain:

> "... the results provide support for a certain habit persistence in some countries (AT, AU, DE, NL) ..." (p 24)

Several empirical studies are focused only on single countries. For Germany, Deutsche Bundesbank offers reports on cash versus non-cash usage on a regular base (Deutsche Bundesbank, 2018). The use of different means of payment is often explored by analyzing payment diaries kept by individuals. This is due to the weak data base especially on cash payments. Typically, these papers show a relatively strong dynamic of non-cash payment methods.

However, the reasons behind the large differences across national payment systems remain widely unexplored. While financial innovations for the payment systems are often regarded relevant, only a few studies exist on the cultural determinants of non-cash-payments in the Eurozone. The study of

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the Eurozone is promising for the cultural analysis because there is a single monetary framework but the member countries show a large degree of heterogeneity – not only in the real but also in the financial sphere. These differences might go back to the history, the legal framework and the culture.

Relevant steps for the inclusion of cultural aspects to the existing economic explanations for non-cash payments are made by comparative studies. In their recent work Busse et al. come to the result that trust is important for the acceptance of a certain payment tool (Busse, et al., 2020). They conclude:

> "We identified cultural norms regarding payment which are specific to the respective societies. (...) This directly affects the use of payment instruments (...). Such habits and their influences on payment culture have – to our best knowledge – not been systematically researched yet. This would be an interesting endeavour for future work." (p 207)

Surprisingly, many empirical studies report cultural differences between nations but avoid to address these differences directly in their empirical work. So far, in the discussion about the acceptance of non-cash payments intercultural differences are widely neglected.

However, qualitative and quantitative research on intercultural differences and the impact of culture on economic decision making has been done. Several attempts were made to transform qualitative information to quantitative data. In doing so, the well-known Hofstede data set helps to compare different nations in regard of cultural aspects (Hofstede, 2018). Hofstede defines culture as "the collective programming of the mind which distinguishes the members of one group or category of people from another" (Hofstede, 2001). Cultural dimensions are assumed to be relatively stable over time. The Hofstede data set is frequently used in international management and intercultural business studies. Only recently it is applied more often in the economic literature.

Uncertainty avoidance is a cultural dimension important in the context of non-cash payment systems. Hofstede & Bond define uncertainty avoidance as (Hofstede & Bond, 1984):

> "(...) the extent to which a society feels threatened by uncertain and ambiguous situations and tries to avoid these situations" (p 419)

The Hofstede dimension uncertainty avoidance can be conceptually linked to the economic definition of "risk" and "trust", which are reported to be crucial for non-cash-payments (Busse, et al., 2020).

In total, Hofstede proposes six cultural dimensions. **Uncertainty avoidance** is only one of them. **Long-term orientation** is another important cultural variable for finance. In addition, the degree of **masculinity** of a certain society might reflect the risk-taking behavior. **Indulgence** might be linked to fast speed internet-based consumption and financial transactions. Furthermore, **power distance** and **individualism versus collectivism** are part of the Hofstede data set on cultural dimensions. Although there are still gaps in linking both, financial and intercultural research, some recent studies on culture and banking take the Hofstede framework for explanation (Boubkari, et al., 2017).

Comparable work on the use of payments methods and culture is rare. The majority of existing studies on payment instruments assume that cash and non-cash transactions are substitutes. Several studies address the determinants of cash transactions and explain that due to the substitution effects the reverse holds for true in the case of non-cash. However, it is a common finding that the degree of substitution varies between nations. Some studies point out that the propensity of crime might influence cash holdings and by this cash transactions. Accordingly, non-cash pay-

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ments are usually well documented and are considered as to be less risky than cash payments. In addition, payment schemes are often long-term which brings in the cultural dimension of long-term orientation. Current non-cash transactions are real-time transaction over the internet, which might support indulgence. As countries and nations differ by these cultural dimensions, country specific patterns of the acceptance of non-cash payments might be influenced not only by the regulation, the financial sector and the economic costs but by several external factors. We argue that economic stability, financial infrastructure, crime, crisis and intercultural aspects such as trust and risk taking habits make a difference in the use of payment methods across countries. However, a developed literature on these issues is still pending.

3 Hypotheses and data

This paper wants to add to the literature by analyzing the relation between the non-cash transactions and external factors such as stability, crime, crisis and intercultural aspects. Accordingly, five hypotheses are at the core of our empirical analysis

1. In line with the existing literature, we assume that non-cash payments are influenced by habits. Therefore, we test a dynamic panel model.
2. In line with the existing literature, we assume that the increase of non-cash payments can be explained by economic growth.
3. In addition, we test whether a higher crime propensity increases non-cash transactions.
4. Cultural dimensions influence non-cash payments.
    a. A higher degree of masculinity goes in line with a higher degree of risk willingness. Consequently, we assume that higher masculinity shows a bias for less non-cash transactions.
    b. Due to security reasons uncertainty avoidance is positively linked non-cash payments.
    c. Payment schemes are often long-term. The cultural dimension of long-term orientation leads to more non-cash payments.
    d. A higher degree of indulgence increases non-cash payments.
5. The international financial crisis of 2008 undermined the trust into the banking sector. Therefore, it is assumed that there is a negative effect on non-cash transactions.

Our data sample is from the Statistical Data Warehouse as provided by the European Central Bank (ECB). The empirical focus of the study lies on the payment behavior in the Eurozone. All member states are confronted with the same monetary policy of the European Central Bank (ECB) but show different cultural frameworks. Therefore, this country set offers interesting insights for the importance of culture on payment. We take the 15 funding members of the Eurozone and focus on the period 2001–2017, including the time of the financial crash 2008/2009.

Our data sample comprises economic indicators, which are supposed to explain the demand for money, and other characteristics of the Eurozone members for the time period 2001–2017. Table 1 gives an overview of the included variables and their short descriptions. Some variables (e. g., GRCASH) vary over time but not across countries and some variables (e. g., CULMAS) vary across countries but not over time. The descriptive statistics for these variables are given in table 2.

Table 1

Our Variables

	Description	Availabe data dimension Time/Country	Expected sign
GROWTHVALUE	Growth rate of non-cash payments per capita	Yes/yes	
GRGDP	Growth rate of GDP, GDP is in market prices	Yes/yes	+
GRATM	Growth rate of the number of ATM per million inhabitants	Yes/yes	-
GRPOS	Growth rate of the number of point of sales accepting non-cash payments (POS) per million inhabitants	Yes/yes	+
GRCASH	Growth rate of the net value of cash in circulation in the Eurozone per million inhabitants	Yes/no	-
GRCR5	Market share of the 5 largest bank institutions, measured in total assets Growth rate of the CR5	Yes/yes	+/-
PRICE	Difference in interest rates for short terms credits and short-term debits	Yes/yes	-
GRCRIME	Growth rate of the number of violent crimes	Yes/yes	+
GRFINSTRESS	Country Level Index of Financial Stress (CLIFS) Composite Indicator as calculated by ECB (Index); Growth rate of FINSTRESS	Yes/yes	-
CULMAS	Masculinity	No/yes	-
CULUAI	Uncertainty Avoidance	No/yes	+
CULLTOWVS	Long Term Orientation	No/yes	+
CULIVR	Indulgence	No/yes	+
DGFC CRISIS	Dummy for years after the Great Financial Crisis 2008	Yes/yes	-

Our dependent variable is the annual growth rate of the value of non-cash payments per inhabitant (GROWTHVALUE) and it shows an average annual growth of nearly 13 percent. The usage of non-cash payments varies tremendously between the Eurozone member states. Some countries (e.g., Germany) seem to be relatively reluctant concerning the usage of non-cash payments, while others (e.g., Luxembourg) are relying on it to a high degree. The growth rates differ considerably between the countries (not reported here).

For our econometric analysis we employ several indicators which go back to economic theory and previous empirical studies. In addition, we focus on cultural aspects. According to standard macroeconomic theory the demand for liquidity depends on income (gross domestic product) and the opportunity costs for cash. As higher the GDP as higher the demand for money. In general, it can be assumed that the demand for cash and non-cash payments is governed by similar factors (Snellman, Vesala, & Humphrey, Substition of Noncash Payment Instruments for Cash in Europe, 2001). Here, we assume that a higher GDP growth leads to higher demand for non-cash transactions (table 2). We argue that as higher the opportunity costs as lower the demand for non-cash transactions. We take the spread between in interest rates for short terms credits and short-term debits as a proxy for the price using non-cash payments. In our econometric analysis we expect that a higher price lowers the growth of non-cash payments (Hayashi & Keeton, 2014). The acceptance of non-cash payments at the point of sale (POS) is an important precondition for card usage. We assume that an increase in POS leads to more non-cash transactions. According to the data set the average annual growth rate of the number of POS per million inhabitants was nearly 7 percent in the relevant period. The number of ATMs (per million inhabitants) increased by about 2 percent annually. Since cash and non-cash payments might be substitutes, we take a look at the cash

circulation. With the introduction of the euro as a common currency national data for cash circulation were abolished and data are only available for the Eurozone as a whole. The average annual growth rate of this indicator is around 9 percent.

The first characteristic of the national financial sectors is the change in the degree of market concentration (Humphrey et al., 1996). Hereby, we focus on the market share of the 5 largest banks for each member state of the Eurozone (GRCR5). The second characteristic is an indicator for financial stress for each Eurozone national financial system, which is provided by the ECB (GRFINSTRESS). In line with previous literature, we include as non-economic characteristic of national systems the growth rate of the violent crimes (GRCRIME). Interestingly the annual average growth rate of this indicator is negative. It can be assumed that the indicator violent crime is positively related to non-cash payments. This is because a higher degree of violent crimes increases the probability of assaults and thefts.

The reported average annual growth rate of financial stress (about 23 percent) is substantial and remarkable. This might go back to the experience with the international financial crisis 2008. In accordance with the literature, we checked for the number of violent crimes; this is a proxy for criminality. Interestingly the annual average growth rate of this indicator is negative. Nevertheless, in line with the literature it can be assumed that the indicator violent crime is positively related to non-cash payments. This is because a higher degree of violent crimes increases the probability of assaults and thefts. Table 2 gives an overview of the descriptive statistics.

Table 2

Descriptive statistics

Variable	Mean	Median	S.D.	Min	Max
GROWTHVALUE	0.129	0.100	0.134	-0.209	0.395
GRGDP	0.0349	0.0335	0.0431	-0.121	0.107
GRATM	0.0191	0.0165	0.0584	-0.179	0.112
GRPOS	0.0685	0.0640	0.101	-0.234	0.243
GRCASH	0.0898	0.0620	0.0570	0.0243	0.207
GRCR5	0.00140	0.00203	0.0341	-0.106	0.0537
PRICE	0.0292	0.0295	0.0135	-0.00519	0.0483
GRCRIME	-0.0393	-0.0125	0.119	-0.574	0.0802
GRFINSTRESS	0.233	-0.0994	0.918	-0.786	2.27
CULMAS	0.446	0.450	0.218	0.0900	0.790
CULUAI	0.736	0.700	0.189	0.350	1.04
CULLTOWVS	0.594	0.625	0.179	0.244	0.821
CULIVR	0.455	0.478	0.179	0.129	0.683

Source: own calculations on the base of Eurostat, ECB data warehouse and Hofstede.

We augmented the model of Humphrey et al (1996) by four cultural indicators for the different Eurozone member states. The data for the cultural indicators are obtained from Hofstede's website.

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The first indicator is masculinity which in economic terms gives an impression of preference for achievement and material rewards for success in any society (CULMAS). Descriptive statistics show that the Eurozone member states are quite different in respect of the value of this indicator. For our analysis we can assume that with the competition and achievement the importance of non-cash payments increases. The second cultural indicator is uncertainty avoidance (CULUAI). Again, we see that the countries differ widely. Non-cash payments need trust into the security of the financial sector. Cash payments make you dependent from the overall security in society. Therefore, the expected sign of this variable in our econometric analysis is not clear cut. The third indicator is called long-term orientation (CULLTOWVS).This cultural dimension should have an impact on financial transactions. Societies with a higher long-term orientation might be more reluctant in the field of financial innovations. Therefore, we could expect a negative sign in our econometric analysis. The fourth cultural indicator is indulgence. Indulgence stands for the fun-orientation of any society (CULIVR). On the one hand it can be assumed that it is positively linked to non-cash payments which enables you for more and more spontaneous spending. On the other hand, one has to bear in mind that non-cash payments lead to a higher degree of transparency where and for what the money is spent. Therefore, both signs of the variable could be expected.

4 Empirical Results

For our econometric analysis we winsorized the data at the 1 % and 99 % quantiles and employed a GMM-dynamic panel estimation approach.[2] All explanatory variables are lagged. The number of observations is 255.

Table 3 reports the GMM estimates. The results suggest that the usage of non-cash payment does not only depend on economic but also institutional and cultural factors. We followed a stepwise approach. In a first step the focus was to test for habits (lagged dependent variable), the impact of economic growth, the financial infrastructure and crime. Payment habits seem to be persistent; the lagged dependent variable is significant. Surprisingly the financial infrastructure variables (ATM, POS, Cash, Price) remain insignificant. This is in contrast to several earlier studies (Humphrey & Berger, 1990). However, in line with the existing literature is the result that the value of non-cash payments per capita increases with the overall economic activity and the crime.

In a second step we substituted crime by the financial stress variable. In line with the above findings on the financial infrastructure this variable is insignificant. However, the estimation model remains stable (column 2 and 3).

The additional of culture dimensions reveals interesting results (column 4). First, masculinity does not explain the usage of non-cash. Second, the growth rate of non-cash payments increases with the degree of uncertainty avoidance. This in line with our expectations since non-cash transactions are well documented and misuse is often covered by insurance. Third, long-term orientation and indulgence are significant but do not show the expected signs. They are negatively linked to the growth rate of the value of non-cash transactions. Here further and more detailed research on the impact of culture on non-cash seems to be necessary. The financial crisis dummy (DGFC) for the

2 In our econometric approach taking the growth rates of the different variables allows us to capture the problem of endogeneity.

Table 3

Estimation results

Specification	1	2	3	4	5
$GROWTHVALU_{t-1}$	0.199*	0.2554*	0.2352*	0.2226*	0.2117
Const	-0.0019	0.1029***	0.1084***	0.2032***	0.2581***
$GRGDP_{t-1}$	0.3586*	0.3954*	0.3841*	0.3683*	0.2501
$GRATM_{t-1}$	-0.1525	-0.1444	-0.1592	-0.0959	-0.1755
$GRPOS_{t-1}$	-0.0509	-0.0252	-0.0123	-0.0685	-0.0683
$GRCASH_{t-1}$	-0.2091	-0.1529	-0.1437	-0.1064	-0.2858
$GRCR5_{t-1}$	-0.0398	-0.0308	-0.0051	-0.0158	-0.0164
$Price_{t-1}$	-0.042	-0.6117	-0.5331	-1.2248**	-1.416***
$GRCRIME_{t-1}$	0.1855***		0.1608***	0.172***	0.1333**
$GRFINSTRESS_{t-1}$		-0.0062	0.0025	0.0053	0.0076
CULMAS				0.0153	0.0214
CULUAI				0.0647**	0.0648**
CULLTOWVS				-0.1117***	-0.1179***
CULIVR				-0.1361**	-0.1479**
DGFC					-0.0394*
S.E. of regression	0.139305	0.111777	0.111007	0.108992	0.109331
Sum squared resid	3.745325	2.586265	2.513801	2.316446	2.318938

* (**, ***) indicates statistical significance at 10 %, (5 %, 1 %).

years 2008 and 2009 suggests a negative impact on non-cash transactions. This can be explained by the reduced trust into the financial system.

Taking all the results into account we see that hypothesis 1 is confirmed by our model. Non-cash payments are influenced by habits by testing for the lagged dependent variable. In addition, hypothesis 2 is supported by our findings – the increase of non-cash payments can be explained by economic growth. Turning to hypothesis 3 we could show that indeed a higher crime propensity increases the value of non-cash transactions. In addition, in general hypothesis 4 is supported by the empirical findings. However, the indicators for the long-term orientation and the indulgence do not show the expected sign. The international financial crisis has a negative impact on non-cash transactions conforming hypothesis 5.

5 Conclusion

Our results suggest that the cultural dimensions add to the explanation of the usage of non-cash-payments in the Eurozone. The uncertainty avoidance dimension leads to a higher propensity of non-cash payments. This study is only a first step for the investigation of the determinants of non-cash payments in the Eurozone. The ongoing digitalization might offer further insights into the payment behavior. It is still an open question, whether and to what degree cash and cash payments will be abolished and substituted by e-money. According to our results the acceptance of e-money will not only depend on costs but also on cultural factors. This result is crucial for policy makers in

recent times of COVID 19 and contagion. If culture is crucial, the acceptance of non-cash transactions will persistently differ between the member states of the Eurozone. Based on our analytical results forecast about the future development of the monetary system might be an interesting field for further research.

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