ONLINE PAYMENT: INDIVIDUAL CHARACTERISTICS AND DIGITAL FINANCIAL INCLUSION IN OIC COUNTRIES

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ABSTRACT

Digital Financial Inclusion (DFI) is a prominent issue in the digital era, since it focuses on the use of technology to serve unbanked people at low cost. The adoption of mobile money platforms that allow users to make efficient peer-to-peer and real-time transactions is one aspect of the DFI agenda. This study aims to investigate the determinants of mobile money usage using data derived from the 2017 Global Financial Inclusion survey conducted by the World Bank and Gallup and applying probit regression and the Heckman selection model to check robustness. Even though access to a financial institution is relatively low, the percentage of mobile money usage in Organisation of Islamic Cooperation (OIC) countries is slightly higher than in non-OIC countries and worldwide. The rate of adoption of mobile money is higher for individuals making online transactions, with more educated and more prosperous males tending to be more included in the use of digital financial services. The U-shape hypothesis for the relationship between age and the use of mobile money is not supported. Our research contributes to the theoretical development of the Unified Theory of Acceptance and Use of Technology 2 in illustrating the use of mobile technology. The empirical results are recommended for use by practitioners, regulators and policymakers in creating and fostering a sound ecosystem for digital finance development.

Keywords: Digital financial inclusion, Mobile money, Online payment, OIC countries.
JEL Classification: G23; L81; O33; C83.

I. INTRODUCTION

1.1. Background

The topic of financial inclusion is an interesting issue for academicians and policymakers in the field of financial development. It is associated with the financial institutions which perform intermediary functions by involving people in the use of formal financial services accounts. Owners of these accounts can use them to deposit or lend money, consume goods or services or expand their businesses. As a result, financial inclusion provides a positive impact on improving community welfare, reducing poverty and facilitating adults in managing their household financial risks (Demirgüç-Kunt & Klapper, 2012; Kapoor, 2014). Governments should therefore construct various strategies to increase financial inclusion, one of these being to encourage increasing access to financial services through technologies such as mobile money.
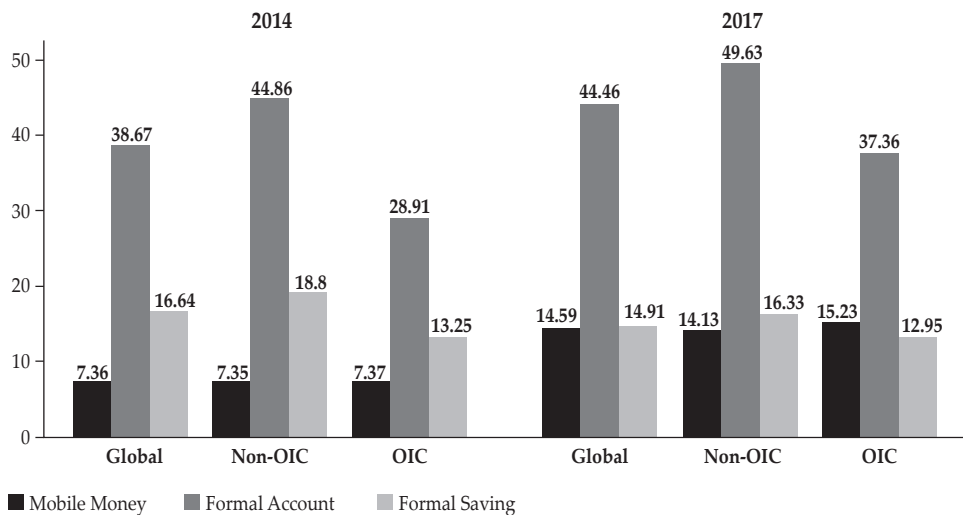
Source: Financial Inclusion Index (2014 and 2017)

Figure 1. Comparison of Financial Inclusion in OIC and Non-OIC Countries and Globally for 2014 and 2017

As can be seen from Figure 1, the percentage of adults with formal accounts increased slightly in 2017 compared to 2014, but those saving money in financial institutions tended to decrease. In contrast, however, the use of mobile money almost doubled in 2017. It is suggested that the advancement of financial technology in mobile devices allows people in restricted areas to benefit easily from digital financial services (Chu, 2017). As part of digital peer-to-peer platforms, mobile money provides financial services for unbanked people by reducing transaction costs by up to 90% (Peric, 2015). Furthermore, the adoption rate of mobile money in Organization of Islamic Cooperation (OIC) countries is slightly higher than in non-OIC countries and globally. This indicates that mobile money has the real potential to be an innovative and appropriate platform for the underserved populations of those countries.

The development of mobile money in several OIC countries, for example, bKash in Bangladesh, Airtel in Uganda, OVO in Indonesia, and M-Pesa in Afghanistan, is extremely rapid, but is at the same time hampered by religious factors (Demirgüç-Kunt et al., 2015). While the Moslem faith dominates in the OIC world, there is a lack of digital platforms available in these countries that comply with shariah principles in terms of the prohibition of *riba'*, *masyir*, and *gharar* in business transactions. Therefore, the adoption of mobile money in OIC countries should be a prominent issue for fostering and boosting digital financial inclusion (DFI). In-depth and comprehensive research is necessary to identify the determinant factors of DFI.

So far, studies of financial inclusion in OIC countries discuss its role in economic growth and stability and in the eradication of social inequality (Abdulkarim & Ali, 2019; Kim et al., 2018). To the best of our knowledge, ours is the first empirical study to investigate the determinants of mobile money usage in OIC countries at an individual level. Our research aims are represented by two key questions: whether online transactions play a significant role in mobile money usage; and how individual characteristics shape mobile money usage.

By applying the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) (developed from the first version UTAUT1), we explain the antecedences of mobile money adoption at the individual level as being expectancy, effort expectancy, social influences, hedonic motivation, price value, habits, and facilitating conditions (Venkatesh et al., 2012). For instance, mobile money offers convenience, enjoyment and high levels of perceived value for consumers. By using money in their digital wallets, they can make online transactions such as sending or receiving money and buying goods or services (Dahlberg et al., 2015; Kim et al., 2010; Sumita & Yoshii, 2010). Integrating e-commerce and mobile money makes payments more efficient and enhances experience for platform users (Hasnain, 2017).

Several researchers have studied how socio-demographic characteristics shape the use of formal accounts (Allen et al., 2016; Fungáčová & Weill, 2014; Patwardhan, 2018; Shihadeh, 2018; Zins & Weill, 2016) and mobile money (Della Peruta, 2018; Gichuki & Mulu-Mutuku, 2018; Hasnain, 2017). In general, being a woman, poorer, and less educated tends to make someone less likely to use a formal account, and there is also a U-shape relationship with age. So being male and more educated is likely to imply more use of mobile money, but there is no difference in adoption across individual income levels.

We use data from the Global Financial Inclusion Index (Findex) for 2017, conduct probit regression, and find two main results. First, a person making an online transaction is more likely to utilize a mobile money platform for the settlement process. Second, the role of individual characteristics to shape the platform usage is significant in countries overall but not in upper-middle-income and high-income countries. Then, we test the robustness of our findings by out-of-the-sample analysis and re-estimating the model using Heckman probit regression. There is no significant distinction in either the primary analysis or the robustness test.

Finally, our research has theoretical and practical contributions. Utilizing UTAUT2, we explain why the level of mobile money usage is relatively high for

individuals making an online transaction. The research findings have implications for e-commerce practitioners, mobile money providers, and regulators in creating a favourable digital ecosystem to enhance financial inclusion.

1.2. Objectives

The definition of online payment is a payment made by an individual when purchasing goods or services via the internet, thus encouraging them to utilize digital financial services to make transactions (Demirgüç-Kunt et al., 2015). The development of technology impacted by the various characteristics of the individuals who use digital financial services. The development of mobile money in the OIC countries is a motivation to examine the factors that influence DFI in those countries. The purpose of this study is to analyse the effect of online payments and individual characteristics on the use of mobile money accounts in OIC countries dominated by Muslim populations.

Our discussions are presented as follows: in Section II, we document theoretical background and some past studies and build our hypotheses. In Section III, our research method will be described clearly. Finally we report results and analysis, including robustness checks, in Section IV and conclusions and recommendations in Section V.

II. LITERATURE REVIEW
2.1. Unified Theory of Acceptance and Use of Technology 2 (UTAUT 2)

In explaining the use of mobile money as an innovative platform for DFI, this study utilizes the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). The theory can illustrate the intentions and behaviours of technology usage by consumers (Venkatesh et al., 2003). UTAUT2 (which is a continuation of UTAUT1, which explaining the use of technology in an organizational context) describes the consumer side of the use of technology platforms such as mobile money, mobile banking and online payments (Venkatesh et al., 2012).

The theory explains that performance expectancy, effort expectancy, social influence, hedonic motivation, price value and habit facilitate the intention to use mobile money, while intention to use, facilitating conditions and habit encourage the actual use of mobile money. These factors can be explained as follows:

i.   Performance expectancy is the consumer's assumption that the use of mobile money provides convenience when they make an online transaction.
ii. Effort performance explains the comfort offered in using the system of mobile money.
iii. Hedonic motivation is related to the existence of consumer enjoyment in using mobile money that can influence the intention to use and actual use of mobile money.
iv. Price value explains the extent of consumer-perceived value compared with their associated sacrifice and the benefits of the use of mobile money.
v.   Habit is previous behaviour or practices related to the consumer's belief that their use of mobile money is outside their conscious behaviour.
vi. Facilitating conditions is the perception of consumers that resources and facilities are in place that can support the easy use of mobile money.

2.2. Previous studies

Previous studies reveal that the use of digital financial services provides solutions for financially underserved adults and the poor (Jenkins, 2008; McKay & Pickens, 2010; Ouma et al., 2017; Sun, 2018). Although the concept of digital finance is still subject to academic debate, it is evident that it can reduce the gap between the rich and the poor, men and women, and the young and the old (Livingstone & Helsper, 2007). Therefore, it should be a concern of stakeholders, and especially policymakers, to feature DFI in their main agendas.

DFI can be improved by creating cashless payments. This requires a digital ecosystem including a digital business platform and societal and physical infrastructure (Kabakova & Plaksenkov, 2018; Iman, 2018). Mobile money is one of the forms of digital platform offering innovative and appropriate technology to enable the unbanked population to access financial services (Demirgüç-Kunt et al., 2018; Lashitew et al., 2019).

Mobile money can be described as an electronic wallet service that allows its users to carry out various financial transactions, from storing, shipping, and receiving money, to bill payments, purchasing goods and services, and even making donations, through their mobile phones, (Jenkins, 2008; McKay & Pickens, 2010; Riley, 2018). The platform can be issued by banks and non-bank organizations in the form of e-money. Access to mobile money now includes technologies such as SMS, NFC and barcode scanning, meaning that the purchase of physical products through mobile money is possible through vending machines, ticketing machines, and directly at point-of-sale stations (Iman, 2018).

The development of e-commerce encourages consumers to use digital financial services (Mukherjee & Roy, 2017) so that mobile money usage can increase access and affordability for the making of payments (Jenkins, 2008). Empirical research conducted by Hasnain (2017) found a mutually beneficial association between e-commerce development and the increased adoption of mobile money. With the entry of the internet networks into mobile phones, customers can connect directly with both merchants and mobile money providers (Dahlberg et al., 2015; Kim et al., 2010; Sumita & Yoshii, 2010). By embracing both merchants and providers in the business chain to create a peer-to-peer and real-time transaction basis, customer trust increases and an efficient settlement system can be established. Finally, the rise of online payment increases mobile money usage; we thus construct our first hypothesis:

H1: online payment is positively associated with mobile money usage.

Several pieces of research investigate the socio-economic characteristics of gender, income, education level and age as the underpinning factors of financial inclusion in saving, withdrawing and borrowing from formal institutions (Allen et al., 2016; Fungáčová & Weill, 2014; Patwardhan, 2018; Shihadeh, 2018; Zins & Weill, 2016). Being a woman, poorer and less educated tends to lead to a lower level of financial inclusion. Also, there is a U-shaped relationship between age and formal account usage. For policymakers, investigating how individual characteristics predict financial inclusion is crucial for constructing appropriate and effective programmes to serve unbanked people in various contexts.

As well as e-commerce developments, socio-economic characteristics play a significant role in predicting mobile money adoption. Previous studies have investigated the association between socio-economic characteristics and mobile money adoption (Della Peruta, 2018; Gichuki & Mulu-Mutuku, 2018; Hasnain, 2017). In terms of gender, Gichuki & Mulu-Mutuku (2018) found that in Kenya, women had a lower adoption rate in mobile banking than men, reflecting women's lack of knowledge and trust in technology advancements (Haider et al., 2018). Peruta (2018) found contradictory results between education and income, with no difference in adoption among income levels because every individual benefits from mobile money services at a low cost. The higher the level of education a person has, the higher their access to mobile money, and this is related to the skill and competence needed to use the service. Importantly, Hasnain (2017) explains that there is an opportunity to enhance mobile money usage for middle-class users aged 15 to 24 because they tend to have limited assets but are digitally knowledgeable. Given these factors, our second hypothesis is as follows:

H2: individual characteristics play significant roles in predicting mobile money usage.

III. METHODOLOGY
3.1. Data
Microdata at the individual level from the Global Financial Inclusion Index (Findex) survey is used to realize the analysis of this study. As the world's most rigorous data set on how adults (aged 15 and above) access and utilize financial services, Findex was published for the first time in 2011 and is available for both 2014 and 2017. These World Bank surveys are carried out along with Gallup and are funded by the Bill and Melinda Gates Foundation. The most recent version for 2017 includes not only the use of the formal accounts at financial institutions but also the development of financial technology (or fintech) such as online transactions, mobile phone ownership and mobile money. As the survey subjects, 150,000 people in 144 countries are randomly selected.

In addressing our research goal this study focuses on DFI in OIC countries and so we employ a purposive sampling approach. Of the 58 member countries of the OIC, 31 are excluded because of the lack of micro and macro data in the World Bank figures.[1] In addition, missing data resulting from refusal to be surveyed is cleaned from the observations. The final number of observations for this study is therefore 24,203 respondents for the year 2017.

This research uses mobile money usage as a DFI dimension. Independent variables are the individual characteristics of age, level of education, level of income and online payment transactions. The definition of each variable is presented in Table 1.

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[1] The countries included in our sample which are Indonesia, Malaysia, Albania, Azerbaijan, Kazakhstan, Kyrgyz Republic, Turkey, Uzbekistan, Egypt, Iraq, Jordan, Lebanon, Afghanistan, Bangladesh, Pakistan, Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Mali, Mauritania, Niger, Nigeria, Senegal, Sudan, Uganda.

Table 1.
Descriptive Statistics of Primary Variables

Variable	Description
Mobile Money	Dummy equal to 1 if the respondents used personally mobile phone services to pay bills or to send or receive money in the past 12 months and 0 otherwise.
Formal Account	Dummy equal to 1 if the respondent, personally or together with someone else, has an account at a bank or another type of financial institution and 0 otherwise
Formal Saving	Dummy equal to 1 if the respondent, personally, saved or set aside money in the past year, including using an account at a financial institution.
Online payment	Dummy equal to 1 if the respondents made personally online payment (bill payment or buy something) using the internet, whether on a mobile phone, a computer, or some other device in the past 12 mounts and 0 otherwise.
Age	Age of respondent in years
Age^2	Age of respondent in years, squared
Gender	Dummy equal to 1 if the respondent is male and 0 otherwise.
Income—poorest	Dummy equal to 1 if the respondent is in the lowest group of income and 0 otherwise. Income groups are based on the incomes of respondents in a country.
Income—second	Dummy equal to 1 if the respondent is in the second-lowest group of income and 0 otherwise. Income groups are based on the incomes of respondents in a country.
Income—middle	Dummy equal to 1 if the respondent is in the middle group of income and 0 otherwise. Income groups are based on the incomes of respondents in a country.
Income—fourth	Dummy equal to 1 if the respondent is in the second-highest group of income and 0 otherwise. Income groups are based on the incomes of respondents in a country.
Income—richest	Dummy equal to 1 if the respondent is in the highest group of income and 0 otherwise. Income groups are based on the incomes of respondents in a country.
Education—primary	Dummy equal to 1 if the respondent completed elementary education or less (up to 8 years of education) and 0 otherwise.
Education—secondary	Dummy equal to 1 if the respondent completed secondary education and some education beyond secondary education (9-15 years of education) and 0 otherwise.
Education—tertiary	Dummy equal to 1 if the respondent completed four years of education beyond high school and received a 4-year college degree and 0 otherwise.

Source: World Bank Global Findex database (2018)

This research focuses on digital financial inclusion in OIC countries, and thus heterogeneity among countries needs to be controlled by financial services penetration, economic soundness and internet and cellular network. The definition of control variables is shown in Table 2.

Table 2.
Control Variables and Definitions

Control variable	Definition	Source
Financial Services Penetration		
ATM	The number of ATM units per 100,000 adults	Financial Access Survey, International Monetary Fund
BRANCH	The number of financial institution branches per 100,000 adults	Financial Access Survey, International Monetary Fund
Economic Soundness		
GDPC	GDP per total population. Data are in constant 2010 US dollars	World Development Indicator, World Bank Database
INF	Inflation (%) measured by consumer index	International Financial Statistics, International Monetary Fund
Internet and Cellular Network		
INT	The number of internet users who have used the internet in the last three months	ICT Development Report and database, International Telecommunication Union
MOB	Mobile cellular subscriptions per 100 people	ICT Development Report and database, International Telecommunication Union

3.2. Model development

Previous studies have aimed to investigate the determinants of financial inclusion using formal account ownership and frequency of withdrawals as indicators (Allen et al., 2016; Fungáčová & Weill, 2014; Zins & Weill, 2016). Therefore, the definition of a person financially included is related to his or her activity with a financial institution, such as saving and borrowing.

In recent years, however, the concept of financial inclusion is not only related to the ability of a person to access financial institutions, as digitalization has disrupted many aspects of modern life including particularly the financial services industry (Puschmann, 2017). The expansion of financial technology (fintech) disturbs the status quo of financial institutions. As one type of fintech, the scope of mobile money is the conversion of cash to digital money and the development of peer-to-peer platforms used via mobile phones, making virtual cash available to buy products and enabling the sending and receiving of money by a mobile device.

Before mobile money, all financial transactions had to be carried out in a fixed place or using fixed facilities. Now, transactions can be done anywhere and anytime through online transactions (Chen et al., 2016). Therefore, transactions through mobile money are still relevant in the era of financial technology.

In developing countries, mobile money services provide solutions to the financial inclusion problems of lack of physical and financial infrastructure facilities and high transaction costs (Forenbacher et al., 2019; Iman, 2018; Lashitew et al., 2019; Ouma et al., 2017). In addition, they offer convenience and flexibility for users so that they can access products anywhere. If mobile money platforms can be well adapted, financial inclusion will be increased, especially in developing

countries. Therefore, identifying the determinants of mobile money usage is crucial.

According to the literature review, several factors are shaping mobile money account ownership and use, such as online transactions, gender, education, income, and age. Because we are analysing across OIC member countries, heterogeneity among these countries needs to be controlled by the characteristics of each country that impact on the adoption of mobile money across level-income countries. Those factors encompass financial infrastructure, technology and information development, and economic soundness.

Financial infrastructure factors such as ATMs and financial institution branches are more accessible in high-income (HI) countries than in lower-income countries. In addition, people in HI countries prefer to use financial institution services rather than mobile money (Iman, 2018). However, the number of ATMs and branches can have an impact on mobile money use across countries. The greater the access to ATMs, the lower the use of mobile money; however, the greater the branch expansion of financial institutions, the higher the adoption level of mobile money (Lashitew et al., 2019). The economic condition of a country is reflected by welfare standards and price stability. A country with higher income and lower inflation provides a good climate for doing business. A well-developed and functioning telecom and internet network can also improve DFI through mobile money (Kabakova & Plaksenkov, 2018; Lashitew et al., 2019). There are three indicators used to measure the extent to which technology and information are available and functioning correctly: subscription levels, access and use. Higher levels of mobile subscription and internet usage are essential elements in investment decisions for both domestic and foreign investors, especially in fintech and e-commerce.

3.3. Methods

The research goal is to investigate how online transactions and demographic factors shape digital financial inclusion (DFI) in the OIC area. The DFI indicator is a binary variable consisting of 1 and 0 and thus is a limited dependent variable. There are two relevant regression methods – logit and probit – appropriate to predicting a binary variable where its value is restricted to 0 and 1 (Wooldridge, 2016). The binary dependent variable can be modelled as follows:

$$P(y = 1|X) = G(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k) = G(\beta_0 + X\beta) \tag{1}$$

where G is a function that takes on values strictly between 0 and 1 i.e. $0 < G(z) < 1$ for all real numbers (z).

In the logit form, G is modelled as $G(z) = \exp(z)/[1 + \exp(z)]$, while in the probit model G is expressed as an integral form i.e. $(z) = \Phi(z) \equiv \int_{-\infty}^{z} \phi(v)dv$, $\Phi(z) = (2\pi)^{1/2}\exp(-z^2/2)$, with $\Phi(z)$ being the standard normal cumulative distribution function. Because of the properties of the normal distribution, probit regression is more favourable than the logit version (Wooldridge, 2016) and this study therefore modifies the regression framework from the previous studies that investigate traditional financial inclusion (Allen et al., 2016; Ouma et al., 2017; Shihadeh, 2018) to conduct probit regression as follows:

$$DFI_i = \beta_0 + \beta_1 onpay_i + \beta_2 gender_i + \beta_3 age_i + \beta_4 age_i^2 + \tag{2}$$

$$\sum_{j=1}^{4} \theta_j inc_{ji} + \sum_{k=1}^{2} \omega_i educ_{ki} + \sum_{m=1}^{6} \delta_m M_{mc} + \varepsilon_i$$

In Equation 2, DFI_i represents the indicators of DFI for the use of mobile money: $onpay_i$ as a proxy of online transactions; $gender_i$ as a proxy of gender gap; age_i and age_i^2 as age in year and in squared year; inc_{ji} as income quantile dummies, with the poorest as base group followed by second, middle, fourth and richest groups; $educ_{ki}$ as education quantile dummies, with primary as base group, then secondary and tertiary groups; M_{mc} as control variables such as ATM, BRANCH, GDPC, INF, SUB and INT across countries (c); and ε_i as an error term.

Although heterogeneity and omitted variable bias can be solved by including cross-country characteristics in the model, there is still a potential problem in cross-individual characteristics. White's robust covariance matrix estimation is applied to accommodate this problem (Greene, 2018). Interpretation of the estimated coefficient in probit differs from ordinary least squares because it contains a log-likelihood form. Therefore, the average marginal effect is used to estimate the change in the average value of the explained variable for a unit change in the value of an explanatory variable, with all other variables held constant by Equation 3 (Wooldridge, 2016), as follows:

$$n^{-1} \sum_{i=1}^{n} \vartheta(\hat{\beta}_0 + X_i \beta) \tag{3}$$

Through average marginal effect as in Equation (3), each main parameter in Equation (2) is interpreted. β_1 is expected to be positively significant, in that a person using the internet to make an online transaction is more likely to own a mobile money account than someone who does not. β_2 indicates the difference in the likelihood of owning a mobile money account between men and women. If β_2 is positively significant, being male indicates greater financial inclusion than being female. To examine the U-shape relationship, this study refers to the significantly positive value of β_3 and the negative value of β_4.

Meanwhile, θ_j and ω_i represent the coefficients of ordinal information for education and income, respectively. Converting ordinal variables into dummy level form in the regression model is more appropriate than including ordinal forms (Wooldridge, 2016). The first quintile of *educ* and *inc*, which are 'the poorest' and 'primary', are treated as base groups so there are four variables for *inc* and two variables for *educ*. Each value of θ and ω is expected to be positively significant and suspected to be higher in line with income level and education level, so that the higher the income level and education level, the more likely someone is to own a mobile money account. We also tested whether there is a different result across national income classifications of low income (LI), lower middle income (LMI), upper middle income (UMI) and high income (HI).

Finally, model specification is measured using McFadden R^2 and the Wald test (Wooldridge, 2016). The Wald test is used to examine joint significance among

explanatory variables. To test the hypothesis, likelihood ratio by χ^2 (chi-squared) distribution is used in this study.

IV. RESULTS AND ANALYSIS
4.1. Results
4.1.1. The DFI and demographic profiles of OIC countries
Table 3 shows total observations and the average values of financial inclusion indicators and determinant variables. According to Table 3 Panel A, the indicators can be compared by economy groups defined as OIC, non-OIC, and global. Based on the Findex surveys for 2014 and 2017, the OIC countries as a whole had a higher level of use of mobile money than non-OIC countries and all countries worldwide. Likewise, the percentage of individuals reporting making online payment transactions in the OIC is higher than in the non-OIC and global groups (Panel B). As a comparison, formal accounts and savings representing traditional financial inclusion (Panel A) are included. Though they are relatively more inclusive than mobile money, adults in the OIC countries are less financially included in formal accounts and savings than those in other economies. This indicates that mobile money services and online transactions are potential markets in which to develop digital society through digital finance. Because of its contribution to creating financial stability and fostering economic growth, the use of mobile money services needs to be increased by identifying its determinants.

Meanwhile, Panel C provides macroeconomic information and indication of the standard of infrastructure. Aspects of economic opportunity and infrastructure availability must be met to support DFI. In this case, the OIC has lower income per capita, lower financial services expansion, poorer ICT networks, and higher inflation than the non-OIC and global countries. Therefore, the OIC can be seen to have unfavourable economic and infrastructure conditions compared to the non-OIC and global countries.

Table 3.
Descriptive Statistics of Financial Inclusion Indicators, Explanatory Variables and Control Variables in OIC and non-OIC Countries and Globally

Variables	OIC		Non-OIC		Global	
	2014	2017	2014	2017	2014	2017
Panel A: Indicators of financial inclusion						
Mobile money	0.0737	0.1523	0.0735	0.1413	0.0736	0.1459
Formal accounts	0.2891	0.3736	0.4486	0.4963	0.3867	0.4446
Formal savings	0.1325	0.1295	18.80	0.1633	0.1664	0.1491
Panel B: Explanatory variables						
Online payment	0.0509	0.1166	0.046	0.1131	0.0479	0.1146
Age	35	36	39	39	37	38
Gender	0.527	0.5089	0.4407	0.4163	0.4742	0.4553

Table 3.
Descriptive Statistics of Financial Inclusion Indicators, Explanatory Variables and Control Variables in OIC and non-OIC Countries and Globally (Continued)

Variables	OIC		Non-OIC		Global	
	2014	2017	2014	2017	2014	2017
Income level						
Poorest	0.1645	0.1649	0.1708	0.1767	0.1684	0.1717
Second	0.1746	0.1733	0.1841	0.1808	0.1804	0.1776
Middle	0.187	0.1893	0.1944	0.1925	0.1915	0.1911
Fourth	0.2114	0.2106	0.2069	0.2098	0.2087	0.2102
Richest	0.2625	0.2619	0.2438	0.2403	0.251	0.2494
Education level						
Primary	0.4922	0.4921	0.4499	0.4337	0.4663	0.4583
Secondary	0.4183	0.4094	0.466	0.4757	0.4475	0.4478
Tertiary	0.0896	0.0985	0.084	0.0906	0.0862	0.0939
Panel C: Control variables						
ATM	28.791	28.946	64.909	61.950	56.111	52.639
BRANCH	8.956	11.702	19.831	19.071	16.961	16.882
GDPP ($)	12729	12463	22418	21517	19634	18727
INF (%)	6.992	5.840	4.450	4.502	5.180	4.914
SUB (000000)	39.70	42.60	130.00	116.00	104.00	93.80
INT (%)	40.82	43.75	60.97	59.34	55.12	54.57

This table displays descriptive statistics in the form of mean values of each variable. Panel A contains information on the percentage of use of mobile money and ownership of formal accounts and savings. Panel B contains explanatory variable information in %, except for age in years. Panel C contains information about control variables.

4.1.2. Probit regression

Table 4 shows the results of the estimated marginal effect of probit regression, goodness of fit and specification tests for the 2017 survey. In Panel B, the value of the likelihood ratio among the regression models is significant, resulting in the null hypothesis of the Wald test being rejected. Therefore, it can be inferred that the models are well specified. Panel A shows the average marginal effect of probit regression based on observations. Column 1 displays full samples while Columns 2 to 4 represent cross-national-income-group marginal effects.

Column 1 shows that the likelihood of using mobile money services is 20.56% higher among individuals who make online transactions than among those who do not. Gender, level of income and education are positively associated with the likelihood of using mobile money. The magnitude for the male category is 4.88%, indicating that being male is related to greater inclusivity in using mobile money services than being female. Similarly, magnitude for the education and income quintiles is prone to increase in line with the rise in levels. This means that the more educated and prosperous the individual, the more inclusivity there is for them in using mobile money services. The coefficient of age is insignificant, while

Table 4.
Probit Regression for the 2017 Survey

	ALL	LI	LMI	UMI	HI
	-1	-2	-3	-4	-5
Panel A: Estimated coefficient and z-statistic by the average marginal effect					
Online payment	0.2056**	0.2830**	0.0856**	0.1715**	0.1778**
	(38.40)	(16.42)	(17.19)	(23.94)	(6.10)
Male	0.0488**	0.0536**	0.0364**	0.0280**	0.0305
	(12.51)	(5.48)	(9.64)	(4.00)	(1.04)
Education					
Secondary	0.0477**	0.1377**	0.0151**	0.0102	0.0766
	(11.24)	(12.54)	(3.81)	(1.03)	(1.09)
Tertiary	0.0841**	0.1883**	0.0275**	0.0396	0.1197
	(10.53)	(6.17)	(3.41)	(3.23)	(1.72)
Income					
Second 20%	0.0184**	0.0723**	0.0016	0.0007	-0.0525
	(2.80)	(4.48)	(0.29)	(0.06)	(-1.23)
Middle 20%	0.0268**	0.0761**	0.0131**	-0.0031	-0.0021
	(4.16)	(4.87)	(2.36)	(-0.26)	(-0.05)
Fourth 20%	0.0344**	0.0874**	0.0243**	0.0065	0.0193
	(5.51)	(5.81)	(4.45)	(0.53)	(0.44)
Richest 20%	0.0429**	0.1222**	0.0267**	0.0027	0.0228
	(7.15)	(8.32)	(4.87)	(0.23)	(0.53)
Age	0.0011	0.0042**	-0.0004	0.0004	-0.0019
	(1.54)	(2.77)	(-0.48)	(0.33)	(-0.44)
Age2	-0.00003**	-0.00005**	0.0000	0.0000	0.0000
	(-2.78)	(-2.80)	(-0.20)	(-1.28)	(0.10)
Control	Yes	Yes	Yes	Yes	No
Panel B: Model specification					
Observation	24203	6718	10624	5876	985
Pseudo R2	0.2400	0.2380	0.3330	0.3250	0.0640
Wald test	3764.08**	1213.21**	882.92**	1033.09**	60.93**

This table displays the results of probit regression analysis using the financial inclusion index (Findex) Survey 2017. Panel A contains the estimated average marginal effect while Panel B provides information about the model specifications, namely pseudo R2 and Wald test. *significant at the 5% level; ** significant at the 10% level

age^2 is negatively significant. The results indicates that the U-shape hypothesis of age is not supported in OIC countries overall. The overall result in the full sample of OIC countries shows that it is just H2 (there is the U-shape relationship between age and mobile money ownership) that is rejected.

Interestingly, the sample based on the World Bank's national income groups is split in the study, as shown in Columns 2 to 5. In general, the higher the level of national income, the fewer the explanatory variables that can predict the likelihood of adults using mobile money. The U-shape hypothesis (H2) is accepted in low-income OIC countries. The magnitude of online payments remains constant across the level of income of countries. Education and income levels are insignificant in the countries categorized as upper-middle income (UMI) and high income (HI).

Meanwhile, individual characteristics are insignificant in HI. The estimated average marginal effect in the lower-middle (LMI) countries tends to be the same as in the overall OIC countries because 43.84 per cent (10624/24230) of the OIC population is in the LMI group. The general findings of the sample splitting analysis are: i) the effect of online payment on mobile money usage remains constant in each national income group, and ii) the role of individual characteristics is smaller at higher levels of state income.

4.2. Robustness test

We conducted a robustness test by estimating out-of-the-sample analysis and using a different estimation method. We engaged the same analysis for the 2014 survey data and applied Heckman probit regression by selecting adults owning a mobile phone.[2] Furthermore, we split the samples into four categories based on the OIC countries' national incomes per capita, to examine the consistency of the previous result.

Table 5.
Probit Regression for the 2014 Survey

	ALL	LI	LMI	UMI	HI
	-1	-2	-3	-4	-5
Panel A: Estimated coefficient and z-statistic by the average marginal effect					
Online payment	0.0949**	0.0885**	0.1006**	0.0328**	0.1283**
	(14.11)	(5.69)	(9.12)	(6.09)	(5.88)
Male	0.0220**	0.0296**	0.0158**	0.0100*	0.0229
	(6.67)	(5.27)	(3.32)	(2.12)	(1.03)
Education					
Secondary	0.0369**	0.0489**	0.0159**	0.1262**	0.0145
	(9.33)	(7.56)	(3.11)	(8.22)	(0.19)
Tertiary	0.0200**	0.0369*	0.0214*	0.1300**	-0.0055
	(3.18)	(2.28)	(2.27)	(8.34)	(-0.08)

[2.] We applied Allen et. al., (2016)'s method as a selection mechanism, in which a person who uses financial services (saving or withdrawal) is one possessing a formal account. In our case, adults using mobile money are assumed to own mobile phones and is conditional on socio-demographic factors, macroeconomic soundness and availability of technology and cellular network (Akiyoshi & Ono, 2008; Forenbacher et al., 2019; Honoré, 2019).

Table 5.
Probit Regression for the 2014 Survey (Continued)

	ALL	LI	LMI	UMI	HI
	-1	-2	-3	-4	-5
Income					
Second 20%	0.0012	-0.0082	0.0096	0.0124	-0.0018
	(0.25)	(-0.95)	(1.34)	(1.43)	(-0.06)
Middle 20%	0.0126*	0.0128	0.0148*	0.0077	0.0139
	(2.42)	(1.40)	(2.05)	(1.00)	(0.41)
Fourth 20%	0.0223**	0.0250**	0.0278**	0.0092	0.0224
	(4.25)	(2.74)	(3.72)	(1.22)	(0.66)
Richest 20%	0.0338**	0.0481**	0.0315**	0.0117	0.0545
	(6.33)	(5.10)	(4.21)	(1.55)	(1.48)
Age	0.0051**	0.0061**	0.0030*	0.0006	0.0086
	(6.32)	(5.91)	(2.38)	(0.58)	(1.40)
age2	-0.0001**	-0.0001**	-0.00004*	0.0000	-0.0001
	(-6.33)	(-6.02)	(-2.54)	(-0.69)	(-1.67)
Control	Yes	Yes	Yes	Yes	No
Panel B: Model specification					
Observation	22774	8888	8937	3227	966
Pseudo R2	0.1230	0.2520	0.2010	0.1590	0.0710
Wald test	955.93**	1176.80**	371.70**	106.60**	56.15**

This table displays the results of probit regression analysis using the financial inclusion index (Findex) Survey 2014. Panel A contains the estimated average marginal effect, whereas Panel B provides information about the model specifications, namely pseudo R2 and Wald test. * significant at the 5% level; ** significant at the 10% level

In Table 5, the magnitudes of online payment and individual characteristics (except age and age^2) remain relatively consistent in the full samples for the Findex surveys, both 2014 and 2017. Higher national income decreases the role of individual characteristics in explaining the likelihood of using mobile money in 2014, and so does not differ from the result in 2017. Although the U-shape hypothesis (age and age^2) is inconsistent, the generational effects are supported in LI countries and tend to decrease in HI countries. Overall, there is no fundamentally distinct result.

Furthermore, Heckman probit estimations (Table 6) allow us to explain how online transactions and individual characteristics are related to the likelihood of using mobile money in the overall and split samples given the ownership of a mobile phone. The result in Table 6 is not significantly different from primary and out-of-the-sample regression. The U-shape hypothesis of age is rejected in both full and split samples. This is due to innovation and the mass expansion of ICT in mobile devices across generations that enables every person to access financial services, especially in the LI and LMI countries (Forenbacher et al., 2019; Iman, 2018).

4.3. Analysis

The positive association between online transactions and mobile money ownership remains consistent whether looked at in the OIC overall or by national income group. This finding indicates that in line with the tremendous growth of e-commerce, consumers can utilize aspects of mobile money services to make online transaction and simplify their transactions (Demirgüç-Kunt et al., 2018; Jenkins, 2008; Mukherjee & Roy, 2017).

Using UTAUT2, we explain how online transactions drive the use of mobile money services. A person who makes an online transaction, either for bill payment or to buy or pay for something, can be driven by hedonic motivations, utility and/ or social influences (Venkatesh et al., 2012; Raphaeli et al., 2017; Tang, 2019; David et al., 2019). Integrating e-commerce and mobile money accounts facilitates people to make online peer-to-peer transactions everywhere and at any time. It enables and supports consumer enjoyment and satisfaction in utilizing mobile money sustainably. Considering the economic benefits of e-commerce, consumers can use their digital money to earn the best value at the lowest price. When users transact with individuals and organizations in the digital payment system they rate it as a high-class activity and so adopt mobile money in their use of financial services.

In the full sample of OIC countries, men are more included in using digital finance than women. Similarly, the more educated and the richer a person, the more financially included in using digital money he or she is. This result indicates that educated and wealthy people tend to be more able to afford the fees charged by digital financial services providers, are more financially literate, and are more likely to own a mobile phone (Ozili, 2018; Demirgüç-Kunt et al., 2013)

Table 6.
Heckman Probit Regression Using Findex 2017

	ALL	LI	LMI	UMI	HI
Panel A: Estimated coefficient and z-statistic by average marginal effect					
Online payment	0.200**	0.317**	0.092**	0.196**	0.243**
	(16.96)	(13.42)	(4.82)	(14.55)	(16.70)
Male	0.048**	0.031	0.033**	0.015	0.010
	(11.45)	(1.94)	(6.72)	(1.38)	(0.65)
Education					
Secondary	0.042**	0.080**	0.013*	-0.006	-0.020
	(7.58)	(3.26)	(2.26)	(-0.42)	(-0.67)
Tertiary	0.081**	0.105**	0.024*	0.008	-0.018
	(9.42)	(2.40)	(2.41)	(0.46)	(-0.58)
Income					
Second 20%	0.015*	0.066**	0.001	-0.033	-0.013
	(2.13)	(2.63)	(0.12)	(-1.59)	(-0.48)
Middle 20%	0.026**	0.067**	0.018*	-0.028	-0.008
	(3.66)	(2.68)	(2.24)	(-1.41)	(-0.32)

Table 6.
Heckman Probit Regression Using Findex 2017 (Continued)

	ALL	LI	LMI	UMI	HI
Fourth 20%	0.034**	0.078**	0.026**	-0.024	-0.014
	(5.02)	(3.12)	(3.56)	(-1.17)	(-0.55)
Richest 20%	0.042**	0.085**	0.027**	-0.020	-0.012
	(6.27)	(3.15)	(3.76)	(-1.00)	(-0.48)
Age	0.001	-0.002	-0.002	-0.001	-0.002
	(1.23)	(-0.58)	(-1.33)	(-0.43)	(-0.73)
age2	0.00002*	0.0000	0.0000	0.0000	0.0000
	(-2.36)	(0.34)	(0.93)	(0.27)	(0.38)
Control	Yes	Yes	Yes	Yes	Yes
Panel B: Model specification					
Observation	24,168	6,702	10,627	3,949	2,89
Wald test	3313.7**	524.28**	810.72**	356.72**	222.25**

This table displays the results of Heckman probit regression analysis using the financial inclusion index (Findex) Survey 2017. Panel A contains the estimated average marginal effect, whereas Panel B provides information about the model specifications, Wald Test. *significant at the 5% level; ** significant at the 10% level

As in previous research carried out by Allen et al. (2016b), Fungáčová & Weill (2014), Patwardhan (2018), Shihadeh (2018), and Zins & Weill (2016), in the overall OIC sample the U-shape hypothesis was supported for the 2014 data. However, when we use Findex 2017, the hypothesis is rejected. This remains consistent when we conduct robustness checks with out-of-the-sample analysis and Heckman probit regression in low-income OIC countries. The results indicate that older people in low-income countries have lower levels of education and literacy, and that this has an impact on their ability to generate income and creates difficulties in accessing financial services. This is different in older people in HI countries, such that the generational effect does not occur.

Moreover, the higher the level of national income, the smaller the coefficient for parameters of age, gender, and level of individual income and education. Even it is just an online payment that is significant in high-income OIC countries. The results indicate that in HI OIC countries, both young and older people are accustomed to using digital finance services, especially mobile money. The gender gap is also prone to be smaller in higher national income situations. The implications are similar for the poor and the rich. There is no disparity between the poor and the rich in access to digital finance services.

In accord with the empirical findings, governments should concentrate on accelerating technology adoption and mitigating any adverse impacts (GSM Association & Boston Consulting Group, 2017; Kernan, 2018). Infrastructure, security systems and socio-economic status should also be considered as important issues. The residents in a region with poor infrastructure are less likely to adopt the use of mobile phones (Forenbacher et al., 2019; Iman, 2018; Lashitew et al., 2019; Ouma et al., 2017) but are more likely to rely on these devices to make

financial transactions than those living in areas with better infrastructure (Mothobi & Grzybowski, 2017). Security issues can be tackled by creating a secure electronic identity for each individual, to ensure verified transactions and settlements (Hassinen et al., 2008). Gender discrimination, low literacy and income gaps are primary problems in those OIC countries that are categorized as LI and LMI (Ouma et al., 2017).

V. CONCLUSIONS AND RECOMMENDATIONS
5.1. Conclusions
DFI is an issue of growing interest for both academicians and financial practitioners. Many types of research into financial inclusion investigate the role of demographic factors, and in this study we examine the contribution of these factors mobile money usage as a specific aspect of DFI. Therefore, this study aims to investigate the effect of online transactions and individual characteristics on DFI in OIC countries using the Global Findex surveys for 2014 and 2017 produced by the World Bank.

The results of the study show that an individual making an online payment is more likely to depend on mobile money services. It is indicated that the habit of making payment for purchases of goods and services through the internet boosts DFI in OIC countries and that the existence of mobile money makes it easier for individuals to make non-cash transactions. Furthermore, the findings conclude that the individual characteristics of gender, age, income and education play a role in DFI in OIC countries. The role of individual characteristics is stronger in emerging OIC countries and weaker in those which are more developed. In HI countries, there are no gender, income, education or generational effects in accessing financial services. The high quality of financial literacy and technology in these countries supports the adoption of financial technology by their populations.

5.2. Recommendations
For mobile money providers, the growth of these services in the OIC countries plays a valuable role in fostering peer-to-peer transactions that comply with shariah principles. For e-commerce practitioners, it is necessary to create synergies with mobile payment providers to create supportive ecosystems for digital transactions. For example, they need to develop multi-transaction customer-to-customer (C2C), business-to-customer (B2C) and business-to-business (B2B) platforms. These platforms can be realized by including banking facilities as their payment channels. The most important role for government is in improving infrastructure.

Most OIC countries are in the low and lower-middle-income groups, in which negative impacts of gender, age, income and education are extensive. These problems require the involvement of industry and policymakers. Digital finance developers have to create technology-based platforms that are easy for women and those who are poorer and less educated to use. For policymakers, it is crucial to improve literacy in ICT and financial services in order to boost DFI. Although the results show that the availability of online payments can have a positive effect on using mobile money accounts, several risks are also implied. Risks faced

include digital fraud, user-data security breaches and hacking. Therefore, the recommendations for regulators are to put in place regulations related to data security for mobile money users and to strictly monitor the operation of digital financial service providers.

Legitimization by regulators is crucial for developing and supporting digital ecosystems. As indicated by success stories such as M-Pesa in Kenya, regulators (financial service authorities and central banks) and practitioners should consider three aspects: co-shaping regulatory design, protecting innovations against counterthrusts, and co-invention (Jack & Suri, 2011; Lashitew et al., 2019). In creating a regulatory framework, both parties should work closely to combine scheme product functionality, legal compliance, technical requirements, prudential controls, and consumer protection. Financial innovation inevitably disrupts incumbent players in the industry, creating regulatory issues. Together with policymakers, practitioners need to position their advantages as a means of supporting financial inclusion for the underserved population, in order to support the positive social impacts of innovations. It is very noteworthy to engage strategic partnerships with incumbent players, for example by creating innovative platforms or products such as savings accounts, interest payments, micro-credit and insurance.

Finally, several factors can be determinant of the use of mobile money, including household mobile phone ownership, household size, and individual characteristics. This study does not refer to these variables because of limitations in the data available in Findex 2014. The recommendation for further studies is therefore to use these variables in determining the factors that influence DFI. Additionally, this research focuses on OIC countries, because most of the populations in these countries are Muslim. Therefore, the context for further research could be expanded to include all countries worldwide or to focus on developing countries.

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