COVID-19 and the Usage of Digital Currencies

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Abstract

The COVID-19 pandemic has coaxed many changes in various areas of human activities. This study investigates the impact of COVID-19 on the usage of digital currencies in the Caribbean. The paper employs survey data from 1979 firms in 13 Caribbean countries along with discrete choice models to examine the usage digital currencies and the factors that have resulted in some firms deciding to utilise these currencies in their businesses. The results suggest that access to digital payment options became a serious obstacle to firms' operations in the advent of the COVID-19 pandemic. The pandemic therefore has increased the demand for the integration of into the daily transactions of firms. The findings of this study provide motivation for the implementation of innovative and efficient digital payment systems in the post COVID-19 world.

Keywords: digital currency; cryptocurrency; covid-19; adoption

1. Introduction

The COVID-19 pandemic has changed the world's sense of normalcy since late 2019. The fallout of the high infection rates halted economic activity and forced humans to reduce social activities for their own safety. Schools went online and several firms and institutions adopted a work-from-home approach to prevent the spread of the virus. Despite the possibility of infection, people still had to engage in business transactions to purchase necessities and pay bills. When Van Doremalen, et al. (2020), however, reported that COVID-19 can remain on surfaces and cardboards for extended periods of time, this prompted individuals to contemplate the safety of exchanging cash. An increase in the demand for online transactions, facilitated by digital payment systems, has accompanied the already surging digital transformation in society. Given that credit and debit card payments also posed some risk to transmit the virus and to limit the transaction access gap in society, utilising digital currencies for transactions provides an avenue to bridge the access gap (Auer, et al., 2022).

In addition to COVID's push for digitisation, developing countries have faced several barriers to seamless ecommerce transactions. UNCTAD (2006) notes that mobile phones are 29 times less ubiquitous in low-income countries than those with a higher-level of income. Secure internet servers, an indicator of e-commerce activity, are 100 times more prevalent in high-income countries than low-income countries, and the cost of internet services in low-income countries are 150 times greater than the price of a similar service in a high-income country. Caribbean firms, for example, launched their e-platforms in the United States or Europe because of an abundance of local companies offering hosting services. In most instances, the cost of launching was exorbitant,

and the service offered was less reliable as compared to what was being offered in foreign countries. Many firms viewed local banks as unsupportive given that the process for conducting online transactions were cumbersome and the cost for e-commerce was unappealing (Hunter & Tan, 2009). The pandemic only increased the public's demand for better services to facilitate easier e-commerce in the Caribbean. The expedited timeline encouraged banks, firms, and other institutions in the region to upgrade their modes of operation to facilitate smoother online transactions with the use of digital payment systems and to capitalise on the use of digital currencies.

It is important to note that undergoing this digital transformation to develop and include digital currencies is important for a myriad of reasons. Particularly for emerging market economies, central banks believe that digital currency provides the opportunity to improve monetary policy implementation, increase payment efficiency both locally and internationally, as well as improve payment security (Moore & Stephen, 2016). These currencies also provide an avenue to improve financial stability and increase financial inclusion in the economy (Auer, Cornelli, & Frost, 2022). For these reasons and more, some countries have already begun experimenting with central bank digital currencies. China began its research on digital currency in 2013. Since then, they have established a digital currency backed by the people's bank of China, the digital RMB. They have conducted several closed internal tests with the currency, and it was even used in the recent Winter Olympic Games. As of 2020, the government announced that research on digital currencies have been progressing exceptionally well in accordance with strong security measures. The currency is being piloted in four cities in China and is available to the Chinese public and to two visitors of China through an account-based interface (Auer, Cornelli, & Frost, 2022; Tan & Liyan, 2021).

In Sweden, the percentage of cash has declined in recent times. Since then, there has been an increase in electronic payments and the Swedish Riksbank has since launched the E-krona, a digital currency whose value is stated in the Swedish currency. The E-krona is interest free in the beginning and the public has ubiquitous access to currency yearly. Consumers can use the currency to make rapid payments and can store it in a Riksbank account or on an app. The Bank of Uruguay developed the E-peso as a complement to physical cash. Twenty million e-pesos were distributed to people and companies to allow for instantaneous peer-to-peer transactions using smartphones or an e-peso app. After the pilot run was concluded in 2018, all e-pesos were retained and terminated. Since then, the program has been under reform (Yılmaz Özsoy, 2020). In Canada, the central bank is developing a retail central bank digital currency to mitigate a reduction in cash use or to compete against the prevalence of any private digital currency (Auer, Cornelli, & Frost, 2022). In the Caribbean, the Central Bank of Bahamas has piloted its digital currency the Sand Dollar (Central Bank of the Bahamas, 2022), the Eastern Caribbean currency Union has piloted its own digital currency, Dcash (Eastern Caribbean Central Bank, 2019) and the Bank of Jamaica has intentions of launching its digital currency very soon (Haynes 2021). Even though the approach to developing a digital currency varies by country, the hope is that with these digital currencies, many previous financial inefficiencies will be minimised, and smoother transaction can take place in the online environment.

Given these considerations, this paper answers the question: what was the impact of the COVID-19 pandemic on the usage of digital currencies? The answer to this question could provide central banks invaluable information that can contribute to policy decisions concerning the development

of central bank digital currencies in the region. The study employs discrete choice models and data from 1,979 firms from thirteen Caribbean countries to answer the research question.

The paper contributes to the literature in three main ways. Firstly, the area of digital currency is a relatively novel area of research globally. To the best of the researchers' knowledge this study is one of the first to focus on firm usage of digital currencies in the Caribbean. Secondly, the study has the rare benefit of using a microeconomic database to gather information when studies relating to the area of digital currencies usually focus on macroeconomic data. Finally, the findings from the paper will provide results that can be employed to increase digital currency usage in developing countries and by extension find ways to sustain online payments so that ecommerce can be smoother.

The structure of the rest of this paper is as follows. After the introduction, section 2 reviews the literature surrounding the topic, while Section 3 analyses the data and then describes the methodology for the research. The results of the study are provide in Section 4 and the final section summarises the main results of the paper along with some policy recommendations.

2. Literature Review

The COVID-19 pandemic has pushed the world to digitise its activities at exponential rates. The demand for internet access has skyrocketed and teleconferencing has become a norm in the work

environment (Branscombe 2020). Additionally, health authorities have encouraged contactless payment through credit and debit cards and even digital currencies for business transactions (Kelly 2020). De', Pandey and Pal (2020), examine the probable effects of the rise in digitisation during and after the pandemic, assuming that a technological metamorphosis had already begun. They add to the literature by analysing key patterns from the pandemic and prospective research obstacles that mandate immediate attention before dire consequences arise. The researchers posit that along with the rise in digitisation, the work-from-home ethic, online fraud as well as technostress, the pandemic will boost the demand for digital payment methods and digital currencies. This surge in demand engenders innovation for digital payment technologies to facilitate virtual payments.

Contactless payment methods have taken many forms across the world. The increased usage of virtual payment methods, such as virtual wallets, have thus far proven De', Pandey and Pal's (2020) postulations accurate. George, Sonawane and Mishra (2021) investigated the causes of increased mobile wallet usage, the significance of mobile wallet usage during the pandemic, and whether the spike in usage will extend beyond the period of the pandemic. The research utilised the convenience sampling methods to obtain primary data, by analysing 120 online questionnaire responses from an indeterminable population. The researchers collected secondary data through statistics from different mobile wallet providers. The results suggest that the COVID-19 pandemic has spawned an expansion in mobile wallet consumption and that consumers will continue to use this form of payment even after the pandemic has ended. The findings of the study provide clarity on the necessity of mobile wallets for consumers and offer firms information on how to maintain the surge in mobile wallet use post the pandemic.

Notably, digital payment options have not been limited to mobile wallets. Individuals are also using digital currencies as a payment method during the pandemic. Take for instance, cryptocurrencies, Ellen (2022) confirms that as of August 2020, Paypal has permitted customers to conduct transactions using four different cryptocurrencies namely: Bitcoin cash, Ethereum, Bitcoin and Litecoin. Furthermore, several academics agree that the Covid-19 pandemic has served as a catalyst for cryptocurrency trading in general. Guzmán, Pinto-Gutiérrez and Trujillo (2021) studied Bitcoin trading patterns to discover whether the pandemic-induced movement restrictions implemented globally affected the volume of bitcoin traded. Their study is the first to focus on Bitcoin trading volume and mobility restrictions. Using multivariate time-series econometric models to analyse the effects of movement on Bitcoin trading, the researchers discovered that as mobility decreased, the volume of Bitcoin trading by investors has increased. In fact, the researchers assert that some traders utilise the Bitcoin market as a form of gambling. Tangentially, Yan, Yan, and Gupta (2022) did not limit the cryptocurrencies in their study to just Bitcoin. Instead, the study aimed to discover the dynamic conditional correlation among myriad cryptocurrencies and their unpredictability since the start of the pandemic. The paper revealed that not only has the volume of cryptocurrencies traded risen above pre-pandemic figures, but the returns yielded have also surged.

Regardless of the rise in cryptocurrency trading volume, there is disunity within the academic community concerning cryptocurrency's status. Some researchers maintain that cryptocurrencies should not be considered currencies as they behave more like investments (Içelliogu and Öner 2019; Baur, Hong and Lee 2018); on the other hand, many researchers assert its use as a currency (Yan, Yan and Gupta 2022). Kim, Lee, and Bae (2021) assert that beyond the realm of academia,

there are pockets of individuals who consider virtual currencies a viable option. The study aimed to identify any changes in the beliefs of tourists concerning the functions of currency including, credit and debit cards, cash, and Bitcoin as the virtual currency. The paper also set out to discover why tourists utilise Bitcoin to fulfil the role of currency and whether Bitcoin consumption will be sustainable over the long run. The nature of the study gives it the characteristic of novelty, as it is the first study in the area to explore the topic. The researchers employed the use of questionnaires prior to and post January 20, 2020, to collect data from participants in Korea. The results revealed that among tourists in a tourism hotspot, the majority gained more utility from spending cash as compared to using virtual currency or debit and credit cards. Additionally, while tourists emphasise that they appreciate Bitcoin's value and convenience as a virtual currency after the pandemic and are prepared to incorporate virtual currencies in the transactions in the future, they gain more utility using virtual currencies for their convenience and as an investment as opposed to using the currencies for exchange, as storage or for its value.

The formation of cryptocurrencies eventually led to the emergence of another type of virtual currency: central bank digital currency (CBDC). Cryptocurrencies, due to their unpredictability, decentralised nature, and other inefficiencies, encouraged monetary authorities globally to begin testing the viability of another type of digital currency, CBDC (Cunha, Melo and Sebastião 2021). As of 2021, more than fifty-five countries have experimented with retail CBDC and by January 2022, at least twenty-eight CBDC were piloted. Of the twenty-eight pilots, two were launched by Caribbean central banks, that is the Central Bank of the Bahamas and the Eastern Caribbean Central Bank (ECCB). Additionally, the central bank of Jamaica has already started to work on their own CBDC (Auer, Cornelli and Frost 2022).

The Central Bank of the Bahamas has a culture of developing new ways to improve the payment system in the Bahamas. It is this culture that eventually led to the pilot and then in October 2020, national rollout of the sand dollar, the first CBDC to be implemented on a national level in the world. The sand dollar utilises the technological expertise of NZIA limited and Zynesis Pte. Ltd, as both companies specialise in the use of blockchain technology (Central Bank of the Bahamas 2022). Moreover, because the Bahamas possesses a 90% mobile device penetration rate, the country possessed the optimal environment to launch the project. The Sand Dollar can be accessed in disconnected settings and can be always accessed throughout the year. Another benefit is that utilising the currency bears low transaction fees (Bharathan 2020).

In the neighbouring Eastern Caribbean, the ECCB embarked on their own digital currency, D-cash. The ECCB launched the D-cash pilot in March 2019. The platform for D-cash utilises private permissioned blockchain technology and the ECCB will receive technical blockchain assistance from Pinaka Consulting Ltd, who will serve as their blockchain technical advisor. The platform is also open source, overseen and accommodated by the Linux foundation. With the pilot underway, the ECCB hopes to expedite the digital transformation process in the region (Eastern Caribbean Central Bank 2019). Neighbouring Jamaica also has plans to institute a CBDC. The Bank of Jamaica is currently preparing a hybrid CBDC to be issued soon. The Bank has chosen to use the real time gross settlement system instead of blockchain technology because they believe it would integrate easily with the payment infrastructure already established. With the aim of increasing financial access and making financial transactions more convenient, the Bank of Jamaica aims to make their currency accessible to the public by 2022 (Haynes 2021).

3. Methodology

The researchers gathered cross-sectional data at the firm-level from the results of the Innovation, Firm Performance & Gender (IFPG) Issues in Enterprises in the Caribbean Survey (2020 & 2021) conducted by the Inter-American Development Bank in partnership with Compete Caribbean. The survey covered thirteen countries: Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, the Bahamas as well as Trinidad and Tobago. The survey sampled 1,979 firms with the aim of garnering information on firm innovation, performance, use of digital technologies, gender related issues as well as firm management methods. The current study focused on the data concerning digital payment methods.

Table 1: Awareness of Digital Payments with Cryptocurrencies and Mobile Money

	Yes, I have heard of mobile money	No, I have not heard of mobile money	Yes, I have heard of payments with cryptocurrency	No, I have not heard of payments through cryptocurrency
Jamaica	62.21%	37.79%	27.33%	72.67%
Antigua and Barbuda	55.33%	44.46%	31.33%	68.67%
Barbados	45.88%	54.12%	12.94%	87.06%
Dominica	43.06%	56.94%	10.95%	89.05%
Grenada	64.52%	35.48%	15.32%	84.68%
Guyana	60.65%	39.35%	24.52%	75.48%
St Kitts and Nevis	64.62%	35.38%	30.77%	69.23%
St Lucia	44.08%	55.92%	25.00%	75.00%
St Vincent	63.16%	36.84%	42.86%	57.14%
Suriname	53.70%	46.30%	25.31%	74.69%
Belize	93.63%	6.37%	71.97%	28.03%
The Bahamas	49.04%	50.96%	13.38%	86.62%

Trinidad and Tobago	54.44%	45.56%	13.89%	86.11%

The awareness of mobile payment options was relatively high in most countries, but knowledge of cryptocurrencies was significantly lower. Table 1 illustrates firm awareness of payment options with the use of digital currencies. The data reveals that 57.86% respondents have heard of mobile money while 42.14% were not aware of different mobile options. In contrast, only 26.43% of firms were aware of cryptocurrency as a payment method. Belize stands as the exception having 93.63% of firms aware of mobile money and 71.97% of firms aware of cryptocurrency.

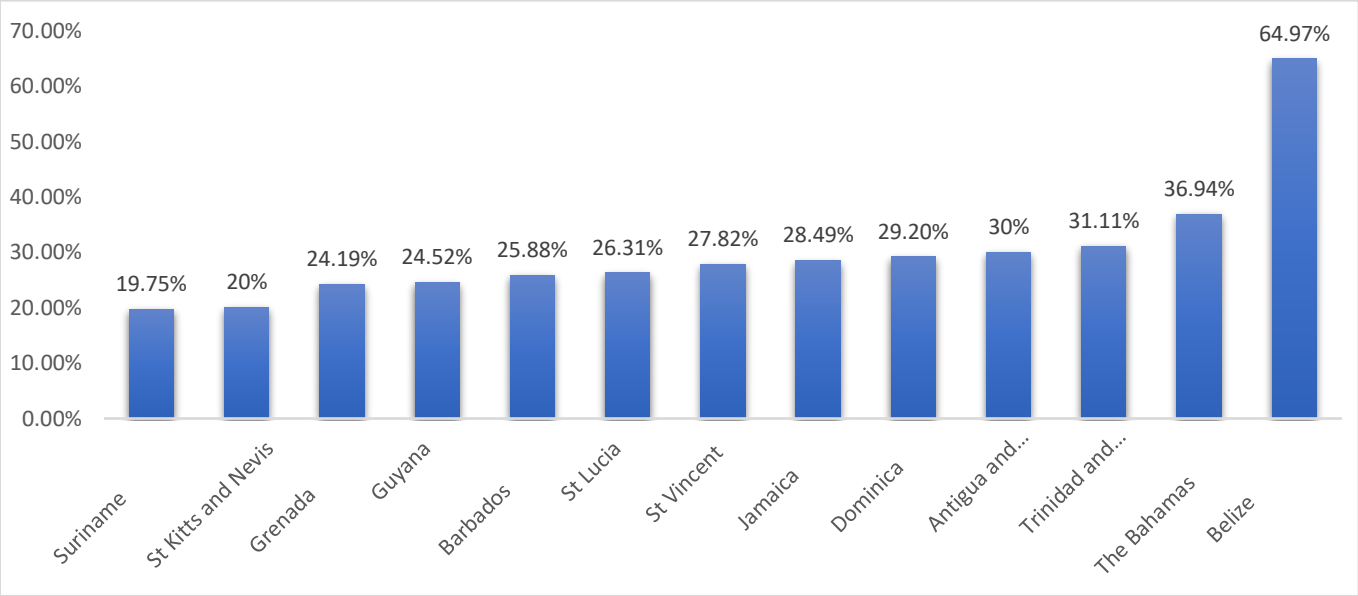
Table 2: Accepted Electronic Payment Methods

	Yes, I accept electronic payments with cryptocurrency either in person or remotely	**Yes, I accept payments with mobile money either in person or remotely**
Jamaica	0.00%	2.80%
Antigua and Barbuda	0.00%	4.82%
Barbados	0.00%	20.51%
Dominica	0.00%	11.86%
Grenada	0.00%	13.75%
Guyana	0.00%	9.57%
St Kitts and Nevis	0.00%	9.52%
St Lucia	0.00%	5.97%
St Vincent	0.00%	14.29%
Suriname	0.00%	6.90%
Belize	0.00%	0.70%
The Bahamas	0.00%	6.49%
Trinidad and Tobago	0.00%	13.27%

It is evident from the data in Table 2 that even though some firms have heard of these electronic payments many still do not accept them as a payment option. The statistics suggest that 91.35% of firms do not accept mobile money. For cryptocurrencies, 0% of firms accept them as a medium of

exchange. Based on the country data, it is evident that Barbados has the highest mobile money usage (20.51%) in the survey while Belize has the lowest (0.70%).

Figure 1: Firms that consider digital payment access as a major or severe obstacle to their current operations



Access to digital payment options is acting as a severe constraint to doing business for many firms. Figure 1 illustrates the ease of access to digital payment platforms, with 30.16% of respondents claiming that access to digital payment options was a major or very severe obstacle to their current operations, 18.19% claim that access is a moderate obstacle, while 51.64% claimed that access posed little or no risk to their current operations. Interestingly, of the firms who claim that access to digital payment systems was a miniscule obstacle to their operations, 0% accept cryptocurrency, only 8.36% accept mobile money and only 23.79% accept electronic payments through mobile phones. Tangentially, 53.26% of firms who reported that access to digital payments had great obstacles for their business operations also claimed that access to electricity was a major or severe obstacle to their operations. In the same vein, 60.13% of respondents who claimed that access to

digital payments proved problematic for their operations also suggested that telecommunications was a major obstacle to their operations.

Figure 2: A comparison of the most serious obstacle to a firm's normal operation before and since the advent of COVID-19

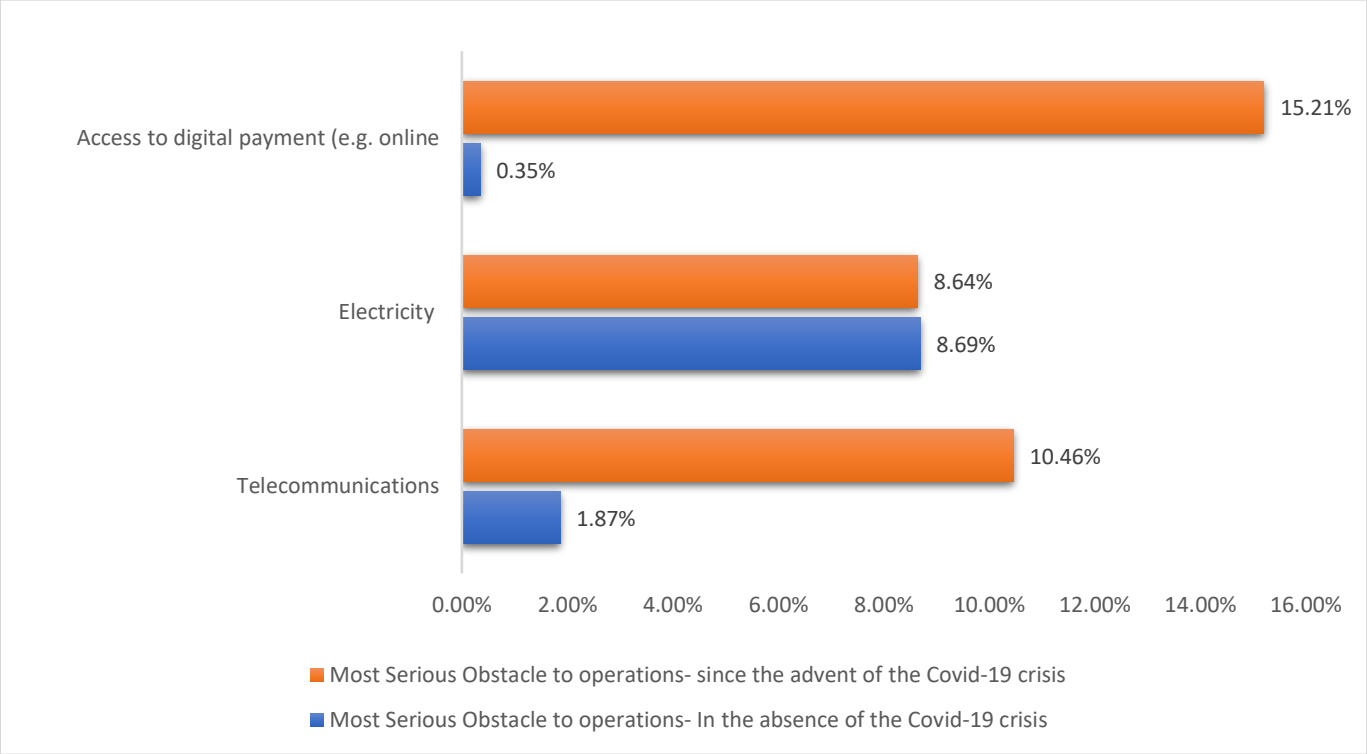


Figure 2 examines the firm's consideration for the most serious obstacle to their current operations. Based on the statistics it is evident that the COVID-19 pandemic increased the importance of digital payment systems, as there was a rise in the number of respondents who claimed that access to digital payment systems was the most serious obstacle: rising from 0.35% before COVID-19 to 15.21% afterwards. Telecommunications saw a similar increase, as it rose from 1.87% of firms claiming that it was their most serious obstacle pre-COVID to 10.46% after the pandemic.

Figure 3: A comparison of the most serious obstacle to a firm's normal operation before and since the advent of COVID-19 by country

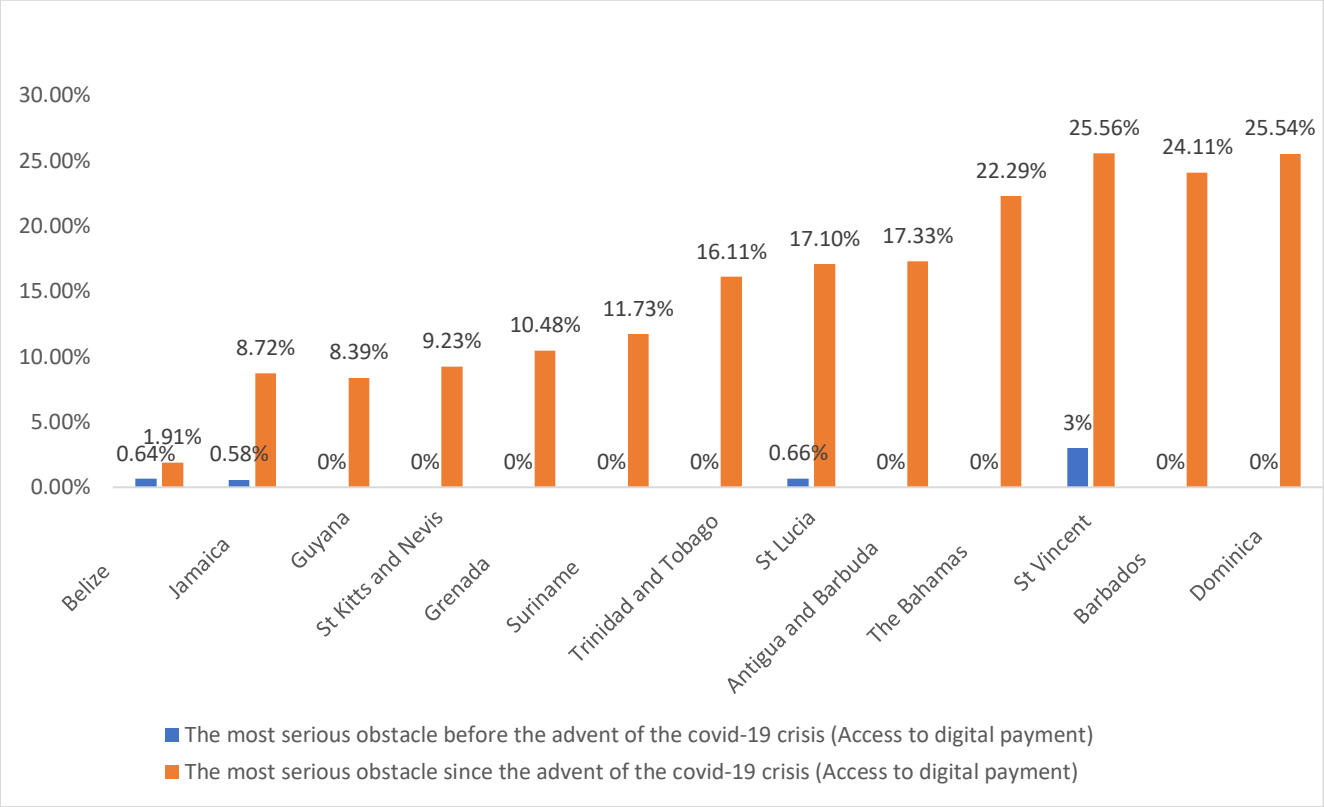


Figure 3 examines the firm's consideration for their most serious obstacle before and after COVID-19 from a country perspective. In every country, access to digital payment became the most serious obstacle since the beginning of the pandemic. Even in countries where access was not an obstacle, the atmosphere brought on by the pandemic made digital payment systems crucial to the life of some businesses.

This paper aims to investigate COVID-19's influence on digital currency usage in the Caribbean. To achieve this end, the researchers utilised Probit regression models. The Probit models are:

$$mobile\ money\ payment\ acceptance = \beta_0 + \sum_{j=1}^{K} \delta_j\ X_{ji} + u_i \qquad (1)$$

$$Crypto\ currency\ payment\ acceptance = \beta_0 + \sum_{j=1}^{K} \delta_j\ X_{ji} + u_i \quad (2)$$

$$Intention\ to\ maintain\ new\ features\ after\ COVID = \beta_0 + \sum_{j=1}^{K} \delta_j\ X_{ji} + u_i \quad (3)$$

In the first model the dependent variable is a dummy variable that represents whether firms accept mobile money or not. A value of 1 is assigned to firms who accept mobile money and a value of 0 is assigned to firms who do not. In the second model, the dependent variable is a dummy variable that depicts whether firms accept cryptocurrency payments, with value of 1 is assigned to firms who accept cryptocurrency and a value of 0 is assigned to firms who do not. In the final model the dependent variable is also a dummy variable, but this time it represents whether firms intend to maintain features such as digital currency payment systems in a post-COVID world: a value of 1 is assigned to firms who wish to maintain or upgrade these features while a value of 0 is assigned to firms who choose to do otherwise.

The explanatory variables as represented by $\sum_{j=1}^{K} \delta_j\ X_{ji}$ and attempt to explain why firms choose to accept or reject mobile money and cryptocurrency payments and will also explain why firms choose to continue offering these payment options in the post covid world. These variables include telecommunications access, the sector of the economy the firm is a part of, electricity access, the firm's country of operation, the gender of the top manager, the gender composition of the management team, the gender composition of the shareholders, the gender of the top shareholder, the type of firm, the firm's main market years of experience of the top manager, years of experience of the largest shareholder, access to digital payment systems, the company's year of establishment, access to finance, the cost of finance, competitors' behaviour, education level of the workforce, access to technological support programs, access to training programs for digitisation, number of

power outages, number of internet and mobile connection interruptions, the firm's local market share in the last fiscal year, and the top three most serious obstacles to the business' operations.

Access to utilities such as telecommunications, electricity, and virtual payment systems form a part of the digital infrastructure available to firms in their respective countries. In the same vein, the number of power, internet or mobile connection outages affect the efficiency of the digital infrastructure. The greater the obstacle these utilities are to a firm's daily operation and the larger the number of outages could reduce the quality of a country's digital infrastructure and subsequently could affect a firm's decision to accept digital payments and whether to maintain this service in a post pandemic world; and according to Auer, Cornelli and Frost (2022) countries with more developed digital infrastructure influence more digital currency development in the respective jurisdiction. The firm's country of operation, sector of the economy that the firm operates within and the number of technological support programmes and training programmes for employees interested in digitisation all influence the level of innovation present. Countries with a higher innovation score are more favourable for digital currency acceptance and sustainability (Auer, Cornelli and Frost 2022). Additionally, a priori competition spurs innovation among firms, other things equal, and thus the actions of competitors in the informal sector is an important explanatory variable as well. The firm's main market and local market share are also important independent variables as increased international transactions could increase the need for accepting digital currency. Further, if the cost of and level of access to finance is a hindrance to business operations, it may be more difficult for firms to fund investments into setting up and maintaining digital payment systems. Finally, length of time that the firm has been in existence, the experience that shareholders have working with the firm and that top managers have gained

from working in the industry coupled with the gender distribution of the shareholders and the management group have a heavy influence on firm decision making and thus would determine whether firms accept digital currency payments or choose to maintain them in the long run.

4. Results

While the data explains firms' awareness of and opinions on digital currencies, it neglects to justify why firms choose to accept or reject digital currency payments and why they would choose to continue or discontinue using these payment systems after COVID if they are already accepting payments. Resultantly, three Probit models were estimated to investigate the factors that influence firms' decision on this matter.

The LR statistic for each model establishes that all three are statistically significant. It therefore means that in every model, some independent variables explain the behaviour of the respective dependent variables and as such cannot all simultaneously be restricted to zero. The explanatory power of the models was reasonable based on the reported pseudo-R^2. The first model had a pseudo-R^2 of 0.2143, the second had a pseudo-R^2 of 0.2397, and the final pseudo-R^2 value was 0.1135. These values indicate that all models are strong enough to explain the variability of the respective dependent variables. The ROC curves scaffold the pseudo-R^2 values as displayed in Figures 4-6, where the area under each ROC curve is greater than 0.5, suggesting that the models have a high chance of accurately explaining the behaviour in the dependent variables. The researchers also analysed the classification success of the models. In the case of model 1, the overall rate of correct classification is approximately 91.70% with 99.62% of the normal weight

group (specificity) being correctly classified and only 8.08% of the low weight group being correctly classified (sensitivity). For model 2, approximately 81.55% of the model was correctly specified with a correct classification rate of 43.87% in the normal weight group and 95.05% in the low weight group. Contrarily, in the third model only 65.82% of the model was correctly classified with a correct classification rate of 59.27% in the normal weight group and 71.23% in the low weight group. Finally, the models employed the use of robust standard errors to mitigate the issue of heteroskedasticity. Based on these indicators, all models give a fairly accurate representation of the interaction between the explanatory variables and the respective explained variables.

Given that all models reasonably represent the interaction between the independent variables and the respective dependent variables, the paper discusses the coefficient estimates. Telecommunications and electricity services make up integral parts of a country's digital infrastructure. The easier it is to harness these services the more firms will use them. As more firms utilise telecommunication and electricity services the jurisdiction's quality of digital infrastructure may increase as well (Auer, Cornelli and Frost 2022). In the same vein, increasing power outages and rising mobile and internet connection interruptions harms the quality of digital infrastructure. Auer, Cornelli and Frost (2022) assert that more developed digital infrastructure facilitates the seamless development of digital currencies. It therefore means that if these services become more of an obstacle to the ease of doing business, it is harder for them to accept digital currency payments. Telecommunications as a very severe obstacle is the only significant telecom variable at one, five and ten percent levels as it relates to accepting mobile money. The negative coefficient indicates that firms are less likely to accept mobile money if telecoms were a very

severe obstacle to the ease of doing business. In terms of accepting cryptocurrency, the coefficients are positive but only significant at the levels where telecom is a major or very severe obstacle. In this case, the results are contrary to the literature as telcom as a major or very severe obstacle to business operations encourages firms to accept cryptocurrency. Telecommunication as an obstacle to the ease of doing business is not a statistically significant determinant of a firm's decision to continue accepting digital currency after the pandemic has ended. Electricity is a minor obstacle to the ease of doing business and is the only significant factor at the five and ten percent levels. The results show that if electricity is a minor obstacle to business operations, firms are more likely to accept mobile money. However, all degrees of electricity as an obstacle are statistically significant and indicate that firms are likely to accept cryptocurrencies regardless of electricity's position as an obstacle; a fact that is contrary to the literature. Firms are less likely to maintain digital currency payments if electricity is a major obstacle to their operations. In terms of outages in the last fiscal year, power, internet, or mobile outages do not have a statistically significant influence on the decision to accept mobile money. However, a positive relationship exists between the number of monthly power outages in the last fiscal year and the decision to accept cryptocurrency which is contrary to the literature. In support of the literature, the results indicate that a negative relationship exists between the number of monthly internet interruptions and a firm's decision to maintain digital currency transactions in a post covid world.

The innovation capacity of a country plays a pivotal role in creating a healthy digital currency ecosystem. Countries with a higher innovation rate are more likely to realise greater digital currency usage in their jurisdiction (Auer, Cornelli and Frost 2022). More pointedly, the literature is highlighting the fact that a firm's country of operation influences its ability to accept digital

currency. At the five and ten percent levels, the results show that a positive and statistically significant relationship exists between operating in Barbados, Grenada, Guyana, St. Vincent, Belize, Trinidad and Tobago, and a firm's likelihood of accepting mobile money. At these same levels, Barbados, Dominica, Grenada, Guyana, the Bahamas, and Trinidad and Tobago all positively influence a firm's decision to accept cryptocurrency. The coefficient for Belize was also statistically significant, however, a negative relationship exists between Belize and a firm's decision to accept cryptocurrency, suggesting that firms operating in Belize are less likely to accept cryptocurrency as compared to other countries. Firms are less likely to sustain these digital payment features in the aftermath of the pandemic if they are operating in Antigua and Barbuda, Barbados, Dominica St. Kitts and Nevis, and St. Lucia. For the other countries in the sample, the location of operation is a statistically insignificant indicator of whether they continue accepting digital currencies after the pandemic. Additionally, the innovation capacity also highlights firms' access to digital payment options. The data reveals that access to digital payment options, regardless of the degree of deterrence it imposes on the ease of doing business, is a statistically insignificant influence on the decision to accept mobile money. On the other hand, firms are less likely to accept cryptocurrencies if access to digital payment platforms are a minor, moderate or major obstacle to the firm's operations. However, regardless of how easy it is to access digital payment options, their role in the ease of doing business for firms does not play a statistically significant role in their decision to continue accepting virtual currencies after the pandemic. Added to this, the results show that a firm's need for technological support programmes do not have any statistically significant influence on a firm's choice to accept and sustain digital currency.

The age of firms is another important variable. The literature reveals that firm innovation tends to decrease as the age of firms increase. Firms with more experience tend to invest in innovation with low levels of technological activity to reduce costs. On the other hand, younger firms tend to have higher productivity rates and generally have a higher innovation rate than older firms (Balasubramanian and Lee 2008). In contrast, Moohammad, Nor'Aini and Kamal (2014) revealed in their study of consultancy firms in Nigeria that firm age and sector grouping have no impact on their innovation methods. The results suggest that as the age of a firm increases, the firm is less likely to accept mobile money. The firm's age is a statistically insignificant influence on their decision to accept cryptocurrency or to continue accepting digital currency in the long run. In terms of sector grouping, this variable has positive and significant influence on a firm's decision to accept mobile money, but a negative and statistically significant influence on a firm's decision to accept cryptocurrency; both results contradict the findings reported in the literature. Firm sector grouping has no statistically significant influence on a firm's decision to continue accepting these virtual currencies post COVID in synchronisation with the results of (Moohammad, Nor'Aini and Kamal 2014).

The firm's local market share as well as its main market are also important variables to consider. The results indicated that local market share are statistically significant influences on a firm's decision to accept mobile money. However, a negative and statistically significant relationship persists between local market share and the decision to accept cryptocurrency: an increase in local market share makes a firm less likely to accept cryptocurrency. When considering digital currency sustenance in a post COVID world the data shows that firms with larger local market shares are more likely to sustain digital currency transactions in the long run. Whether a firm's main market

is national or international has no statistically significant bearing on their decision to accept cryptocurrency or mobile money. Regardless of whether the main market is international or national, however, the influence on the decision to sustain the virtual currency payment system is positive and statistically significant at the ten percent level for international markets and at the five percent level for national markets. The literature accounts for the influence of firms that participate in the international market given that digital currencies would be more expected within jurisdictions that engage in high levels of trade openness. The fact that the type of market is not a statistically significant influence on the decision to accept mobile money or cryptocurrency goes contrary to the some of the findings reported in the literature (see, for example, Auer, Cornelli and Frost 2022).

Financial inclusion is an important ingredient for firm innovation. Donati (2016) notes that anaemic access to inexpensive credit poisons a firm's ability to grow and create employment. Therefore, Lee, Wang and Ho (2020) believes that expanding financial access to firms allows them to increase innovation and expand sales. Given that investments in digital currency is a novel area and is thus innovative, access to finance and the cost thereof are important factors to determining whether firms will accept digital currencies or even invest in these payment methods in the long run. Contrary to the literature, the results indicate that access to finance is not a statistically significant factor to a firm's decision to accept mobile money regardless of whether access is a minor obstacle to the ease of doing business or a very severe one. In terms of cryptocurrency, the data explains that firms are likely to accept this form of digital currency if the access to finance poses a moderate, major, or very severe obstacle to the ease of doing business; these results differ from the literature since would expect that the harder it is to access finance the harder it would be

to implement these novel payment systems. Similar to access, the cost of finance has a statistically insignificant effect on a firm's desire to accept mobile money; a negative and statistically significant relationship exists between the cost of finance and firm's willingness to accept cryptocurrency. According to the literature, if the cost of finance is a minor, major or very severe obstacle to the ease of doing business, companies are less willing to make the necessary adjustments to accept cryptocurrency payments. The cost of finance has no statistically significant effect on a firm's decision to sustain digital currency features in the long run.

A priori it was expected that the actions of competitors in the informal sector will have a significant impact on the decision to accept and sustain digital currency payments. The results from the sample show that this is not the case as it concerns mobile money. If the actions of competitors, however, pose a minor, major or very severe obstacle to the firm's ease of doing business, they are more likely to accept cryptocurrency, in accordance with theoretical expectations. As it concerns sustaining these new features post COVID, firms are more likely to do so if their competitors' actions are a major threat to their normal operations. In addition to competition the results also examine the type of firms. The data shows that limited partnerships and shareholding companies are more likely to accept mobile money, while the other types of firms have no statistically significant influence on that decision. Further, if the firm is a shareholding company, limited proprietorship, or partnership they are more likely to reject cryptocurrency payments. Interestingly, the firm type has no statistically significant influence on a firm's decision to maintain virtual currency payments after the pandemic.

Education and experience are also important factors to consider. Based on the results, if an inadequately educated workforce serves as a moderate or very severe deterrent to the firm's operations, the firm is more likely to accept mobile money. Contrarily, an inadequately educated workforce as a moderate obstacle to the ease of doing business makes firms less likely to accept cryptocurrencies and has no statistically significant bearing on the decision continue accepting digital currencies. The literature proposes that the level of education that the workforce possesses is a pivotal to conquering innovation barriers (D'Este, Rentocchini and Vega-Jurado 2014). The greater the horizontal education diversity, the more firms will implement technological innovation activities (Bello-Pintado and Bianchi 2020). It is surprising that even when the inadequately educated workforce is a major deterrent to firm operation that business will still be willing to accept mobile money. Moreover, the experience of the top manager and largest shareholder are also important variables to consider. Given that a firm's ability to pursue exploratory and exploitive innovations synchronously can determine its long-term survival (Benner and Tushman 2003) and considering that engaging in these ambidextrous innovations depends on the authority of the top manager (Kortmann 2015), it is fitting to explore how the experience of top managers affect the decision accept digital currencies. The data shows that the years of shareholder experience is a statistically insignificant determinant of the decision to accept digital currency and sustain acceptance after the pandemic. In contrast to the literature, the years of experience of the top manager has no statistically significant influence on the decision to accept cryptocurrency or on the decision to sustain these new features in a post COVID society. On the other hand, at the ten percent level a negative and statistically significant relationship exists between the top manager's years of experience and the decision to accept mobile money; a result that scaffolds theory that the influence of top managers in making innovative decisions is critical.

The gender composition within the firm is a factor that can give insight into managerial decisions concerning innovative products. Research has shown that a positive relationship exists between gender diversification and innovation (Østergaard, Timmermans and Kristinsson 2011). Based on the empirical results, the gender of the top manager being female has a significant and positive relationship with the decision to accept cryptocurrency, however, it does not significantly affect the decision to accept mobile money or the decision to sustain these new features after the pandemic has ended. The gender of the top shareholder, however, has a negative and significant relationship with the firm's decision to accept cryptocurrency. The gender composition has no significant influence on firms' decision to accept mobile money or cryptocurrency. However, at the ten percent level of significance a firm whose shareholders are predominantly men or women is less likely to continue accepting digital currency after the pandemic. Contrary to the literature, the gender composition of the top management group of the company has no significant effect on the decision to accept mobile money. Furthermore, regardless of gender distribution in the top management group, a negative and statistically significant relationship exists between the gender distribution and the decision to accept cryptocurrency. The results oppose the literature as even when the gender distribution is equal, firms are still not willing to accept cryptocurrencies. Similarly, the gender diversity of the management group does not change the positive and statistically significant relationship between the decision to maintain these new features in a post COVID world and the gender composition of the top management team. This positive relationship is strongest in firms where the gender is equally distributed in the management group.

Finally, given that the pandemic has forced people to remain indoors and slowed normal operations for many businesses, one would expect the top three obstacles that firms have encountered since the beginning of the pandemic to be an important factor in determining the decision to accept digital currencies and maintain them post COVID-19. The empirical data reveals that the top two obstacles will positively influence a firm's decision to accept mobile money, however top three obstacles have no statistically significant influence on the acceptance of cryptocurrency. The second most serious obstacle negative and statistically significant influence on the decision to maintain these features in the long run.

Figure 1 : Mobile Money ROC

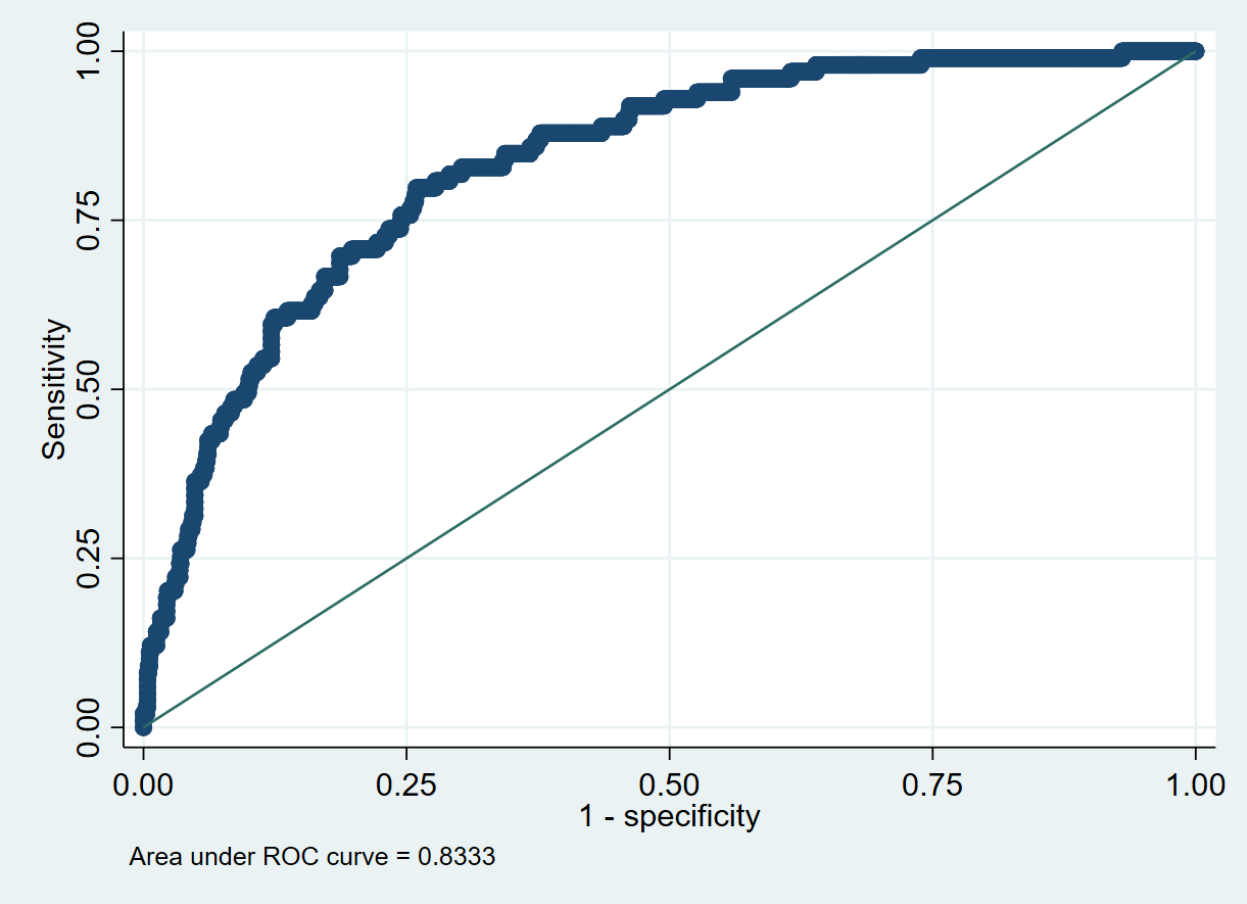


Figure 2 cryptocurrency roc

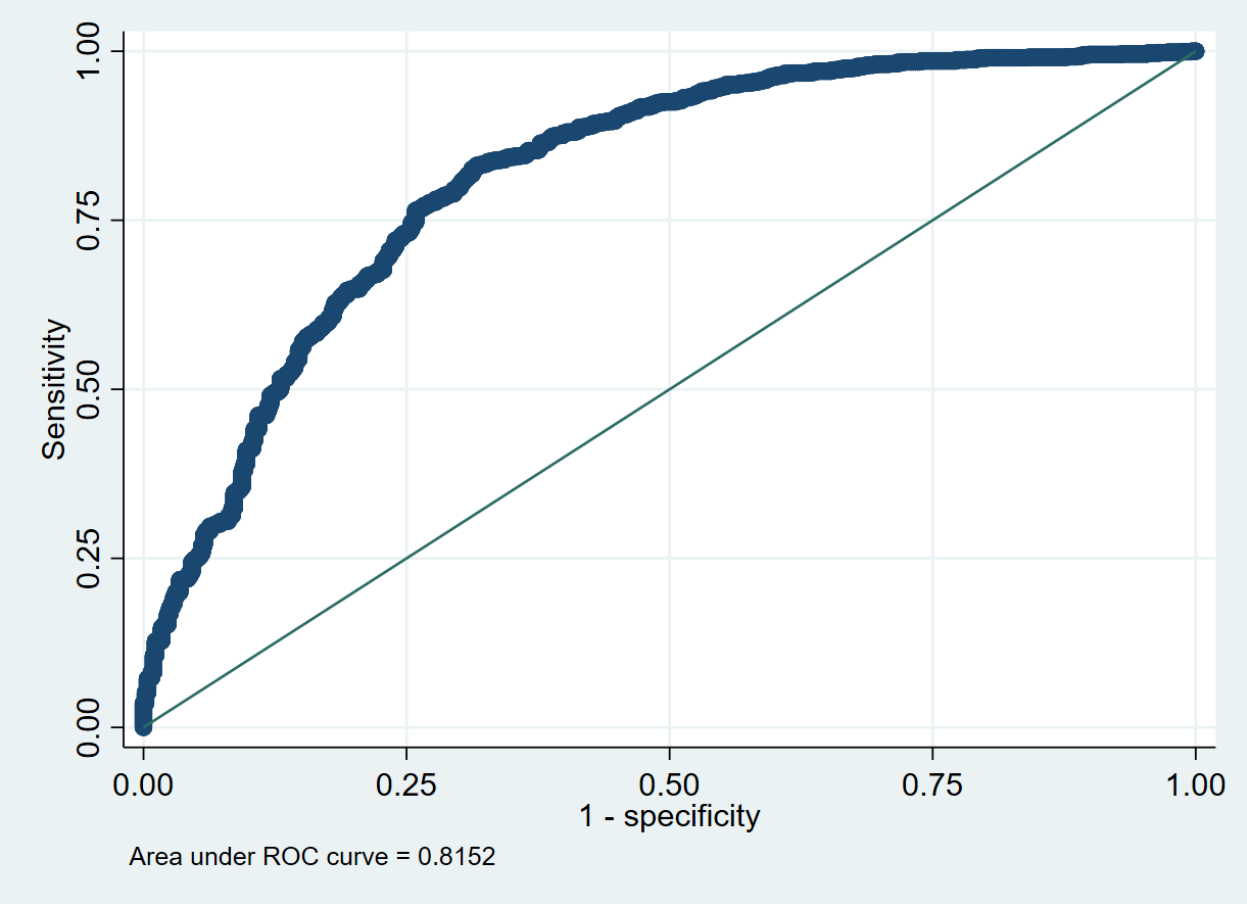


Figure 3 post cov

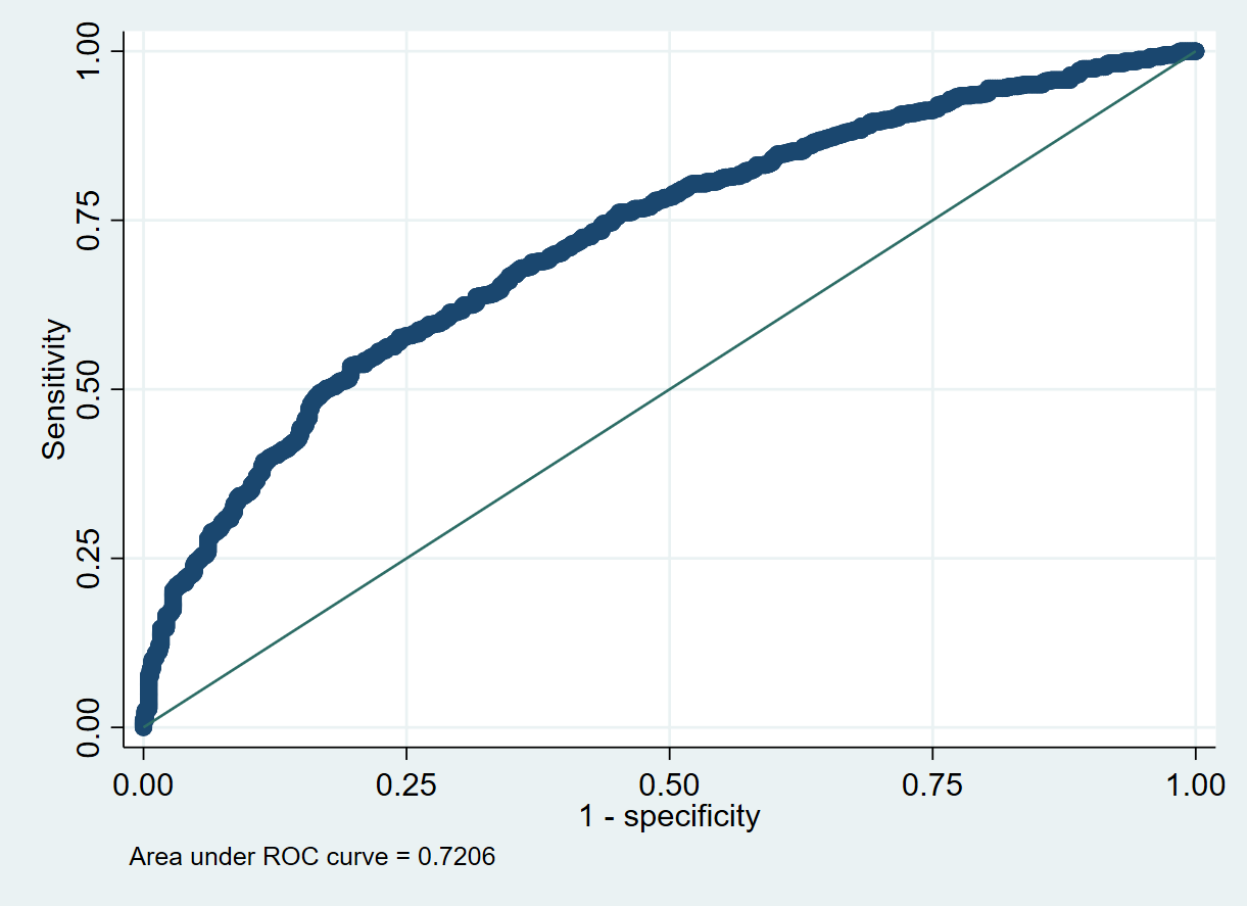


Table 1: Econometric Results

Explanatory Variable	Dependent Variable					
	Mobile Money		Cryptocurrency		Post Covid	
	(Marginal Effects)	P>|Z|	(Marginal Effects)	P>|Z|	(Marginal Effects)	P>|Z|
Telecommunications						
Minor obstacle	-.0179894	0.442	.0459984	0.115	-.0408702	0.347
Moderate obstacle	-.0168188	0.513	.010264	0.759	-.0656307	0.204
Major obstacle	.0028756	0.915	.0658447	0.032	.0243101	0.621
Very severe obstacle	-.0624967	0.034	.0730509	0.071	-.0296388	0.620
Country						
Antigua and Barbuda	.0154695	0.610	-.0229137	0.653	-.1411869	0.066
Barbados	.1114556	0.005	.1394834	0.002	-.1173639	0.063

Dominica	.0560505	0.130	.1463974	0.002	-.1801573	0.007
Grenada	.1004482	0.009	.1423541	0.003	-.0655058	0.330
Guyana	.132395	0.003	.0793607	0.088	.0357169	0.597
St Kitts and Nevis	.0470547	0.135	-.0071492	0.888	-.1244476	0.076
St Lucia	.0411774	0.284	.0635581	0.194	-.1718003	0.009
St Vincent	.0953602	0.007	-.0748197	0.162	-.0381879	0.589
Suriname	.0419121	0.159	.0139442	0.777	.0572639	0.399
Belize	-.0294183	0.088	-.2621604	0.000	.0354785	0.652
The Bahamas	.0341409	0.313	.1342838	0.004	-.0801398	0.217
Trinidad and Tobago	.1135158	0.004	.1723076	0.000	-.0663201	0.287
Electricity						
Minor obstacle	.0560456	0.022	.112765	0.001	-.0295741	0.505
Moderate obstacle	.0252201	0.303	.0647453	0.067	-.0478468	0.297
Major obstacle	.0258851	0.273	.1366483	0.000	-.0783157	0.078
Very severe obstacle	.0134065	0.598	.1135801	0.001	-.0541547	0.288
Access to Digital Payment						
Minor obstacle	-.0016065	0.944	-.0684837	0.018	.0493235	0.276
Moderate obstacle	.0004655	0.985	-.0640101	0.036	.0719405	0.153
Major obstacle	.0137549	0.601	-.063212	0.045	-.0283475	0.580
Very severe obstacle	.0100431	0.772	-.0387393	0.262	.0340438	0.537
Firm age	-.0008668	0.004	.0005384	0.208	.0001608	0.808
Firm's sector group	.0336315	0.031	-.0555348	0.002	.0394431	0.135
Firm's local market share	.0004728	0.544	-.0044032	0.000	.0042918	0.016
Gender of largest shareholder	.0121917	0.744	-.066352	0.081	-.1030365	0.111
Need for technological support programmes	-.0172815	0.330	-.0170445	0.412	-.0192089	0.543
Gender of top manager	-.0103972	0.678	.0538107	0.054	-.0744303	0.136
Type of Firm						
Shareholding company with non-traded shares or shares traded.	.0817557	0.005	-.1030602	0.003	.0450707	0.422
Sole proprietorship	.0360243	0.174	-.0971557	0.004	.0569667	0.302
Partnership (including limited liability companies)	.0235551	0.407	-.0731184	0.041	.0810532	0.162
Limited partnership	.0788811	0.022	-.0449511	0.228	-.00473	0.941
Firms Main Market						
National	.0062397	0.729	-.0169552	0.387	.1243003	0.000

International	-.0279949	0.161	-.0153242	0.559	.0699611	0.068
Gender composition of share holders						
Predominantly men	.0814873	0.430	-.0580816	0.549	-.2230646	0.070
Equally men and women	.0229726	0.775	-.0467873	0.620	-.1793578	0.146
Predominantly women	.0222047	0.761	.0242378	0.775	-.2003727	0.090
All women	.0694715	0.482	.0940053	0.197	-.1516869	0.210
Years of experience of largest female share holder	-.0010808	0.387	-.0006261	0.645	.0028404	0.198
Gender composition of management group						
Predominantly men	-.0182168	0.364	-.0743028	0.001	.1857416	0.000
Equally men and women	.0087653	0.778	-.1278166	0.000	.2046958	0.000
Predominantly women	-.0145575	0.650	-.0953212	0.007	.2035242	0.000
All women	-.0287315	0.401	-.0877896	0.044	.1310407	0.057
Years of sector experience of top manager	-.0009858	0.090	-.0008661	0.180	.0004623	0.646
Access to Finance						
Minor obstacle	.0434235	0.190	.0582672	0.195	.0598665	0.322
Moderate obstacle	-.0273887	0.323	.1711563	0.000	.0203018	0.734
Major obstacle	.0226566	0.419	.1280078	0.001	-.0148707	0.777
Very severe obstacle	.0251663	0.371	.1828408	0.000	-.0736338	0.167
Cost of Finance						
Minor obstacle	-.0106367	0.645	-.0769204	0.007	-.043733	0.300
Moderate obstacle	.0299322	0.253	.0070054	0.794	-.0409502	0.316
Major obstacle	.0117141	0.632	-.0666726	0.017	-.0582412	0.170
Very severe obstacle	-.018379	0.435	-.0598848	0.045	-.0364409	0.410
Inadequately educated Workforce						
Minor obstacle	.0229613	0.326	-.0018986	0.954	.0112045	0.828
Moderate obstacle	.0655381	0.007	-.0826291	0.016	.0718072	0.160
Major obstacle	.017306	0.375	-.0216371	0.460	.0516728	0.270
Very severe obstacle	.1189224	0.000	.0252846	0.381	.0065054	0.888
Competitors' actions in informal sector						
Minor obstacle	.0124157	0.569	.0770606	0.001	-.0265571	0.463
Moderate obstacle	-.0149032	0.495	-.0272969	0.314	.016475	0.678
Major obstacle	-.0175598	0.444	.0781276	0.003	.0901939	0.034

Very severe obstacle	-.0173367	0.568	.0584999	0.086	.0091496	0.861
Monthly outages for last fiscal year						
Power	.0003268	0.366	.0009934	0.014	-.0009457	0.142
Mobile phone connection	.0003268	0.096	.0006038	0.173	-.0003013	0.654
Internet	.00013	0.674	-.0001328	0.722	-.00108	0.054
Top three most serious obstacles since COVID						
The most serious obstacle	.0025245	0.049	-.0013986	0.384	.0009046	0.697
The second most serious obstacle	.0034557	0.023	.0018594	0.252	-.0043664	0.063
The third most serious obstacle	.0010588	0.481	-.0026496	0.108	-.0012376	0.625

5. **Conclusion**

This paper delves into the impact of COVID-19 on digital currency usage within the Caribbean basin. With data from 1,979 companies across thirteen Caribbean countries and three Probit model regressions, the research discovered invaluable of information about the factors that could influence the firms to use digital currency and more pointedly, how the pandemic has influenced firms to utilise digital currency in their daily operations. Investing in novel payment systems such using digital currency lies within the jurisdiction of innovation. Expanding digital currency use in the region increase financial inclusion, raise the efficiency of business transactions, bring about financial efficiency, and central banks and governments can even use the digital currency to aid monetary policy. Additionally, the COVID-19 pandemic has transformed the way the world operates. along with the fear of contracting COVID-19 by exchanging cash, the improvements in digital conferencing technology to facilitate online schooling and online meetings there have been increases in online stores and online shopping. Thus, there has been an increase in demand for a variety of online payment systems including digital currencies. The results of this study provide policymakers with valuable information that can help tailor future policies to maintain these online payment systems in the long run.

The empirical results of the paper have produced several interesting findings. The first is that even though mobile money and cryptocurrency are both types of digital currency, the decision to accept cryptocurrency or mobile money often react differently to the independent variables. For instance,

while older firms are more likely to accept mobile money, age is not a statistically significant factor when deciding to accept cryptocurrencies or even maintain these new payment features after COVID. If telecommunications were a severe obstacle to the ease of doing business, firms were less likely to accept mobile money, but more likely to accept cryptocurrencies. The difference in response could be caused by the fact that mobile money has better relationship with banks than cryptocurrency does. Also, mobile money is easier to use as several cryptocurrency tend behave more like assets than currency. Surprisingly, the status of telecommunications as an obstacle to the ease of doing business is an insignificant determinant of the decision to sustain these payment systems. Additionally, firms that have a larger share of the local market, in their jurisdictions are more likely to maintain new services such as digital currency payments in a post COVID world. While at the same time, firms that operate mainly in the international market or national market are still likely to sustain digital currency systems. The cost of finance is insignificant determinant of sustaining digital currency payments however, if the firm's competitors are major threats to their daily operations, they are more likely to sustain digital currency payments in the long run. The country of operations yielded different responses for the three dependent variables. Firms operating in Barbados, Grenada, Guyana, St. Vincent, Belize, or Trinidad and Tobago were more likely to accept mobile money; while firms operating in Barbados, Dominica, Grenada, Guyana, the Bahamas, and Trinidad and Tobago were more likely to accept cryptocurrency except for Belize where firms there were less likely to accept cryptocurrency. Companies located in Antigua and Barbuda, Barbados, Dominica St. Kitts and Nevis, or St. Lucia were less likely to sustain these new payment features after COVID. Perhaps the difference in innovation scores for the countries could explain the varying results. Finally, the top three obstacles to the ease of doing business since the advent of COVID had no statistically significant effect on the decision to accept

cryptocurrency, however, the top two obstacles since the beginning of COVID will influence firms to accept mobile money. Only the second most serious obstacle has negative significant effect on the decision to sustain these payment features after COVID.

These findings suggest that policymakers should employ measures to enhance the telecommunications and electrical systems so that firms are better able to harness the use of digital currencies. Another way to sustain the use of digital currency is to educate the public on the advantages of digital currency usage. A populace with a better understanding of how virtual currencies operate are in a better position to capitalise on the system. Central banks who are yet to begin researching and experimenting with central bank cryptocurrency should lead the way in their respective jurisdictions and thereby partner with local firms integrate these virtual currencies into society.

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