Cashless Payments and Economic Growth: Comparative Evidence from Developing and Developed Economies

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"And be patient; verily, Allah loses not the rewards of the good-doers. "

[Al-Quran 11: 115]

Certificate

The thesis entitled “Cashless Payments and Economic Growth: Comparative Evidence from Developing and Developed Economies” submitted by “Iqra Ambreen” is partial fulfillment for the degree of Master of Science in Economics has been completed under my guidance and supervision. It is certified that she has incorporated the necessary changes suggested by the Examiners during the Viva voice exam held on April 25, 2024. Now this is ready for further process.

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A thesis submitted to Department of Economics, International Islamic University, Islamabad as a partial fulfillment of requirement for the award of the Degree of (MS Economics).

DEDICATION

To my Parents :

“*Haji Safdar Ali (late)” and Shahmim Akhter*

For being my first teachers, whos’e affection, love, support and paryers make me able to get any success in my life

DECLARATION

I, **Iqra Ambreen**, hereby state that my MS thesis titled "**Cashless Payments and Economic Growth: Comparative Evidence from Developing and Developed Economies**" is my own work and has not been submitted previously by me for taking any degree from International Islamic University Islamabad. At any time if my statement is found to be incorrect even after my graduation, the University has the right to withdraw my MS Degree.

(Iqra Ambreen)

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List of Acronyms

BIS Bank for International Settlements

BCCR Banco Central de Costa Rica

BNM Bank of Negara Malaysia

BOT Bank of Thailand

BTCA Better Than Cash Alliance

CBK Central Bank of Kuwait

CPI Consumer Price Index

DCTP Domestic Credit to Private Sector

ECB European Central Bank

ECM Error Component Model

FRED Federal Reserve Economic Data

FE Fixed Effect

GDP Gross Domestic Product

GFCF Gross Fixed Capital Formation

GLS Generalized Least Square

ECM Error Component Model

OLS Ordinary Least Square

R^2 Coefficient of Determination

RE Random Effect

Abstract

This research aims to estimate the effect of cashless payments on economic growth in developing and developed economies. Besides, it also scrutinizes how economic growth varies corresponding to each transitional phase of cashless payments. Using a sample of 38 countries and utilizing panel data spanning between 2010 to 2021 our study identifies the following outcomes: Firstly, cashless payments positively affects the economic growth in both developed and developing countries. Secondly, impact of cashless payments on economic growth is relatively higher in developed economies as compared to developing economies. Thirdly, empirical analysis reports that growth varies with the level of transitional stages of cashless payments. To be more explicit it is found that response of growth against advance stage of cashless payment is relatively higher as compared to it is found corresponding to transition, inception, transitioning and advanced stage. The study have the following implications: the initiatives are required, particularly in this day and age that is quickly adjusting to the advancement of information technology. Thus, a workable and successful policy requires continuing to promoting the adoption of cashless payments. It is suggestive for the policy makers of less developed countries to reform institutional structures that can support non-cash payments. Furthermore, Countries around the world are considering move cashless payments in various forms.

CHAPTER 1: Introduction

1.1 Background

The payment system is the framework (which includes organization, instruments, regulations, process, and technical methods) that enables the monetary values to be transmitted between parties who have mutual responsibilities. It is like the circulatory system in the human body; when it performs well, it contributes to the overall health of the economy but it may cause serious implications for the financial system when it fails. Therefore, efficiency and safety are the primary public policy objective for regulators around worldwide (Brucej., 1994).

Cash is always considered the core of transactions; however cashless society is getting popularity in the modern world. Cashless payments have been revolutionized by using information technology in financial institutions. A cashless payment occurs when a financial transaction is carried out with financial technologies rather than physical notes. For instance, as opposed to the past, currencies are no longer correlated with any actual precious metal or other commodities. Digital money is being used with increasing frequency in many regions of the world for daily activities, investments, and trade (Rivera, 2019). Digital transfer payments, such as bank cards, e-wallets, internet banking, and other electronic applications, while non-digital payments, such cheques, can be used for cashless transactions (Tee and Ong, 2016).

Cashless payments are believed to have a higher impact on economic growth in developed economies rather than in developing economies. (Lau et, al. 2022). There are manifold potential reasons for this belief prevailing in theory and empirics: Cashless technology are adopted differently in different regions and countries, as the developed countries have already established the infrastructure (technological and legal aspects), developing nations are not yet aware of the

various challenges they may encounter First, there is the legal infrastructure, which requires additional financial and time commitment that may be difficult to achieve. (Ligon et al., 2019).

The majority of empirical research has shown that cashless payments have a positive effect on economic expansion. (Hassan et al, 2012; Zandi et al, 2013; Tee and Ong, 2016, Lau et, al. 2022). The excessive usage of electronic modes of payment, increases country's GDP by 0.04 on average or approximately USD 104 billion dollar amounts with a greater impact in developed economies rather than less developed economies (Zandi et al., 2015).

Increased cashless payments would achieve high economic growth (GDP) in different ways. Firstly, the use of cashless payment systems controls counterfeit currency, money supply to terrorists, financial crime, robbery, and other cash-related crimes, all of which contribute to economic security and thereby stimulate economic growth. (Lipow, 2010; Tee and Ong, 2016; Wright et al., 2017). Secondly, a cashless payment system might render all financial transactions more transparent. It is going to reduce the amount of money laundering, tax evasion, bribery, and hawala transactions. Therefore, there will be less black money in circulation which helps to generate more revenues for the government and also provides an opportunity to reduce tax on all necessary goods. Therefore, the cashless payment system affects economic growth through a reduction in the economic offense.

Thirdly, a cashless economy also helps to attract foreign investment, as investors are often more comfortable investing in countries with well-developed and transparent financial systems. An increase in foreign investment will help the businesses grow which will create more employment opportunities. Therefore, cashless payments positively affect economic growth through increased employment (Essame, 2006; Hasan et al., 2012; Zandi et al., 2013). Fourthly, the adoption of

cashless payment systems contributes to economic growth by lessening government spending on the criminal justice system, eliminating the need for cash, as well as reducing spending in the banking industry.

The primary mode of production for the underground economy is cash transactions. Lowering the number of cash transactions would contribute to limiting the operation of such an economy, this would lessen crime, bribery, money laundering, counterfeit currency, robberies, and tax evasion. Based on this recommendation, several developed countries, including a few developing ones, have implemented initiatives that substitute payments made in cash with cashless transactions in the regulated financial system. Cashless payments are traceable at all times, because they are recorded in electronic format (Vimal, et. al, 2020).

The main objective of this study is to analyze the overall impact of cashless payments (card, debit card, checks) on economic growth. Sub objectives includes comparing how cashless payments affect economic growth in developed and developing economies. The economy gets benefits due to a shift from a cash payment system to a cashless. Most of the developed economies have already moved towards a cashless payment system and few developing economies are making the transition towards this payment system. This movement provides an efficient and modern payment system to an economy and is believed to be positively correlated with economic growth and development. Therefore, it is also important to explore how economic growth varies corresponding to each transitional stage of the cashless payment system.

1.2 Research Gap

Available literature has mostly focused on financial sector development and its impact on economic activities (Masoud and Hardaker, 2012; Park and Sin, 2015; Cojacrue et al., 2016, Durus-Cifi et al., 2016). However, it is appropriate to speculate that the invention of the digital payment system is responsible for the financial development function that has received a lot of attention nowadays (Lau et al., 2022; Pang et al., 2022). Therefore, it is interesting to explore the significance of cashless payment on economic growth by carrying out an empirical study on the said theme and our study makes an important contribution towards this goal.

Plenty of empirical studies have been done thus far to figure out the impact of cashless payments on economic growth (Hasan et al., 2012; Tee and Ong., 2016; Grzelczak and Pastusik, 2020; Lau et al., 2022) in European economies, Oyewole et al., 2013; Muyiawa et al., 2013 in Nigeria and Ravikumar et al., 2019; Sreenu 2020 in India). However our research is differentiated and unique on many fronts: Firstly, our study analyses the impact of cashless payments on economic growth in the overall sample of developed and developing countries to ascertain the relationship between the two variables. Earlier studies on a similar subject, however carry a regional or country-specific focus. Secondly, this study compares the impact of cashless payments on economic growth between developed and less developed economies.

Thirdly, our study classifies and ranks economies (developed or less developed) according to specified stages (inception, transitioning, tipping point, and advanced) of cashlessness to determine how economic growth varies corresponding to each transitional phase of cashless payments by uniquely ranking the countries according to their phases of transition towards cashless payment system. This gives us an advantage to compare the growth response of

countries lying in earlier stages of cashlessness with those lying in the terminal phase of transition.

1.3 Research Objective

The current study looks at the following challenges based on findings from the literature from earlier research:

1. To examine the impact of cashless payments on economic growth (based on an overall data sample of developed and less developed countries).
2. To relatively compare the effect of cashless payments on economic growth in developed and less developed economies.
3. To explore how economic growth varies corresponding to each transitional stage of cashless payments by ranking countries according to their phase of transition.

1.4 Significance of Study

Multiple research efforts indicate that cashless transactions contribute to economic growth, making them "theoretically important" to it. In fact, still there are additional factors that influence economic growth in either a direct or indirect manner. As a result, quantifiable findings from this empirical study are important for supporting the statement's validity. The ability of central banks in developing and developed nations to evaluate the success of their policy initiatives and devise appropriate strategies to achieve their goals of increasing economic growth is made possible by their understanding of the true relationship between cashless payments and economic growth. For instance, Central banks in developed and developing economies might further encourage the transition from cash to cashless payment systems and may make cashless

payment institutionalized. If the study's findings reveal that cashless payments have a positive impact on economic growth.

Furthermore, this study has implications for businesses operating in micro-economies since cashless payment systems make it simple and economically feasible for business owners to interact with banks, employees, suppliers, and new markets for their products and services. Paying employees with cashless transactions can improve security while cutting down on employee payment time and expenses. From the user's perspective cashless payment system is convenient, efficient and easy to use and reduces their cash-carrying enabling them to avoid the risk of theft and robbery that exist in the case of cash money. This is evidenced by the annual increase in the adoption of cashless payments. The results of this study can help firms decide whether to implement a cashless payment system. If the findings of this study confirm the above-mentioned idea, businesses may begin to implement cashless payment systems since cashless payments increase household spending, which contributes to macroeconomic growth.

1.5 Organization of Study

The rest of the research is consists: The second chapter delivers a review of the literature about of on our research objectives. In chapter three, we review the data technique and aspects related to our empirical models. Chapter four reports the results of empirical analysis and offers an intuitive explanation of parameter estimates of empirical models framed in our study. While, the final chapter presents conclusions implications, and suggestions for future research, based on this study.

CHAPTER 2 LITERATURE REVIEW

Reviewing previous research and empirical work on the topic under investigation is essential for any dissertation since it provides a clear path of inquiry by revealing what has already been done and published in that field. Additionally, the activity keeps the researcher from replicating the work of earlier researchers and gives them motivation to identify the potential research gaps to be explored on similar themes. The literature review presented in this chapter attempts to cover the body of knowledge about of on evolution of cashless payment system, its inevitable role, and its relational aspect with economic variables in general and economic growth in particular.

2.1 Historical Backdrop of Evolution of Payment System

Payments include the transfer of value from one agent to another. Direct exchange of goods and services between two agents is achieved by barter. In situations where a definition of the medium of transaction has not yet been established, barter is the most ancient and primitive sort of payment. Even in underdeveloped economies, this method of payment is still practiced; it has serious flaws called the “double coincidence of wants”. This led to the development of money. Thus, it is often considered that money is derived from the troublesome tasks or loopholes of barter economy (O’Mahony et al., 2002). Commodity money was the first form of money to emerge. Commodity money consists of items that have value in them as well as value in their use as money (Sullivan et al., 2003).

Jevson., (1883) suggested that money should be held in the following order of importance: convenience and worth, portability, inviolability, uniformity, partition, the certainty of value, and recognizability. The arrival of metallic money indicated the next stage in the evolution of money. Metal was the dominant choice for a long time. China had a long history of using base metal in

the evolution of money and was accepted as the first to present coin. It satisfied the essential requirement of state verification, acceptance by society, identicalness, and guarantee of symbol of worth. Lydia and Lonia introduced the assurance of purity and weight, which led to the birth of modern non-Chinese currency (Davies, 2005).

Eventually, people began to carry small tokens (200 Before Christ) representing the object they aspired to exchange for goods and services. The intrinsic value of money had been removed from the currency. Tokens, such as bank notes, were supported, and their value was ensured by deposits of gold and silver made by money issuers, typically the state. The removal of gold and silver standards in the 1930's was the final step that produced the form of money we use today. At that time, the state had stopped backing money with gold and silver to ensure its value; instead, money was only supported by the state's fiat. For this reason, the current monetary system is referred to as fiat money. It is believed that recurring currency and financial crises in 1997 in Asia, 2007's financial crises in US, and Greece's debt crises in 2010 are the latest examples of the effect of fiat-based monetary system. This system offers large opportunities for speculation and manipulation which contribute to the instability of the economy. Hence, inflation, asset price bubbles, and instability in the economy are caused by money supply.

The "emergence of plastic money" (credit card) in the 1950s was a significant payment system breakthrough. Diner's Club stipulated the first credit card in the United States for "Travel and Entertainment" to a mobile business audience (Giessmann 2018). This new form of payment is widely adopted in the US and promoted as a way to speed up the payment process. Cryptographer David Lee Chum originally proposed the concept of digital currency in 1983. He then pursued it and implemented it in his Digi Cash Company to avoid bank intermediation and introduce digital money. After that, there was a lot of controversy regarding blockchain

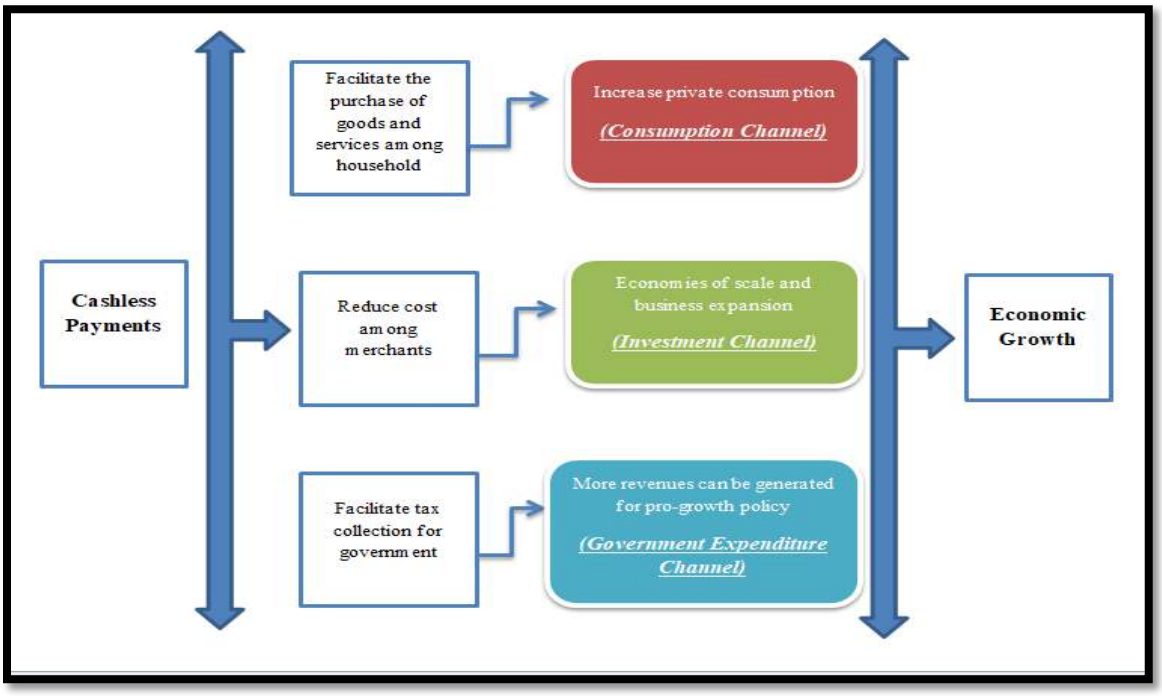
technology, which was first discussed by anonymous author Satoshi Nakomoto in his paper "Bitcoin" about peer-to-peer electronic cash system. The global flow of alternative payment methods persisted in its significance, encompassing the developed and developing economies. The brief history of payment system development demonstrates the ongoing progress and evolution.

2.2 Transmission Channels of Cashless Payments

Research conducted by Lau et al. (2020) on cashless payments and economic growth presents the transmission model which elaborate that cashless payments positively affects the country's economic growth (GDP) through three channels _ Consumption, Investment, and Government Expenditure. Figure.1 illustrates how the benefits of cashless payment contribute to economic growth.

First, Zandi et al. (2013)'s proposed consumption channel has been demonstrated by the model. He explains that customers that pay with cashless methods receive instant credit thereby facilitating the purchasing power of goods and services. Consequently, this would raise private consumption and contribute to economic growth. Cashless payments significantly increase the convenience of making transactions, as people can make payments with a single click of their mobile. In high-income countries, cashless payments enhance private consumption around 0.7% and increase economic growth by around 0.17% annually (Zandi et al. 2013).

Figure 1: Transmission Channels of Cashless Payment on Economic Growth



Source: Author's construction

Secondly, the model indicates cashless payments enhance economic growth through increased private investment. Hasan et al., (2012) explain the investment channel of cashless payments. By lowering the costs associated with traditional paper-based transactions, cashless payments help retailers achieve economies of scale and minimize operational costs. As a result, this would encourage corporate expansion and increased economic investment, which would promote economic growth. According to the majority of research, using cashless payment methods excessively can actually lower operating expenses and boost profits for businesses.

Thirdly, the model indicates the government expenditure channel as a critical element of the transmission mechanism. Kearney and Schneider (2011), introduced implicitly the government expenditure channel, which states that cashless payments lower tax evasion. Cashless payment

methods encourage economic growth by increasing government revenue and enabling the implementation of pro-growth policies. Most of the previous studies on the effect of cashless payments on the shadow economy suggested that the absolute cashless society provides a valuable source for the elimination of shadow economy. A shadow economy is one of the parts of an economy that involve illegal events and unreported transactions. Transparency is one of the main characteristics of cashless payments. This facilitates the tracking of illicit transaction production by the government. The uses of cashless payments in the country negatively affect the shadow economy. In other words, excessive use of cashless payments will lead to the elimination of the shadow economy (Schneider, 2013). It will cut the nation's shadow economy by 5% annually for at least four years in parallel. Since the government can track all revenue, tax collection could become easier as the shadow economy declines. The government may invest more and spend more on national development when tax revenue rises, which would progressively promote economic growth. In a nutshell, it is well acknowledged that the implementation of cashless payment systems can augment economic growth through the augmentation of household spending, private investment, and government expenditure.

2.3 Benefits of Cashless Society

The literature analysis identifies various benefits of cashless societies for both businesses and consumers. The advantages of cashless payments include increased security, cost savings, and convenience. Beacuse they require less handling of physical currency and have reduced transaction costs, cashless transactions are seen to be more effective and affordable. Better security is also highlighted, since cashless transactions offer a digital trail that can be subsequently followed, lowering the possibility of theft and making it simpler to identify fraudulent activity. There are numerous macroeconomic advantages to using electronic payments

that are safe, convenient, and efficient. The impact of electronic payments is acknowledged to accelerate economic growth (Cobb, 2005).

The excessive use of cashless payments accelerates a country's economic growth. The adoption **e-** payment systems enhances expenditures and consumption. By reducing the costs, risk of loss, and the burden of documents relating to financial transactions, it also enhances efficiency and international competition (Tanpat and Kraiwanit, 2019). The cashless economy also helps to reduce the circulation of black money. As a result, it lowers real estate prices because the majority of black money is invested in real estate raises market values (Garg and Panchal, 2017).

From the perspective of the user paying bills where the consumer is made easy or effortless by cashless transactions, which eliminates the need to stand in long bank lines. Additionally, since cashless payment services don't require expensive equipment to provide, finding them for account recharges or withdrawals is simple. Because it just requires a mobile device or point of sale (POS) to make transactions, these services may be very useful in remote areas and developing economies (Mariani et al., 2010).

Delaney et al. (2020) found that customers with lower household incomes were more likely to spend significant amount of cash than high-income ones. Their research also indicates that consumers without internet access are more likely to utilize cash. This is attributed to problems with digital cashless payments or a lack of connectivity to the internet.

The evidence shows that using a cashless payment system can boost sales by up to 20%. The quantity of loose coins in our pockets generally dictates our vending and catering purchases. With the implementation of a cashless system, this kind of problem never occurs because the

value on the card is accessible all the time, every single day of the week. More sales and satisfied consumers are the results of all of this (Rasaki, 2012).

2.4 Transitional Stages from Cash to Cashless

2.4.1 Transformation Stages

When a country switches from a cash-based to a cashless payment system, it usually goes through four major phases. Thomas (2013) has divided each stage into four categories: inception, transitioning, tipping, and advanced. A coordinated approach must be used for efficiently arranging for countries to organize transition through each classification phase while taking time and cost into account. The government, aid distributors, and major employers make big electronic payments to start the shift from the inception to the transitional period. At this stage, infrastructure progress is confined to cash withdrawal operations in terms of ATM and bank branch expansion, while the volume of small and medium transactions remains based on traditional (cash-based) payment systems. (BFA/BTCA, 2015).

In developing economies, it is found that Less than 39% of transactions into an account have been reported by 100 million people who receive government wage or social transfer payments, compared to more than 80% in developed nations. Therefore, there is a considerable chance of corruption and the shadow economy, which puts recipients at risk. Digitalizing government-to-government (G2P) payments lowers government expenses, boosts money transfer efficiency and transparency, enhances security, raises the bar for financial inclusion, and strengthens the economic position of women. (Klapper and Singer, 2017).

There are multiple confirmations has been backed up by an argument for reduced government costs, in less developed economies with such cost occurring from uncertified payments, interest

payments, and bank fees (Aker et al., 2013). Furthermore, an emergency situations like the Ebola epidemic, when the Liberian government had to quickly send payments to workers in remote areas—the most recent example of this being COVID-19—the necessity for a more efficient payment system is extremely important.

The second shift from "transitioning to tipping point" occurs when individuals have more options to spend money or transfer digitally. The advancement of information and communication technology has been resulting in a rapid revolution in financial inclusion. This modern financial system makes it easier for individuals and enterprises to access markets that do not have formal banking accounts or have no ability to participate in electronic payment systems for many kinds of reasons.

The third transition entails moving from a tipping point to an advanced stage, when small and everyday purchases are made electronically (BFA and BCTA, 2015). Both the supply and the demand currently have little cost access to alternate payment methods. The advanced stage is frequently pulled by society to increase convenience and reduce transaction costs, whereas the previous two shifts are primarily motivated by the need for a secure and transparent payment system.

2.4.2 Barriers in Shifting

The regulatory framework to establish an ecosystem, recipient education, acceptance of a dependable cashless payment experience, and investment in payment system infrastructure are the primary obstacles to implementing the first shift (Klapper and Singer, 2017). As a result, to evaluate a country's early stages, the simplest means to move money must be considered.

World Bank (2010) introduced two decisions to begin with the, the first one is, the type of delivery instrument and the other one is the selecting of the distributing agency. Payment methods depend on country specific determinants such as demographic, policy, and economic aspects (Faz and Moser, 2013). Hence, for a few emerging economies direct bank account deposits are considered a more suitable mode of payment. Payments using mobile money accounts are, yet, expected in nations with insufficient financial infrastructure. Thus, to provide better coverage that includes both urban and rural areas, the distribution agency selection decision must be based on the physical infrastructure that is now in place. Since it is possible to pay for goods in shops by presenting an electronic card, other options include commercial or government banks, ATMs, and postal services that are accessible in urban areas. Similarly, recipients may not have engaged in financial activities in the past, so it's important to start with education and assistance to introduce current financial products and services and to raise the level of financial literacy.

While heading from, transitioning to the tipping point stage, various obstacles can appear during the process. Electronic payment facility suppliers may face hurdles from regulatory concerns such as new producers for new firms of financial services, lack of developed infrastructure, licensing requirements, and underdeveloped distribution channels among others (World Economic Forum, 2018). The International Trade Center carried out a global survey for micro, small, and medium-sized enterprises. The survey found that the main obstacles to electronic payments were a deficient "link between the third party e-payment suppliers and commercial bank," which affected less developed countries (26%) more than developed ones (16%). Other major barriers included a lack of e-payment providers (18%), online banking (15%), and e-payment knowledge (ITC, 2016).

From the aspect of consumer, an economy may remain stuck with conventional methods of payments primarily due to insufficient trust, lack of financial knowledge, and cultural preferences on face-to-face interactions, limited internet penetration (World Economic Forum, 2018). Individual perception of security and trust has a great impact on the adoption of electronic payment systems with past experience and technical assurance as major factors of each. (Oney et al., 2017). Due to the absence of trust in the security of credit card information shared during Internet transactions, developing nations have a greater need for cash. India serves as an example of how increased card penetration contributes to the widespread use of cashless transactions as well as playing a significant role in strengthening consumer trust in transaction security. The financial institution witnessed the trust as a crucial vehicle for the use of electronic payments (EWS, 2018). Alibaba, a well-known e-commerce company in China, developed a payment system that elevated the country's level of e-payments in order to deal with the trust issue (Boston Consulting Group, 2016). In the Global Connected Commerce Report, one-third of the respondents from less developed economies cited high access costs and poor internet connection as barriers to buying goods on internet (Nielsen, 2016).

The transitional period between the tipping point and advanced stages is primarily determined by people who choose to make transactions online. It enables retailers several practical alternatives, such as opening up fresh channels of sales, enhancing customer experiences during transactions, boosting output, enhancing profits, and thwarting fraud. Although, at this point, individuals reveal a willingness to engage in electronic trade and have the necessary skills to do so. There are certain obstructions existing that prevent the customers are not willing to using new methods of payment or engaging in e-commerce at all. The primary obstacles to new technologies include security concerns, uncertainty about the service's availability, and a lack of comprehension of the

service's operation. Conversely, for merchants, the biggest barriers to implementing these cutting-edge new technologies are the expense of upgrading, the difficulties of integrating them with the current system, and the absence of client desire for the use of these new tools (Alam et al, 2017).

2.5 Cashless Payments and Economic Growth

2.5.1 Studies focused at Single Country Analysis

The adoption of cashless payments will contribute to reducing the inflation rate, and unemployment level and increasing foreign direct investment, and government revenue and, ultimately enhancing economic growth (Yusuf, 2016). Another study conducted by Oyewole et al., (2013) uses multiple regression models to scrutinize the impact of electronic cashless payments on Nigeria's economy and conclude that there is positive relationship between e-payments and economic growth. In contrast, there is a negative relationship between cheque transactions and economic growth or real gross domestic product. This may be attributed to the considerable transaction cost of cheque payments in developing economies which in turn outweigh the benefits of cashless payments on economic growth.

Further, there is couple of prior research on the effect of cashless transactions on India's economic expansion easily available. A study carried out by Zandi et al. (2013) indicates that the increased use of credit cards contributed 127 billion dollars in US dollars to their GDP, denoting 0.2 percent of GDP annually. Using e-payment instruments may save banks USD 0.5% billion in costs, and a 0.6% increase in ATM card use nationwide would result in a 0.023% rise in average spending and a 0.02% growth in the gross domestic product. An annual savings of about USD 1650 per person might arise from the revenue on a cut-rate basis gradually shifting from 87.1%

paper-based tools and cash to 85% automated cash machines such ATMs and card instruments. Baxter.,(1983) claimed that the E-money transactions may also results in the collection of more taxes which will increase government revenue. Generally, tax revenues are used to finance public goods and services including public safety, infrastructure, and health care. Without adequate revenue generated through taxation, the government would be unable to provide these services, which are essential for economic growth. A study by Ravikumar et al., (2019) suggested that digital modes of payment such as card payments, Clearing Corporation Operated System and other instruments of cashless payments significantly affect economic growth in India in the short run. Moreover, the research conducted by Sreenu, (2020) finds that while it may not be feasible to completely substitute the cashless payment system in India, society will entirely grow and become more accustomed to cashless transactions with continued technological advancements and payment structure improvements. However, in the near run, using one form of electronic payment system will affect using another sort of electronic transaction system. Long-run findings imply that adopting a cashless payment system has an important impact on economic development. Therefore, implementing a cashless policy that encourages a cashless payment system is unlikely to have an indirect impact on economic growth.

The study conducted for Indonesia by Givelyn et al.,(2022), finds that there is no significant link between the usage of debit cards and e-money transactions and economic development prior to and during the COVID-19 pandemic, as the use of cards does not actually increase consumption. Debit and ATM cards are examples of cards that might delayed consuming; in order to consume, we must first have money or savings in the bank before going to an ATM to take out cash. Public deposits in banks shift with the use of e-money from time and savings accounts to float, which remains on the liabilities side of commercial banks' balance sheets. As opposed to promoting

economic growth, e-money increases the velocity of money by sending funds from banks to non-bank institutions.

A lot of people accept that by reducing corruption through excessive usage of cashless transaction, these transaction can be boost to economic growth (Poja & Rahul, 2021). Cybersecurity, poor infrastructure, low digital literacy, and the requirement for a explicit legislative direction are the primary roadblocks to the wide implementation of cashless payment systems (Chaturvedi et al., 2021).

Cashless payments increase tax collection, greater financial inclusion, thereby fostering economic growth. These transactions will also beneficial for the government by improving regulatory services, administrative processes (automation), and by reducing the cost of currency administration and management (Ashike, 2011). Another study found the same results an increase in cashless payments could lead to a rise in the gross domestic product. This is because digital payments, such as those made with cards, are simple to track, making it easier for government agencies to monitor consumer spending and more individuals who previously did not pay taxes despite earning high incomes. Furthermore, a digital platform makes it easier for the government to retrieve and track payment records, which might have an important impact on the economy as a whole regards to efficiency, safety, and openness.

2.5.2 Studies focused at Cross-Country Analysis

Cross-country analysis also supports a strong correlation between cashless payments and economic growth. Customers' preferred ways to make of payment have changed as a consequence of innovation in payment systems as well as there is a substitution effect between electronic card payments and check transactions. Additionally, contrasted with to cash and

checks, US consumers are making use of electronic cards more frequently, according to Visa (2003). Furthermore, during the past 20 years, the use of electronic cards has resulted in a 6.5 trillion jump in consumer spending in the US. Regarding, consumers are anticipated to reap benefit from efficient or cashless payment methods in terms of expenses and timing. Thus, it has been suggested that cashless transactions generate to increased consumption, which in response promotes economic expansion.

Empirical evidence suggests that electronic retail payment (debit and credit card payments, credit card payments, credit transfers, direct debits, and cheque payments) enhance trade and consumption which raised economic growth for a group of 27 European countries from 1995 to 2009. Furthermore the research also found that, out of all the payment methods, credit and debit cards have the biggest growth-enhancing effects. Conversely, it is discovered that the macroeconomic impact of check payments on growth is little because of the substitution effect of electronic card payments (credit and debit cards). Consequently, in order to foster economic growth, the study confirms the implementation of rules pushing a rapid migration to reliable and standardized electronic methods of payment via electronic means (Hasan et al., 2012). Additionally, the same study concludes that the greatest boost to economic growth comes from card payments. The main focus of Zandi et al. (2013) is the impact of electronic payments in 56 high-income nations globally between 2008 and 2012. Increased use of electronic card payments brings USD 983 billion to the real GDP, as estimated by pooled OLS estimator. In particular, electronic payments increased GDP by 0.8% in developing nations and by 0.3% in developed nations. Further, he discovers that a rise in credit card payments boosts economic expansion.

Cashless payments (credit card, debit card, cheque, telegraphic transfer) have impact on European economies might only be prosperous in the long run if digital cashless payments have

no discernible inpact right now. Using the panel Vector error correction model (VECM), the study examined five specific European nations between 2012 and 2020 and concluded that all cashless payment methods had an influence on economic growth over the long term (Tee and Ong., 2016).

Lau et al., (2012) investigate, using a fixed effect model, the connection between economic development and digital cashless payments in 27 CPMI nations from 2013 to 2019 (Lau et al., 2022). Their efforts are align with earlier studies, which found an advantageous relationship between economic growth and each of the three types digital payments analyzed in the study. Additionally, research indicates that developed countries are more impacted by digital cashless payments than developing ones.

Aldaas., (2022) found contrary results based on comparative analyses from Saudi Arabia and India. This study states that there is a low and negative association between cashless payments and the Indian economy, while an extensive and positive correlation with the Saudi Arabian economy. In the context of technology advancements and growing prevalence of non-cash payment methods, he holds that the positive effects of cashless payment increase as an economy transitions from a developing to a developed state. In a study, equivalent findings have been reported (Zandi et al., 2016).

Similarly, research conducted by Lau et al., (2020) estimates the impact of cashless payments on economic growth by using panel data of 15 OECD countries for the period between 2007-2016. The study indicates that as compared to credit card payments, debit card payments promote more economic activity, which in turn boosts economic growth. However, unlike credit cards, the funds on a debit card are drawn from a personal savings account. As a result, increased debit

card usage will not lead to household debt buildup because debit cards give customers with instant access to funds, facilitating private consumption and so contributing to economic growth.

The economic growth of countries in the Organization for Economic Cooperation and Development (OCED) has not been responsive to a rise in the growth rate of credit card transaction value. This could be because of the counteracting impacts of the positive and negative effects of credit card payments. The positive effects of credit card payments belongs to the instantaneous availability of credit to consumers, which will improves their purchasing power and elevate aggregate demand in the economy, which will enhance economic growth. (Zandi et al, 2013; Zandi et al, 2016).

Credit card use has an unfavorable effect on household debt collection, which worsens the economy's default rate and hampers the growth of the national economy (Kang and Ma, 2009). This is particularly true when taking into account the OECD's countries of membership. Hence, in the wake of the Global Financial Crisis of 2007–2008, easy credit and surging real estate values have led to a significant growth in household debt (OECD, 2017b). As a result, the upsides and downsides of using credit cards to make payments balance out, exerting no effect on the economic growth of nations within the OCED.

For the government, Tax collection seems to be facilitated by cashless payments. Additionally, it's speculated that the shadow economy and the volume of cashless transactions have a strong negative correlation (Kearney, 2011; Schneider, 2013). Thus, it is trickier for tax evaders to cover up their incomes since the enhanced accountability of cashless payments. Additionally, a different study demonstrated a negative correlation between the acceptance of credit and debit

cards for payments in Europe and the evasion of Value Added Tax (VAT). On the other hand, it is predicted that the use of cashless payments will lead to higher revenue.

For the banking sector, as cashless payments preserve operating costs, they improve banking productivity. As a result, breakthroughs in the payments system have brought down the cost of their back-office procedures, which make up for the nearly all of banks' operational expenditure. In turn, the banks have the capacity to reap advantage from increased efficiency and economies of scale as a result of the making transition from paper to electronic payment systems (Berger, 2003). Inversely, research has appears to indicate that cashless transactions boost banks' performance by increasing their revenue. Thereby, one might claim that cashless payment systems increase banking performance, which in essence encourages company expansion and higher investment in the economy, eventually contributing to economic growth. Furthermore, according to (Bolt et al., 2008), in 2004 Norway Bank saved an approximately 0.7 billion euros and the Netherlands Bank conserved 2.9 billion euros by employing cashless payment methods. Savings therefore accounts for 0.35% and 0.61% of GDP, respectively.

For the merchants, as stated by Hasan et al. (2012), cashless payments cut the costs involved with paper-based transactions, which results in lower operating costs and the development of economies of scale. As a result, there would be an increase in economic growth and domestic economic investment. Stated differently, a smooth payment system promotes commerce, services, money transfers, and economic expansion. This increases commerce and consumer spending, which promotes economic expansion (Zandi et al., 2013; Zandi et al., 2016).

2.5 Factors Effecting the Adoption of Cashless Methods

People's attitude towards to embracing cashless payment methods is obvious in the fact that a significant percentage of population utilizes these gadgets for regular payments. As the findings of Fortune Business Insights, the digital payments market is anticipated to expand at a rate of 24.4% annually on a global scale by 2026. It comes to light that four factors—Performance Expectancy (PE), Social Influence (SI), Facilitating Conditions (FC), and Trust (T)—have a substantial influence on e-wallet up take. According to Nurulhuda and Abdullah (2020), the most important factor encouraging e-wallet adoption is Facilitating Conditions (FC).

At the strategic level, the cashless payment method has been adopted by numerous companies and nations. Different elements and causes that lead to acceptance of the cashless payment system have been observed by researchers. Chang et al., 2022; Xena & Rahadi, 2019) identified six factors—effort expectation, social influence, perceived security, performance expectancy, technological acceptance, and culture—that positively influence SMEs' acceptance and implementation of cashless payment systems.

Furthermore, reviewed the acceptance and execution of cashless payment systems at the national level have also been addressed in piece of literature (Wang et al., 2022, Peng et al., 2022). In the findings of Rahman et al. (2020), there is a considerable effect of performance expectancy, favorable conditions, dispute redressal, and behavioral goals on the uptake of cashless payment systems in Pakistan.

However within the Indian context, perceived utility excels other significant predictors of client readiness to adopt a cashless payment system, especially, social influence, perceived costs, attitude, trust, and device obstruction (Vimal et al., 2023). They also discovered that the intention

to embrace a cashless payment system is highly and positively influenced by one's income and experience.

In case of Malaysia, it was discovered that factors including technological security, social impact, reward (hedonic), and innovation were significant in the adoption of a cashless payment system along with performance expectations and enabling conditions. The establishment of a cashless society in Malaysia has been impacted by factors such as transaction speed, convenience, security, perceived value, and compatibility.

Other factors involving income, education, homeownership, marital status, as well as employment (managerial, professional, technical, and administrative positions) have a connection with the adoption of electronic transactions (Rui Jin, 2005). Additionally, consumers who earn more are more likely to use debit cards. This is in accordance with the diffusion of innovation theory, which contends that consumers who are younger and wealthier are more likely to experiment with novel items like cashless transactions or payments. Higher labor income earners could have higher time-opportunity costs and be able to pay more. As an illustration, consider transaction speed, individual safety, ease of use, safety, social impacts, perceived utility, compatibility, business preparedness, and financial cost. The adoption of new technologies, like cashless payments, provides users with extra advantages. (Hirniss et al.., 2021).

A research conducted by Tee and Ong., (2016), reveal that the expansion of implementation of information technology segment is an important factor in the adoption and expansion of cashless payment system. Although monetary terms are still used extensively worldwide, there is an

increasing perception that they are more analogous to electronic or digital forms than they might have been in the past (Ejoh, Adebisi & Okpa, 2014).

Both Media and Social influence plays a significant and positive role in shaping users behavior in adopting and accepting cashless payment system. Other agents (such as attitude) equally contributed their own influence in the adoption of cashless transaction. It is considered that awareness also influences the users' attitude towards adopting and continued usage of cashless transactions to a certain extent. The adoption of cashless payment has been associated with hedonistic operate, social impact, and inventivness (Shamshul et al., 2020).

Additionally, socioeconomic backgrounds have been identified as moderating factors in the adoption of innovations including cashless payment systems. As was stated prior to, various factors have been identified by empirical studies that contribute to the acceptance of new technology (Albort-Morant et al., 2021). First, as reported by Goczeka and Kwiatkowski (2015), those between the ages of 40 and 49 are more inclined to be using a card for payment.

Conversely, research conducted by Crow and Staten (1999) illustrated that younger individuals are inclined to use credit or debit cards over cash for their purchases. Regarding education, Kim and DeVaney (2001) show that education has a positive effect on credit card spending. As a result, the long overdue debit rises with education degree. Higher educated persons are more likely to rely on electronic payment methods, according to research published by Bounie and Francois (2006), Goczeka and Witkowski (2015), Arango et al. (2015), and Carow and Staten (1999). According to (Meisel Roca et al., 2016), there is a upward trend between education level and a probability of using an account with bank.

Third, the value of real money and assets also appear to be important factors to consider while analyzing the possibility that people will opt for cashless payment methods. The possibility of switching to a cashless system of payment increases with income (Carow and staten., 1999; Mantel., 2001; Kim and DeVaney., 2015). The study results of Gomez-Gonzaleaz et al. (2016), which reveal that with those have higher incomes are far more inclined to request a bank account, corroborates this claim. Moreover, Kim and DeVaney (2001) argue that the value of assets can be used as a predictor that increases credit card spending. Fourth, the place of residence and number of children are also taken into consideration as determinants for the adoption of cashless payment system. It is considered that people who live in urban area are more likely to pay by cards (Goczeka and Witkowski., 2015). Additionally, number of children has also been reported to affect the card payments. Finally, there is no evidence of a gender effect on the tendency to use a cashless payment method (Mantel, 2001, Bouines and francios, 2006; Chen and Nath, 2008; Arango et al., 2015). In addition, some studies also involve employment status as a relevant factor; however, they did not find significant results.

2.6 Hypothesis Development

According to the aforementioned objectives and the literature assessment, it is possible to hypothesize that

H0 = There is no significant relationship between cashless payment and economic growth (GDP).

H1 = There is a significant relationship between cashless payment and economic growth (GDP).

Hypothesis 2:

H0 = The impact of cashless payment on economic growth (GDP) in the developed countries and developing countries is same.

H1 = The impact of cashless payment on economic growth (GDP) in the developed countries developing countries is different.

Hypothesis 3:

H0**=** Economic growth does not varies with the level of transitional phases of cashless payments.

H1= Economic growth varies with the level of transitional phases of cashless payments.

In all of the selected countries, the first hypothesis above has been investigated to see if there is a positive association between cashless payments and economic growth. Despite divergent results from prior empirical research on the subject at the hand, most nations' economies are continue to projected to benefit from cashless payments since most of them possess high rates of cashless diffusion and an elevated levels of technological advancement.

Furthermore, as was already mentioned, the transmission channels act as a main source of inspiration for the development of Hypothesis 1. On the other hand, the second hypothesis evaluates how cashless payments differ in their effects on GDP growth in developed and developing nations. Although the previous research has proven that cashless payment systems are more probable to have a major impact on the economies of developed nations, it is worthwhile taking a peek at the details of this study further. The earlier studies have checked this impact by using individual measures of cashless payment, our study in contrast has utilized

composite index of cashless payments instead. Furthermore, third hypothesis is developed to analyze how economic growth varies with the level of transitional phases of cashless payments.

CHAPTER 3 METHODOLOGY and DATA DESCRIPTION

This chapter has it unique importance because designing the appropriate empirical models based on theory, compilation of filtered data and selection of appropriate empirical methodology are considered as central pillar of any research. Therefore, this chapter comprehensively explains the relevant methodology, estimation techniques and other statistical information used in this research. This chapter is divided into following sections: Section 3.1 formulate and construct theoretical framework. Section 3.2 presents variable description and data. Section 3.3 explains transformation stages score. 3.4 presents empirical model and Section 3.5 discusses empirical analyses and estimation technique that has been employed in our research.

3.1 Theoretical Framework

3.1.1 Cashless Payments and Economic Growth

(i) Diffusion of Innovation Theory (DOI)

The process of accepting modern technologies has been studied for more than 30 years. In this respect E.M Rogers define one of the most famous adoption models in his book “Diffusion of Innovation” in 1962. Within a social system, individuals embrace innovative goods and products gradually; instance that, some people are more eager than others to endorse new ideas. According to previous research, those who adopt innovations earlier than later have different characteristics. It might be hard to identify the characteristics of a given group that may facilitate or obstruct the adoption of an innovation when it pertains to marketing it to that society. Innovative individuals, early adopters, early majorities, late majorities, and laggards are the five defined adopter categories.

Grzelczak and Pastusiak (2020) proposed analyzing the impact of cashless payments on economic growth with the diffusion of innovation theory (DOI). This theory states that an innovation value, communication channels, social system and time are the primary determinants of adoption of an innovation (Morte, 2019).In such a case, the adoption of cashless payments would be expected when consumers find out an increase in the speed and convinence of doing transactions and companies pursue new, attractive business ventures. Further, people are going to perform cashless transactions if they believe they will something from them. Even though the more than half of the population belongs into one of the five established adopter categories, it is still crucial to understand the characteristics of the target demographic.

(ii) Technology Acceptance Model (TAM) Theory

This theory helps us comprehend how information technology is used and adopted. In information systems research, it is currently a well-known theory that is used to describe technology acceptance and adoption. In his doctoral thesis at the MIT Sloan School of Management, Fred Davis proposed the TAM in 1985. According to Ajayi (2014), TAM is an information systems theory that simulates how consumers adopt and use technology in a way that promotes economic progress.

This theory can be applied to examine how cashless payments promote economic growth based on these claims. Based on the model, when consumers get exposed to new technology, an assortment of factors affect their pick of when and how they will use it. Additionally, Davis put up the Technology Acceptance Model hypothesis in 1989, which asserts that the primary factors fueling technology adoption are perceived utility and perceived ease of use, which both shape a person’s disposition to accept an invention.

According to him, three elements—perceived usefulness, perceived ease of use, and attitude toward making use of the system—can be employed to explain weather users are motivated or not. He claimed that a user's mindset toward a system had a major factor when assessing whether or not they would really use it. The two fundamental beliefs that were deemed to regulate the user's behavior were perceived usefulness and perceived ease of usefulness, having perceived ease of usefulness getting a direct effect on perceived usefulness.

(iii) Endogenous Growth Theory

Paul M. Romer developed the endogenous growth theory in the 1980s. According to the economic theory commonly referred to as endogenous growth theory, a system's internal processes immediately produce economic growth. In particular, the theory recognizes that the development of new technologies and productive and effective methods for manufacturing will culminate in economic growth when a human capital of a country is increased. A model created by Greenwood and Jovanovic (1990) identifies the relationship between income, growth, and financial development. Moreover, they imply that financial development and growth are positively associated, allowing for a scrutiny the relationships between financial structure and economic development plus the relationship between income distribution and growth.

First, financial institutions stimulate investment and growth by providing a wide range of investment decisions with the greatest possible returns and by allocating resources toward the most profitable course of conduct. Second, expansion gradually offers the necessary resources and, through innovation, creates expensive financing strategies. When King and Levine (1993) highlighted innovation as a growth driver, they were colluding. Their argument is backed by the fact that financial intermediaries that systematically distribute capital to businesses reduce investment costs and enhance production via innovation, hence promoting economic growth.

Therefore, a payment system innovation could ultimately have a favorable impact on economic growth. Growth is usually viewed as a spectrum, with finance performing no role. However, there are real oscillations in growth that can be attributed to finance, given the connection between savings, investments, and growth. Grasp these transitory fluctuations in development suggested by the Endogenous development takes an understanding of the financial system (Allen & Oura, Caporale, Howells and Soliman., 2004). In nut shell, theory holds that the extent of financial development, technological advances, income sharing, and innovation all influence the health of the economy (Demetriades and Law, 2006). The theory aids in quantifying the contribution of financial services, innovation, and development to economic growth. Bulo, Dumbor C. (2018).

3.1.2 Other Determinants of Economic Growth

a) Inflation and Economic Growth

Since the emergence of classical economic theory and the development of contemporary ideas, economists have been exploring inflation and the impact it has on economic growth. This link between inflation and economic growth is discussed in this section in light of several growth theories including, Classical, Keynesian, Monetarist, and Neoclassical and Endogenous growth theory. The association between inflation and the way that it relates to output is not explicitly addressed by classical theory. Fortunately, because of the firm's sliding profit level and cost savings from high earning, there is an implicit negative relationship between these two variables. In line with the aggregate supply and demand model, which forms the cornerstone of the Keynesian model, Changes in the demand side of the economy have an effect on both price and output when the aggregate supply curve in this case slopes higher in the short run. An adjustment path can be obtained by combining aggregate supply and demand. The relationship between

inflation and economic growth is positive at first, but as the adjustment path approaches its conclusion, it finally takes a different turn. The time inconsistency problem is the cause of the early positive correlation between inflation and economic growth (Dornbusch, et al., 1996). Economic growth and inflation are positively linked because businesses agree to supply at a specific cost. The company must therefore persist to manufacture albeit at a higher expensis. The relationship inevitably takes a bad turn (Blanchard and Kiyotaki, 1987).

Furthermore, the monetary theory breaks the Philips curve into two sections: the long run and the short run. In the short run, this theory will go up this notion; still over time, it will not. Eventually, projected inflation will remain identical to actual inflation. Hence, unemployment, production, and other real economic variables are not going to be impacted by inflation. This is referred to as monetary neutrality. Gokal and Hanif (2004) defined neutrality and super neutrality as follows: neutrality take place if real variable equilibrium values, such as GDP, are long-term independent of the money supply's level, and super neutrality occurs when real variable equilibrium values, such as GDP growth rate, are long-term independent of the money supply's level. In the scenario of neutrality and extreme neutrality, inflation will be harmless. Because it lowers capital accumulation, investment, and exports all of which lead to lower production as well as inflation is bad for the economy.

Neoclassical Economists supplied their own perspective on how inflation and economic growth are tied. According to Mudell (1963), inflation has an effect on economic growth. He claims that inflation may perpetually accelerate the rate of output creation by encouraging capital accumulation since it will cause consumers to hold more assets rather than cash. Mundell and Tobin (1965) concurred that there is a upward association between inflation and economic growth. Based on this theory, inflation promotes consumers to invest their money into other

assets, which stimulates capital intensity and fosters economic growth. Despite, Mundell and Tobin, Stockman (1981) constructed a model which exhibits a negative correlation between inflation and economic growth. As per the Stockman's model, a rise in the inflation rate results in an erosion of the steady-state production level and an overall decline in the welfare of the population. In Stockman's theory, money functions as a supplement to capital by explaining the negative relationship between the rate of inflation and the steady-state level of production. It is, still a substitute for Mundell and Tobin. Theoretical review of neoclassical growth theory frequently reveals inconsistent findings over the relationship between inflation and economic growth.

b) Trade and Economic Growth

A theoretical viewpoint on the connection between international trade and economic growth is provided in this section. According to the Adam Smith theory of absolute advantage and David Ricardo's comparative advantage theory, commerce is a positive-sum game in which all trading nations win, but some gain relatively more than others. It states that trade allows efficient allocation of resources and improve modern innovations and technique, retain a higher level of production that encourage economic growth. In this regard, Heckscher-Ohlin's theory recommends mass production conforming to factor endowment: Capital intensive or labor intensive and trade with other countries to boost economic growth. Although, these traditional theories of trade assume factors of production as exogenous to the models and provide static aspects.

Examining the benefits of trade for participating economies reveals four main elements in the standard view. First, commerce offers the material resources such as capital goods, machinery, raw materials, and semi-finished products that are needed for economic growth. Second,

commerce is a method and a vehicle for entrepreneurship, the conveyance of ideas, the expansion of technological expertise, and the arrival of management ability, skills, and experience. Third, commerce functions as a conduit for the transfer of capital over international borders, particularly from developed to developing countries. The strongest antimonopoly strategy and best insurance for preserving free trade and competition is, in the end, free international trade (Harbeler, 1988: p. 335).

c) Human Capital and Endogenous Growth

The Lucas model of "Human Capital and Productivity" is defined by self-sustaining development driven by human capital accumulation. The Ben-Habib-Spiegel approach (Human Capital and Technological Diffusion) states that the country with the most advanced technology serves as the "locomotive" for other nations to catch up to it. Countries similar to the leader (in terms of productivity and human capital) may grow slower than the leader if the impact of catch-up is negligible in comparison to the endogenous growth effect. Conversely, countries with low levels of technology and human capital may grow faster than the leader due to the catch-up effect. The "Human Capital and Innovations" Schumpeterian Growth Model. Romer (1990) noted that educated employee conduct research and development and came to the conclusion that higher levels of human capital would result in stronger economic growth because they foster innovation.

d) Gross Fixed Capital Formation and Economic Growth

The acquisition of capital has been a key component of economic growth. In reality, physical capital accumulation increases the level of productivity since Solow's 1957 research. The endogenous growth hypothesis, which was mainly put forward by Romer (1986), Lucas (1988), Romer (1990), and Barro (1990), reviewed this claim by contain additional variables that support gross capital formation, such as infrastructure, research and development and human capital.

Gross fixed capital formation can stimulate economic growth in a number of ways, including by generating enormous benefits, boosting investments through expanded markets and economies of scale, and facilitating the spillover of information, technology, and expertise. It results in more resource effectiveness, while advancements in trade-related technologies, and improved trade facilities. All of these things enhance foreign exchange, which is then used for the less developed economic sectors. Numerous theorists endorse this idea, and some research has found that in developing nations, the function of human and physical capital is highly effective.

e) Domestic Credit to Private Sector and Economic Growth

Joseph Schumpeter made the case in 1911 that financial institutions' risk management and project appraisal services are crucial to economic growth. He also further pointed out that in order for production to occur, credit is necessary; additionally, one may only become an entrepreneur after first becoming a debtor and requires capital from credit services (Schumpter, 1911). He was therefore considered the first supporter of the idea that financial development—that is, credit provided to the private sector by banks—leads to economic expansion. Banks are crucial for the growth of an economy overall and to raising the levels of private sector investment. Since they finance investments, banks are essential to raising employment, boosting productivity, and stimulating economic growth. Whenever the public sector receives the majority of funding in a country, the private sector has significant obstacles in obtaining credit facilities necessary to finance new investments. Furthermore, the Robert Solow growth model from 1956 emphasizes the connection between total savings and economic growth. According to the model, more saving stimulates investment, which in turn stimulates economic growth.

3.2 Data and Variable Description

3.2.1 Variable Description

Table 3.1: Variables description

Variables	Abbreviation	Description	Unit of	Data source
		Dependent Variable		
Gross Domestic Product	GDP	sum of all resident producers' gross value added, including any product taxes and any subsidies that have not been factored into the product value	US$	WDI, World Bank
		Independent Variable		
Cashless Payment index	CP	Value of credit card, debit card and cheques Transaction	Index(US$)	BNM,BIS,ECB ,BCCR, CBK, BOT
		Control Variables		
Consumer Price Index	CPI	variations in the average consumer's cost of consuming a basket of products and services	Index	WDI, World Bank
Human Capital Index	HCI	Years of schooling and return of education	Index	FRED
Trade	Trade	Value of export and imports	US$	WDI, World Bank
Gross Fixed Capital Formation	GFCF	fixed assets plus the net change in inventories	% of GDP	WDI, World Bank
Domestic Credit to Private Sector	DCTP	Financial resources that another financial institution provides to the private sector	% of GDP	WDI, World Bank

3.2.3 Data and its Sources

This research used a dataset of 38 nations, including the years 2010 to 2021, to examine the hypothesis proposed in Chapter 2. Furthermore, the sample is divided between 22 developed and 16 developing countries. Table 3.2 displays the entire list of nations that were examined for the purpose of the study. The World Bank's criteria definition serves as the basis for the classification of countries. Countries have been selected to reflect a variety of regions as specified by the "List of countries" offered by the United Nations in its most current edition of "World Economic Situation and Prospects" in 2022, in order to maintain a global perspective for the research. The dataset has been retrieved from the World Bank, the financial access survey (FAS), Bank for international settlements (BIS). This study used unbalanced panel data.

Table 3.2: List of the countries and regions that were sampled between (2010 and 2021)

Regions	**Countries**
Developed Economies (D_1)	Australia, Austria, Belgium, Bulgaria, Czechia, Cyprus, Estonia, Finalnd, France, Germany, Greece, Ireland, Italy, Japan, Latvia, Malta, Netherland, Norway, Portugal, Poland, Spain, Sweden
Developing Economies (D_2)	Argentina, Brazil, China, Costa Rica, Dominician, India, Indonesia, Jamicia, Kuwait, Korea, Mexico, Malysia, Saudi Arabia, Singapor, Thailand, Turkey,

3.3 Classification of Transitional Phases of Cashlessness

This study's second chapter, which reviews the literature, identified and thoroughly examined the four main phases that economies go through while switching from cash to cashless payment systems. It achieved this by taking into account the findings of empirical research, hurdles to this change, and general statistics. Thomas, (2013) introduced a process to assess the cashless

journey in a nation and they also suggested that access to financial services is an important factor to analyze the stage of an economy moving toward a cashless payment system. This factor is evaluated by three main variables, which includes: 'the availability of financial services, the affordability of financial services, and the bank account usage'. Table 3.3 summarizes the indicators used for classifying (transitional phases) of cashless payments.

To meet the third objective of our study fulfill, we have calculated an equal weight composite index by aggregating scores against all individual sub pillar or indicators mentioned in table 3.2. The resultant aggregate score index is then classified into four levels based on percentile distribution. Scores which are "equal or less than 25th" percentile mark the first stage (inception) of transformation, those which lie between "25th and 50th" percentile mark the second stage (turning point) of transformation, likewise scores that falls between "50th and 75th" percentile comprises the 3rd stage (tipping point) of transitional phase and finally scores which are equal or "greater than 75th" percentile define the final stage (advanced) of transformation. This scheme also provides us an option to identify and rank countries corresponding to each transitional phase of cashlessness; this ranking is provided in table 3.4. The further detailed information on country scoring is provided in table A.1 in Appendix A. After that, we performed regression on each transitional stage of the cashless payments system by adding interaction term.

Table 3.3 : Components of the Transformation Scores

Sub-pillar	Indicator	Source
Account ownership	Number of deposit account at commercial bank	Federal reserve economic data, (FRED)
Access points	Number of automated teller machines (ATMs) (per 1000 adults)	FAS, financial Access Survey
Access points	Number of bank branches (per 1000 adults)	Financial Access Survey, (FAS)
Account usage	Number of credit card	Financial Access Survey, (FAS)
Account usage	Number of debit card	Financial Access Survey, (FAS)

Table 3.4 : Classification of Countries

Inception Stage (S_1)	Transitioning Stage (S_2)	Tipping point Stage (S_3)	Advanced Stage (S_4)
Greece	Dominician	Australia	Brazil
Ireland	Estonia	Austria	India
Jamaicia	Germany	Bulgaria	Japan
Malta	Singapore	Costa Rica	Korea
Malysia	Belgium	Czeschia	Kuwait
Netherland	Finland	Italy	Latvia
Norway	China	Saudi Arabia	Mexico
Portugal	France	Sweden	Spain
Poland		Argentina	Thailand
			Turkey
			Indonesia

3.4 Empirical Model

This study examined how cashless payments influence economic growth using a quantitative data methodology. According to Gale et al. (2012), the most appropriate methodological technique is quantitative since it enables more precise analysis of the results and the formulation of objective study findings. To create a panel dataset, the study data is split into two dimensions: the first represents the nation or country (i), and the second represents time (t). By taking into account heterogeneity at the country level, the panel data technique improves cross-sectional or

time-series datasets and allows for the comprehensive analysis of various countries throughout time. It also enables for the consideration of time and country or regional aspects. Panel data analysis is seen to be an effective technique to manage unobserved dependency chains, which can result in biased estimators in straightforward linear regression models. Compared to research based solely on time-series and cross-sectional data, it offers numerous benefits. For instance, the inclusion of both cross-sectional and time-series data results in a larger sample size, which increases the accuracy of estimations of the model parameters since there are more degrees of freedom and less multicollinearity than with just cross-section or time-series data. Furthermore, panel data accounts for the impact of missing variables on the estimation outcomes since it provides details on the individuality of entities as well as the intertemporal dynamics. Lastly, panel data makes it possible to identify model specifications that had not before been found (Hsiao, 2005). For panel data, econometric models are employed and verified to produce estimators that are reliable and efficient. Panel data models come in three different varieties: static linear, non-linear, and dynamic. The lagged, current, and future values of the dependent variable cannot be included as one of the independent variables for time periods pertaining to the same individual in the static panel data models. Strong assumptions like removing lag dependent variables from the model are made under this one. The term "linear" in the designation relates to how the regression coefficients show up. As a result, the model's parameters, individual effect αi, and error term εit are linear.

First-order criteria for least squares parameter estimation in static non-linear panel data models are nonlinear functions of the parameters. Subsequently, dynamic effects are used in dynamic linear panel data models; in this example, a lagged dependent variable is added to the independent variables. These models incorporate observable and unobservable permanent

(heterogeneous) or transient (serially-correlated) individual changes, as well as the lag value of the dependent variable as one of the independent variables to account for dynamic processes. To measure the relationship between cashless payments and economic growth in rich and developing countries, this study, however, focuses on the static panel approach. This choice is made based on some pretesting of lagged term of dependent variables in competing models. We have employed the Wooldridge test for auto-correlation in panel data to check whether the lagged term of GDP is correlated with cashless payments or not. The results are found to be insignificant in this study, which states that the null hypothesis of no-autocorrelation is not rejected, which makes it legitimate not to include the lagged GDP term in our model and therefore not opt for a dynamic version of the model and results are reported in Appendix A.6.

Furthermore, we know that the problem of endogeneity may exist in the panel data. For this purpose, we have employed the Granger-Causality test to check whether there is any feedback effect of GDP on Cashlesness or not before employing the static model of the version. There is no feedback effect of GDP on the growth of cashless payments, as per Panel Granger-Causality test results that we have found insignificant results in this study, which indicates that there is not much chance of endogeneity. The results of Granger-cause test are reported in Appendix A.7.

We have designed our empirical model based on the understanding built through our theoretical framework presented in section 3.1. The general outlook of our empirical model is as followed:

$$GDP = f\ (CP, CPI, TRD, HCI, GFCF, DCTP) \qquad (3.1)$$

Where CP refers to cashless payment index, this study created a cashless payment index employing three cashless payment indicators—the value of credit card transactions, the value of debit card transactions, and the value of check transactions—in order to verify the cashless

payment with more data. Due to incomplete data, other cashless payment indicators were not taken into account while creating the cashless payments index. Recently, large and multi-dimensional datasets are frequently used by researchers in their work. Variables might also differ in magnitude and unit; for instance, there are several measuring units for cashless payments. Furthermore, there are variables with low volatility and variables with high volatility. These factors make it challenging to investigate these datasets. Researcher's needs strategies and approaches for shrinking the size of massive datasets without losing the original data's content and that also improve the interpretability of new variables. These factors make it challenging to investigate these datasets. Researcher's needs strategies and approaches for shrinking the size of massive datasets without losing the original data's content and that also improve the interpretability of new variables.

For inflation, we have used consumer price index in this study, TRD represents trade, HCI represents human capital index and GFCF represents gross fixed capital formation, and DCTP represents domestic credit to private sector as % of GDP. The variables of the above expression are specified in log form to obtain log-log econometric specification of our model for achieving the objectives of this study.

3.3.1 Econometric Specifications of Empirical Model

Three regression analyses are carried out to meet the underlying objectives of our study with the three different empirical models:

Empirical model 1 – to analyze the overall impact of cashless payments on economic growth in all selected countries.

$$LNGDP_{it} = \beta_0 + \beta_1 LNCP_{it} + \beta_2 LNCPI_{it} + \beta_3 LNTRD_{it} + \beta_4 LNHCI_{it} + \beta_5 LNGFCF_{it} + \beta_6 DCTP_{it} + \mu_{it} \quad (3.2)$$

Where GDP is the Gross Domestic Product measured as a natural log. The current literature primarily focuses on the real GDP growth rate to measure the impact of cashless transactions on economic growth, even though the Gross National Income is a better indicator of national welfare (Tan, Tang, and Devi, 2019). (Bolt et al, 2008; Tee and Ong, 2016; Zandi et al, 2013; Zandi et al, 2016). Thus, this study uses the logged GDP as an indication of the nation's economic growth in keeping with earlier research.

Next, CP refers to composite index comprised to represent the cashless payments. Furthermore, control variables includes LNCPI is the natural log of consumer of price index used as a proxy for inflation, GFCF is gross fixed capital formation, LNHCI is the natural log of human capital index, LNTRD is the natural log of trade and DCTP is domestic credit to private sector as percentage of GDP. By including the variables, the model may analyze the factors that influence a country's growth rate, such as trade, domestic loans to the private sector, human capital, gross fixed capital formation, and inflation are aligned with a few early studies conducted on related theme (Abbas and Mujahid and Mukhtar, 2001; Abdullah, 2013; Law, Azman Saini and Ibrahim, 2013; Law, Kutan and Naseem, 2018; Lau and Yip, 2019).

Empirical model 2 – to analyze the heterogeneous effects of developed and less developed countries. For each country group, the interaction terms are formed as indicated in the following expression (3.3) by introducing the interaction term of the country dummy and the cashless payment index in the model country dummy.

$$LNGDP_{it} = \beta_0 + \beta_1 LN\ CPI_{it} + \beta_2 LNHCI_{it} + \beta_3 LNTRD_{it} + \beta_4 GFCF_{it} + \beta_5 DCTP_{it} + \beta_6 LNCP_{it} * D1_{it} + \beta_7 LNCP_{it} * D2_{it} + \mu_{it} \quad (3.3)$$

In developed economies, the impact of cashless payment on economic growth is identified by the dummy variable interaction term $LNCP_{it} * D1_{it}$, while in less developed economies; the impact is analyzed by the dummy variable interaction term $LNCP_{it} * D2_{it}$. The rest of the variables are same as specified in our model (1).

Empirical model 3 – to analyze the variations in economic growth corresponding to each transitional phase of cashless payments. Therefore, to examine the heterogeneous effects of the four transitional phases we have introduced four dummy variable interaction terms of each stage rank and cashless payments index in the model. The rest of control variables are same i have taken in first empirical model. The econometric specification is reported in equation 3.4.

$$LNGDP_{it} = \beta_0 + \beta_1 LNCPI_{it} + \beta_2 LNTRD_{it} + \beta_3 LNHCI_{it} + \beta_4 GFCF_{it} + \beta_5 DCTP_{it} + \beta_6 LNCP_{it} * S_1 + \beta_7 LNCP_{it} * S2_{it} + \beta_8 LNCP_{it} * S3_{it} + \beta_9 LNCP_{it} * S4_{it} + \mu_{it} \quad (3.4)$$

Where,$LNCP_{it} * S1_{it}$, $LNCP_{it} * S2_{it}$, $LNCP_{it} * S3_{it}$, $LNCP_{it} * S4_{it}$ are dummy variable interaction term with cashless payment index with cashless payment index to identify the response of GDP corresponding to each transitional phase of cashlessness and the rest of control variables are same as we have specified in first empirical model 1. $LNCP_{it} * S1_{it}$, has been used

to explore the impact of cashless payments on economic growth in inception stage. $LNCP_{it} * S2_{it}$, has been employed to examine the impact of cashless payments on economic growth in transitioning stage of cashlessness. $LNCP_{it} * S3_{it}$, has been used to analyze the impact of cashless payments on economic growth in turning or tipping stages. $LNCP_{it} * S4_{it}$ has been used to analyze the effect of cashless payments on economic growth.

3.5 Estimation Technique

To deal with heterogeneity or individual effects that may or may not be identified, panel data models assess group (individuals-specific) effects, time effects, or both. There are two types of effects: random and fixed (Park, 2011). Through the estimations of the OLS method, the panel data shows the issue of heterogeneity in the data across time. Nonetheless, pooled OLS is frequently utilized as a foundational method for panel data analysis. When conducting data analysis with panel data, the outcomes of pooled OLS are contrasted with those of more complex models. For this reason, it is widely regarded by scholars as a suitable place to start when conducting analysis (Toska and Fetai, 2023). Thus, in our study, the parameter of equations 1, 2, and 3 is estimated using a pooled OLS model in the first step of estimation. Pooled OLS model with the assumption of no country- and time-specific effects. The pooled ols model applies Ordinary Least Square (OLS) methodology to panel data. This is appropriate to use when there is no correlation between unobserved individual-specific effect and observed independent variable and individual's effects are uncorrelated with each other. The pooled OLS model may lead less accurate and bias results if the assumptions are not meet. The assumption of homoscedasticity and no-autocorrelation is found to be violated in this study therefor we have proceeded to the choice between the use of fixed effect and random effect models.

All models are estimated using the Fixed Effect model in the second step of estimation. The individual-specific impact in the fixed effects model is a random variable that can have correlations with the explanatory factors and different individuals can be accommodated to different intercept. The Least Square Dummy Variable (LSDV) is a common name for this model. The fixed effect model applies the ordinary least square approach while being different from the common effect model. It is deemed less realistic to base modeling assumptions on the idea that each cross-section and time will give a constant intercept. Fixed Effects (FE) makes the assumption that variations in individual differences (cross section) can be accounted for by various intercepts. The dummy variable technique is used to estimate the Fixed Effects Model with varied intercepts amongst individuals.

The random effect model is used to estimate each model in the third step of estimation. This methodology makes estimates for panel data in which time and individual factors may be related interference variables. The error term in the random effect model accommodates the intercept. The removal of heteroscedasticity is a benefit of employing the Random Effect Model. The Error Component Model (ECM) and the Generalized Least Square (GLS) approach are other names for this model. The random effect model differs from the fixed effect and common effect models in principle, primarily because it does not apply the ordinary least squares principle.

The Hausman test has been conducted in the fourth estimating stage to choose between the Fixed Effect (FE) and Random Effect (RE) models in this study. The Hausman specification test establishes if the individual effects in the model have no correlation with any other explanatory variables. The random effect is no longer the best linear unbiased estimate (BLUE) and violates a Gauss Markove assumption if individual effects are associated with any other independent

variable then we should use fixed effect model. In this study the null hypothesis of random effect is not rejected therefore, random effect model is favored over fixed effect.

Lastly, the Bruesch-Pagan LM test has been employed to determine if the random effect model is appropriate or Pooled OLS model. The Bruesch-Pagan LM test yields results that the null hypothesis is rejected. So random effect model is appropriate rather than Pooled OLS model. Lastly, for all equations in our estimations, we employed the random effect model. The results of all carried out pre-testing and diagnostics are presented in table A.2, A.3 and A.4 of Appendix A at the end.

CHAPTER 4 RESULTS AND DISCUSSION

The estimation findings of our empirical models are presented in this chapter. We have chosen to use the usual criteria and tests that are available for selecting between the Pooled OLS, fixed effect, and random effect models because our estimation predominantly uses panel data settings. It is important to note that findings are explained in subsections based on research objectives. The first subsection is dedicated to the results of the first empirical model which we have used to analyze of the impact of cashless payments on economic growth (GDP). Second subsection represents the results of our second model which is based on second objective of this research that: compares the impact of cashless payment on economic growth in developed and less developed economies. The third subsection presents the results of third empirical model that we have used to analyze how economic growth varies corresponding to each transitional phase of cashless payments.

4.1 Descriptive Statistics

The following indicators are included in this study's descriptive statistics: The sum of the observations, the average, and the standard deviation. The variable's minimum and maximum values provide a summary of the study data. The mean is defined as the central point of a distribution; in other words, it is known as the tendency of data to cluster around a middle value while a standard deviation is a measurement of how dispersed is the data around the mean. While data with a great or large standard deviation are widely spread, those with a low or small standard deviation are closely stationed around the mean. Consequently, a standard deviation of almost zero indicates that the data points are relatively near to the mean; a larger standard deviation suggests that the data points are distributed farther from the mean.

Table 4.1: Descriptive Statistic

Variable	N	Mean	Std.Dev	Minimum	Miximum
LNGDP	454	26.267	3.001	10.817	30.506
LNCP	446	16.601	9.905	2.833	50.335
LNCPI	445	6.708	9.084	4.602	70.834
LNHCI	380	1.069	0.223	0.039	1.4750
LNTRD	456	12.71	1.411	9.132	15.709
GFCF	454	2.419	0.617	1.189	5.495
DCTP	416	9.107	4.479	1.125	25.466

Table 4.1 shows the results of descriptive statistics of variables used in our study. The first variable presented in Table 4.1 is logged GDP in million dollars, which is our dependent variable in all three empirical models. The minimum value of this variable is 10.817 and maximum value is 30.506. The average value of logged GDP in millions of dollars is 26.67%.

The second value of the variable chain in table 4.1 is the logged value of cashless payments we have constructed as a composite index. The minimum score is 2.83 implying the minimum level of cashlessness and the maximum score is 50.33 implying maximum level of cashlessness. The mean and standard deviation for this variable are 16.601% and 9.9 respectively.

The third variable represents the logged value of the consumer price index (2010=100) which is used as a proxy for inflation. The consumer price index has an average value of 6.708. 4.602 is the least value and 70.834 is the maximum value. With a standard deviation of 9.084%, it is evident that there were differences in the consumer price index amongst the study nations between 2010 and 2021.

The fourth variable presents logged value of Human capital index per individual, determined by returns to education and years of education. The human capital index has an average value of

1.069, a minimum value of 0.039, and the maximum value of 1.4750. It has a 0.223 standard deviation.

The total of all imports and exports is displayed as the fifth variable, which is the logged value of trade. Trade has a logarithmic average of 12.71%. Trade's estimated standard deviation of 1.14 indicates that it is highly variable. It is located somewhere between 9.132 and 15.709.

Fifth, gross fixed capital formation (GFCF), which represents an average of 2.419% of GDP, is variable. The gross fixed capital formation (GFCF) standard deviation is 0.617%, indicating that the GFCF is neither uniformly distributed nor dissimilar among nations. Gross fixed capital formation falls between 1.189 and 5.495.

Domestic credit to the private sector (DCTP), which averaged 9.107% of GDP, is the sixth variable. The gross fixed capital creation standard deviation is 4.479%, indicating that the DCTP varies throughout nations. Domestic credit to the private sector falls between 1.125 and 25.466.

4.2 Panel Regression Results

4.2.1 Impact of Cashless Payments on Economic Growth (Overall Sample Results)

The following discussion presents an interpretation of estimation results of random effect regression model of our empirical model 1.

Table 4.2: Estimation Results (Empirical Model 1)

Random Effect Panel Data Model Dependent variable: LN GDP				
Independent/ Control Variable	Coefficient	Standard Error	t-statistics	P-value
C	24.001	0.607	39.48	0.000
$LNCP_{it}$ (Index)	0.014	0.002	5.03	0.000
$LNCPI_{it}$ (Index)	-0.203	0.006	-3.07	0.002
$LNHCI_{it}$ (Index)	0.509	0.202	2.51	0.012
$LNTRD_{it}$ (US$)	0.115	0.027	4.23	0.000
GFCF(% of GDP)	0.092	0.021	4.38	0.000
DCTP(% of GDP)	-0.009	0.004	-2.32	0.020
Porb>F =0.000				
R-squared = 0.058				
Number of Observations= 369				

The findings of our first empirical model, which tries to investigate the effect of cashless payments on the economic growth of particular nations in our sample, are shown in Table 4.2. The findings indicate that the likelihood of the F-Statistic is 0.0000, which is smaller than the p-value of 0.05. This demonstrates that, at the five percent significance level, the regression model is statistically significant. The aforementioned statistically significant finding, according to Davidson and McKinnon (1999:48), indicates that the regression model is accurate and does not occur randomly. All independent variables of our model have been found significant in terms of their impact on economic growth. A positive association has been found between (cashless payments, consumer price index, human capital, trade, and gross fixed capital formation) and

GDP while a negative association is witnessed between (inflation and domestic credit to the private sector) and GDP. In the subsequent section, we have presented detailed interpretation and discussion for each independent variable separately.

i. Cashless Payments

Cashless payment is the key variable in our model. A cashless payment has a coefficient of 0.014, according to the regression results, which is likewise statistically significant at the 5% significance level. This suggests that in both developed and developing economies, a 1% rise in cashless payments corresponds to a 0.014 percent increase in GDP. Therefore, results show positive and significant relationship between cashless payments and economic growth. These findings are consistent with the "Diffusion of Innovation" concept. The theory posits that interpersonal networks perform a crucial role in the adoption of new approaches, ideas and innovations through individual contact. Diffusion in this sense refers to the high usage of cashless payment, as businesses look for new revenue streams and consumers look for more convenient and better transactions.

The result of our key variable is also in compliance with many empirical studies conducted on the similar or related themes. According to an empirical study by Lau et al. (2020), cashless payments increase GDP in OECD nations in a way that is both statistically significant and beneficial. Furthermore, the outcome is consistent with research conducted by Hasan et al. (2012), Zandi et al. (2013), and Zandi et al. (2016), which found that debit card payments promote economic activity and, as a result, accelerate economic growth. Debit cards actually give customers instant access to money, which facilitates private expenditure and supports economic growth.

Moreover, researchers including (Hasan et al. 2012; Oyewole et al. 2013; Zandi et al. 2013) have discovered a positive correlation between cashless payments and economic growth. The study conducted by Slozko and Pelo (2014) also demonstrates a positive correlation between e-payments and economic expansion. They come to the conclusion that the degree of economic progress is directly correlated with the prevalence of cashless payments. Overall, our findings support the idea that cashless transactions can significantly influence a nation's economic expansion. In particular, this work adds to the corpus of existing knowledge on the topic.

ii. Inflation

Inflation is the second independent variable among the chain of regressors in our analysis. The estimated coefficient of consumer price index which is used as proxy for inflation in this study carries the expected negative sign and is statistically significant. Our results corresponding to this variable suggest that a 1% increase in inflation results in 0.20 percent decrease in economic growth (GDP) in developed and less developed economies. This result is also in line with the theoretical propositions available in literature. Theory offers manifold explanations for the potentially negative impact of inflation upon economic growth. Increased price fluctuation is frequently associated with high inflation, raising doubts about the long-term viability of investment initiatives. This leads to more cautious investment decisions than would otherwise occur. It will ultimately lead to a decline in investment and a slower the rate of economic growth. Since inflation can make exports relatively more expensive, it can also have an effect on an economy's balance of payments in an open economy.

Ahmed and Mortaza, (2010) conduct a research on exploring relationship between economic development and inflation in Bangladesh. Employing Co-integration and error correlation model

to examine empirical data, the research reveals statistically significant negative association between the nation's economic growth and inflation. Saad and Uddin (2021) examine the effects of inflation, FDI, money supply, financial development, unemployment, and population growth on Pakistan's economic growth between 1980 and 2019.

(iii) Human Capital

In the economic literature, human capital is examined as a crucial factor determining economic growth by enhancing labor productivity. By looking at the results of our model it is confirmed that our results are not different than what the theory propagates. The value of the parameter estimate of the human capital index (HCI) has a positive sign as expected and has a statistically significant effect on GDP. A 1% increase in human capital will lead to 0.50% improvement in economic growth. This shows that every increase in the human capital that occurs in developed and less developed countries will have an impact on an increase in economic growth and vice versa.

Human capital raises physical capital's marginal product, encouraging additional physical capital accumulation that boosts output and spurs economic expansion. A number of theoretical and empirical studies, including those by Nelson & Phelps (1966), Lucas (1988), Rebelo (1992), Becker, Murphy, & Tamura (1 990), Mulligan & Sala-i-Martin (1 992), and Barro (1 992), have suggested that human capital plays a significant role in economic growth and, consequently, in the economic development of nations. These studies discuss two ways that investing in education can contribute to growth. The first is that the accumulation of human capital can directly influence output growth by acting as a productive component in production (Solow, 1956; Lucas, 1988).

(iv) Trade

Trade is a major factor in influencing economic growth. The estimated coefficient carries a positive and it is found to be statistically significant. The result indicates that trade positively impacts economic growth during the study periods. A 1 percent increase in trade expansion in developed and less developed has been found to enhance GDP growth enhance by 0.115 per cent in the selected countries included in our sample.

These findings are consistent with Solow's theory, which holds that the economy meets to a balanced growth path where the pace of technological advancement determines the growth rate of output per capita. According to this notion, overseas commerce is crucial for supporting economic growth. Through trade, a nation can maximize its comparative advantage and use the gains from trade to raise its GDP level by importing foreign technology and skills, which increases the efficacy and effectiveness of domestic labour and capital (Gunter et al., 2005).

Our results are supported by a large body of empirical research on how the trade variables respond to economic growth. The long-term relationship between South Africa's economic success and overseas trade is examined by Ogbokor and Meyer (2017). Their findings demonstrate cointegration relationships between the variables under investigation. Furthermore, the study reports that an export has a greater impact on economic performance as compared to exchange rate and degree of economic openness. The authors came to the conclusion that one of the main drivers of South Africa's economic growth will continue to be external trade.

(iv) Gross Fixed Capital Formation

Investment has always been discussed among the important determinants of growth. Our study has also attempted to fortify or validate its significance. Gross fixed capital formation has been utilized to approximate role of investment in our empirical model. Our results confirm the theoretically proposed relationship between investment and economic growth. A 1 % increment in Gross Fixed Capital Formation leads to 0.092 % increase in GDP in all selected countries.

Theoretically, an economy's gross fixed capital formation promotes technical advancement, which in turn fosters the benefits of large-scale production and boosts the level of economic specialization. Furthermore, income levels rise and individuals are able to meet their demands when capital production leads to the right use of natural resources and the establishment of varied enterprises. Therefore, encourages citizens' financial well-being and serves as a gauge of economic growth. Numerous empirical researches attest the substantial and positive correlation between GDP and investment. Topalova (2016) discovers that public investment has a large, positive, short- and long-term impact on output for advanced economies. Furceri and Li (2017) discover that public investment casts a favorable short- and medium-term impact on output for developing nations with low incomes. Sturm, Jacobs, and Groote (1999), in contrast, discovered no long-term impacts from public investment.

(v) Domestic Credit to Private Sector

One key indicator of an economy's financial development and growth is its domestic credit. The findings of our parameter estimations show that the GDP and domestic credit to the private sector are negatively correlated. The findings show that a 1% increase in domestic credit to the private sector causes the GDP to fall by 0.009%. This indicates that the GDP growth of the

studied nations is marginally reduced by a rise in the domestic credit to the private sector variable (DCTP).

According to theory, there are a few ways that finance, or credit, influences economic expansion. The association between finance and economic growth is examined from a monetarist perspective by Hagman., (2014)., who argued that changes in the monetary policy rate have an effect on growth because they alter the amount of credit available, which in turn affects aggregate demand in the economy and influences the amount of investment and production, which in turn affects economic output and growth. The theory of finance and growth is another hypothesis that suggests a pathway by which credit or finance influences economic growth.

There is healthy evidence available in the empirical literature through which we can justify the negative association between GDP and DCTP found in our results. The impacts of atypical credit fluctuations on the GDP per capita of ten Economic Community of West African States (ECOWAS) are examined by Ozili et al. (2022). The study comes up with there is an evidence that abnormal credit contraction and expansion lowers the GDP per capita of ECOWAS countries. This suggests that excessive levels of credit expansion to any segment of economy can prove to be detrimental foe economic growth. Wushibba Bako's study from 2023 also shows that the use of domestic borrowing in the economy lowers output growth Levine (2005) also highlights that the short-term credit boom and the long-term negative effects could result from the excessive expansion and wasteful usage of domestic credit. In a similar strand of literature, a study by Pagano and Pica (2012) comes up with a conclusion that the excessive increase in domestic credit would not have a favourable impact on economic growth with regard to the OECD countries between 1970 and 2003. In a similar study pirit, Cournède and Denk (2015) reports a negative correlation between domestic lending and economic development within the

sample the OECD and G20 countries. Actually, the current global financial crisis is a prime illustration of how waste of home resources results from an excessive expansion and inefficient use of domestic credit, which in turn hinders economic progress. According to Toan Ngoc Bui (2019), increased domestic credit will accelerate economic growth. On the contrary, domestic credit that exceeds the ideal level becomes abundant and eventually has a harmful impact on economic growth and consequently or a conversely, slows down economic growth.

4.2.3 Impact of Cashless Payments (Comparison between Developed and Less Developed Countries)

Table 4.3: Estimation Results (Empirical Model 2)

Random Effect Panel Data Model Dependent Variable = LNGDP				
Independent/ Control Variable	Coefficient	Standard Error	t-statistics	P-value
C	23.88	0.611	39.05	0.000
CP*D_1(Developed)	0.348	0.197	1.77	0.077
CP*D_2 (Developing)	0.140	0.290	4.85	0.000
$LNCPI_{it}$ (Index)	-0.019	0.006	-2.99	0.003
$LNHCI_{it}$ (Index)	0.485	0.204	2.37	0.018
$LNTRD_{it}$ (US$)	0.116	0.027	4.27	0.000
$GFCF_{it}$ (% of GDP)	0.916	0.021	4.34	0.000
$DCTP_{it}$(% of GDP)	-0.009	0.611	-2.32	0.021
Porb>F =0.000				
R-squared = 0.028				
No. of observations=369				

Table 4.3 reports the results of random effect regression for the second empirical model of our study that aims at capturing the differential impact of cashless payments between developed and less developed countries. The fixed effect model is finalized after running the diagnostics including the F-test and hasuman test. The results of these diagnostics are reported in the Appendix. Results reported in table 4.3 are distinguished from those presented in table 4.2 based

on the inclusion of two interactive dummies ($CP*D_1$) for developed and ($CP*D_2$) for less developed countries. The rest of control variables are same in our empirical model 2, as we have taken in our first model. The results show that F-Statistic has a probability of 0.0000 which is less than the p-value (0.05) this shows that the regression model is statistically significant at a 5 percent level of significance. The rest of control variables are same in our empirical model 2, as we have taken in our first model. At the 5% significance level, the F-Statistic probability of 0.0000, which is less than the p-value of 0.05, indicates that the regression model is statistically significant, according to the data. All independent variables of our model have been found significant in terms of their impact on economic growth. Positive association has been found between (cashless payments, human capital, trade, and gross fixed capital formation) and GDP. On the other hand, there is a negative association observed between economic growth and both domestic credit to the private sector and inflation. We will subsequently focus on detailed discussion corresponding to regression coefficient against each independent variable of our empirical model 2.

i. Like the first model, cashlessness is considered as a key variable for our empirical model 2 as well. However, model 2 has been designed to identify and capture the differentiated effect of cashlessness between developed and developing nations. Table 4.3 shows that cashlessness is positively related with economic growth in both developed and developing countries as evident from the positive signs of coefficients corresponding to both interactive dummies included in the model. The regression analysis for the connection between the expansion of economies in developed and developing nations and cashless payments. Cashless transactions, as predicted, boost economic growth. It is discovered that cashless payments and GDP have a positive correlation. In developed nations, a 1% rise in cashless payments

over the research period results in a 0.348 % boost in economic growth; in less developed economies, the response is 0.14%. This finding is in line with the empirical findings of Zandi et al. (2016) and Aldaas (2020), which show that developed countries benefit more from cashless payments in terms of economic development than do developing countries. Since numerous researches indicate that different regions and countries embrace cashless technology differently, developed economies have had a greater benefit from cashless payment on economic growth than less developed economies. Compared to underdeveloped countries, more developed nations have demonstrated a higher acceptance and implementation rate (Ligon et al., 2019). Developed nations have established technology and legal infrastructure, whereas developing nations are not as aware of many potential problems. The first is the legal infrastructure, which may require additional financial and time investments that may be challenging to get.

ii. The second independent variable in our analysis's chain of regressors in this model is inflation. Our results line up with this indicator, which suggests that during the research periods, a 1% increase in inflation causes 0.019% of GDP to grow in both developed and developing nations. It demonstrates that the relationship between GDP growth and inflation is negative and significant. The outcome is in compliance with previous research by Saeed (2007), which found a negative relationship between inflation and economic growth and asserted that maintaining price stability is a strategy for boosting growth. Bittencourt (2011) investigates the degree to which inflation explains variations in GDP growth rates. The study's conclusions demonstrated that inflation has a negative effect on the region's economic growth. In another empirical study, Chowdhury (2002) shows that price stability has no bearing on economic growth in emerging nations such as Indonesia.

iii. Moreover, the findings of this study's second model support the theoretical hypothesis regarding the relationship between economic growth and human capital. According to our study results, the human capital index has a statistically significant positive correlation with economic growth at the 5% level of significance. A 1% increase in human capital results in 0.485 % increases in GDP. This outcome is in alignment with other research that found human capital has the ability to grow an economy, including studies by Bundell (1999), Griliches (1997), Jenkins (1995), Englander and Gurney (1999), and Bundell et al. (1999). By enhancing productivity, participation rates, social well-being, equality, and innovation, a rise in human capital fosters economic growth. Since trade is predicted to have a statistically significant and positive effect on economic growth.

iv. A 1% increase in trade encourages both developed and developing economies to grow by 0.116%. These findings are consistent with the studies of Emery (1967), Voivodas (1973), Krueger (1978), Ballassa (1978), Tyler (1981), Salvatore (1983), and Ram (1985), Das and Paul (2011), Ogbokor and Meyer (2017), Kabuga and Ismail (2018), which discovered that trade makes it possible to allocate resources more effectively and to advance contemporary discoveries and practices that lead to increased productivity and economic growth (Kumar et al., 2023

v. Likewise, The estimated coefficient capture a positive sign and is found to be statistically significant which shows that 1% rise in Gross Fixed Capital Formation enrich the economic growth by 0.091% in developed and less developed economies. This outcome is consistent with research by Keho (2017) and Doan (2019), which proposed that an increase in the

physical capital stock boosts the economy's total productive capacity and enables the production of more goods and services using the same quantity of workers.

vi. The result of domestic credit to private sector (DCTP) is statistically significant but negatively associated with economic growth. Our results indicates that a 1% increase in domestic credit to private sector DCTP will leads to 0.009% decrease in economic growth (GDP) in developed and developing economies. This result is similar to the one found by Levine (2005), Pagano and Pica (2012) came to the conclusion that the excessive increase in domestic credit would not have a favorable effect on economic growth with regard to the OECD countries between 1970 and 2003.

4.2.4 Impact of Cashless Payments (Classification of Transitional Phases)

Table 4.4 : Estimation Results (Empirical Model 3)

Random Effect Panel Data Model Dependent variable = LNGDP				
Independent/ Control Variable	Coefficient	Standard Error	t-statistics	P-value
C	23.99	0.615	39.02	0.000
CP*S_1(Inception)	0.022	0.187	-0.12	0.905
CP*S_2(Transitioning)	0.106	0.022	4.72	0.000
CP*S_3(Tipping)	0.129	0.405	3.20	0.001
CP*S_4(Advance)	0.189	0.009	1.97	0.049
$LNCPI_{it}$(Index)	-0.163	0.006	-2.44	0.015
$LNHCI_{it}$(Index)	0.530	0.202	2.62	0.009
$LNTRD_{it}$(US$)	0.106	0.027	3.94	0.000
$GFCF_{it}$ (% of GDP)	0.098	0.020	4.96	0.000
$DCTP_{it}$(% of GDP)	-0.008	0.004	-2.06	0.039
Porb>F =0.000				
R-squared = 0.0105				
No. of observations=369				

Table 4.3 reports the results of random effect regression for the third empirical model of our study, where we are conducting a deeper analysis for the impacts of cashless payments by breaking down the countries into four transitional phases which occur during transition from

cash to cashless payments. The random effect model is finalized after running the diagnostics including the hasuman test and Bruesch pagan LM tests. The results of these diagnostics are reported in the Appendix. Results reported in table 4.4 are distinguished from those presented in table 4.2 and 4.3 based on the inclusion of four interactive dummies ($CP*S_1$) for first stage (inception), ($CP*S_2$) for second stage (transitioning), ($CP*S_3$) for third stage and ($CP*S_4$) for fourth stage (advance). The rest of control variables are same in our empirical model 3, as we have taken in our first two models. The results reveal that the probability of F-Statistic is 0.0000, which is less than the p-value (0.05), indicating that the regression model is statistically significant at the 5% level of significance.

i. The first interaction term describes the effects of a cashless payment system at its start. The results demonstrate a negative and minor influence on economic growth, with a 1% increase in cashless payments resulting in a 0.022% increase in economic growth due to the lower utilization of cashless payment instruments at this stage. The second interaction term reveals the effects on the transitional stage. The findings demonstrate that the cashless payment index has a favorable and considerable impact on economic growth. A 1% increment in cashless payment led to 0.106 % increase in economic growth. Compared to the first stages of cashless payments, this stage is more advantageous to the economic growth of developed and developing economies because the government of the country is starting to recognize the growing trend of new cashless solutions and may be introducing new regulations to regulate and steer the market. Additionally, the authority is formulating plans for when and how to regulate cashless systems in the future. In the same way, the third interaction term is employed to examine how cashless transactions affect economic growth for tipping or turning points. The third interaction term's estimated coefficient demonstrates a positive and

significant influence on economic growth. A 1% increase in cashless payments will result in 0.129 percent increase in economic growth. Fourth, interaction term is used to estimate impact of cashless payments on economic growth for advanced stage. The coefficient of cashless payment index shows positive and significant impact on economic growth. A 1% increase in cashless payments will leads to 0.189 % increase in GDP growth. It is found that reaction of economic growth against advance stage of cashless payments is relatively higher as compared to it is find to inception, transitioning and turning stage. The results indicate that as countries move towards cashless payment system, it will be more beneficial for the economic growth of developed and less developed economies.

ii. The findings show that there is a statistically significant and negative association between economic growth (GDP) and inflation. A 1% rise in inflation will result in a 0.016% reduction in economic growth (GDP). The results are aligning with previous studies Smyth (1995) found that Germany's economic growth slows to 0.025% when inflation reaches 10%.

iii. According to the results of our third model, GDP growth rates climb by 0.53% for every 1% increase in human capital. Oketch (2006) examined the role that human capital had in the economic growth of 47 African countries. . The findings demonstrated that the two most significant factors influencing economic growth in African nations are human and physical capital, both of which are crucial to the overall economic growth and development of the continent.

iv. Furthermore, results scrutinizes that a 1% increase in trade will provide a 0.106 % increase in economic growth (GDP). The results are consistent with the studies conducted by Malefane and Odhiambo (2018) who investigated the dynamic effects of trade openness on South Africa's economic growth. Their long-term empirical findings demonstrated that trade

openness significantly and favorably impacted economic growth. Additional studies using panel data include those by Moyo and Khobai (2018), Chang and Mendy (2012), Dava (2012), Zahonogo (2017), and Tinta et al. (2018). A study conducted by Keho (2017) and Doan (2019) discover that an increase in the physical capital stock boosts the economy's total productivity and makes it possible to create more goods and services with the same amount of labour.

v. Additionally, analysis of the data shows that a 1% increase in GFCF will result in a 0.098 % increase in GDP. This result is consistent with study by Rahman et al., (2019) where they conclude that GFCF has a significant impact on GDP. The logic may be that economies have ability to save and spend more on investment out of the given total income, which further to increase output, income export, employment opportunity and promote economic welfare.

vi. Moreover, the results of random effect model indicate that 1% increase in the domestic credit to private sector (DCTP) results in a 0.007% loss in economic growth (GDP). These findings are consistent with previous studies such as a study conducted by Mohammed (2008) used (ARDL) to estimate the short- and long-term relationships between financial development and economic growth in Sudan. He concludes that the contribution of bank credit to the private sector's real GDP is negligible and unfavourable. Toan Ngoc Bui (2019)., demonstrated that increased domestic credit will accelerate economic growth. Conversly, domestic credit that exceeds the ideal level becomes abundant and ultimately has a negative impact on economic growth, or on the other hand, slows down economic growth. Aziz et al., (2019) study estimates the effect of bank-provided private loans on Bangladesh's economic growth. They discovered that short-term economic growth is adversely affected by private sector credit. The regression analysis's overall outcome often agrees with the research's

hypotheses. As was already noted, there is a strong relationship between GDP growth and cashless payments.

CHAPTER 5 CONCLUSION AND POLICY IMPLICATIONS

5.1 Conclusion

The purpose of this study is to address cashless payments from a broader perspective in relation to economic growth in developed and developing nations. By taking into account both developed and less developed countries transformation to cashless methods of payment alters a number of aspects. Therefore, our research tries to capture the concept of cashless payments using multiple indicators including account ownership, account usage, access point, etc. This makes it possible to look harder at the subject.

Furthermore, we formed the transitional score ranking on percentile basis to report for more extensive picture on the transformation among countries. This research has the capacity to offer novel insights on the effects of cashless payments on economic growth in developed and developing nations by utilizing new evidence, which has rarely been examined by earlier studies. Furthermore, this research used a composite index of cashless payments rather than the separate indicators of cashless payments used in earlier studies to examine the effect of cashless payments on economic growth. In addition, this study's sampling period is later than that of previous studies, offering the most recent findings in this field of study, which differ from earlier findings due to shifting consumer payment patterns and technological advancements throughout time. The empirical findings of this study show that, in both developed and developing nations, cashless payment and economic growth are positively and significantly correlated. Second, the data also show that developed countries that have a well-established payment network and easy card usage get benefit more from cashless payments in terms of economic growth than do less developed ones. The high cost of financial services in less developed economies could potentially be the cause of this. Thirdly, the study comes to the conclusion that economic growth relation with

cashlessness has been found to be heterogeneous corresponding to different stages of cashlessness.

5.2 Implications and Recommendations

The study's conclusions have the following implications. Economic growth is proven to have a substantial and favorable relationship with cashless payments. This outcome suggests that the initiatives are required, particularly in this day and age that is quickly adjusting to the advancement of information technology. Thus, a workable and successful policy requires continuing to promoting the adoption of cashless payments. This could be achieved through various measures such as improving infrastructure of cashless payments, enhancing financial literacy and awareness and providing support to businesses. However, the findings also suggest that developed countries benefit more from cashless payments in terms of economic growth than do developing nations; therefore it is suggestive for the policy makers of less developed countries to reform institutional structures that can support non-cash payments. Furthermore, Countries around the world are considering move cashless payments in various forms. Our study provides valuable inputs to policymakers: a move towards cashless payment system affects economic outcomes in a positive manner. Therefore, the impact of cashless payments goes beyond a simple change in the means of payment. It alleviates economic frictions that can benefit marginal agents of the economy in a meaningful way.

5.3 Limitation and Future Research

The study's limitations could have an impact on how accurate the findings are. Only statistics from 2010 to 2021 are currently accessible, which is a pretty limited time frame. The estimation's precision could be weakened by the brief sampling duration. Furthermore, because of data

limitations, this research only examines three categories of cashless payment systems. However, there are a ton of more cashless payment options, including charge cards, direct debits, internet banking, pre-paid cards, etc. The accuracy and resilience of the effects of cashless payments on economic growth will rise with the addition of more cashless means of payment. Future studies can examine how cashless transactions affect each of the factors that determine GDP (consumer consumption, private investment, and government spending). This offers a clearer linkage and understanding of the effects of cashless payments as they look at how they first influence GDP determinants and then impact GDP through the cashless payment transmission channels as noted in the literature study.

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Appendix A

Table A.1: Transformation Stages Score Ranking

Country	Score	Ranks
Australia	108675397.04	3
Austria	108657148.99	3
Brazil	2369115939.62	4
Bulgaria	136554024.30	3
Costa Rica	74151147.93	3
Czechia	201777445.01	3
Dominican	68314607.02	2
Estonia	33208493.47	2
Germany	1009532.07	2
Greece	66045.94	1
India	17704208039.76	4
Ireland	48776.74	1
Italy	394358806.31	3
Jamicia	32547.38	1
Japan	9550278377.13	4
Korea	2863444056.95	4
Kuwait	30890897875.71	4
Latvia	61707644603.49	4
Mexico	1087855236.07	4
Netherlands	47860.28	1
Norway	52002.25	1
Portugal	65702.23	1
Saudi Arabia	320687765.68	3
Singapore	71334.04	2
Spain	937921291.37	3
Sweden	324142.49	2
Thailand	1074301012.04	4
Turkey	2270535341.95	4
Belgium	78387.94	2
Finland	136666.22	2
Malta	43889.28	1
Malaysia	54106.98	1
China	58905689.70	2
Indonesia	2766404272.97	4

Argentina	628685289.50	3[1]
France	1146613.33	2
Poland	27337.74	1
Cyprus	14020.27	1

Table A.2: F-test

F-test			
H_0= equal variances across all entities H_1= not equal variances across all entities			
	P-value	P-value	P-value
	Empirical Model 1	Empirical Model 2	Empirical Model 3
Prob > F	0.000	0.000	0.000

Table A.3 : Hausman Test

Hausman test			
H_0 = Random Effect Model H_1 = Fixed Effect Model			
	P-value	P-value	P-value
	Empirical Model 1	Empirical Model 2	Empirical Model 3
Cross-section random	0.1627	0.0721	0.2013

Table A.4 : Breusch-Pagan LM test

Breusch-Pagan LM test			
H_0 = Homogeneity (Pooled OLS) H_1 = Heterogeneity (Random Effect Model)			
	P-value	P-value	P-value
	EmpiricalModel 1	Empirical Model 2	Empirical Model 3
Prob > chibar2	0.000	0.000	0.000

[1] We have appraised the classification of countries according to a specified stage of cashlessness from a study by Thomas (2013), where he introduced the criteria or indicators for the classification of economies. However, in this study we have used percentiles to assigen ranks to each stage of cashlesness. we assigned rank 4 for advance stage , 3 for turning or tipping stage, 2 for transitioning stage and 1 for inception stage.

Table A.5: Correlation Matrix

	LNGDP	LNCP	LNCPI	LNHCI	Trade	GFCF	DCTP
LNGDP	1						
LNCP	0.128	1					
LNCPI	0.109	0.213	1				
LNHCI	-0.166	0.474	-0.184	1			
Trade	0.447	0.339	0.056	0.023	1		
GFCF	-0.041	0.289	0.049	-0.031	0.074	1	
DCTP	-0.180	-0.062	-0.153	0.327	-0.044	-0.043	1

Table A.6: Wooldridge Test

Wooldridge Test	
H_0 =no auto-correlation H_1 = auto-correlation	
P-Value	0.969

Table A.7: Granger-Causality Test

Granger-casuility Test	
H_0 =LNGDP does not Granger-cause CP H_1 = LNGDP does Granger-cause CP	
Prob > F	0.102