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**COVID-19, DIGITAL TRANSACTIONS,
AND ECONOMIC ACTIVITIES:
PUZZLING NEXUS OF WEALTH
ENHANCEMENT, TRADE, AND
FINANCIAL TECHNOLOGY**

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Abstract

This study examines the role and effectiveness of the several modes of financial inclusion and technology for uninterrupted economic and business activities during the COVID-19 pandemic. The study is based on empirical analysis through statistical estimation of four mathematical equations. The Cross-sectional Random-Effects Model in panel least squares (PLS) technique based on four years' data on 102 countries was applied to identify the determinants of GDP growth, shareholders' wealth, and trade in goods and services. The impacts of the use of credit cards, use of the internet for shopping and payment of utility bills, and electronic transfer of funds on GDP growth, trade in goods and services, and shareholders' wealth have been tested. It is envisaged that COVID-19 has adversely affected GDP growth, but the use of financial technology for buying goods and services, and receiving money through digital modes during the pandemic crisis, may set off economic losses to some extent. The empirical evidences show that a higher share of the population receiving payments by digital modes and use of the internet for paying bills or buying something online are significant and robust determinants of trade in goods and services. Similarly, the use of the internet for buying things and for paying utility bills is a significant positive determinant of GDP growth. The results have also been estimated for 35 Asian countries separately and it was found that the COVID-19 pandemic and the use of fintech have affected these Asian countries in a similar way. These conclusions support the promotion of e-money and digital transactions in the economy. Although the role of the provision of domestic credit to the private sector is not significant in the determination of trade in services, it is a highly significant determinant of the value of investors' wealth and merchandizing trade. The positive association of trade in services with the magnitude of merchandizing trade indicates that policymakers must consider the interconnectivity of these two types of trade. Another important finding of this study from the policy formulation point of view is the significant role of financial technology in GDP growth. A significant association between GDP growth and the number of deaths due to COVID-19 was also observed.

Keywords: digital payments, payments through the internet, debit/credit card, market capitalization, trade in services, panel least squares

JEL Classification: E51, F34, G10, O33

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1. COVID-19, ECONOMIC ACTIVITIES, AND DIGITAL PAYMENTS

The countermeasures in the state of emergency due to the coronavirus pandemic have restricted the mobility of people, economic activities, entertainment opportunities, and trade in goods and services. The negative and slow growth in the global economy is a natural consequence of such countermeasures and restrictions. Most of the negative growth in the global economy has been transmitted through restrictions and blockages in the trade of goods and services. Educational activities, tourism, traveling, entertainment, hoteling, dining in public restaurants, and transportation are included in those services that have been damaged badly because of the coronavirus pandemic. This shows that trade in services has been a badly affected area due to countermeasures and restrictions during the pandemic crisis. It is worth noting that the share of trade in services was 13.6% of global GDP in 2019, which dropped to 10.8 in 2020 (World Bank 2021). This indicates the impact of the coronavirus pandemic on global trade in services.

According to one estimate (University of Cambridge 2020), the global economy faces a GDP loss over the next five years due to the coronavirus pandemic ranging from an optimistic loss of \$3.3 trillion (0.65% of five-year GDP) under a rapid recovery scenario to \$82.4 trillion (16.3%) in an economic depression scenario. According to the mid-range consensus of economists in the study (University of Cambridge 2020), the global GDP may drop by \$26.8 trillion or 5.3% of five-year GDP. The economic growth and priorities in development planning in developed and developing countries have been affected by the spread of coronavirus (COVID-19) and the countermeasures adopted by the governments under the state of emergency in different ways. It is mainly the disruption in supply chains, the stoppage of business activities, the interruption to traveling and transportation, and the drop in global demand for commodities and services that have steered the economic contractions across the world. However, the different types of businesses are affected by the pandemic in different ways, with a surge of more than 25 billion dollars being recorded in the wealth of the top 100 companies (Mehar 2021). The *Financial Times* (2020) has classified e-commerce, cloud computing, pharmaceuticals, and gaming as the winning sectors.

This uncertainty or declining trend of GDP can also affect the value of financial assets, particularly the value of equities of the companies listed on stock exchanges. The value of equities indicates the wealth of investors, which is an indicator of the investment and business activities in the economies. The investors' wealth, trade, and GDP growth are mutually dependent areas and their linkages determine the trends of economic progress. How the linkages of shareholders' wealth, GDP growth, and trade activities have been affected due to the coronavirus pandemic is the core area of this study.

The measures to counter the spread of COVID-19, including lockdowns, the suspension of educational and entertainment activities, the temporary ban on public transport, the suspension of flights and airport operations, and the enforcement of social distancing, have accelerated the use of electronic payments, online buying, and the use of social media for normal business activities. Several strategies for enhancing the use of digital technologies have been attempted during the COVID-19 crisis. The objective of those attempts was to mitigate the adverse effects of the crisis and to provide alternative ways of continuing economic activities during the crisis. Digital technology was rapidly adopted by the public for transferring remittances when remitting cash become a difficult option due to numerous pandemic-related restrictions. The central banks in different countries have encouraged digital payments and mobile

money transfers by waiving transaction fees and charges on digital payments. Though it is a common opinion that COVID-19 is a temporary crisis and, like other pandemics, it will become history, the countermeasures will initiate a new era in the use of digital technology. The countermeasures will change business processes and customers' habits. According to a survey carried out by McKinsey & Company (2020), 75% of people who used digital modes of payment for the first time during the pandemic crisis have indicated that they will continue to use these modes even after things have returned to normal. According to the World Trade Organization (2020), online e-commerce platforms have registered significant growth since the start of the pandemic. A rapid growth in the businesses of e-commerce companies has been reported. Amazon announced revenues of USD75 billion in the first three months of 2020, MercadoLibre reported more than a 70% increase in net revenue in the first quarter of 2020, and Alibaba reported a 22% growth in sales in the first three months of 2020. All these indicators predict that a speedy shift to electronic payments and e-commerce is likely.

Organizations and enterprises in developed and developing countries have invested in digital transformation to enable their business activities to continue successfully. Educational institutions, banks, and financial services providers, home delivery of foods, groceries, clothes, and medicines, and other such services are among those businesses where heavy capital has been invested in digital transformation. Their workers, consumers, and clients have also learned to use collaborative software and participate in virtual meetings. The flourishing of informational technology and its peripheral businesses due to the pandemic crisis is quite obvious.

Here, it is notable that maximization of shareholders' wealth is the ultimate objective of the changes in business and economic policies and processes. In this context, it is notable that the increasing share of capital gain in the total return on investment, risk-return tradeoffs, long-term strategies and planning in assets management, and venture capital industries have led to the "wealth maximization hypothesis" in financial economics. Contrary to well-accepted "profit maximization theories" in economics, financial economists have adopted the wealth maximization hypothesis to develop their models and theoretical advancement. Modern economic thought is dominated by the financial markets' mechanism, which is primarily based on this hypothesis. To achieve the maximization of the "end of period wealth" as the "core objective" of firms and investors—both individual and institutional—is the basic fundamental principle in all financial theories and models established under the wealth maximization hypothesis. This concept favors all those actions that can improve the end of period shareholders' wealth. The provision for health insurance, spending on CSR, use of digital currency, adopting e-commerce, use of cryptocurrency, mobile banking, and investing in information technology to enhance or continue existing business operations are included in those actions and policies that can be considered for wealth maximization. One of the premises in this reasoning is that growing use of financial technology will lead the growth in shareholders' wealth (or market capitalization) or it will reduce the magnitude of the expected decline in shareholders' wealth due to COVID-19.

The World Economic Forum (2021) has pointed out that interrupted social interactions, job losses, a growing digital divide, and abrupt shifts in markets due to the pandemic can lead to severe concerns and lost prospects for large parts of the global population. Climate changes, infectious diseases, weapons of mass destruction, debt crises, and the possibility of the IT infrastructure breaking down are risk factors for the global economy, while in the post-COVID-19 world, the digital power concentration, digital inequality, and cybersecurity failure may create further risks.

A consistent erosion of institutions as shown by declining or stalling checks and balances and transparency indicators, high levels of debt in selected economies, widening inequalities, eroding tax bases, and dispersion in ICT access were identified global issues before COVID-19. Moreover, the declining trends in fundamental aspects of productivity have been masked by long-standing accommodative monetary policy but have remained bottlenecks for strengthening economic development (World Economic Forum 2020). Now, COVID-19 has accelerated and broadened the “Fourth Industrial Revolution” with the rapid expansion of e-commerce, online education, digital health, and remote work.

Based on an assessment by business leaders—through an executive opinion survey—the World Economic Forum (2020) has identified some common strategies to counter the adverse effects of COVID-19. Social distancing, economic digitalization, safety nets, and financial soundness to support those who could not work through the pandemic, supporting companies with direct subsidies or credit to prevent excessive bankruptcies and job losses, sound governance and planning, and improving the health system and research capacity, are the common strategies that were identified by the executive opinion survey. However, a mismatch between the corporate debt risks and required liquidity in the global financial system over the past decade was found by the World Economic Forum (2020), while access to finance despite increasing financial inclusion by fintech applications is not sufficiently widespread. Krugman (2020), Rogoff (2020), and Mehar (2021) have insisted on debt financing and enhancement in financial inclusion through the use of fintech and digital modes for financial transactions for economic persistence, while the common actions and strategies that have been adopted by governments in developed and developing countries belong to short-term borrowing. Mehar (2021) has established a mathematical model to devise a standard to measure the sustainability of external financing. Shirai (2020) explained that the liquidity crunch motivated many central banks to use extensive monetary easing along with substantial fiscal incentive measures. As a result of such policies, a large number of central banks have confronted the effective lower bound (or even zero) in their policy rates. Central banks in the eurozone, Japan, and the United States (US) have scaled up quantitative easing (QE) through the large-scale buying of financial assets (e.g., treasury securities). The Bank of England has restarted quantitative easing (QE) as its policy rate declined to approximately 0%. The Bank of England has also permitted a delay of the government’s existing overdraft facility amid growing financing needs and burdens in the short-term funding markets. The Bank of England has advised that the country’s unemployment rate will be over 9% even in 2021. The Bank advised the commercial banks to keep lending because a drop in lending will lead to the liquidation of several businesses, which will come back to upset the banks. The central banks in Australia, Canada, and New Zealand also confronted the effective lower bound in March 2020 and introduced quantitative easing (QE). Central banks in Brazil, Chile, Columbia, Hungary, Indonesia, the Philippines, Poland, the Republic of Korea, Romania, and South Africa have also implemented quantitative easing (QE), despite some still continuing with relatively large positive interest rates (Shirai 2020).

It is noteworthy that global economic growth during the last two decades was closely associated with globalization, while the components of globalization can be broadly classified into two categories. The first category belongs to digital technology, which includes use of the internet, digital payments, e-commerce, and e-money. The second category covers the physical movements of people, goods, and services. The short-term measures to counter the spread of coronavirus can create a barrier in the way of globalization, while adverse effects of these short-term measures on global economy are quite obvious. The disruption of tourism activities and international flight operations, and the restriction of the trade of goods and services, may hinder the global economic

growth. However, accelerated use of the components in the first category can compensate for the effects of the second category to some extent. This is one of the areas of concern in this study.

Although GDP losses due to COVID-19 have been estimated by various studies, a growing use of financial technology, including digital transfer, e-money, and e-commerce, has been observed worldwide. One of the important questions in this regard relates to the mitigation of GDP and business losses by the growing use of financial technology. This question has been addressed in this study. We have ascertained the extent to which GDP losses can be mitigated by the use of financial technology.

One of the important questions concerns the role and effectiveness of the numerous modes of financial inclusion and fintech in perpetuity of economic and business activities. In this study, we have empirically tested the impacts of several elements of the uses of digital payments on GDP growth, trade in goods and services, and shareholders' wealth. The use of credit cards, the use of the internet for shopping and payment of utility bills, and electronic transfer of funds are the components of fintech that have been included in this study.

The core purpose of this analysis is to examine the effects of different means of financial technology on economic growth, trade in goods and services, and investors' wealth. This study examines the impacts of various modes of online and digital payments on: (1) GDP growth; (2) trade activities; and (3) shareholders' wealth. The next section of this paper establishes a model to explain the relations between the instruments of financial inclusion and technology, trade activities, economic growth, and investors' wealth. The methodology and statistical model used to test the impacts of financial technology on economic growth, trade activities, and investors' wealth are explained in Section 3, while Section 4 describes the empirical proof based on statistical estimates, and Section 5 presents the deductions and some policy-related inferences.

2. ECONOMIC GROWTH AND FINANCIAL INCLUSION AND TECHNOLOGY

The magnitude of trade in services was 13.6% in 2019, which dropped to 10.8% after the spread of the coronavirus pandemic in 2020 (World Bank 2021). A decline in global GDP growth from 3.4% in 2017 to -3.4% in 2020 was observed. This declining phenomenon is common across the regions (America, Europe, and Asia) with different magnitudes. A decline in merchandizing trade was also observed (World Bank 2021), while domestic credit to the private sector was enhanced after COVID-19, which reflects the government support for the private sector through financial institutions to safeguard the economic activities during the crisis period. The growth in domestic credit to the private sector was a common phenomenon all over the world.

A clear change in the patterns of economic growth, investment, and financing of economic activities from 2017 to 2020 has been noted. The hard data show the changes in global and regional positions of economic growth, trade in goods and services, and shareholders' wealth after and before the spread of COVID-19, while the sources of financing have also been changed. The World Bank carried out a survey that depicts the financial inclusion and use of financial technology in economic transactions before the spread of COVID-19 (World Bank 2017). This study is based on interactions of the hard data and variables that have been shown in this survey, while

some control variables to determine the effect of COVID-19 on GDP growth, trade in goods and services, and investors' wealth have also been included. A list of the variables is presented in Appendix I.

Various studies have discussed the economic changes in the context of coronavirus and recommended some policy measures to counter the adverse effects of COVID-19 (World Bank 2020a; IMF 2020a, 2020b; Krugman 2020; Rogoff 2020; Mehar 2021). Similarly, the links between economic growth and the use of financial technology have been established in various studies. Amstad et al. (2019) broadly defined "Fintech as advanced technology to improve and automate delivery and use of financial services to consumers and businesses. It covers a broad landscape from digital currencies and payment systems (e.g., mobile phone wallets, cryptoassets, remittance services) to asset management (e.g., internet banking, online brokers, robo-advisors, cryptoasset trading, personal financial management, mobile trading) to alternative finance (e.g., crowdfunding, peer-to-peer lending, online balance sheet lending, invoicing, and supply chain finance)." According to Gormez (2019), electronic money is not a new concept, and technology can enhance the way of dealing, but it does not change the fundamental nature. He claims that central banks that have perfectly addressed all the fundamental glitches of money and financial service provision can issue digital currencies with no reluctance.

Haddad and Hornuf (2019) concluded that more fintech startup formations are possible when the economy is well developed and venture capital is readily available. Claessens et al. (2018) mentioned that fintech credit deals a substitute funding source for businesses and consumers, and may expand access to credit for underserved fragments. This may improve the efficiency of financial intermediation. However, fintech credit sizes are greater in countries with less rigorous banking regulation. The International Fund for Agricultural Development and the World Bank Group (2015) pointed out that governments and institutions are now realizing the vast potential of mobilizing migrant capital for the development of national and local economies. However, because of the centrality of remittances to development, it is vital to develop policy guidelines to maximize the impact of migrants' funds. Xu and Xu (2019) explained how the government of the People's Republic of China (PRC) has implemented many regulations for fintech applications for the prevention and resolution of financial risks. They included P2P lending, third-party payments, and cryptoassets in those measures, while some additional measures, including financial standardization, fintech infrastructure development, and investor protection, have also been strengthened to promote sustainable fintech development. The government has tried to strike a balance between encouraging fintech innovation and strengthening regulations.

Based on these studies, current observations in global economic trends, the global inclination to use digital instruments for financial transactions, and measures to counter the spread of coronavirus, we have established an econometric model based on four simultaneous equations. The interconnectivity of the equations is shown in Figure 1, which illustrates how the use of digital instruments influences GDP growth, trade in goods and services, and investors' wealth.

We supposed that decision-making by investors will be based on the expected change in their wealth in response to their decisions. Investors' wealth has been measured by the market capitalization to GDP ratio in a country. It is further supposed that investors' wealth, GDP growth, and trade activities are determined simultaneously. It is quite obvious that trade of goods and services is largely affected by the countermeasures in response to COVID-19 and the growing use of digital technology. So we included the trade in goods and services to GDP ratio in our analysis. In the light of these suppositions, we established four equations to identify the determinants of GDP growth

(GROW), the merchandise trade to GDP ratio (MTGDP), the trade in services to GDP ratio (STGDP), and the market capitalization to GDP ratio (MCGDP). The fundamental idea in determining these equations is to test the effects of several types of digital instruments for financial transactions and the COVID-19 pandemic on economic growth, investors' wealth, and trade in goods and services. These equations have been estimated by different alternative options (models), where several control variables have also been included in these equations.

It is hypothesized that GDP growth is determined by trade in services (STGDP), the use of the internet for online buying of goods and services and payment of utility bills (NETBUY), and the use of credit cards (CARDBUY), while the spread of the coronavirus pandemic in 2020 and the number of deaths due to this pandemic have adversely affected the GDP growth. To determine the magnitude of merchandise trade (MTGDP), we supposed that domestic credit to the private sector (DCPS), receiving payments through digital modes (RCVDGT), and the size of the economy (GDP) are the determinants of merchandise trade (MTGDP), while the COVID-19 pandemic (COVID) has negatively affected the magnitude of merchandizing trade (MTGDP). It is further hypothesized that receiving payments through digital modes (RCVDGT), the size of merchandizing trade (MTGDP), and the size of domestic credit to the private sector are the explanatory factors of the trade in services (STGDP). The underlying assumption for considering the merchandizing trade (MTGDP) in the determination of trade in services (STGDP) is the strong association between these two types of trade. The trade in merchandizing goods (MTGDP) establishes the relations between the people and business communities of two countries, which may enhance the trade relations to promote trade in services (STGDP). The relation between the business communities of two countries boosts their mutual trade in services like banking and insurance, education, tourism, traveling, and health facilities. It was also supposed that the COVID-19 pandemic (COVID) has negatively affected the magnitude of trade in services.

In determining shareholders' wealth in terms of the market capitalization to GDP ratio (MCGDP), merchandizing trade (MTGDP) and domestic credit to the private sector as a percentage of GDP (DCPS) have been included as independent variables, while GDP growth rate (GROW), permission to commercial banks for issuance of e-money (BNKEMON), and receiving payments through digital modes (RCVDGT) have been taken as control variables. We have also tested the impact of the coronavirus pandemic (COVID) on investors' wealth (MCGDP).

The estimated models are based on various theories and justifications in economic literature (Amstad et al. 2019; Gormez 2019; World Bank 2020a; IMF 2020a, 2020b; Krugman 2020; Rogoff 2020; Durrani, Rosmin and Volz 2020; Sachs et al. 2020; University of Cambridge 2020; Mehar 2021), while the logical reasoning of the determinants of explained variables has been described in the above discussion.

3. METHODOLOGY TO MEASURE THE IMPACTS OF FINANCIAL TECHNOLOGY

The above-mentioned theoretical discussion, models, and Figure 1 have been summarized in the following mathematical expressions while Appendix I provides descriptions of the variables:

$$GROW_{it} = \alpha_i + \beta_1 COVID_t + \beta_2 DEATH1MP_{it} + \beta_3 COVID_t * NETBUY_i + \beta_4 NETBUY_i + \beta_5 CARDBUY_i + \beta_6 STGDP_{it} + \beta_7 BNKEMON_i + \beta_8 RCVDGT_i + \beta_9 MTGDP_{it} + \beta_{10} GDP_{it} + \beta_{11} DCPS_{it} + \varepsilon_{it} \tag{1}$$

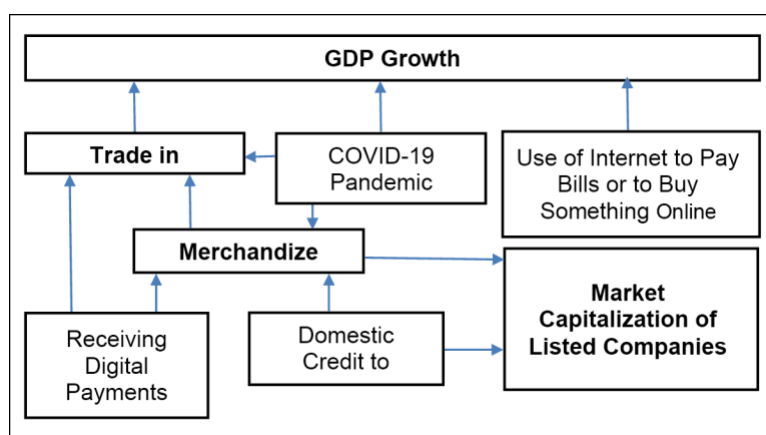
$$MTGDP_{it} = \alpha_i + \beta_1 COVID_t + \beta_2 RCVDGT_i + \beta_3 DCPS_{it} + \beta_4 GDP_{it} + \varepsilon_{it} \tag{2}$$

$$STGDP_{it} = \alpha_i + \beta_1 COVID_t + \beta_2 RCVDGT_i + \beta_3 COVID_t * RCVDGT_i + \beta_4 MTGDP_{it} + \beta_5 DCPS_{it} + \beta_6 COVID_t * DCPS_{it} + \varepsilon_{it} \tag{3}$$

$$MCGDP_{it} = \alpha_i + \beta_1 DCPS_{it} + \beta_2 MTGDP_{it} + \beta_3 GROW_{it} + \beta_4 COVID_t + \beta_5 RCVDGT_i + \beta_6 BNKEMON_i + \varepsilon_{it} \tag{4}$$

The above Equations (1) to (4) have been estimated through panel data. The data for this study were obtained from the World Development Indicators' Data Bank (World Bank 2021). In this analysis, we employed data on 102 countries for four years (from 2017 to 2020). To compare Asian economies with the global conditions, we estimated the same equations for 35 Asian countries. The inclusion of Asian countries in this study is based on the World Bank classification of countries by region (World Bank 2021). The data on further economies could not be incorporated in the model because of the absence of data on some indicators that are included in the study. The Cross-sectional Random-Effects panel least squares (PLS) technique was applied to estimate the effects of explanatory variables. Gross domestic product (GDP) data are in billion USD, while merchandise trade (MTGD), trade in services (STGDP), market capitalization (MCGDP), and domestic credit to the private sector (DCPS) are shown as a percentage of GDP. The data on GDP growth were measured in annual percentage change.

Figure 1: Wealth Enhancement, Trade, and Financial Technology



Source: Author's depiction.

The Global Financial Development Report 2019–2020 (World Bank 2019) provides the details of countries where commercial banks are permitted to issue e-money (BNKEMON). These data have been incorporated through a dummy variable, which is equal to “1” if commercial banks in a country are allowed to issue e-money (plus prepaid e-money cards) and “0” otherwise. The data on the use of a debit or credit card to make a purchase in the past year (CARDBUY), use of the internet to pay bills or to buy something online in the past year (NETBUY), receiving digital payments in the past year (RCVDGT), receiving payments from self-employment through a mobile phone

(RCVMBL), and sending domestic remittances through a mobile phone (RMTMBL) have been extracted from the Global Financial Inclusion and Consumer Protection Survey Report (World Bank 2017).

4. RESULTS AND EMPIRICAL FINDINGS

The outcomes of regression testing are shown in Tables 1, 2, 3, and 4. Tables 1a to 4a show the estimated parameters in the global context, while Tables 1b to 4b depict the picture in Asian countries. The significance of parameters and overall goodness of fit in the equations have also been reported in the above-mentioned tables. The parameters associated with the betas show quantifications of the impacts of explanatory variables, though some outcomes are shocking and contradict common opinions. The adjusted R-squares and F-statistics demonstrate goodness of fit in all estimated equations, which shows that independent variables included in the models significantly include the effects of explanatory variables.

The robustness in assessed parameters has also been tested by using the replacements of control variables, where some falsification tests have also been performed. For this intention, some control variables have been incorporated in the regression analysis.

To estimate the GDP growth (GROW), we incorporated two dummy variables: COVID (equal to “1” for 2020 to represent the COVID-19 pandemic and “0” otherwise) and BNKEMON (equal to “1” if commercial banks are allowed to issue e-money—including prepaid e-money cards—in the economy and “0” otherwise). The effect of COVID-19 was significantly negative and robust in all alternative scenarios. To test these important results, we tested this model in four alternative scenarios. But the negative and significant effect of COVID-19 was not falsified. However, the issuance of e-money by commercial banks was not significant. The impact of the use of the internet for paying utility bills or buying something (NETBUY) was significant in all scenarios, which indicates that the use of e-money or electronic transactions may improve the economic situation. However, the negative impact of buying through debit and credit cards is not understandable. It may well be because of high multicollinearity between the use of credit/debit cards and e-money. To capture the effects of the use of buying through the internet during the coronavirus pandemic (COVID), we created an interaction variable by multiplying the dummy variable of ‘COVID’ by the dummy variable of the use of the internet for buying and for paying bills (NETBUY). The significant parameters associated with this interaction variable indicate the positive effects of using the internet for buying and paying utility bills during the pandemic period on GDP growth. The effect of the number of deaths due to COVID-19 in a country on GDP growth was also tested and significant results show that the higher number of deaths because of the pandemic have significantly affected the GDP growth. This provides additional information that as well as the existence of the coronavirus pandemic (COVID), its severity (Death1MP) in a country also affects economic activities. The results for Asian countries depict the same conclusions. The results of the Asian sample are not statistically different from those of the global sample, though the magnitude of betas is different.

The effects of the coronavirus pandemic and receiving payments through digital modes of financing on merchandizing trade are shown in Tables 5a and 5b. It is thought that the COVID-19 pandemic has significantly affected the merchandise trade to GDP ratio; however, the use of digital modes for receiving money provided some compensation, as the role of digital modes for receiving money is significantly positive for determining

the magnitude of merchandizing trade. The negative betas associated with the GDP indicate that the trade to GDP ratio is relatively lower in large-sized economies. Another important conclusion is the significant role of the domestic credit to private sector in improving the merchandise trade to GDP ratio. It justifies the role of monetary policy in ensuring the growth and sustainability of the merchandizing trade. The sample from Asian countries shows consistency with global findings.

Tables 6a and 6b show that the use of digital modes for receiving payments (RCVDGT) positively affects trade in services. The positive effects of receiving digital payments (RCVDGT) on international trade in services are significant and robust in all alternative scenarios. Similarly, the impact of the magnitude of merchandise trade (MTGDP) is also positive. However, domestic credit to the private sector (DCPS) is not significant for enhancing trade in services (TSGDP). This last finding is contrary to the common opinion, as it is a common intuition that enhancing domestic credit helps the services sector to promote its trade and production. This opinion was not supported by this study. The negative impact of the coronavirus pandemic on trade in services is confirmed in this analysis. The results are significant and robust in all alternative scenarios, including global and Asian samples. However, in the case of Asian economies, the effect of the use of digital modes for receiving payments (RCVDGT) is not significant.

Tables 7a and 7b show the significant impacts of domestic credit to the private sector (DCPS) and merchandizing trade (MTGDP) on shareholders' wealth (MCGDP). The results are statistically significant and consistent in all scenarios. The impacts of the use of digital technology for financial transactions and growth in GDP have not been proved significant explanatory variables for the determination of investors' wealth. However, these variables affect shareholders' wealth indirectly through growth in merchandizing trade.

It is believed, in regard to the results (Tables 4 to 7), that in the absence of financial technology, including buying through the internet and using digital modes for receiving money, the GDP losses due to the COVID-19 pandemic might be much higher. The use of financial technology has significantly mitigated the GDP losses. The inferences are the same for trade in goods and services. In the absence of financial technology, the adverse effects of COVID-19 on trade in goods and services might be higher.

It has been concluded that from the statistical significance point of view, Asian economies are not different from other economies. Though it is contrary to common intuition, the results show that the COVID-19 crisis has affected the Asian economies in the same way, though the magnitudes of parameters are slightly different.

To compare the Asian economies with the global sample, we have also adopted an alternative technique. To reconfirm the results we have re-estimated the equations in the global scenario by introducing a dummy variable (equal to "1" for Asian economies and "0" otherwise). The results of these estimations are shown in Appendices II to V. It has been consistently noted that the dummy variable (for Asian economies) was statistically insignificant in all cases, which shows that Asian economies have no significant difference. The COVID-19 pandemic and the growing use of financial technology have affected the Asian economies in the same way, though the magnitudes are slightly different.

Table 1a: Dependent Variable: GDP Growth Rate (GROW)
Panel Least Squares (Cross-sectional Random Effects)
No. of Countries: 90; No. of Years: 4 (2017–2020); Total Observations: 344

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
| | β | T | β | T | β | T | β | T |
| Constant | 3.083*** | 6.007 | 2.883*** | 5.407 | 3.453*** | 6.591 | 4.019*** | 4.503 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -7.685*** | -16.947 | -7.674*** | -16.890 | -7.375*** | -14.976 | -8.817*** | -12.945 |
| Death due to COVID-19 against 1 million population: DEATH1MP | -0.004*** | -6.184 | -0.004*** | -6.166 | -0.004*** | -6.435 | -0.002** | -2.174 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Used the internet to pay bills or to buy something online in the past year (% of population aged 15+): NETBUY | 0.038*** | 4.379 | 0.038*** | 4.353 | 0.035*** | 3.727 | 0.048*** | 3.290 |
| Used the internet to pay bills or to buy something online in the past year (% of population aged 15+): NETBUY | 0.058** | 2.514 | 0.050* | 2.134 | 0.053** | 2.426 | 0.067** | 2.229 |
| Used a debit or credit card to make a purchase in the past year (% of population aged 15+): CARDBUY | -0.083*** | -3.741 | -0.084*** | -3.754 | -0.072 | -3.347 | -0.084*** | -3.035 |
| Received digital payments in the past year (% of population aged 15+): RCVDGT | 0.028 | 1.430 | 0.033 | 1.682 | 0.017 | 0.905 | 0.006 | 0.245 |
| Trade in services as % of GDP: STGDP | 0.012 | 1.427 | 0.013 | 1.587 | 0.0159** | 2.055 | 0.015* | 1.776 |
| Merchandise trade as % of GDP: MTGDP | -0.001 | -0.177 | 0.001 | 0.105 | 0.003 | 0.744 | -0.0004 | -0.058 |
| GDP in billion USD: GDP | | | 0.0001 | 1.373 | 0.0002** | 2.049 | 0.0002 | 1.381 |
| Domestic credit to private sector as % of GDP: DCPS | | | | | -0.009* | -1.763 | 0.001 | 0.173 |
| Dummy variable equal to "1" if commercial banks are allowed to issue e-money (plus prepaid e-money cards) and "0" otherwise: BNKEMON | | | | | | | -0.516 | -0.983 |
| Adjusted R-square | 0.7785 | | 0.7788 | | 0.7654 | | 0.7420 | |
| F-statistic | 151.6968 | | 135.1951 | | 100.4964 | | 43.6222 | |
| Durbin-Watson stat | 1.5125 | | 1.3273 | | 1.1662 | | 1.0282 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

Table 1b: Dependent Variable: GDP Growth Rate (GROW)
Panel Least Squares (Cross-sectional Random Effects)
No. of Asian Countries: 29; No. of Years: 4 (2017–2020); Total Observations: 107

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|--------|-----------|--------|-----------|--------|------------|--------|
| | β | T | β | T | β | T | β | T |
| Constant | 4.131*** | 3.624 | 3.901*** | 3.297 | 4.476*** | 3.798 | 2.357* | 1.817 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -8.799*** | -8.857 | -8.821*** | -8.814 | -8.253*** | -8.725 | -10.431*** | -9.796 |
| Death due to COVID-19 against 1 million population: DEATH1MP | -0.005** | -2.272 | -0.005** | -2.203 | -0.006** | -2.438 | -0.003 | -1.177 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Used the internet to pay bills or to buy something online in the past year (% of population aged 15+): NETBUY | 0.073*** | 3.524 | 0.073*** | 3.517 | 0.070*** | 3.243 | 0.113*** | 5.002 |
| Used the internet to pay bills or to buy something online in the past year (% of population aged 15+): NETBUY | 0.086 | 1.470 | 0.069 | 1.095 | 0.118* | 1.903 | 0.121** | 2.123 |
| Used a debit or credit card to make a purchase in the past year (% of population aged 15+): CARDBUY | -0.120** | -2.060 | -0.112* | -1.889 | -0.115** | -1.989 | -0.106* | -1.886 |
| Received digital payments in the past year (% of population aged 15+): RCVDT | 0.038 | 0.827 | 0.042 | 0.917 | 0.040 | 0.845 | 0.010 | 0.238 |
| Trade in services as % of GDP: STGDP | -0.028 | -1.206 | -0.026 | -1.129 | -0.029 | -1.237 | 0.005 | 0.141 |
| Merchandise trade as % of GDP: MTGDP | 0.005 | 0.658 | 0.006 | 0.797 | 0.023** | 2.403 | 0.015* | 1.836 |
| GDP in billion USD: GDP | | | 0.001 | 0.798 | 0.001** | 2.111 | 0.001*** | 3.023 |
| Domestic credit to private sector as % of GDP: DCPS | | | | | -0.038*** | -2.978 | -0.033*** | -2.764 |
| Dummy variable equal to "1" if commercial banks are allowed to issue e-money (plus prepaid e-money cards) and "0" otherwise: BNKEMON | | | | | | | 2.552** | 2.420 |
| Adjusted R-square | 0.6622 | | 0.6607 | | 0.6806 | | 0.7394 | |
| F-statistic | 26.9724 | | 23.9340 | | 21.0268 | | 22.1456 | |
| Durbin-Watson stat | 1.3967 | | 1.4027 | | 1.5157 | | 1.6764 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

Table 2a: Dependent Variable: Merchandise Trade as % of GDP (MTGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Countries: 99; No. of Years: 4 (2017–2020); Total Observations: 355

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | β | T | β | T | β | T | β | T |
| Constant | 47.565*** | 5.312 | 46.880*** | 5.241 | 47.676*** | 5.386 | 48.277*** | 3.969 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -3.614*** | -6.149 | -2.954*** | -3.340 | -3.625*** | -5.647 | -3.737*** | -6.572 |
| Received digital payments in the past year (% of population aged 15+): RCVDT | 0.416** | 2.211 | 0.391** | 2.065 | 0.358* | 1.916 | 0.338* | 1.724 |
| Domestic credit to private sector as % of GDP: DCPS | 0.086* | 1.888 | 0.113** | 2.145 | 0.112** | 2.341 | 0.056 | 1.213 |
| GDP in billion USD: GDP | -0.003** | -2.447 | -0.003** | -2.454 | -0.003** | -2.568 | -0.003** | -1.968 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Domestic credit to private sector as % of GDP: DCPS | | | -0.011 | -1.003 | | | | |
| Foreign direct investment in billion USD: FDIBIL | | | | | -0.007 | -0.721 | | |
| Dummy variable equal to "1" if commercial banks are allowed to issue e-money (plus prepaid e-money cards) and "0" otherwise: BNKEMON | | | | | | | 3.775 | 0.307 |
| Adjusted R-square | 0.1157 | | 0.1157 | | 0.0980 | | 0.1335 | |
| F-statistic | 12.5814 | | 10.2653 | | 8.2339 | | 11.2016 | |
| Durbin-Watson stat | 1.2844 | | 1.2920 | | 1.2137 | | 1.2590 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

**Table 2b: Dependent Variable: Merchandise Trade as % of GDP (MTGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Asian Countries: 35; No. of Years: 4 (2017–2020); Total Observations: 121**

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|--------|-----------|--------|-----------|--------|-----------|---------|
| | β | T | β | T | β | T | β | T |
| Constant | 53.021*** | 3.518 | 50.219*** | 3.438 | 53.733*** | 3.963 | 49.129*** | 3.003 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -5.008*** | -3.744 | -3.262* | -1.845 | -4.996*** | -3.442 | -5.922*** | -4.6114 |
| Received digital payments in the past year (% of population aged 15+): RCV DGT | 0.118 | 0.330 | -0.013 | -0.038 | -0.056 | -0.168 | -0.355 | -1.053 |
| Domestic credit to private sector as % of GDP: DCPS | 0.261*** | 2.996 | 0.364*** | 3.517 | 0.324*** | 3.708 | 0.243*** | 2.957 |
| GDP in billion USD: GDP | -0.004* | -1.926 | -0.004** | -2.049 | -0.006** | -2.606 | -0.003 | -1.583 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Domestic credit to private sector as % of GDP: DCPS | | | -0.033 | -1.598 | | | | |
| Foreign direct investment in billion USD: FDIBIL | | | | | -0.066 | -1.414 | | |
| Dummy variable equal to "1" if commercial banks are allowed to issue e-money (plus prepaid e-money cards) and "0" otherwise: BNKEMON | | | | | | | 21.427 | 1.220 |
| Adjusted R-square | 0.0944 | | 0.1086 | | 0.0992 | | 0.1287 | |
| F-statistic | 4.1267 | | 3.9237 | | 3.5111 | | 4.1032 | |
| Durbin-Watson stat | 1.3820 | | 1.5150 | | 1.3482 | | 1.4334 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

Table 3a: Dependent Variable: Trade in Services to GDP Ratio (STGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Countries: 102; No. of Years: 4 (2017–2020); Total Observations: 376

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|---------|-----------|--------|-----------|--------|-----------|--------|
| | β | T | β | T | β | T | β | T |
| Constant | 6.961 | 1.494 | 6.848 | 1.465 | 6.576 | 1.324 | 6.241 | 1.248 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -4.266*** | -12.921 | -5.316*** | -7.222 | -3.939*** | -4.763 | -2.809*** | -4.431 |
| Merchandise trade as % of GDP: MTGDP | 0.053*** | 1.775 | 0.058* | 1.945 | 0.092*** | 2.849 | 0.088*** | 2.706 |
| Received digital payments in the past year (% of population aged 15+): RCVDGT | 0.278*** | 3.071 | 0.272*** | 2.993 | 0.324*** | 3.213 | 0.308*** | 3.010 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Received digital payments in the past year (% of population aged 15+): RCVDGT | | | 0.023 | 1.594 | 0.011 | 0.727 | | |
| Domestic credit to private sector as % of GDP: DCPS | | | | | -0.065** | -2.325 | -0.045 | -1.423 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Domestic credit to private sector as % of GDP: DCPS | | | | | | | -0.009 | -1.262 |
| Adjusted R-square | 0.3423 | | 0.3454 | | 0.3238 | | 0.3266 | |
| F-statistic | 66.0647 | | 50.4662 | | 32.8880 | | 33.2965 | |
| Durbin-Watson stat | 1.3885 | | 1.3863 | | 0.9629 | | 0.9371 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

Table 3b: Dependent Variable: Trade in Services to GDP Ratio (STGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Asian Countries: 35; No. of Years: 4 (2017–2020); Total Observations: 129

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|--------|-----------|--------|-----------|--------|----------|--------|
| | β | T | β | T | β | T | β | T |
| Constant | 8.027 | 1.441 | 8.120 | 1.437 | 6.332 | 1.174 | 6.424 | 1.175 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -5.517*** | -7.631 | -5.917*** | -4.059 | -2.011 | -1.429 | -2.218 | -1.611 |
| Merchandise trade as % of GDP: MTGDP | 0.104*** | 2.772 | 0.103*** | 2.727 | 0.187*** | 4.885 | 0.162*** | 4.110 |
| Received digital payments in the past year (% of population aged 15+): RCVDGT | 0.184 | 1.573 | 0.182 | 1.535 | 0.297** | 2.306 | 0.219 | 1.635 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Received digital payments in the past year (% of population aged 15+): RCVDGT | | | 0.010 | 0.316 | -0.029 | -0.836 | 0.047 | 1.042 |
| Domestic credit to private sector as % of GDP: DCPS | | | | | -0.118*** | -2.713 | -0.059 | -1.201 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Domestic credit to private sector as % of GDP: DCPS | | | | | | | -0.038** | -2.503 |
| Adjusted R-square | 0.3385 | | 0.3338 | | 0.3624 | | 0.3913 | |
| F-statistic | 22.8287 | | 17.0315 | | 13.9564 | | 13.2139 | |
| Durbin-Watson stat | 1.3545 | | 1.3667 | | 1.3714 | | 1.3092 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

**Table 4a: Dependent Variable: Market Capitalization to GDP Ratio (MCGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Countries: 54; No. of Years: 4 (2017–2020); Total Observations: 177**

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|--|-------------|--------|-------------|--------|-------------|--------|-------------|--------|
| | β | T | β | T | β | T | β | T |
| Constant | -178.995*** | -3.231 | -138.862*** | -2.943 | -161.224*** | -2.810 | -137.953*** | -2.993 |
| Merchandise trade as % of GDP: MTGDP | 1.929*** | 5.438 | 1.662*** | 5.130 | 1.813*** | 4.807 | 1.555*** | 4.385 |
| Domestic credit to private sector as % of GDP: DCPS | 1.748*** | 4.478 | 1.954*** | 4.968 | 1.945*** | 4.378 | 2.128*** | 4.687 |
| GDP growth (annual %): GROW | 0.140 | 0.051 | 0.210 | 0.076 | | | | |
| GDP in billion USD: GDP | | | | | -0.009 | -0.912 | -0.005 | -0.762 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | 18.401 | 0.650 | 15.278 | 0.545 | 15.508 | 1.018 | 11.750 | 0.787 |
| Dummy variable equal to "1" if commercial banks are allowed to issue e-money (plus prepaid e-money cards) and "0" otherwise: BNKEMON | -14.659 | -0.286 | | | -34.478 | -0.617 | | |
| Received digital payments in the past year (% of population aged 15+): RCVDGT | | | -1.205 | -1.397 | | | -1.231 | -1.410 |
| Adjusted R-square | 0.2910 | | 0.2751 | | 0.2911 | | 0.2737 | |
| F-statistic | 15.4473 | | 14.7367 | | 15.4547 | | 14.6391 | |
| Durbin-Watson stat | 1.6523 | | 1.6417 | | 1.6359 | | 1.6231 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

**Table 4b: Dependent Variable: Market Capitalization to GDP Ratio (MCGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Asian Countries: 22; No. of Years: 4 (2017–2020); Total Observations: 75**

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|--|------------|--------|------------|--------|-----------|--------|------------|--------|
| | β | T | β | T | β | T | β | T |
| Constant | -168.567** | -2.141 | -209.096** | -2.354 | -140.027 | -1.432 | -209.659** | -2.244 |
| Merchandise trade as % of GDP: MTGDP | 2.436*** | 5.055 | 1.487*** | 2.802 | 1.515** | 2.529 | 0.796 | 1.318 |
| Domestic credit to private sector as % of GDP: DCPS | 2.0492*** | 3.643 | 3.2570*** | 4.399 | 3.624*** | 4.743 | 4.447*** | 5.171 |
| GDP growth (annual %): GROW | -5.923 | -1.598 | -3.872 | -1.054 | | | | |
| GDP in billion USD: GDP | | | | | -0.033** | -2.299 | -0.029** | -2.088 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | 1.634 | 0.053 | -6.907 | -0.221 | 24.256 | 1.273 | 7.060 | 0.373 |
| Dummy variable equal to "1" if commercial banks are allowed to issue e-money (plus prepaid e-money cards) and "0" otherwise: BNKEMON | -83.022 | -1.106 | | | -193.932* | -1.877 | | |
| Received digital payments in the past year (% of population aged 15+): RCVDT | | | -2.152 | -1.256 | | | -2.923 | -1.591 |
| Adjusted R-square | 0.4434 | | 0.3555 | | 0.4092 | | 0.3650 | |
| F-statistic | 12.7908 | | 9.6045 | | 11.2504 | | 9.9681 | |
| Durbin-Watson stat | 1.1953 | | 1.2249 | | 1.2373 | | 1.2404 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

APPENDIX I

List of Variables

| Variable | Description |
|----------|---|
| BNKEMON | Dummy variable equal to “1” if commercial banks are allowed to issue e-money (plus prepaid e-money cards) and “0” otherwise |
| CARDBUY | Used a debit or credit card to make a purchase in the past year (% of population aged 15+) |
| COVID | Dummy variable equal to “1” for 2020 to represent COVID-19 pandemic and “0” otherwise |
| DEATH1MP | Death due to COVID-19 against 1 million population as on 20 th December 2020 |
| DCPS | Domestic credit to private sector as % of GDP |
| FDIBIL | Foreign direct investment in billion USD |
| FDIGDP | Net inflow of foreign direct investment as % of GDP |
| GDP | GDP in billion USD |
| GROW | GDP growth (annual %) |
| MCBIL | Market capitalization of listed domestic companies in billion USD |
| MCGDP | Market capitalization of listed domestic companies as % of GDP |
| MTGDP | Merchandise trade as % of GDP |
| NETBUY | Used the internet to pay bills or to buy something online in the past year (% of population aged 15+) |
| RCVDGT | Received digital payments in the past year (% of population aged 15+) |
| RCVMBL | Received payments from self-employment through a mobile phone (% of population aged 15+) |
| RMTMBL | Sent domestic remittances through a mobile phone (% of population aged 15+) |
| STDB | Short-term debt as % of total external debt |
| STGDP | Trade in services as % of GDP |
| XDBT | External outstanding debt in billion USD |

Source: Author’s Compilation.

APPENDIX II

Dependent Variable: GDP Growth Rate (GROW)
Panel Least Squares (Cross-sectional Random Effects)
No. of Countries: 90; No. of Years: 4 (2017–2020); Total Observations: 344

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
| | β | T | β | T | β | T | β | T |
| Constant | 2.827**** | 5.383 | 2.668*** | 4.921 | 3.218*** | 6.195 | 2.686*** | 4.187 |
| Dummy variable equal to "1" for Asian countries: ASIA | 0.694* | 1.800 | 0.647* | 1.669 | 1.032*** | 2.672 | 0.725* | 1.774 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -7.739*** | -17.040 | -7.726*** | -16.974 | -7.459*** | -15.128 | -7.930*** | -15.064 |
| Death due to COVID-19 against 1 million population: DEATH1MP | -0.004*** | -5.939 | -0.004*** | -5.934 | -0.004*** | -6.156 | -0.004*** | -5.680 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Used the internet to pay bills or to buy something online in the past year (% of population aged 15+): NETBUY | 0.038*** | 4.367 | 0.038*** | 4.343 | 0.035*** | 3.803 | 0.040*** | 4.233 |
| Used the internet to pay bills or to buy something online in the past year (% of population age 15+): NETBUY | 0.056** | 2.476 | 0.050** | 2.132 | 0.050*** | 2.344 | 0.049** | 2.254 |
| Used a debit or credit card to make a purchase in the past year (% of population aged 15+): CARDBUY | -0.083*** | -3.767 | -0.083*** | -3.771 | -0.066*** | -3.095 | -0.068*** | -3.157 |
| Received digital payments in the past year (% of population aged 15+): RCVDT | 0.030 | 1.586 | 0.035* | 1.793 | 0.018 | 1.009 | 0.021 | 1.158 |
| Trade in services as % of GDP: STGDP | 0.011 | 1.410 | 0.013 | 1.551 | 0.016** | 2.063 | 0.020*** | 2.617 |
| Merchandise trade as % of GDP: MTGDP | -0.001 | -0.346 | -0.001 | -0.079 | 0.003 | 0.686 | 0.003 | 0.847 |
| GDP in billion USD: GDP | | | 9.07E-05 | 1.217 | 0.001** | 2.198 | 0.001** | 2.124 |
| Domestic credit to private sector as % of GDP: DCPS | | | | | -0.013** | -2.548 | -0.011* | -1.995 |
| Dummy variable equal to "1" if commercial banks are permitted to issue e-money (including prepaid e-money cards) and "0" otherwise: BNKEMON | | | | | | | 0.263 | 0.509 |
| Adjusted R-square | 0.7786 | | 0.7789 | | 0.7678 | | 0.7814 | |
| F-statistic | 135.0601 | | 121.8318 | | 92.6607 | | 85.8986 | |
| Durbin-Watson stat | 1.5152 | | 1.5200 | | 1.5297 | | 1.5784 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

APPENDIX III

Dependent Variable: Merchandise Trade as % of GDP (MTGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Countries: 99; No. of Years: 4 (2017–2020); Total Observations: 355

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | β | T | β | T | β | T | β | T |
| Constant | 42.235*** | 4.206 | 41.912*** | 4.197 | 43.621*** | 4.366 | 44.576*** | 3.290 |
| Dummy variable equal to "1" for Asian countries: ASIA | 10.976 | 1.191 | 10.344 | 1.126 | 8.272 | 0.896 | 6.161 | 0.636 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -3.565*** | -6.053 | -2.965*** | -3.352 | -3.584*** | -5.570 | -3.708*** | -6.503 |
| Received digital payments in the past year (% of population aged 15+): RCV DGT | 0.461** | 2.396 | 0.436** | 2.250 | 0.396** | 2.056 | 0.364* | 1.808 |
| Domestic credit to private sector as % of GDP: DCPS | 0.079* | 1.720 | 0.1042* | 1.958 | 0.105** | 2.193 | 0.052 | 1.102 |
| GDP in billion USD: GDP | -0.003** | -2.464 | -0.003** | -2.474 | -0.003** | -2.567 | -0.003** | -2.002 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Domestic credit to private sector as % of GDP: DCPS | | | -0.010 | -0.916 | | | | |
| Foreign direct investment in billion USD: FDIBIL | | | | | -0.007 | -0.703 | | |
| Dummy variable equal to "1" if commercial banks are permitted to issue e-money (including prepaid e-money cards) and "0" otherwise: BNKEMON | | | | | | | 4.814 | 0.386 |
| Adjusted R-square | 0.1167 | | 0.1164 | | 0.0973 | | 0.1321 | |
| F-statistic | 10.3571 | | 8.7690 | | 6.9842 | | 9.3959 | |
| Durbin-Watson stat | 1.4690 | | 1.4873 | | 1.5604 | | 1.5212 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

APPENDIX IV

Dependent Variable: Trade in Services to GDP Ratio (STGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Countries: 102; No. of Years: 4 (2017–2020); Total Observations: 376

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-----------|---------|-----------|--------|-----------|--------|-----------|--------|
| | β | T | β | T | β | T | β | T |
| Constant | 6.257 | 1.211 | 6.163 | 1.190 | 5.549 | 1.006 | 5.267 | 0.954 |
| Dummy variable equal to "1" for Asian countries: ASIA | 1.521 | 0.332 | 1.478 | 0.322 | 2.185 | 0.443 | 0.489 | 0.100 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | -4.269*** | -12.926 | -5.316*** | -7.222 | -3.407*** | -8.265 | -2.737*** | -4.316 |
| Merchandise trade as % of GDP: MTGDP | 0.052* | 1.732 | 0.057* | 1.902 | 0.090*** | 2.766 | 0.082** | 2.534 |
| Received digital payments in the past year (% of population aged 15+): RCVDGT | 0.284*** | 3.065 | 0.278*** | 2.987 | 0.336*** | 3.219 | 0.266*** | 2.669 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Received digital payments in the past year (% of population aged 15+): RCVDGT | | | 0.022 | 1.590 | | | | |
| Domestic credit to private sector as % of GDP: DCPS | | | | | -0.065** | -2.325 | | |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID* Domestic credit to private sector as % of GDP: DCPS | | | | | | | -0.014** | -2.180 |
| Adjusted R-square | 0.3412 | | 0.3442 | | 0.3237 | | 0.3222 | |
| F-statistic | 49.5496 | | 40.3712 | | 32.8761 | | 32.6658 | |
| Durbin-Watson stat | 1.4240 | | 1.4443 | | 1.4592 | | 1.4422 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

APPENDIX V

Dependent Variable: Market Capitalization to GDP Ratio (MCGDP)
Panel Least Squares (Cross-sectional Random Effects)
No. of Countries: 54; No. of Years: 4 (2017–2020); Total Observations: 177

| Explanatory Variable | Model I | | Model II | | Model III | | Model IV | |
|---|-------------|--------|-------------|--------|-------------|--------|-------------|-----------|
| | β | T | β | T | β | T | β | T |
| Constant | -180.396*** | -3.198 | -133.114*** | -2.715 | -163.322*** | -2.763 | -130.814*** | -2.700950 |
| Dummy variable equal to "1" for Asian countries: ASIA | 4.689 | 0.127 | -18.751 | -0.499 | 6.479 | 0.173 | -20.492 | -0.539923 |
| Merchandise trade as % of GDP: MTGDP | 1.935*** | 5.463 | 1.669*** | 5.091 | 1.811*** | 4.766 | 1.556*** | 4.343843 |
| Domestic credit to private sector as % of GDP: DCPS | 1.727*** | 4.196 | 2.025*** | 4.856 | 1.931*** | 4.175 | 2.214*** | 4.618020 |
| GDP growth (annual %): GROW | 0.088 | 0.032 | 0.3799 | 0.138 | | | | |
| GDP in billion USD: GDP | | | | | -0.009 | -0.924 | -0.005 | -0.801673 |
| Dummy variable equal to "1" for 2020 to represent COVID-19 pandemic and "0" otherwise: COVID | 18.143 | 0.639 | 16.232 | 0.578 | 15.609 | 1.022 | 11.077 | 0.739696 |
| Dummy variable equal to "1" if commercial banks are permitted to issue e-money (including prepaid e-money cards) and "0" otherwise: BNKEMON | -13.627 | -0.264 | | | -33.479 | 0.589 | | |
| Received digital payments in the past year (% of population aged 15+): RCVDGT | | | -1.307 | -1.464 | | | -1.347 | -1.486029 |
| Adjusted R-square | 0.2882 | | 0.2694 | | 0.2851 | | 0.2680 | |
| F-statistic | 12.8770 | | 12.1217 | | 12.6960 | | 12.0426 | |
| Durbin-Watson stat | 1.5101 | | 1.5156 | | 1.5251 | | 1.5249 | |

" β " indicates coefficient; "T" indicates T-statistics.

*p < 0.1; **p < 0.05; ***p < 0.01.

Source: Author's Estimations.

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