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Front Pages

Athens Journal of Business & Economics

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The ***Athens Journal of Business & Economics (AJBE)*** is an Open Access quarterly double-blind peer reviewed journal and considers papers from all areas of business and economics, including papers on accounting, finance, management, marketing, organization etc. The AJBE welcomes theoretical (including methodological), empirical (including case-studies) and policy (i.e., descriptive and non-analytical) papers. Given the mission of ATINER, the AJBE will also consider papers which emphasize country-related studies both at the business and the national economy level as well as economic history, history of economic thought and philosophy of economics papers. All papers are subject to ATINER's Publication Ethical Policy and Statement.

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Editorial and Reviewers' Board

President's Message

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The current issue is the third of the eighth volume of the *Athens Journal of Business & Economics (AJBE), published by the Business & Law Division and the Economics Unit of ATINER.*

Gregory T. Papanikos
President
ATINER

Athens Institute for Education and Research

A World Association of Academics and Researchers

17th Annual International Symposium on Economic Theory, Policy and Applications 27-30 June 2022, Athens, Greece

The Economics Unit of ATINER, will hold its **16th Annual International Symposium on Economic Theory, Policy and Applications, 27-30 June 2022, Athens, Greece** sponsored by the Athens Journal of Business & Economics. The aim of the conference is to bring together academics and researchers of all areas of economics and other related disciplines. You may participate as panel organizer, presenter of one paper, chair a session or observer. Please submit a proposal using the form available (https://www.atiner.gr/2022/FORM-ECO.doc).

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- **Dr. Chris Sakellariou, Head, Economics Unit & Associate Professor of Economics, Nanyang Technological University, Singapore.**

Important Dates

- Abstract Submission: **16 May 2022**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **30 May 2022**

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1-4 May 2023, Athens, Greece

The Business, Economics and Law Division (BLRD) of ATINER is organizing its **10th Annual International Conference on Business, Law & Economics, 1-4 May 2023, Athens, Greece,** sponsored by the Athens Journal of Business & Economics and the Athens Journal of Law. In the past, the six units of BLRD have organized more than 50 annual international conferences on accounting, finance, management, marketing, law and economics. This annual international conference offers an opportunity for cross disciplinary presentations on all aspects of business, law and economics. This annual international conference offers an opportunity for cross disciplinary presentations on all aspects of business, law and economics. Please submit an abstract (email only) to: atiner@atiner.gr, using the abstract submission form (https://www.atiner.gr/2023/FORM-BLE.doc)

Important Dates

- Abstract Submission: **3 October 2022**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **3 April 2023**

Academic Member Responsible for the Conference

- **Dr. Gregory T. Papanikos**, President, ATINER.
- **Dr. Michael P. Malloy**, Director, Business, Economics and Law Division, ATINER & Distinguished Professor & Scholar, University of the Pacific, USA.
- **Dr. David A. Frenkel**, LL.D., Head, Law Research Unit, ATINER & Emeritus Professor, Law Area, Guilford Glazer Faculty of Business and Management, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

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Post COVID-19 and the Acceptance of Financial Inclusion as a New Normal in Financial Transactions: Implications for Nigerian Accountants and Other Financial Service Providers

By Uwem E. Uwah[*], *Joseph O. Udoayang*[+] *& Peter A. Uklala*[±]

This study examined the preparedness of financial service providers to launch into the post COVID-19 era, using financial inclusion as a new normal in their clients' financial needs. The study adopted the survey research design, using a judgmental sampling technique. The questionnaire was used as the method of collecting data from 102 respondents, drawn from accounting firms, insurance companies, financial houses and pension fund administrators in Nigeria. With the aid of descriptive and inferential statistics, the hypotheses were tested at 5% level of significance. The findings revealed that there is a significant relationship between the socio-economic development structure in Nigeria and the acceptance of financial inclusion as a new normal in financial transactions. It was recommended that the public and private financial institutions be ready to provide the enabling environment for financial technology to thrive as a driver for financial inclusion in the Nigerian developing economy.

Keywords: *COVID-19 pandemic, financial technology, financial inclusion, new normal, financial service providers*

Introduction

Prior to the advent of COVID-19, many countries in the world had gone far in adopting strategies to promote and sustain financial inclusion. This is to emphasize that financial inclusion, as a subject matter is not new in finance and accounting. However, with the challenges posed by the pandemic, avenues must be sought to strengthen economic growth through the adoption of financial inclusion, embracing its numerous advantages, though its demerits must also be recognized and watched.

According to Sahay et al. (2020), during the COVID-19 pandemic, financial technology was intensified and this brought new opportunities for the use of digital financial services that accelerated and enhanced financial inclusion globally.

Nigeria as a developing economy did not lag behind in this re-invigorated trend in financial technology. Looking at the journey so far, since the adoption of the National Financial Inclusion Strategy by the Central Bank of Nigeria (CBN) in

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2012, the pandemic period brought about heightened embrace of financial inclusion (CBN 2020). The CBN noted that the key performance indicators such as access to and usage of diverse, convenient and affordable financial services were in display and accepted by clients of the financial service providers in the country.

As a developing economy, access to and usage of financial services have a major impact on economic growth. This is what Fintech is known for, as it provides the enabling environment for financial inclusion that entails the delivery of financial services at affordable costs for the financially underserved population, especially the rural dwellers (Nwanne 2015).

Adeyinka and Olugbamila (2015) take a position that financial inclusion, as a concept, came into limelight in the early 2000s, principally as a result of research findings which stressed that poverty and low economic growth in developing nations was as a result of financial exclusion. Similarly, Fung et al. (2014) assert that financial exclusion is the bane of economic under-development in developing nations. The motivation for financial inclusion was therefore rekindled in making entrepreneurs to have access to extensive financial products that are tailored to their needs and at reasonable costs during the period of the COVID-19 pandemic.

It is worthy to mention that policy makers and scholars did not have any idea of an impending pandemic, but with the emergence of COVID-19 pandemic, there is much need to increase the advocacy for adopting financial inclusion by developing nations, entrenching in their policies, beyond access and usage of financial services, to have the need for affordability, appropriateness and protection of financial service consumers. Therefore, as opined by De et al. (2016), access to financial services for the rural dwellers in every country in the world would catalyze development, reduce poverty and empower economic activities.

Constantinescu and Schiff (2014) assert that looking at the past two decades, the banking sector had predominantly been plagued by the traditional financial services where large pool of customers was excluded financially. In an earlier quest for a variant to the traditional banking system, Irechukwu (2000) opined that the Fintech sector has a tendency to grow and bring innovation through new methods of digital financial solutions that could be implemented to fill the gaps in response of the traditional banking sector that could not make financial services accessible to crisis-affected populations essentially.

The novel COVID-19 came up with its notoriety in pummeling economic blow to every country, Nigeria inclusive. The aim of this study therefore was to research on how financial inclusion as a tool for economic empowerment can be utilized by developing countries, for economic development and sustainability in the post COVID-19 era. The focus of the research was on the use of Fintech, as described by Sahay et al. (2020) as the technology-enabled innovation in financial services that could result in new business models, applications, processes or products with the attendant effect on the provision of financial services.

There have been various researches on Fintech and financial inclusion prior to the COVID-19 pandemic. Studies similar to this study were conducted on the determinants of financial inclusion in Africa by Evans and Adeboye (2016) and also Migap et al. (2015) on "Financial inclusion for inclusive growth: The Nigerian

Perspective." The model similar to what was used in this study was used, but gaps were created because those studies lacked the extraneous variables which affected business decisions as witnessed during the COVID-19 pandemic.

The gaps to be filled in this study therefore is based on the fact that COVID-19 incidentally brought a new normal, a concept which means accepting the reality of changes in the norms and values that were in operation before a new era, which cannot be reversed. This is the reality of what COVID-19 pandemic has brought to the entire world, and Nigeria as a country, in particular. The review and acceptance of the new normal, with regards to financial inclusion in Nigeria would re-position a vast number of people, small enterprises and potential entrepreneur who were, and still are excluded from financial services (Mohan 2006).

Literature Review

For development to be sustainable in a country, there are various resources that are required to be utilized so that the economic, social and environmental needs of the populace can be met. In the first instance, there must be improvement on the quality of life from the earlier generation to the future.

Oluba (2008) opine that most adult Nigerians in rural areas do not have any transactions with financial institutions. This assertion implies that private and public financial service providers are not mostly available in the rural areas. More so, with the estimated population of over 200 million Nigerians, where a greater part of this number are rural dwellers, financial services are deficient. The stringent safeguard measures maintained during the pandemic gave a serious blow to economic development of this great West African country. Policies on financial inclusion should be re-designed and enforced as a new normal in the post COVID-19 era.

According to Beck et al. (2007) financial inclusion is a key dimension of, and a strategic means towards financial development of any country. This assertion is affirmed as it is more or less a means by which firms and households meet their financial needs at costs that are reasonable and affordable, as they participate in the formal financial system.

Adeyinka and Olugbamila (2015) suggest that economic development of a nation depends on how every sector of the economy functions and it was recommended that the formulation of clear policies among other things should be made by the government of the nation. This review is necessary as it is in line with our thought that things would never remain the same after the COVID-19 pandemic. In the pandemic era, physical access to domains and structures are done with utmost care, observing social distancing and avoiding contacts with persons to avoid contracting the virus. Financial services were disrupted negatively as noted by Sahay et al. (2020).

Uwah and Akinninyi (2020) opine that individuals are assumed to make choice according to the rank ordering of expected values. Therefore, from the theory of information economics/statistical decision, during the pandemic, financial service providers were affected in their financial returns. So were their

clients. The need therefore arises that the formal method of providing financial services must be positively disrupted through digital access to and usage of such services. This could be through mobile phones and computers to access the internet, and financial service providers have to wake up to the challenge so as to abate an economic slide (Islam et al. 2017).

In this wise, financial inclusion could be seen as a means of formally getting financial transactions carried out, providing opportunities for payments and transfers of funds, savings, insurance services and a whole of other functions which economic agents can offer. Nwanne (2015) noted that financial inclusion supports financial development, and failure to define its operations and concept could mean that the real effect expected of an inclusive financial system is underestimated or exaggerated. The concept of financial inclusion came up when it was realized that a section of the society made up of individual and businesses could not access the appropriate financial services from the main financial service providers (Nwanne 2015).

According to Leyshon and Thrift (1995) if one is not financially inclusive, then the other side of the coin, financial exclusion becomes imperative. For financial service providers in Nigeria to gear up towards financial inclusion as the new normal in the post COVID-19 era, it implies that their clients must not be financially excluded. Leyshon and Thrift (1995) maintained that the idea of financial exclusion first came up officially in 1993 when a group of geographers in a survey research discovered how limited the access to physical banking services had been, owing to massive closures of banks' branches.

Uwah and Udoayang (2020) posit that this situation escalated in recent times when banks had to close shops owing to the pandemic, and financial inclusion as a concept got a boost from financial service providers in order to balance the economic equilibrium. However, the authors were concerned about reporting issues, as earnings management may raise its ugly side if the new normal is not captured in financial reporting. As various scholars and academics have expressed their thoughts on the aftermath of COVID-19 in recent times, Singhraul and Batwe (2020) maintain that the outbreak of COVID-19 has affected human lives and services the world over. Situations in the post COVID-19 era, according to Singhraul and Batwe (2020) will either, give new boost, or depression to the world economy. The Gross Domestic Product (GDP) of a country might rise or fall, depending on how provision of goods and service are carried out, to stifle or stimulate the economy.

Financial inclusion, according to Hannig and Jansen (2010) could be that catalyst which would guarantee every economic agent, the accessibility to the use of basic financial services that would help in the growth of the economy.

Effiong et al. (2020) believe that it is the desire of every business to operate beyond the near future and maximize contributions and shareholders' wealth. It is also a new normal that COVID-19 pandemic has brought financial crisis to every country of the world, and for a country to sustain and grow its economy, there must be engagement in financial innovation so as to avert devastating systematic impacts. It is expected that international financial standard setters as well as

financial regulators would make effort in streamlining financial standards to accommodate financial inclusion (Hannig and Jansen 2010).

Soludo (2008) puts it that for financial inclusion to present opportunities for enhancing financial stability in a destabilized financial setting, its acceptance would ensure that individuals and firms could access and use formal financial services in their transactions. There would be availability as well as accessibility of credit at costs favourable to the poor and the marginalized in the society (Onaolapo 2015). As witnessed during the COVID-19 pandemic, International Monetary Fund (2020) observes that digital payment which includes payments using mobile phones or operated online were greatly used by clients of financial service providers during the pandemic. Other services carried out during the pandemic in increased dimension were digital lending and credit. Credit activity involves the extension of funds through digital means, while digital lending was carried out through market place lending, e-commerce lending, online lending by banks, mobile lending and peer-to-peer lending (IMF 2020). Sahay et al. (2020) had buttressed that market place lending, which has to do with lending through digital platforms connecting lenders and borrowers was very paramount during the pandemic. The use of mobile money, the financial service offered to its clients by mobile network operators and their allies were also heightened.

In any event, Sarma and Pais (2011) assert that a financial system is said to be inclusive when it serves the needs of a wider spectrum of society in an affordable and efficient manner. They maintain that the socio-economic status of the client would not be considered as important if financial inclusion is to meet its objectives in the provision of the services by the financial service providers. Therefore, Cohen et al. (2006) maintain that when customers are satisfied, there is a tendency for the financial service provider to retain them. More so, there would be a promotion of efficient allocation of financial resources that is expected to increase economic growth and development in any given environment.

Financial Inclusion and the Financial Service Providers

Financial service providers cannot be successful in the implementation of financial inclusion, if financial technology is not embraced. This is the main reason financial service operators must be involved in digital economy, E-commerce and M-commerce. Anyalenkeya (2020) opine that digital economy is an economy that is based on digital transactions and people cannot be financially included if they are not involved in digital financial transactions. Anyalenkeya (2020) further outlined the five pillars of digital economy as digital infrastructure, digital platforms, digital financial services, digital entrepreneurship and digital skills.

Adeyinka and Olugbamila (2015) maintain that the digital economy uses the internet, and it is not limited by space or distance. The public sector as well as the private sector in Nigeria have to look inwards and collaborate to make this happen, otherwise the template for financial inclusion is nil. According to them, e-commerce is an emerging business driver that uses technology to fulfill commerce

and/or deliver financial services and products to consumers. It thrives on online sales, insurance and digital payments.

Schmitz and Grayston (2020) assert that m-commerce involves the use of mobile technology. It entails buying and selling through mobile phones, mobile apps and other mobile compatible payment platforms. It stands out to be true that financial service providers who use financial technology platforms have easy operation of financial inclusion as they offer cheaper deals to customers and may not need to invest money in physical infrastructure. Therefore, in the context of post COVID-19, financial inclusion driven by financial technology as evidenced in e-commerce and m-commerce give consumers the benefit of having greater choice of products and services they could buy them remotely, regardless of location. It is also opined by scholars (Soludo 2008, Swamy 2011, Sarma and Pais 2011) that financial inclusion in these dimensions allows financial service providers the opportunity to store more information on customers so as to offer them more personalized products or services.

It is evidenced that digital commerce is made possible through internet, cloud, mobile and social media. Therefore, accountants and other financial service providers must seek to be relevant in the post COVID-19 era by getting these infrastructures as assets in the new normal disposition.

The Concept of Intermediation and Financial Inclusion

Asuquo et al. (2020c) assert that financial intermediation as carried out by financial service providers will take a new turn, as a matter of fact in the post COVID-19 era. According to them, the national government should be ready to use micro-economic variables to control the economy owing to many modifications that are inherent in the new normal. The concept, modified operationally, has the capacity to bring financial providers together online, in a group, even though they are physically apart. In the same vein, target customers are brought online, to meet with them. The acceptance of this new concept of financial intermediation improves financial transactions through financial inclusion. Therefore, government must ensure price stability, redistribution of income from the high to low income earners and among many others, ensure the provision of social infrastructures within the economy to assist other responsibilities which could be done by the citizens and other private organizations. Accounting Standard setters should be ready to make adjustments and regulate financial accounting Standards to meet this new reality (Asuquo 2013). As opined by Mohan (2006) this new concept of financial intermediation has the benefit of eliminating wastages, because the financial service providers and their clients share resources, and pay lower than they would ordinarily have paid if they were taking it alone. The positive effect here is that the financial service providers would have more customers than they would have had.

Ojedokun (2020) maintains that the key digital trends that would shape the world economically and socially in the post COVID-19 era include big data, Blockchain, Artificial Intelligence (AI), machine learning, and quantum computing. It implies that the financial providers must be ready alongside the population of the

geographical entity, and both must be ready to embrace the changes for economic sustainability to be achieved. The digital platforms in the post COVID-19 era would also ensure payments through Unstructured Supplementary Service Data (USSD), Automatic Teller Machines (ATM), Points of Sale (POS) gadgets and many more that are simple and easy to access, even in the rural areas. This is how economic activities can be supported for the new mode of business operations (Wakdok 2018).

Consideration by Accountants and Other Financial Service Providers as they Plan for the New Normal

According to Schmitz and Grayston (2020) uncertainty is the only certain thing lurking around businesses and their transactions during the COVID-19 pandemic. To move ahead and be certain of our businesses, it is pertinent for accountants and other financial service providers to prepare for the post COVID-19 world. The acceleration of digital transformation that many organizations had already set in motion prior to the COVID-19 era must be maintained. IMF (2020) says countries of the world, the developing economies inclusive, were already in motion to accepting new technological changes that would support business transactions into the future. In this dispensation, it is left for both consumers and financial service providers to embrace the change in technology so as to keep economic activities possible (Schnitz and Grayston 2020).

Rees (2020) maintain that the COVID-19 crisis has made it possible for services/goods providers and the consumers to have a sudden glimpse into a future world. This informs why technology adoption should be extended to, and adopted with speed by all developing countries, including Nigeria, if they are to remain relevant in the new normal (Asuquo et al. 2020b). Retailers have started moving to contactless and online shopping/delivery, while insurance companies and tax authorities have transitioned to self-service claims assessment. Organizations have rolled out technologies that enable remote working for the majority, if not all, of their workforce (Schmitz and Grayston 2020).

Rees (2020) outlined technological tools that can help financial service providers and their customers to move on, negating the impact of COVID-19 pandemic. Medical services providers are beginning to warn that the pandemic may become endemic, therefore, to remain relevant, accountants and other service providers in finance must do the needful, such as:

Putting the Right Connections in Place

Rees (2020) opines that Accountants and other financial service providers should be able to access their business data and applications. The use of cloud applications like Google Docs and Xero is easy and affordable and there should be the readiness to set up an outreach team with the remote access software. Adeyinka and Olugbamila (2015) emphasize that the greatest impediments to effective remote working are inadequate technology and infrastructure. These are provisions expected to be put in place by governments in developing economies,

alongside with the organized private sector. These sectors, the public and private, would be the better for it in the long run, considering digital economy which the 21st century is rolling on effectively (William and Tavneet 2016).

Wakdok (2018) indicates that to optimally adopt and accept financial inclusion based on the provision of adequate technology and infrastructure, necessary risks assessment to elucidate the challenges of transitioning a workspace to remote environment must be carried out. Rees (2020) identifies the major concern here as finding the right mix of tools to assist in the transition, factoring in cybersecurity concerns, employee wellbeing as well productivity and convenience. Singhraul and Batwe (2020) assert that financial service providers need to stay safe and secure in the new dispensation. According to Rees (2020) a security vendor recently detected more than 230,000 COVID-19 related cyber-attacks including, ransomware, business email compromises and malicious domains. These pose the threats that culminate into major challenge of securing business data in remote basis financial transactions of financial inclusion. To mitigate this, McEwan (2020) suggests the use of effective anti-virus software or other end point protection.

Swamy (2011) suggests that for financial inclusion to develop properly, financial service providers should also use the virtual private network (VPN) especially where the remote access software is used by the staff for on-premises systems. This makes it pertinent for financial service providers to keep in touch and motivate their clients.

Rees (2020) suggests the use of conferencing apps such as Zoom, GoTomeeting or Cisco Webex. He opines that a balance is expected to be maintained by financial service providers through minimizing any feelings of isolation that employees may have owing to the remote operations they engage in. These apps are therefore essential for regular team meetings so as to keep employees' minds on the job. Chat tools, such as 'Slack', 'Chanty' and 'Workplace by Facebook' can improve communication so greatly, even in rural settings, once the infrastructure is in place.

Another implication for financial service providers is how to manage remote teams effectively. According to McEwan (2020) cited in Rees (2020) "remote work success depends heavily on whether employees are entrusted to the work, even if managers do not see them." In Nigeria, for instance, it is obvious that the necessary gadgets that would help to keep track of the actual work being done by employees in remote basis by the financial service providers as owners of the business are available. The success of this, is still dependent on the provision of infrastructure to support the post COVID-19 era.

Ojedokun (2020) puts it that business transformation, using the cloud is something to consider by accountants and other financial service providers. McEwan (2020) says that in adapting to the pandemic, significant digital transformation is imperative for many businesses, and the clouds apps offer long-term business benefits. He maintains that migrating on-premises data to the cloud will make it easier to access files remotely and has the tendency to minimize or completely remove the expenses incidental to server's maintenance. It is noted that Microsoft's OneDrive, Google Drive or Dropbox Business are platforms that can do this (McEwan 2020).

To be relevant in the post COVID-19 era, accounting and finance professionals must ensure that customers' interaction is taken to a new level. Rees (2020) assert that in-person meetings are good, but even at the best of times, they are not always possible. The advent of conferencing apps has offered the opportunity to catch up with clients more often, and travel expenditure is reduced for the organization. Webinars become a great option for educating customers through apps like Zoom video and email newsletters are important in the new dispensation to keep customers informed and educated, giving solutions to whatever challenges the business entity or the clients may have (Anyalenkeya 2020).

The Institute of Chartered Accountants of Nigeria (ICAN) (2020) opines that it is apt to say that companies in the developing economies that would succeed in the new normal are likely to be those that are smart about identifying prospects and interact frequently with customers. ICAN in its 2020 Accountants' workshop on ICT proffers that while CRM systems were traditionally designed to help manage business clients, new platforms like Salesforce and Insightly have helped to market new consumers. These platforms, according to the Accountants' Institute, are equipped with advanced tools like analytics that could identify sales opportunities, manage sales staff, and more.

Asuquo et al. (2020a) want accountants and other financial service providers to adopt performance management best practices. The shift to remote working, as proposed in the post COVID-19 era will force managers to do away with traditional management practices that refused to grow with time (Nwanne, 2015). According to McEwan (2020) when the dust settles, we will see the that our remotely working staff would be just as productive, if not more, than during the traditional era of managing staff and work. Sahay et al. (2020) believe that businesses in future, adopting technology with sophisticated key performance indicators will realize how effective their employees are and the much value the business is achieving.

Schmitz and Grayston (2020) believe that the firms that would succeed in adopting the right technologies in the post COVID-19 era, and adapting to flexible work arrangements are most likely to do better in their businesses, even in the future.

Exploiting Digital Disruption in the Post COVID-19 Era by Financial Service Providers

Digital disruption, according to Ojedokun (2020) are the changes that occur when new digital technologies and business models affect the value proposition of existing goods and services. According to him, disruption refers to a very specific process that explains how entrants can successfully compete with incumbents. It has to do with business model innovation that enables entrants to enter market with cheap, easy to use products. Digital disruption could be a combination of new and existing technologies, but the focus is the impact/influence it would have on the society. This concern is the acceptance the technology would have when the society notices the disruptive experience.

A model of digital disruption would show how new digital technologies (Cloud, Social mobile, Big data, Internet of everything) would give rise to New sources of value, which in turn would give rise to improved economics. The improve economics would then result in marginal cost reduction, wherewith customers' loyalty would increase, leading to high profit margin, revenue growth and eventually a higher enterprise value (Evans and Adeoye 2016). Ochi et al. (2021) opine that there would however be the vicious cycle of business growth and development, where the new sources of value will support new business models, and this in turn will support new types of customers and employees. The new types of customers and employees will support the new leadership styles showcased by management, and the cycle will go back to support the new sources of value derived by the financial service providers.

Ojedokun (2020) maintains that digital disruption at any given level should have four basic elements, which are:

1. The business concept, which evaluates the current and potential market, business development plans, pricing strategies, delivery of services or goods and the like.
2. The technology that is in place, looking at inventions, the design and usage that the new technology will expose the business operation to.
3. The industry the business is found would influence the processes, standards that have been in existence and proposed changes to existing standards, methods of performance and how the customers will accept the changes.
4. The society where the disruption is going to be carried out is an important element to observe. This has to do with the culture of the people and how the change is welcome. What about their habits and movements of the new technology? This is what has recently been witnessed during the 5G Network technology movement in many parts of the world.

In the final analysis, digital disruption would prove useful in a post COVID-19 era if the business owners and the society would recognize the change, the financial service providers would build their identity in the new changes and our collective future is brought to life (Ojedokun 2020).

Audit Technology in the Post COVID-19 Era

Schmitz and Grayston (2020) assert that before the pandemic, many audit firms have been in the process of adopting technology-enabled audit processes, using digital client-platforms. It is practically seen in the COVID-19 pandemic situation that during the lockdown and afterwards, physical distancing has magnified the need for such technologies and platforms, especially when it relates to client engagements. Rees (2020) reported that an Auditor, Peter Kerr of the Australian National Audit Office, commented that audit in the post COVID-19 age is becoming an automated exercise. He said "COVID-19 just shows that the focus

shifts from manual reconciliation to more automation. Technology fast-tracks audits through automated procedures."

However, Hucklesby and Macdonald (2004) opined that for the new normal to balance with the technology adoption by accountants and other financial service providers, the clients need to be technologically up to date. In an audit situation, the new order demands that clients also need to have the technology in place to allow for data to be made accessible to the auditors.

Theoretical Framework

This study was based on some theories in Economics, accounting and finance, majorly the theory of information asymmetry, and theory of financial development.

The theory of information asymmetry that was developed in the 1970s and 1980s explains the financial constraints on small firms and poor borrowers and how intermediation would ensure efficient allocation of financial resources to avoid market failures. This also concerns an imbalance between buyers and sellers. In this context, the buyers are the clients in the financial inclusion net while the sellers are the financial service providers. When financial intermediaries are able to overcome the problems of information asymmetry, there would be efficient distribution of goods and services in a free market, and there would be no market failure. The post COVID-19 era would make the financial service providers to breast up and provide adequate information through digital channels, and this would meet the clients who use the service at the right time. This will then give adequate flow to financial development.

Theory of financial development has a proviso that private contractual arrangements form the basis of financial activities. More so, financial theory's legal adaptability holds that legal traditions differ in terms of their ability to adapt to changing commercial and financial circumstances. The theory provides that effective adaptation to changes in operating conditions will concomitantly support financial development more effectively. In this context, this includes financial structure, inclusion and deepening. Financial deepening has a nexus with financial inclusion as economists use it to refer to increased provision of financial services and better access for different socio-economic groups. A deepened financial system would encourage governments and organizations to set up public sector banks that can offer pro-poor services as part of financial sector reforms. This will be an improved performance from the traditional banking and other financial services provision. This theory ensures that a deepened financial system that is inclusive ensures both inclusive and pro-poor growth that is equitable. This is an aid to economic development.

Empirical Framework

Many authors have empirically studied the concept of financial inclusion at various dimensions, though a study has not yet linked the subject matter to the COVID-19 pandemic. Anyanwu (2004) empirically studied the empowerment of rural households through financial inclusion. He obtained secondary data,

analyzed same and found out that there was a close relationship between financial inclusion and the empowerment of the rural dwellers. The study concluded that financial inclusion can enhance economic stimulus among economically weaker sections of a country, the rural dwellers.

Murari and Didwania (2010) investigated the impact of microfinance on poverty, using financial inclusion as a catalyst. The study, conducted in India adopted the regression analysis method and analyzed the secondary data obtained from banks and primary data from 260 rural dwellers in the country who did not have incomes large enough to access banking facilities. The result indicated that financial inclusion has significant influence on poverty eradication and could provide self-employment opportunities for the poor and vulnerable in the society.

Swamy (2011) examined the trends of financial inclusion in India and found out that the number of banks is inadequate for the large rural population in India living in rural areas. It was concluded that greater number of small farmers was not included in the provision of basic financial facilities. This was believed to be responsible for the negative slope in the contribution of agriculture, the mainstay of the rural dwellers, to the Indian GDP.

Sarma and Pais (2011) researching on financial inclusion and development identified the factors that had significant association with financial inclusion in cross-country level. The study reveals that levels of human development in a country have a significant relationship with financial inclusion, though with few exceptions in the hypotheses tested. The study further revealed the significant relationship of financial inclusion with physical infrastructure. On the study of financial service providers, such as banks, the study however indicated that government ownership of banks was not significantly associated with financial inclusion.

Onaolapo (2015) studied the effect of financial inclusion on the economic growth of Nigeria. The major variables in the study were poverty reduction, and financial intermediation as indices of economic growth, while lending, means of payment and investments indicated for financial inclusion. The study found out that there is a significant relationship between financial inclusion and Nigerian economic growth. It was recommended that financial regulators in the Nigerian economic space should issue proper guidelines and regulations to encourage financial intermediation among the poor rural dwellers in Nigeria.

Gebrehiwot and Makina (2015) researched on "financial inclusion in Africa, using GMM dynamic panel data analysis". The paper examined the determinants of financial inclusion across 27 African countries. They adopted a model that studied the problems plaguing against past studies of determinants of financial inclusion. Their model showed that financial inclusion is significantly and positively related to its lagged value, GDP per capita and mobile infrastructure, and negatively related to government borrowing. Their recommendation was that the upward trend of mobile infrastructure penetration in Africa is a welcome development and should be encouraged. In the same vein, the large ratio of government debt to GDP which hampers efforts to achieve financial inclusion should be minimized.

Methodology

This study adopted a survey, descriptive and causal research design. Therefore, an instrument, an unstructured or checklist questionnaire was drawn. The population of the study was 150 that included accounting/audit firms, insurance companies, financial houses, Central Bank of Nigeria, Pension Fund Administrators (PFAs), and accounting academics. The choice of this population was based on the fact that corporate organizations, both private and government agencies in Nigeria and individuals have one stake or the other in the use of financial information and devices. We had the believe that their access to financial information can influence their decision about financial inclusion and increase in productivity which can enhance socio-economic activities in the post COVID-19 era.

Judgmental sampling technique was used to ensure that respondents to the administered questionnaire were drawn from the six geo-political zones of Nigeria. The Taro Yamane sampling size method was used to select 109 respondents across those six geo-political zones. The total number of instruments (questionnaire) retrieved, which we gathered data from were 102, and the data were analyzed using the Pearson Moment Correlation Coefficient at a 0.05 level of significance.

Model Development

The model for this study was developed as shown in the schematic representation of the conceptual framework.

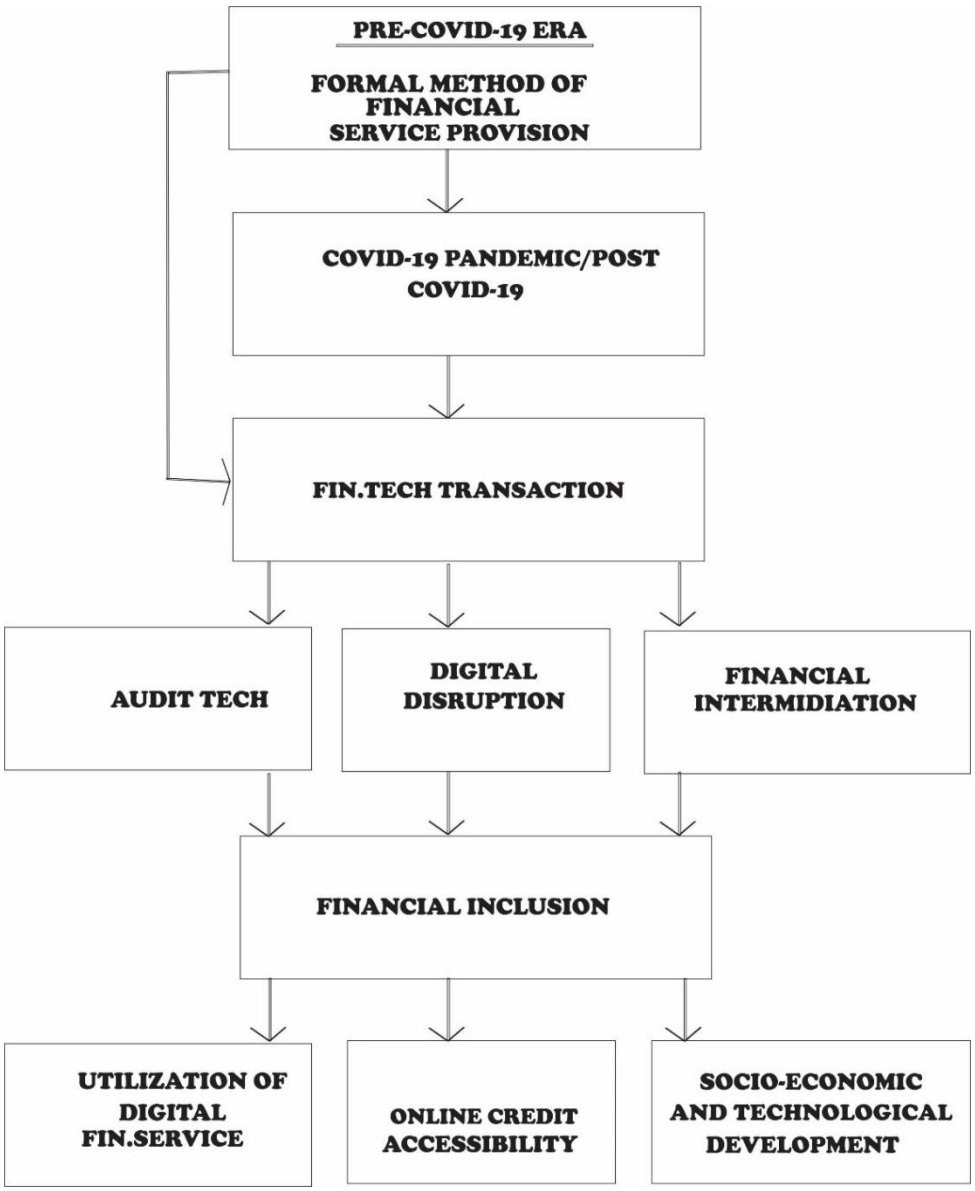
In the pre-COVID-19 era, the formal/traditional method of providing financial services by banks and other financial institutions was in vogue. Services that make up financial inclusion were skeletal, largely because of information asymmetry.

During the COVID-19 pandemic, the traditional method of financial services provision was disrupted and prominence was given to financial inclusion activities because of the lock-down and social distancing policies that were in force. Fintech transactions became a new norm in financial transactions during the time. The variables of Fintech in this study are: Audit Technology (AT); Digital Disruption (DD) and; Financial Intermediation (FN) which became a new normal in financial services and major drivers of financial inclusion. The benefits of financial inclusion therefore become its sub-variables, which are: Utilization of digital financial services; online credit accessibility, and; socio-economic and technological development.

Development of Hypotheses

The hypotheses for this study were developed based on the relationship amongst the variables as shown in Figure 1.

Figure 1. *Schematic Representation of Conceptual Framework and Derivation of Variables*



$H_0$1: There is no significant relationship between audit technology and financial inclusion in Nigeria.
$H_0$2: There is no significant relationship between digital disruption and financial inclusion in Nigeria.
$H_0$3: There is no significant relationship between financial intermediation and financial inclusion in Nigeria.
$H_0$4: There is no significant joint relationship between audit technology, digital disruption, financial intermediation and financial inclusion.

Model Specification

A relationship was established among the variables, using an adopted model from Uwah and Udoayang (2020), following the general equation for regression, Y = f (X), indicating that Y depends on X,

The model was adapted as follows:

Financial Inclusion (FI) = $f(Financial\ Technology\ Transactions)$

i.e., FI = $f(FT)$

and the equation is written as:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \mu$$

Where, α is the intercept, and $\beta_1, \beta_2, \beta_3$ are the coefficients of the variables respectively, which show the kind of relationship between dependent and independent variables and μ is known as the error term. Therefore,

Y = Dependent variable, which is financial inclusion.
X = Independent variable, which is Post COVID-19, with financial technology transactions as a major variable and the sub-sub variables were indicated by: audit technology, digital disruption and financial intermediation.

Financial inclusion, as the dependable variable was indicated by the following sub-variables: Utilization of digital financial services; Credit accessibility and; Socio-economic and Technical development.

A bivariate statistical analysis, the Pearson Moment Correlation Coefficient was used to test the above hypotheses using the data gathered from primary sources, and having established that a causal relationship existed between the data gathered, we had to test for evidence of good correlation.

From our model,

$FI = f(FT)$

$$FI = a_0 + \beta_1 AT + \beta_2 DD + \beta_3 FN + \mu$$

Where, AT = Audit technology.
DD = Digital disruption.
FN = Financial intermediation.

Testing of Hypotheses and Analysis

Hypotheses one to four were tested using SPSS. Financial inclusion as the dependent variable was used against the proxies of financial technology transactions, a major representative of the independent variable. A confidence interval of 95% was taken and the decision rule was to reject the null hypothesis if the calculated value, p, is less than the alpha value of 0.05 ($p<0.05$) and to accept, if otherwise.

Results and Discussion

This section shows the tables and the findings from the study with the associated results.

Table 1. *Correlation Analysis Showing the Relationship between Financial Technology Transactions' Sub-Variables and Financial Inclusion*

Pearson Correlation	**F INCLUSION**	**AT**	**DD**	**FN**
F INCLUSION	1.000	0.770	0.156	0.843
AT	0.770	1.000	0.082	0.734
DD	0.156	0.082	1.000	-0.096
FN	0.843	0.734	-0.096	1.000
Sig.(1-tailed) F INCLUSION	.	0.000	0.115	0.000
AT	0.000	.	0.265	0.000
DD	0.115	0.265	.	0.000
FN	0.000	0.000	0.230	.
N F INCLUSION	102	102	102	102
AT	102	102	102	102
DD	102	102	102	102
FN	102	102	102	102

Source: SPSS V.20 Field Data Analysis (2020).

The data are presented with tables and analyzed using SPSS Package. In Table 1, the entire pair wise correlation coefficients indicate the actual significance level for each correlation. The table reveals that financial inclusion correlates with Audit Technology (AT) at 0.77 that shows a high correlation level (about 77%) of relationship. The table also reveals that the p-value is less than the alpha level ($p<0.05$). This was significant at 0.000. Using our decision rule, the null hypothesis 1 was rejected, and the alternate accepted. This means that there is significant relationship between utilization of digital financial services through financial inclusion and Audit technology.

Hypothesis 2 was on financial inclusion and the proxy of financial technology transactions. Using Digital Disruption as a sub-variable of financial technology transactions, the correlation with online credit accessibility has r of

0.16, an insignificant relationship of a paltry 16%. However, the table reveals that the calculated p is greater than the alpha level ($p>0.05$). Therefore, using our decision rule, null hypothesis 2 is accepted.

In the same vein, hypothesis 3 on financial inclusion and financial intermediation as a new normal caused by COVID-19 pandemic in Nigeria was tested. The relationship has r of 0.84 as the correlation between financial intermediation and Socio-economic and Technical development, a significant correlation of about 84%. With Table 1 showing the calculated p-value being less than the alpha value ($p<0.05$), the null hypothesis was rejected, using our decision rule. This means there is significant relationship between financial inclusion and financial intermediation.

Table 2. *Analysis of Variance (ANOVA) Associated with Multiple Regressions on the Joint Relationship between Variables of Financial Technology Transactions and Financial Inclusion*

Model	Sum of Squares	df	Mean Square	F	R	R^2	Adjusted R^2	Sig.	Result
Regression	59.262	4	14.816						
Residual	10.475	56	0.187						
Total	69.738	60		79.203	0.922**	0.850	0.839	0.000	Significant

**Dependent variable: Financial inclusion. *Independent variable: Financial Technology Transactions (AT, DD, FN).

Source: SPSS V.20 Field Data Analysis (2020).

Table 2 shows analysis of variance (ANOVA) which indicates that when the multiple correlation is converted to F, it shows an F ratio of 79.20 that is significant at 0.000. This depicts that all the sub-variables of financial technology transactions in this study when jointly regressed against financial inclusion had a lower p-value than the alpha value ($p<0.05$). A multiple correlation coefficient, R of 0.922 was also realized, indicating a very high correlation. The R^2 value of 0.850 indicates that all the independent variables combined contribute about 85% to financial inclusion. Therefore, with a lower p-value of 0.000 that is lower than the 0.05 value, the null hypothesis 4 was rejected. This implies that there is significant joint relationship between Audit Technology; Digital Disruption; Financial Intermediation, and Financial inclusion.

Table 3. *Coefficients of the Joint Relationship between Variables of Financial Technology Transactions and Financial Inclusion*

Model	Unstandardized Coefficients		Standardized Coefficients	95% Confidence interval for B			
	B	Std. Error	Beta	Lower Bound	Upper Bound	t	Sig.
(Constant)	-1.025	0.224		-1.474	-0.576	-4.573	0.000
AT	-0.013	0.093	-0.014	-0.199	0.173	-0.138	0.890
DD	0.085	0.053	0.094	-0.021	0.190	1.609	0.113
FN	0.680	0.080	0.665	0.520	0.841	8.483	0.000

Source: SPSS V.20 Field Data Analysis (2020).

Table 3 shows the coefficients of the joint relationship between variables of financial technology transactions adopted for this study and financial inclusion. The regression shows a significant relationship (0.000) in the overall, though the relationship of AT and DD do not show significant values. The Beta for AT is -0.014 (not significant, $p>0.05$), 0.094 for DD (not significant, $p>0.05$).

In Table 1, the pair wise correlation coefficients show the level of significance for each correlation. Financial inclusion and Audit Technology (AT) has r of 0.77, or 77% relationship, indicating a high correlation. Equally, the table reveals that the p-value is less than the alpha level ($p<0.05$) and was significant at 0.000. Since the null hypothesis was rejected, it means that audit technology, relate significantly with financial inclusion through the utilization of digital financial services. It is possible that this result arose because of the automation of audit services. During the pandemic, social distancing was observed and for the service to continue, Auditors adopted the automation of their roles to the clients. The result, as it were, is an indication that aside from the Auditors, the clients are ready for digitalization of their work, so that the auditors can be effective and efficient in their audit functions.

Hypothesis 2 showed an insignificant relationship between digital disruption and financial inclusion, with online credit accessibility as its proxy. The reason for non-correlation of the variables is believed to be as a result of slow adoption of digital services by the service providers as well as their clients. In Nigeria, power supply is epileptic with most customers not being able to power their mobile phones and other accessories that supports the digital disruption. The drag in providing this technology owing to environmental conditions could be responsible for this result.

Hypothesis 3 that was on the relationship between financial intermediation and financial inclusion, represented by socio-economic and technological development showed a significant result. This result may be as a result of the lower cost of transacting loans and other payments, which hitherto, would have taken the rural dwellers out of their comfort zone to negotiate for such facilities. With the encouragement and campaign for SMEs in Nigeria to be involved in e-commerce, the people have cashed in on the development to have easy business mechanism than it used to be when it was manually operated.

Hypothesis 4 measured the joint relationship between the sub-variables of the independent and dependent variables. The result showed a positive relationship. This may likely be from the fact that financial inclusion is accepted by majority of rural and urban dwellers in Nigeria. It is easily understood that there is cost reduction and time-saving when the era of formal financial services provision is compared with what is obtained in the digital dispensation of doing business. There have been various groups and individuals making advocacy for the adoption of the 'new normal' because of its simplicity.

Conclusion and Recommendations

This study was conducted to examine the relationship existing between the Fintech-enabled 'new normal' arising from the activities of the COVID-19

pandemic. Variables supporting the digital technology and those supporting financial inclusion were regressed against each other, and the result gave an overwhelming support that the role of accountants and other financial service providers should move beyond the traditional formal financial service provision, to adopting and moving ahead with the 'new normal' services to their clients.

This study recommends that the governments (Federal and States) in Nigeria who are in charge of the public sector economy should provide the enabling environment for financial technology to thrive as a driver for financial inclusion.

The private sector which is the domain of investors and financial service providers should realize that in a competitive world that we are, most investors will close shop to their competitors if they are not willing to move along with technology.

The socio-economic indices of development are still very low in Nigeria. There must be active participation by the rural dwellers who are the majority of the population. More so, the small-scale entrepreneurs who are known to contribute so much for economic development, should be encouraged to be financially inclusive.

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A Stochastic Frontier Analysis of the Human Capital Effects on the Manufacturing Industries' Technical Efficiency in the United States

By Salem Gheit[*]

This study seeks to establish substantive empirical evidence on the role of college and non-college labour in productivity through technical efficiency in the manufacturing sector in the U.S. economy. This investigation fits a Cobb-Douglas stochastic frontier function with inefficiency effects to a set of panel data for 15 manufacturing industries over the period from 1998 to 2019. The contribution of this paper lies in the application of the stochastic frontier analysis following the approach of Caudill et al. (1995) by estimating and testing stochastic frontier production functions, assuming the presence of heteroscedasticity in the one-sided error term (inefficiency), which provides robust estimates of the technical efficiency measures. This paper also contributes to the literature in the sense that it follows the Hadri (1999) approach and its extension for panel data, Hadri et al. (2003), assuming the existence of heteroscedasticity in both error terms (the one-sided inefficiency term and the two-sided symmetric random noise). The rationale for the double heteroscedasticity estimation is that it results in more accurate measures of the effects of the technical efficiency determinants. Therefore, it adds another layer of confidence in the economic analysis of the impact of human capital components on the manufacturing sector efficiency and by extension, its productivity. The stochastic frontier results show the effects of highly educated workers and low educated workers – proxied by college and non-college labour – on technical inefficiency. This is where the maximum likelihood estimates suggest that the increase in the percentage of the hours worked by college workers tends to contribute positively to technological efficiency in the U.S. manufacturing industries. While on the minus side, it can be noted that the rise in the share of the hours worked by non-college persons seems to have negative impact on efficiency in these industries.

JEL Codes: *J24, D24, C23, C24, Q12*
Keywords: *human capital, technical efficiency, stochastic frontier production, double heteroscedasticity, panel data*

Introduction

Skilled human capital has been widely recognised as efficiency-driver and growth-enhancing in advanced economies and underdeveloped economies alike. It is therefore regarded – according to the endogenous growth theories – as a crucial

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ingredient for innovation growth and as an endogenous factor in production (Ali et al. 2018, Mahmood and Alkahtani 2018, Lawanson and Evans 2019).

The advances in the theory of economic growth, especially the developments in endogenous growth models, lie in the assumption that the long-run growth is determined within the model. The main element in these models is the technological progress, which means that a purposeful research and application would certainly result in new and cutting-edge products and state-of-the-art methods of production, and would pave a way to adopting the superior technologies that have been contrived and originated, as well as those developed in other countries or sectors (Barro 2013).

In Romer's model (1990) human capital plays a special role, and it has been identified as the principal input to the research sector that produces new ideas and commodities which underlie technological progress (Barro and Lee 1994, Ogundari and Awokuse 2018). That is to say, human capital overcomes the limitations imposed on growth due to the diminishing returns to other inputs (labour (L) and capital (K)) (Arshed et al. 2021), and it promotes growth and development through the important externalities of knowledge stock through raising the productivity of both labour and capital, and providing the appropriate environment for the emergence of entrepreneurs, who implement and benefit from diffusing innovations in order to encourage quality over the quantity of children when fertility rates gradually fall down worldwide (Mathur 1999).

In this respect, there are three main types of conclusions to be considered: (a) studies that consider human capital as a fundamental factor of economic growth; (b) studies that stand for the assumption that human capital accumulation cannot clarify the difference in income distribution when using these findings at an international scale; and (c) studies that consider human capital as a result of economic growth (Loening 2002). However, having said that, the difficult question that seems to face economic policy makers is how to generate and stimulate a sustainable unintermittent growth using scarce, irreproducible, and exhaustible resources? The answer appears to lie in the role that technological progress can play, but it could be the case that technological progress will involve the greater use of depletable resources, unless there are new ways, yet to be invented, to economise the use of those inputs – which are not regeneratable – of production, to allow for per capita income levels and standards of living to rise in the long run (Grossman and Helpman 1994, Huffman 2020).

In line with the endogenous growth models, the contribution of human capital to growth, via innovating new ideas and imitating existing ones, was further examined by Vandenbussche et al. (2006) in their model. The main assumption in this respect is that relatively skilled workers are better suited to innovation activities, while imitation, which is a more unskilled-intensive activity, is fundamental in this model.

This is while bearing in mind that the absolute intensity of skilled labour in innovation, and unskilled labour in imitation, is not specifically required in the argument of Vandenbussche et al. (2006). Thus, the allocation of endogenous skilled and unskilled labour between innovation and imitation, and the impact of

the two components of human capital, largely relies on the technological progress in the economy (Vandenbussche et al. 2006).

The argument also involves exploring the effect of the interaction between human capital, and the economy's distance to the frontier, where the model proposes that the effects of the interaction for higher education and the proximity to the frontier is positive, whereas for primary and secondary education it is negative (Ang et al. 2011). In addition, given the more basic and the less advanced technology that is in use in the less developed economies, there might be weaker demand for highly skilled labour and stronger demand for the basic level of skills embodied in workers (Hanushek 2013). By extension, this means that the effects of the interaction between primary and secondary education in an economy that is far from the frontier, is positive, owing to the reliance on imitating technologies and innovations produced in economies at – or close to – the frontier, which could be put down to the low cost of imitation in comparison with the high cost of innovation in the less developed countries.

Literature Review

The literature contains various definitions of what human capital exactly means, and it is commonly defined as " knowledge, skills, competencies, and attributes embodied in individuals which facilitate the creation of personal, social, and economic well-being" (Healy and Côté 2001). It is similarly defined by Armstrong and Taylor (2014) as the knowledge and skills and abilities of the people employed in an organization. This is where these two main components are being created, maintained and, most importantly, being applied by the employees when performing their work tasks (Mičiak 2019).

There are three main policy domains for which education is considered to be crucial: (i) the stock of skills in the economy, which is the centrepiece for the prospects of economic growth (Tran and Vo 2020); (ii) the distribution of the skilled people in an economy, which is a fundamental determinant for income inequality, especially with the high wage premium for skills; and (iii) the relationship between an individual's stock of skills and knowledge and their background, which is also a key factor of social mobility and societal progress (Burgess 2016, Huffman 2020).

Cross-country research had found that measures of cognitive skills are associated with economic growth; albeit, some economists were concerned about this, and contended that the evidence on this relationship between skills and growth is rather mixed (Ali et al. 2018). This is where some argue that previous research used unsuitable proxies for educational attainment. More precisely, they emphasise that neither the completed years of education nor the national rates of enrolment in schools can capture the skills of educated individuals; Alternatively, there are direct measures of cognitive skills that are being sourced from the international tests of maths and science abilities in 50 nations (Hanushek and Woessmann 2012).

In recent decades, a great importance has been given to the role of human capital in any economy. Especially, with the emergence of the knowledge economy, which has been derived from the revolution in information technology, innovation, and communication, in which human capital was regarded as the mainstay of this new economy (Gogan 2014).

A great deal of research highlighted, and investigated the impact of human capital on wages and earnings – which was regarded by Lebedinski and Vandenberghe (2014) as a proof that education and training can raise labour productivity – and this research was equipped with a variety of methods and approaches in the related strands of literature, which were utilised, so as to estimate human capital and its various impacts (Tchernis 2010, Pulyaeva et al. 2020).

On the whole, much of the current literature on growth and human capital confirms two major routes: (1) that countries with a larger stock of human capital have more capacity to grow faster, and (2) investing in schooling is a prerequisite and the foundation for human capital, which in turn, is the principal generator of ideas and new technology (Mirza et al. 2020).

In the main, there appears to be some accord on the above two points. However, Aghion et al. (2009) suggest that researchers, mostly, have no choice but to apply their methodologies on crude proxies for human capital stock, such as average years of schooling or enrolment rates in formal education in a nation. They, therefore, argue that the average years of education, as an indicator, is the result of individuals' decisions to have more education, while considering the future returns of that education. Thus, it is endogeneity that could be the main driver for this decision, and not the nation's investment policy, in it being persuasive, to lead these individuals to decide to have more education.

On the other hand, most of the literature on efficiency analysis and measurement has been linked with the seminal work of Farrell (1957) who was influenced by the ideas of measuring "technical efficiency" posited in Koopmans (1951), and the "coefficient of resources utilization" by Debreu (1951) and Nguyen (2010). This is where according to Koopmans (1951), a producer is said to be technically efficient if, and only if, the goal of producing more of at least one output without the need for producing less of another output, or using more inputs, is achieved. The concept of "technical efficiency *TE*" refers to the ability to maximise output from a given vector of inputs, or put it the other way around, it is the firm's ability to minimise input utilisation in the production function of a given vector of outputs (Coelli et al. 2005, Arazmuradov et al. 2014).

Producer's efficiency (technical, allocative) principally concerns the comparison between the optimum (maximum production possibilities, behavioural targets of producers; optimum cost, profit, revenue) and the observed levels of the producer's outputs and inputs. In other words, the comparison involves the ratio of the observed to the maximum potential output attainable given the available input. Conversely, it includes the ratio of the minimum potential to the observed level of input needed to produce the given output or a combination of the two (Kumbhakar and Tsionas 2020).

There are two constituents of economic efficiency, technical and allocative efficiency. According to Koopmans (1951), technical efficiency can be observed as; a production unit that is technically efficient if an increase in any output necessitates a reduction in at least one other output, or an increase in at least one input, and if a reduction in any input involves an increase in at least in one other input or a reduction in at least one output (Koliński et al. 2016).

By measures of efficiency, the economic performance of a producer is normally described using two terms: efficient or productive. Productivity mainly refers to the ratio of a producer's output to the same producer's input. Given the fact that producers, in the more likely event, would use several inputs to generate many outputs; therefore, productivity calculations would require the aggregation of these outputs and inputs in a valid economic manner, so that productivity stays the same, as being the ratio of the output to the input (Lovell 1993).

With respect to the effect of human capital on technical inefficiency, some studies implemented SFA, this is where Kneller and Stevens (2006) found out that technical inefficiency was negatively linked to the levels of human capital in 9 industries across 12 OECD countries over the years 1973-1991.

The reviewed literature suggests that higher levels of education are assumed to lead to higher levels of innovation (Fonseca et al. 2019), and therefore, higher growth rates (Lucas 1988, Romer 1990, Gregory et al. 1992, Hansen and Knowles 1998, Vandenbussche et al. 2006, Charochkina et al. 2020); this is in spite of the Bils and Klenow (2000) argument on the reverse causality between education and growth, where they state that the richer and faster growing countries find it easier than less developed countries to increase their spending on education because they have better institutions to improve the quality of the education system output (Aghion et al. 2009, Lutz et al. 2018).

However, some studies on human capital provide compelling evidence that primary and secondary levels of schooling tend to play a crucial role in promoting growth throughout developing countries (Krueger and Lindahl 2001), while on the other hand, higher education plays a more decisive role in more developed economies, (Petrakis and Stamatakis 2002). Other studies showed ample evidence at best, on the positive impact of human capital in boosting growth, where with using a regional dataset, it was found that primary education, in Spain for instance, is positively associated with higher growth in poorer regions, whereas secondary levels of education seemed to be more significant in strengthening and supporting growth in more affluent areas (Di Liberto 2007, Faggian et al. 2019, Mellander and Florida 2021).

In addition, considerable attention has been paid to examine the relationship between human capital and efficiency across the years, and sizeable empirical research has established marked positive quantifiable impact of human capital on efficiency, productivity and therefore growth (Dimelis and Papaioannou 2014).

Furthermore, it has been suggested that by the means of intensifying domestic technical innovations, productivity can be spurred on (Romer 1990, Aghion et al. 1998). By way of contrast, some empirical evidence, resulting from examining the interaction between human capital and productivity, has shown some ambiguity

that has emanated from the divergent and contrastive outcomes of the human capital effect on productivity (Wei and Hao 2011).

The proposed rationalisation for the differences in the impact of human capital on growth across countries includes: (i) the significant skills underutilisation in some countries is caused by improper institutional environment, and by devoting the available skills in the wrong economic activities. (ii) The variations of the marginal returns of education are due to changes in the growth rates of demand for educated labour caused by different structural shifts, and by the policies in some countries, which are exposed to various technical developments derived externally. (iii) The distinct approaches and strategies followed in transferring knowledge have widely varied across countries, which gave rise to variant and diverse impacts on growth throughout nations (Pritchett 2001, Van Hiel et al. 2018).

Cörvers (1997) distinguished between two factors of human capital: intermediate and highly skilled workers and their effects on labour productivity. The estimates indicated the positive impact of both factors on productivity, and just the highly-skilled labour alone is proved to be the statistically significant component of human capital that positively affects productivity (Cörvers 1997).

In the economic literature there can be four distinct effects of human capital on productivity: worker's, allocative, diffusion, and research (Cörvers 1994, Cörvers 1997). Welch (1970) points out that the productive value of education stems from the "worker's effect" or "own productivity", which refers to the worker's ability to be more efficient in using the resources available on account of receiving more education. This effect represents the marginal product of education. The outcome of this would be the ability of these efficient workers are assumed to produce more physical output and switch the production possibility curve outward. Hence, the higher the proportion of intermediate or highly skilled workers, as opposed to low-skilled workers, in the whole combination of labour, the higher the efficiency and productivity levels. The second phenomenon is called the "allocative effect", which implies the worker's ability to acquire and decrypt information about other production inputs' costs and features, which in turn would change the use of specific inputs and consider the use of new inputs that had not been used before, as well as developing alternative uses of them, that is if a certain change in the worker's education has not occurred (Welch 1970).

The third impact is known as the "diffusion effect", which incorporates the adaptability of a better-educated worker to absorb and assimilate technological advancements and generate new production approaches in a faster manner (Nelson and Phelps 1966, Twum et al. 2021); thereby, higher education levels will facilitate the dispersion of technology, and provide a worker with the quality of being able to successfully opt for the more remunerative inventions that are to be quickly adopted, accommodated and employed (Bartel and Lichtenberg 1987, Adams 2018). This is where empirical evidence confirms that a well-educated and highly-trained labour force is fundamental in attracting and adapting technology investment; whereby, it leads to more technical change, and therefore, long-term economic growth (Bresnahan et al. 1999). Bassanini and Scarpetta (2001) also examined the impact of human capital on growth and observed significantly positive role of human capital across a selected group of OECD countries.

The fourth impact is believed to be "the research effect", which involves the crucial role of higher education, as an essential and vital factor in research, and the development of complex activities, which in turn entails intermediate and highly skilled workers to reach higher levels of technological knowledge in order to be able to increase the growth levels of productivity (Englander and Gurney 1994).

Methodology: Stochastic Frontier Analysis

In 1977 and in two independent papers, a stochastic frontier function for Cobb-Douglas case was specified and introduced by Aigner et al. (1977) and Meeusen and van Den Broeck (1977). This specification assumes that inefficiency represents a component of the error term in the orthodox production function (Maudos et al. 2003). Thus, the error term contains inefficiency effects along with other factors effects which are uncontrollable by the production unit such as natural disasters, strikes, sickness, and so forth.

The core idea is that all production units are expected to perform either below or exactly on the frontier line, this is where none of the production units is expected to perform at any level above the frontier, simply because they do have the capacity to do so, due to several factors, including technological limitations.

The most widely used frontier analysis is the output-oriented stochastic frontier approach, where the basic idea involves the existence of an unobserved best-practice production frontier corresponding to the set of maximum attainable output levels for a given combination of inputs. However, most of the time actual production comes about below the best-practice of production frontier because of technical inefficiency.

Technical efficiency is $$TE = \frac{The\ observed\ output}{The\ potential\ maximum\ output} = \frac{Y^A}{Y^M}$$

Where $$0 \leq TE_{it} \leq 1$$

Therefore

$$\therefore Y^A = Y^M.TE \ = f(x;\beta).TE$$

The observed output is $$Y^A = f(x;\beta).exp(v).exp(-u)$$

Where:

$v \leq 0$ "noise" error term, (normal distribution).

$u \geq 0$ "inefficiency error term", (half-normal distribution).

and

$$f(x;\beta) \rightarrow deterministic\ kernel$$
$$exp(v) \rightarrow the\ effect\ of\ exogenous\ shocks\ on\ output$$
$$exp(-u) \rightarrow inefficiency$$

$$f(x;\beta).exp(v) \rightarrow stochastic\ frontier$$

The basic idea of deterministic frontier and stochastic frontier can be illustrated as follows:

OLS: $q_i = \beta_0 + \beta_1 x_i + v_i$

Deterministic: $q_i = \beta_0 + \beta_1 x_i - u_i$

SFA: $q_i = \beta_0 + \beta_1 x_i + v_i - u_i$

Where:

$$q_i = exp(\beta_0 + \beta_1\, ln\, x_i) \times exp(v_i) \times\ exp(-u_i) \qquad \text{Equation (1)}$$
$$= Deterministic\ Component \times Noise \times Inefficiency$$

The distance by which a firm lies below its production frontier is the measure of its inefficiency. However, Farrell (1957) proposed a decomposition of economic efficiency into technical efficiency and allocative efficiency where the former is meant to measure the firm's ability to reach the maximum level of output given a vector of inputs, whereas the latter refers to the firm's ability to use the inputs available with optimal shares given their market prices. That is to say:

$$Economic\ Efficiency = Technical\ Efficiency + Allocative\ Efficiency$$

Measuring technical efficiency can be achieved through two frontier methods. The first approach is named as the Data Envelopment Analysis (DEA) which is a non-parametric method, while the other is referred to as the Stochastic Frontier Analysis (SFA) which is regarded as a fully parameterized model, and both are categorized as frontier approaches, yet no excogitated formulation has been introduced to merge these two in one single analytical framework.

The rationale of these techniques is that efficiency of production is determined by the distance between the actual production and the best practice production frontier (Dimelis and Papaioannou 2014). Technically speaking, the two-component error term are the symmetric term (v_{it}) which demonstrates the noise, and the asymmetric term (u_{it}) that explains technical inefficiency.

In addition, the *SFA* provides a technique where panel data can be applied and encompasses other external environmental factors which could affect technical inefficiency related to the decision making unit (Arazmuradov et al. 2014). Another advantage of *SFA* is that it considers the effects of the random shocks on GDP.

However, the downside of this approach is that it requires an exact functional form (which is not given much of attention) of production function and the distribution assumption on the error term (Greene 2008).

Following Aigner et al. (1977) approach and Meeusen and van Den Broeck (1977) methodology, in particular the Battese and Coelli (1995) specification, technical inefficiency can be estimated from the stochastic frontier and

simultaneously interpreted by a group of a firm's specific characteristic variables. The benefit of this methodology is that it escapes the problem of inconsistency which results from applying the two-stage method when investigating determinants of inefficiency (Diaz and Sánchez 2008).

Thus, growth in productivity will be mainly attributed to technical change or in other words, *TFP* growth is interpreted as the movement of the frontier function (Maudos et al. 2000). Still, the estimates would be regarded as biased owing to the presence of technical inefficiency.

On top of that, and despite the nonoccurrence of technical inefficiency, the estimates of the accounting growth of *TFP* would be affected by the allocative inefficiency which causes them to be biased again, and therefore it will affect the measurement of human capital impact on growth. On the other hand, non-parametric approaches (e.g., Data Envelopment Analysis DEA) do not impose any restrictions on production function. However, they are not flawless, because they cannot segregate the inefficiency effects from the white noise (Dimelis and Papaioannou 2014).

To avoid the prejudice problem, and considering the existence of inefficiency, the frontier techniques are more efficient tools to use. One of the SFA pros is that it allows for the estimation of firm-specific inefficiency according to the methodology proposed by Jondrow et al. (1982) based on the conditional expected value of u_i given e_i (Hadri et al. 2003).

The general form of Cobb Douglas stochastic frontier production function can be observed as follows:

$$Y_{it} = \acute{\beta} x_{it} + E_{it} \qquad \text{Equation (2)}$$

$$E_{it} = V_{it} - U_{it} \qquad \text{Equation (3)}$$

Where, Y_{it} denotes the appropriate function (logarithm) of the production for the ith sample firm, $(i = 1, 2, \dots \dots . \mathrm{N})$ in the tth time period $(t = 1, 2, \dots \dots . . \mathrm{T})$ x_{it}, represents the $(1 \times k)$ vectors of appropriate function of the explanatory variables associated with the ith sample firm in the $\mathbf{t^{th}}$ period (the first element would generally be one) $\acute{\beta}$, represents the $(k \times 1)$ vector of the coefficients for the associated independent variables in the production function which need to be estimated.

The term $(V_{it} - U_{it})$ is the composed error term. V_{it}, represents the random variables which are assumed to be independently, identically, and normally distributed with zero mean and constant variance. $N(0, \sigma_v^2)$, and it is independent of the U_{it}.

U_{it}, represents non-negative random variable that are assumed to be identically, independently, and normally distributed with zero mean $N(m_{it}, \sigma_u^2)$ and it is used to capture technical inefficiency.

According to Coelli et al. (2005) the above Cobb-Douglas stochastic frontier function can also take the following form:

$$Y_i = exp(\beta_0 + \beta_1 \ln x_i) \times exp(v_i) \times exp(u_i) \qquad \text{Equation (4)}$$

Where:
$exp(\beta_0 + \beta_1 \ln x_i)$ = deterministic component
$exp(v_i)$ = noise
$exp(u_i)$ = inefficiency
and according to Kokkinou (2009) the forenamed function can be rewritten as:

$$y_i = \mathrm{F}(x_i\beta) \times exp(v_i - u_i), u_i \geq 0 \qquad \text{Equation (5)}$$

Where:
u_i denotes for the shortfall of output from the frontier as previously defined. Since v_i is the random statistical noise, a symmetric distribution is usually assumed for v_i. In the same time, u_i which represents technical inefficiency term is assumed to be one-sided, it is also non-negative for the production frontier, and non-positive for the cost frontier. In most of the cases of production frontier, the distribution of [$e_i = (v_i - u_i)$] will be skewed, keeping in mind that the composed error (e_i) will ($v_i + u_i$) in the case of cost frontier

With respect to technical efficiency of a given firm (i), TE_i , it can be defined as the ratio of its mean production (in original units), given its realized firm effect, to the corresponding mean production if the firm effect was zero (Battese and Coelli 1988). In that, it measures the difference in the observed output of the firm relative to the output produced by a fully efficient firm using the same amount of inputs.

The value of TE_{it} can be defined and estimated through the following form;

$$TE_i = \frac{E(Y_{it}^* | U_i, x_{it}, t=1,2,....)}{E(Y_{it}^* | U_i=0, x_{it}, t=1,2,....)} \qquad \text{Equation (6)}$$

$$TE_{it} = \frac{y_{it}}{exp(x_{it}\acute{\beta}+v_{it})} = \frac{exp(x_{it}\acute{\beta}+v_{it}-u_{it})}{exp(x_{it}\acute{\beta}+v_{it})} = exp(-u_{it}) \qquad \text{Equation (7)}$$

The value TE_{it} is necessarily expected to be between one and zero. Thereby, the closer the observed point is to the frontier, the higher is the technical efficiency of a firm. If, for instance, a firm's technical efficiency is 0.75, then it implies that the firm realizes, on average 75% of the production possible for a fully efficient firm having comparable input values (Battese and Coelli 1988).

The analysis of production function in the stochastic frontier framework concerns two steps. The first step requires the use of the maximum likelihood to estimate the frontier model. In the second, measures of inefficiency or efficiency are constructed using the estimated frontier model.

Following Caudill et al. (1995), a multiplicative heteroscedasticity is assumed in the one-sided error term u_i only. However, it is argued by Hadri (1999) that in the cross sectional data, the two-sided symmetric error term can also be affected by size-related heteroscedasticity. Ignoring this assumption is likely to lead to a misspecified maximum likelihood function due to heteroscedasticity being not integrated in the estimation which yields inconsistent estimated parameters (White 1982).

To integrate heteroscedasticity in the symmetric noise term *vi*, at the same time with the one-sided inefficiency term u_i, the model H_{UV} (Heteroscedasticity in *u* and *v*) is specified where we now have a vector of non-stochastic regressors related to the firm size characteristics to be included in the v_i side along with a vector of unknown parameters to be estimated. Also, the values of both σ_i^2 and λ_i will be determined as $\sigma_i^2 = \sigma_{vi}^2 + \sigma_{ui}^2$ and $\lambda_i = \frac{\sigma_{ui}}{\sigma_{vi}}$. where each of σ_{vi} and σ_{ui} comprise a set of explanatory variables that affect both v_i and u_i respectively.

The SFA methodology enables the assessment of different variables' effects on efficiency and the extent of their importance in performance. In this field, unlike other areas, the model's parameters estimation is not the ultimate intent per se. Instead, estimating and analysing the industries' inefficiencies are objectives of greater interest (Greene 1990). Therefore, the rationale for choosing the SFA is that estimating average production functions by conventional regression methods rather than frontiers hinges upon the assumption that all units of production are efficient, which means that if this assumption does not hold, the parameters estimated would be affected, and consequently the importance of human capital as well.

Moreover, estimating *TFP* through the growth accounting approach (Solow's approach) implies all individuals are efficient, therefore, any estimated growth in *TFP* would be interpreted as a shift of the frontier function (technical change), but in the existence of technical or allocative inefficiency, the estimated *TFP* would be biased, and accordingly, the assessment of human capital contribution in efficiency will lack accuracy (Maudos et al. 2003). Thus the use of SFA is necessary to take into account any possible presence of inefficiency and to avoid the bias resulting from the estimation by conventional methods (Färe et al. 1997, Taskin and Zaim 1997).

Heteroscedasticity in the Stochastic Frontier Production Functions

As noted by Caudill et al. (1995) that the measures of inefficiency are based on the residuals derived from the stochastic frontier estimation and they noticed that these residuals tend to be sensitive to errors of specification and to a higher degree in the stochastic frontier models. They argue that this problem of sensitivity will affect the accuracy of the inefficiency measures. To tackle this issue, they proposed that researchers might need to test for heteroscedasticity presence, and if present, they can correct for heteroscedasticity in the one-sided error term (inefficiency) (Zhang 2012).

Furthermore, Hadri (1999) suggested that the two-sided error term might also suffer from heteroscedasticity, and if that was to be ignored, then the maximum likelihood estimates will be inconsistent and inaccurate. Therefore, he advises to test for heteroscedasticity in both error terms, and if present, the appropriate corrective procedures must be applied on both terms to obtain the correct and robust estimators (Hadri et al. 2003).

In the panel data models, and when *v* is heteroscedastic, the estimates of the parameters in the frontier function and those of technical inefficiency function are

consistent under both the time-invariant fixed-effects and the random-effects methods. Whereas, in both the maximum likelihood approach, the estimates consistency is preserved only if the time trend observed (T) in the panel is relatively large in comparison with individuals (N).

In the time-varying panel data models, and when v is heteroscedastic, with the correction of Kumbhakar (1990), Cornwell et al. (1990), and Lee and Schmidt (1993) methods, the imprecision in the estimates can be solved and the MLE can be considered even if the (N) is large (Zhang 2012). According to Caudill and Ford (1993), Caudill et al. (1995) and Hadri (1999) a term of multiplicative heteroscedasticity is incorporated into the one-sided error term with the variance $\sigma_u^2 = \exp(\gamma' Z_{it})$.

Panel Industry-Level Data

It is scarcely needed to underscore the advantages of panel data over other types of data. However, besides its benefits for being more informative and more dynamic, with less collinearity between variables. The panel data allows researchers to control for heterogeneity of individuals or entities in a proper way both via the estimating methodology and by the specifications of the model.

In addition, if one has panel data, they can avoid three major problems in the stochastic frontier estimation, including (a) the variance of the technical inefficiency distribution conditional on the whole error term does not disappear as the sample size increases. (b) the segregation of the technical inefficiency from the statistical noise and the estimation of the model needs specific assumptions about the technical inefficiency and statistical noise distributions, but it is not obvious yet how robust the results of the estimation to these assumptions. (c) it may be inaccurate to assume that inefficiency is independent of its explanatory variables if the firm/industry knows the level of its inefficiency.

A 22-panel data for a 15-industry cluster was extracted from the Bureau of Economic Analysis (BEA) on *Value-Added Output, College Labour Inputs, Non-college Labour Inputs, ICT Capital, R&D Capital, Software Capital, Energy, Materials, Services Inputs, Labour Inputs, Gross Output, and Other Capital Inputs.*

It is noteworthy to state that the gross output concept differs from the sectoral output concept used by the BLS in its industry-level *TFP* statistics. The sectoral output methodology elides intermediate production and purchases which come from within the industry (intra-industry transactions) from either outputs or inputs (Schreyer 2001).

The 3-digit 15 industries along with their $NAICS$ codes are as follows:

(1) Machinery (333), (2) Computer and Electronic Products (334), (3) Food and Beverage and Tobacco Products (311, 312), (4) Textile Mills and Textile Product Mills (313, 314), (5) Apparel and Leather and Applied Products (315, 316), (6) Paper Products (322), (7) Chemical Products (325), (8) Wood Products (321), (9) Primary Metals (331), (10) Electrical Equipment, Appliances, and Components (335), (11) Fabricated metal products (332), (12) Petroleum and coal products

(324) , (13) Plastics and rubber products (326). (14) Motor vehicles, bodies and trailers, and parts (336), (15) Furniture and related products (337).

The data is observed annually and measured as indexes of each of the real value-added output – as a dependent variable – and capital inputs, labour inputs and a measure of intermediate inputs including energy, materials, and purchased services as independent variables, knowing that all variables are converted into logarithm values. The lack of accessible sources that provide firm-level data on the U.S. manufacturing sector is the main problem the researcher had faced when collecting this panel data.

As regards labour composition, the contribution of labour to output growth is decomposed into demographic characteristics which account for the contribution of the college-educated workers and those workers who did not attend college. The benefit of this adjustment is to allow for the contribution of labour to reflect the changes in the workers' skills level composition and the number of hours worked in each industry over the years.

Variables for the Stochastic Frontier Production Functions

The variables included in the frontier production function in shorthand are as follows:

Ln VA = Value-Added output. It is the aggregate value-added growth which is the sum of share-weighted value-added growth by industry. Value- added output represents compensations of employees, taxes on production and imports, fewer subsidies, and gross operating surplus. It does not include intermediate inputs.

Ln K = Capital services: are the services derived from the physical assets stock and intellectual property assets. In other words, capital services reflect the flow of productive services provided by an asset that is employed in production. The value of capital services is the number of services provided by an asset (multiplied by) the price of those services.

Assets such as:

1- Fixed business equipment and structures.

2- Inventories, lands.

Ln L = Labour inputs which are denoted by hours at work by age, education, and gender group are weighted by each group's share of the total wage bill. Labour hours represent the annual hours worked by all persons employed in an industry.

Labour inputs by industry in the industry-level production accounts published jointly by the Bureau of Economic Analysis BEA and Bureau of Labor Statistics BLS are measured as Tornqvist quantity indexes of hours worked classified by gender, age group, and education group. The education group include grade school, less than high school degree, high school degree, some college, college degree, and more than a college degree.

The dollar value of this work is labour compensation. The implicit price of labour input is the labour compensation divided by the quantity index. The labour

compensation includes the payroll + any supplemental payments. The payroll includes salaries, wages, bonuses, commissions, dismissal pay, vacation and sick leave pay...etc.

Labour compensation is the cost to the employer of securing the labour services, and the unit labour costs describe the relationship between the compensation per hour and real output per hour (labour productivity). To estimate college and non-college labour, the BEA and BLS form Tornqvist indexes for hours worked for college and non-college workers by industry.

Ln IM = Intermediate inputs: consist of the goods and services – including energy, raw materials, semi-finished goods, and services that are purchased from all sources – that are used in the production process to produce other goods or services rather than for final consumption.

They represent a large share of production costs, and it is found that the substitution among inputs (intermediate inputs included) has its impact on the changes in productivity.

Ln E= Energy inputs: the amount of fuel, electricity, and other forms of energy used to produce output.

Ln M= Material inputs: the number of commodities, in the form of intermediate materials, used to produce output, also known as materials inputs.

Ln S = Purchased Service inputs: the amount of outside contract work used to produce output.

The determinants of efficiency included in the inefficiency model are in shorthand as follows:

Ln ICTK = *ICT* capital stock: information or data that has intrinsic value which can be shared and leveraged within and between organisations.

The information technology capital assets consist of communications equipment, mainframe computers, personal computers, direct access storage devices, printers, terminals, tape drives, storage devices, and integrated systems.

Ln RDK = *R&D* Research and Development capital stock.

Ln College = College labour input. It includes workers with a bachelor's degree and above.

Ln Non-college = Non-college labour inputs. It represents the remainder of workers after bachelor's degree holders and above is subtracted from the total.

Ln Other K = represents other capital which includes about 90 types of other capital equipment and structures, inventories, and land according to the BEA/BLS integrated industry-level production accounts reports where office and accounting, machinery, photocopying and related equipment, medical equipment, electromedical instruments, and nonmedical instruments are redefined by the BEA measures and included in other capital assets.

Econometric Results and Economic Analysis

Table 1 shows the output of the stochastic frontier production function results and inefficiency models obtained from the $Nlogit5$ Econometric software, following the CFG (1995) approach assuming the presence of heteroscedasticity in the one-

sided inefficiency term in the H_U *models (1, 2, and 3),* and following the Hadri (1999) and Hadri et al. (2003) approach and its extension for panel data, which includes the double heteroscedasticity assumption in the H_{UV} *model (4).*

As can be seen, the estimated parameters of the frontier production function are represented in this table by labour inputs (*L*) and capital inputs (*K*). The lower section of the table shows the estimated parameters of the technical inefficiency function which has been estimated contemporaneously using the *College* and *Non-college* labour indexes, the *ICT* capital, *R&D* capital, and *Software* capital indexes as principal explanatory variables in technical inefficiency changes. Inefficiency is modelled as dependent on the level of *human capital*, *ICT* capital, *R&D* capital, and *Software* capital in industry *j* at time *t*.

Table 1. *Maximum Likelihood Estimates in the U.S. Manufacturing Industries during the Period (1998-2019) Cobb-Douglas Stochastic Frontier Production Functions*

Cobb-Douglas stochastic frontier production function: dependent variable Ln VA= (ln Value Added Output)	**Model 1 Two- input and time-invariant stochastic frontier production function (correction for heteroscedasticity in u only)**	**Model 2 Two- input and time-varying stochastic frontier production function (correction for heteroscedasticity in u only)**	**Model 3 Three- input and time-varying stochastic frontier production function (correction for heteroscedasticity in u only)**	**Model 4 Three- input and time-varying stochastic frontier production function (correction for heteroscedasticity in both u and v)**
	Parameter (robust SE)	Parameter (robust SE)	Parameter (robust SE)	Parameter (robust SE)
Constant	-0.083 (0.511)	0.211 (0.662)	0.516 (0.670)	0.477 (0.621)
Ln K input	0.500*** (0.084)	0.464*** (0.095)	0.443*** (0.100)	0.293***(0.112)
Ln L input	0.539*** (0.065)	0.510*** (0.077)	0.357*** (0.106)	0.643***(0.072)
Time input	-	0.749 (0.002)	0.730 (0.002)	0.002 (0.002)
Ln IM = Ln Intermediate Inputs	-	-	0.108 (0.078)	0.016 (0.040)
Inefficiency function				
Constant	-4.159 *** (.112)	-4.142***(.13155)	-4.143*** (.132)	31.937 (23.818)
Ln_College_Labour	-14.022***(3.795)	-12.147***(4.218)	-12.667***(4.688)	-9.356*** (2.404)
Ln_Non-College_Labour	5.280*** (1.703)	5.06042** (2.552)	4.334 (2.769)	6.143** (2.500)
Ln_ICT_Capital	-1.678* (0.965)	-1.578 (1.089)	-1.185 (1.187)	-1.671** (.771)
Ln_R&D_Capital	-	-0.426 (4.080)	-0.791 (4.542)	-0.697 (4.415)
Ln_Software_Capital	1.640 (1.208)	3.556** (1.721)	3.364** (1.689)	3.021** (1.241)
Ln_Materials	3.567*** (1.287)	5.321*** (1.878)	6.171*** (2.156)	4.110*** (1.061)
Ln_Purchased_Services	-	-1.321 (1.273)	-1.045 (1.412)	-1.772* (.931)
Ln_Other_Capital	-	-10.546 (6.900)	-11.178 (7.040)	-8.045(5.849)
Log-likelihood function	134.2216	142.3402	144.4410	170.1102
Parameters in variance of v (symmetrical term)				
Constant	-	-	-	13.059** (5.805)
Ln RD Capital	-	-	-	-4.443*** (.901)
Ln Other Capital	-	-	-	9.007*** (2.589)
Ln Non-college Labour	-	-	-	-4.329*** (1.382)
(Gamma) γ	0.879	0.880	0.887	0.915
σ = Sqr[(s^2(u)+s^2(v)]	0.359	0.364	0.375	0.422
N. obs. [K]	330 [10]	330 [14]	330 [15]	330 [19]
Deg.freedom for inefficiency model	6	9	9	9
Deg.freedom for heteroscedasticity	5	8	8	8
LR test results 1- **H_0 = Cobb-Douglas stochastic frontier**	Accept H_0 at 95%	Accept H_0 at 95%	Accept H_0 at 95%	Accept H_0 at 95%

	production function				
2-	**H_1 = Translog stochastic frontier production function**				

Notes; 1- See Table 1 for the definitions of variables. 2 - * Significant at 90% level of significance.
3 - ** significant at 95% level of significance.4- *** significant at 99% level of significance.
5- Figures in parentheses are robust standard errors.

Regarding the effects of human capital – proxied by *College* and *Non-college* labour – on technical inefficiency, the maximum likelihood estimates suggest that the increase in the percentage of the hours worked by *college* workers tends to contribute positively to technological efficiency in the U.S. manufacturing industries. On the other hand, it can be noted that the rise in the share of the hours worked by *non-college* persons seems to have negative impact on efficiency in these industries. Human capital is included in the model as efficiency determinant due to the role that it could play indirectly through efficiency by its impact on the absorptive capacity.

From the reported results of the *generalised likelihood ratio test LR* in Table 2, in *model (1)* it can be concluded that the null hypothesis was accepted at 95% level of confidence with a preference to the *Cobb Douglas* functional form to represent this panel data. According to the latter, it would seem to be possible to distinguish the significant and positive effects of two inputs *labour* (*L*), and *capital* (*K*) on output in the fitted frontier production function. From the literature point of view, this appears to be reasonable and consistent with the conclusions reached in previous studies with similar weights of labour and capital coefficients where the value of output and inputs were deflated by the appropriate price indexes.

The information and communication technology capital *ICT* shares appear to be of significant impact and contributed positively to minifying technical inefficiency in the U.S. manufacturing industries. From an economic perspective, it should be also marked that economies that are largely endowed with a high proportion of skilled labour of the total labour force would bear the high cost of skilled labour because of the wage bills. These economies are more able to find the optimal level of technology to enhance the level of efficiency to their labour and capital by employing more sophisticated technology. Whereas those countries with high percentages of less skilled labour find it easier to deploy less advanced technologies and the level of capital accumulation will be lower. However, the optimal combination of technology and capital is largely determined by the endowment of human capital.

In Table 1 the value of the variance parameter ($Gamma$) (γ) which lies between 0 and 1 is equal to 0.879 in *model (1).* It, therefore, confirms the presence of stochastic technical inefficiency and that it indicates to its relevance to obtaining the adequate representation of the data. The same analysis applies to the $gamma$ parameter (γ) in the other *models 2, 3, and 4.*

From this, if $Gamma = 0$, then the technical efficient capacity utilisation $TECU$ value is expected to score 1 $(\sigma_u^2 = 0)$, meaning that the deviations from the frontier can neither be ascribed to the presence of technical inefficiency nor to

capacity underutilisation, and if $Gamma = 1$, where the value of $TECU = 0$, $(\sigma_v^2 = 0)$, it will indicate that deviations from the frontier can be attributed to technical inefficiency and capacity underutilisation (Pascoe et al. 2003). In case $gamma$ is larger than 0 and less than 1, then deviations can be explained by both technical efficient capacity utilisation and the random component (Battese and Corra 1977).

In addition, the production function inefficiency is calculated by the error term using the composite error term of the stochastic frontier model which is defined by $\gamma = \frac{\sigma_u^2}{(\sigma_v^2+\sigma_u^2)}$. This is where it represents a measure of inefficiency level in the variance parameter which ranges from 0 to 1.

In this case since $Gamma \approx 0.88$ (yielded either from $\frac{\sigma_u^2}{\sigma^2}$ or $\gamma = \frac{\sigma_u^2}{(\sigma_v^2+\sigma_u^2)} = \frac{.11393}{.12955}$ = 0.879). That indicates that the variance of the inefficiency effects is a significant term of the total composite error term variance, and therefore the deviations from the optimal level of output in the U.S manufacturing industries subject to study is due to both the random exogenous factors and inefficiency existence in the production processes. In other words, this implies that the stochastic production frontier is significantly different from the deterministic frontier which does not comprise a random error. The same logic applies to the *gamma* values in *models 2, 3, and 4*, where it equals = 0.880, 0.887, and 0.915 respectively.

Table 2. *Summary of the Generalised Likelihood-Ratio Tests of the Null Hypothesis*

Model 1: Null Hypothesis, H_0	**Production Function Form**	**Log Likelihood Function**	**P**	**Critical Values of the $\chi 2$ Distribution**
H_0: βij = 0, i = 1,…,6				
	Translog	138.457	99% ρ = (0.01)	16.8*
	Cobb – Douglas	134.221	95% ρ = (0.05)	14.5*
	LR Test	8.472	90% ρ = (0.1)	10.7*
Model 2: Null Hypothesis, H_0				
H_0: βij = 0, i = 1,..,8				
	Translog	144.846	99% ρ = (0.01)	20.1*
	Cobb - Douglas	142.340	95% ρ = (0.05)	15.5*
	LR Test	5.011	90% ρ = (0.1)	13.4*
Model 3: Null Hypothesis, H_0				
H_0: βij = 0, i = 1,..,8				
	Translog	148.054	99% ρ = (0.01)	20.1*
	Cobb - Douglas	144.441	95% ρ = (0.05)	15.5*
	LR Test	7.226	90% ρ = (0.1)	13.4*
Model 4: Null Hypothesis, H_0				
H_0: βij = 0, i = 1,..,8				
	Translog	171.418	99% ρ = (0.01)	20.1*
	Cobb - Douglas	170.110	95% ρ = (0.05)	15.5*
	LR Test	2.616	90% ρ = (0.1)	13.4*

Bearing in mind that skills are aggregated with a skill-specific share in total labour remunerations. With these suggested particular measures of labour and capital – which can be very often constrained by sources and data to establish such distinction and cover all labour and capital inputs – the different impacts of the technological progress resulting from improved (capital, intermediate inputs, and labour or human capital) need to be reflected in the varying contributions of each of these inputs.

Moreover, the residual or the disembodied technical change will be captured in *TFP* growth, and that is how *TFP* gathers up the spillover effects on output growth which came about production factors improvements. The key point here is that growth in *TFP* cannot only be attributed to technological progress. To put it another way, there are other determinants including; changes in efficiency, measurement errors, cost adjustments, cyclical effects, economies of scale, that could give rise to *TFP* increment.

Model (2) demonstrates the time-varying version of the Cobb-Douglas stochastic frontier production function presented in model (1). However, in this model the observed years (T) were factored in the model in order to proxy for technological change (the so-called Hicksian neutral) given the period of time over which this set of data was observed is 22 years. The time-varying technical inefficiency is obtained via the same normalisation for each year of the panel in the time-invariant case which ensures that $\hat{u}_{it} \geq 0$ and that is to say, $TE_{it} = exp(-u_{it})$. Where $\hat{u}_{it} = max_i\{\hat{\beta}_{it}\} - \hat{\beta}_{it}$. The time trend parameter is found to be of positive yet not significant impact at any level of statistical confidence in the model in which heteroscedasticity was assumed to be present only in u_{it}. The same analysis applies to the stochastic frontier *model (4)* which includes the double heteroscedasticity assumption following the Hadri (1999) and Hadri et al. (2003) approach and its extension for panel data. This is where the time trend was also found to be statistically insignificant and of positive effects on efficiency. It is also shown in Table 2 that the null hypothesis is accepted via the likelihood ratio test at 95% in this *model (4).*

In *model (3)* intermediate inputs were factored in as a third input in the frontier production function. It can be observed that the value of the capital input coefficient is not hugely different from its value in the two-input model presented in *models (1) and (2).* Whereas the labour input parameter is lower than in *model (1)* when the extra input of intermediates is integrated in *model (3).* However, the extra production input of intermediates was not found to be of a significant importance in the single-heteroscedasticity H_U model.

On the other hand, still the time trend (*T*) shows no sign of any statistical significance in both models. However, in *model (4),* the exogenous factors were included as an extra vector of variables to correct for heteroscedasticity in the two-sided error term ($random\ noise$).

The integration of the exogenous variables in the maximum likelihood procedure for the panel data yielded a variation in the values of the parameters estimated in the inefficiency function. See *model (4*). This is where the change in

technology indicates positive but rather statistically insignificant impact on the frontier production function in this model.

It can be noticed that the human capital (*college* and *non-college* labour) and *ICT* capital coefficients' weights in the inefficiency functions in *models (1), (2), and (3)* do not change substantially, despite the information technology capital *ICT* parameter does not appear to be statistically significant even when the time trend has been included as an additional variable in the production function in *models (2) and (3)*. Nonetheless, in *model (4)* the impact of human capital represented by the *college* labour remains statistically significant and positively associated with higher levels of efficiency. Whereas the *non-college* workers component is still contributing in a negative way to the efficiency.

In terms of the effects of both college and non-college labour inputs on productive efficiency, there seems to be no considerable differences between the two models (the single-heteroscedasticity H_U model and the double-heteroscedasticity H_{UV} model) both presented in *models (3) and (4).* In addition, there seems to be no marked disparity in the weights of the coefficients associated with each factor (college and non-college labour inputs).

In the double-heteroscedasticity three-input *model (4)*, the weights of the parameters of capital, labour differed from their values in *models (1, 2, and 3).* This might be ascribed to the substitutability between production inputs. This is where introducing more intermediate inputs such as energy and materials, less capital and more labour will be required. That is, the use of extra intermediate inputs might imply a reduction in the capital inputs and increase in labour inputs to generate the same volume of output.

Conclusion

By way of summary, the different efficiency models presented in this paper whether in the presence of heteroscedasticity in the one-sided error term or in the symmetric two-sided error term demonstrated the importance of *College* labour (those workers with tertiary education) in enhancing efficiency and productivity at the industry level in the manufacturing sector in the U.S. economy.

It is also proved that the Information and telecommunication *ICT* capital has played a key role in promoting industry efficiency in the U.S. over the period from 1998 to 2019 thanks to the information revolution and the stream of innovations and new technologies in the mid-1990s and its continuous spillovers over the two decades that followed. Regarding the *Non-college* labour (those workers with high school education), the role of this component of human capital in reducing inefficiency at industry level does not seem to be key in the U.S. In fact, in some models it is found to have had negative contributions to efficiency. As for the *R&D* capital, it showed no significant impact on efficiency when included as an endogenous factor in the H_U inefficiency *models 1, 2, and 3*, but when included as an exogenous input in the final H_{UV} *model 4,* it appeared to have had significant effects on efficiency in the U.S. manufacturing sector over the stated period from 1998 to 2019.

The selected sample in this paper is formed of industries with different levels of technology ranging from low and med low technology industries to high and med high technology industries. These industries will – in one way or another – have inter and intra-industries trade links, which by extension will stimulate innovation and technological diffusion among industries. In addition, intra-industry trade in vertically differentiated goods which are recognised by their variety in quality and prices can reflect some endowments in production factors between industries such as highly skilled labour. Hence, trading in these types of markets can offer some industries the opportunity to specialise and direct their resources and trading in the goods that they have some sort of comparative advantages in their production cost, such as using expensive educated workers for research and development and knowledge creation activities while allocating less skilled labour in less complex production activities.

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COVID-19 Pandemic and Business Survival as Mediation on the Performance of Firms in the FMCG-Sector

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COVID-19 pandemic has become a global issue causing the restriction of people and international trading and it has affected the loss of jobs and closure of firms all over the world. This paper aims to examine COVID-19 pandemic and business survival as a mediation on the performance of firms in the Fast moving consumer goods (FMCG) sector: insight for the future of business operation. Cross-sectional survey research design was adopted making use of stratified and simple random sampling technique as a guide to select participants while data analysis was subjected to exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and structural equation model (SEM). The findings show that COVID-19 pandemic has affected the performance and survival of businesses in Nigeria leading to the loss of jobs, firm productivity, customer retention, increase unemployment rate, closure of businesses and GDP of Nigeria as a whole. The research has been able to provide insight on the need for full integration of technology into all the firm operational process and for the firm to remain flexible to accommodate changes as imposed on the firm's operations through environmental uncertainties such as the pandemic. The study is the first of its kind to examine the extent of the effect that COVID-19 pandemic have had on the survival, performance of businesses and the gross domestic product (GDP) of the country since its eruption and announcement in China and has been able to provide insight by exposing most organization's weakness especially with regard to technology-adoption and its integration into all the firm operational capabilities as is the reason why most firm struggle to meets customer needs during the lockdown.

Keywords: *COVID-19 pandemic, performance, survival, customer retention, Nigerian economy, GDP*

Introduction

The novel corona virus (COVID-19) pandemic ravaging the world sprung from Wuhan City, China and has since spread it tentacles to over 216 countries of the world. There are 4,125,533 global cases and 280,965 deaths as at Mid-May, 2020 (Kampf et al. 2020). However, investment in research and development on

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vaccine creation to combat the effect of COVID-19 has practically reduce the global cases to 111, 419, 939 and 2,470,772 deaths as at late August 2021 (Wang and Tu 2020). The last pandemic that halted business activities and social gathering was the Spanish flu. The COVID-19 pandemic brought a new way of life, business and otherwise (Nicola et al. 2020). The major worry and cause of anxiety in the business world as at 2019 was the trade war happening between the United States of America and China, coupled with the move for Brexit. The anxiety in the business world was focused on the impact the trade war and Brexit will have on the global economy and analysts are split on the impact (Michie 2020). The International Monetary fund (IMF) also joined in the debate predicting a moderate growth of about 3.4% of the global economy (Bentolila et al. 2019).

COVID-19 pandemic brought a disruption like no other (Ozili and Arun 2020), business environment uncertainty necessitates critical decisions for survival, including laying off of workers, salary cuts by as high as 75%, and compulsory leave without pay (Nadeem 2020). Global stock dipped with a stock market loss of about USD 6 trillion within a week of the pandemic outbreak declaration, while the United States recorded its highest unemployment rate (14.7%) since the great economic depression era (Bernanke 2020). Nigeria is not left out of the crisis as price of crude oil (being the major export and foreign currency earner for Nigeria) fell. The price of crude oil as at January, 2021, was about $54.77, and highly unstable, while Nigeria forecasted $57. The difference in price will trigger government borrowing to cushion the effect (Ozili and Arun 2020), while the Nigerian economic temporary shut-down had tremendous impact (Nkengasong and Mankoula 2020). Due to the COVID-19 pandemic, businesses have had to shut down operations, significant number of jobs were lost, low production especially for essential firms producing consumables goods and services. This pandemic gave rise to technology inclined firms to thrive and many employees were forced to work from home.

Thus, as the pandemic is exposing the weakness in most countries labour force especially Nigeria making many jobs to become obsolete and thereby leading to joblessness, it also gave voices to technology inclined organizations and some technological software (Zoom, meetings etc.) to became the new order of holding and conducting business meetings, delegating task and a means to assess employee performance and productivity since physical contact is discouraged due the COVID-19 pandemic. This shows that as the pandemic is disrupting the usual physical work flow and schedule, it is also indirectly preparing the mind-set of the people especially organizations and government all over the world to adopt and fully integrate a virtual work mode that's capable of delivering expected result in terms of conducting businesses, meetings and all forms of transactions and engagements (Türker 2012, Allam and Jones 2020).

FMCG is one of the most essential sectors contributing significantly to Nigeria's GDP. The fast moving consumer goods (FMCG) sector are responsible for the production of essential product and services necessary for everyday living and this is why many government all over the world including Nigeria gave firms in this sector special privileges to operate at a minimum capacity in order to cater for the essential needs of their citizens during the lockdown (Barua 2020, KPMG

2020). In Nigeria, food, beverage and tobacco subsector of the FMCG industry contribute up to 5% of the total GDP of the country in 2019. Furthermore, the Nigerian stock exchange market report that FMCG sector constitute 17% of the value of equity in its market capitalization (KPMG 2020). This shows the significance of the sector to the Nigeria economy. While some other studies have examined the implication of COVID-19 on the oil sector and the educational sector in Nigeria, there's still dearth of study on the implication of the COVID-19 pandemic, this serves as the novelty of this study as this study researched on the impact of the pandemic in the FMCG sector vis a vis the health challenges created by COVID-19, the uncertainty in the global business outlook, the shutdown of businesses in Nigeria, and the looming recession which necessitated a study to appraise the challenges posed by COVID-19 on business survival, with focus on the FMCG sector.

Literature Review

COVID-19

Research show that Corona Virus (COVID-19) is from a large number of viruses which usually cause sickness linked to common cold, severe acute respiratory syndrome (SARS-CoV), middle east respiratory syndrome (MERS-CoV), etc. Global cases increase daily despite measures to reduce the spread, alas, the spread of the COVID-19 virus remains very high and astounding (Açikgöz and Günay 2020). COVID-19 can be described as a global pandemic simultaneously affecting all spheres, and little hope kindles bearing in mind that a vaccine is unavailable as at late 2020 (Anderson et al. 2020). However, the first quarter of 2021 recorded many significant breakthroughs in the development of COVID-19 vaccines in countries such as USA, Russia, and UK among others (Wang and Tu 2020). There is possibility for increased individualization, less need for religious gatherings, and governments will adopt new forms of engagement regarding economic, social or political integration to mitigate the spread (Gössling et al. 2020).

Global Economy and COVID-19

China, the virus's origin has over 1.4 billion population. China's economy was beginning to rank with the United States before the outbreak of the pandemic; clocking $13.7 trillion as gross domestic product (GDP). China started battling with the outbreak of the virus around December, 2019, leading to shut down of almost all activities as demand and supply also plummet; affecting the Chinese economy in the first quarter of 2020 and spilled over to other economies (Açikgöz and Günay 2020). The global economy has been projected to fall by 2.4% in 2020 due to the outbreak of the pandemic, while some experts predict worse (1.5%) come first quarter of 2021 (Barua 2020).

China shut-down meant 20.2% of world's total crude oil became redundant. In addition, oil price war between Saudi Arabia and Russia adversely affected oil price (Michie 2020). International Labour Organization (ILO) projected 5.3 million to 24.7 million job loss due to the pandemic, tethered to revenue loss (between $860 billion to $3.4 trillion) by December, 2020. Such revenue loss can trigger global financial crisis and recession (Bloomberg 2020b). The global stock market price is falling sharply over the uncertainty in the global economy as the FTSE, Nikkei, Dow Jones have all witnessed share price fall since the beginning of the COVID-19 pandemic (Anderson et al. 2020). The United States had to inject $2.2 trillion into the economy to save the vulnerable citizens, the United Kingdom did likewise by paying up to 80% of employees' wages to prevent massive layoffs, bankruptcy, and economic meltdown. The major problem is experts predict an economic recession after the pandemic (Bernanke 2020).

FMCG Sector and COVID-19 Pandemic in Nigeria

The outbreak of the COVID 19 pandemic brought unprecedented challenges to the FCMG sector in Nigeria. The COVID 19 pandemic lead to drastic fall in the demand for goods and services by consumers while some manufacturers had to shut down completely in order to obey government regulations and to prevent spread of the virus among their workforce (Adesoji and Simplice 2020, National Bureau of Statistics 2020b). While safety measures are being embraced and COVID 19 strictly being adhered to by firms in the FMCG sector in Nigeria, this makes it impossible for them to attain full production as it was before the pandemic outbreak and after some months of partial operations, most of the firms in the FMCG sector in Nigeria had to fully shutdown their production operations (KPMG 2020). Few firms in the sector tried to rise to the occasion by seeking innovative means of dealing with the situation but it was a situation not foreseen and most of these firms in the FMCG sector in Nigeria end up incurring more cost than usual leading to more disruptions in production. The restrictions imposed on Nigeria's border trade by the Federal Government of Nigeria due to the pandemic outbreak also significantly disrupted supply chain for the FMCG sector starving them some components of raw materials needed for continued production and placing them also at the verge of losing some already acquired materials for production due to material expiry and inability to continue production activities (National Bureau of Statistics 2020a). Some states in Nigeria like Lagos state and Ogun state which are the major hubs used by FMCG firms for production were also in total shutdown as directed by the government due to the COVID 19 pandemic outbreak, this total shutdown further acted a bigger impediment for production thereby forcing production in the sector close to a near zero margin (KPMG 2020). The FMCG sector is projected to contribute 5% of Nigeria's GDP before the COVID 19 pandemic outbreak and the question remains if the FMCG sector in Nigeria will still be able to contribute this percentage to Nigeria's GDP post COVID 19 or if the sector itself will be able to bounce back from the present near zero production and operation.

COVID-19 and the Nigeria Economy

The outbreak of the COVID-19 pandemic disrupted economic and business activities in Nigeria like most other parts of the world; The Nigeria government in recent time has not experienced such pandemic and also did not have any preparations in place to cushion the effect of the COVID-19 pandemic. Nigeria's economy high dependence on imports especially imports from China aggravated Nigeria's economy vulnerability as imports and raw material imports from China into Nigeria's economy constitutes about 70%. Also, Asia and Europe combined contributed about 86% of Nigeria's import indicating that the restrictions imposed across Asia and Europe on cross border trades has distorted supply chains to Nigeria and starving the Nigeria economy the needed raw material input for production (National Bureau of Statistics 2020c). The total lockdown order and travel restrictions from various parts of the world limited Nigeria's economy access to raw materials and also prevented export of goods and services from Nigeria's economy to other economies of the world which in turn starved the Nigeria economy from earning foreign exchange that could have help further to boost the economy. The global oil price also went from over $62 to as low as $23 due to the outbreak of the COVID-19 pandemic; this had a devastating effect on Nigeria's economy because Nigeria economy is majorly dependent on crude oil export and Nigeria mostly earn her major foreign exchange from oil export (Bloomberg 2020b, Ozili and Arun 2020).

The Nigeria Federal Government also had to embark on some strict measures necessitating cutting of spending and expenditure while putting available resources into managing the health pandemic brought about by COVID 19, though the move by the Federal Government of Nigeria was logical bearing the serious need to curtail the COVID-19 virus but the move also lead to other aspect of the economy been starved of needed fund (Adesoji and Simplice 2020). The Nigeria economy is also expected to experience one of its deepest recession since 1980s due majorly to the COVID-19 pandemic outbreak and the disruptions caused by the COVID-19 pandemic. The Nigeria economy has witnessed disruptions leading to lower oil prices and remittances, enhanced risk aversion in global and local markets; the Nigeria economy is also projected to contract around 4% due to the COVID-19 pandemic (World Bank 2020b). While the Federal Government of Nigeria is still working on how to revive the economy, it's still very uncertain how long the recovery of the Nigeria economy will take and if the current effort of the Nigeria government will yield the desired result.

Underpinning Theory

Profit Maximization Theory and Survival-Base Theory

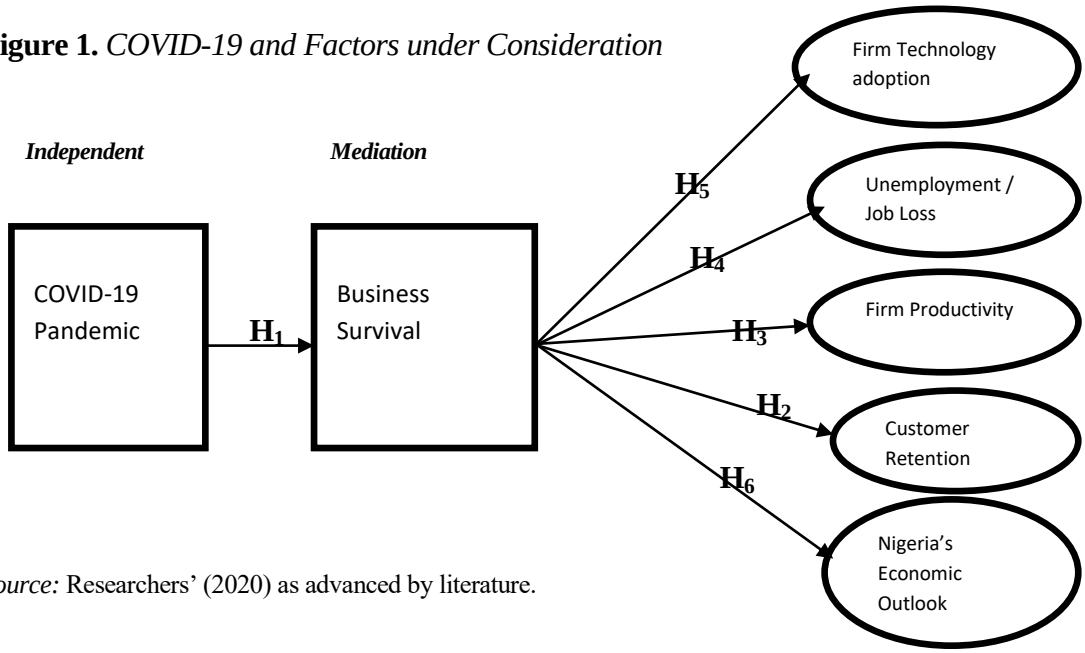
Profit maximization theory was propounded by Adam Smith and was first used in his publication titled the wealth of nations, stating every business will act in self interest in order to maximize profit from their business engagements. While

the Survival-based theory was originally developed by Herbert Spencer (Miesing and Preble 1985), the theory was very popular in the 19th and 20th century and the theory places emphasis on survival of the fittest as every business organization will put every available strategy in place to ensure survival. The theory of profit maximization argues that every business owner or organization will act in self-interest at every point in time in order to maximize profit, ensure longevity and to increase aggregate benefit derived by the society (Lynch et al. 2000, Jafar et al. 2010). The theory also assumed an economic perspective reiterating that organizations seek to maximize profit by equating marginal revenue to its marginal cost. The theory further stated that profit maximization is the ultimate goal of the organization as long as law and ethical custom are followed in the conduct of the organization's business activities (McAleer 2003).

While Survival-Based theory on the other hand based its arguments on the survival of the fittest and explains that organizations must do everything legally possible to thrive, compete and survive (Dwyer et al. 2003). Survival-Based theory emphasizes that it's normal for competitors to put in efforts to produce the fittest organization that adapts easily and is efficient. The theory assumes ruthless business rivalry supports the goal, which is legitimate survival (Lantos 2001). The application of the theory in the corporate turnaround of businesses is relevant till date, as ailing organizations usually face financial difficulties, loss of personnel, failing products, loss of market share, etc. An organisational resurgence may require reduction/layoff of its employees, cutting of salaries, selling of the organization's under-capacity asset, repositioning their product to aid survival (Gössling et al. 2016). The primary aim of organizations is efficiency, flexibility, and profitability; these ensure survival (Coad et al. 2013). All measures adopted by firms, especially post COVID-19 outbreak supports these theories (profit-maximization and survival), hence, they are relevant.

Conceptual Framework and Hypotheses Development

Figure 1. *COVID-19 and Factors under Consideration*



Source: Researchers' (2020) as advanced by literature.

COVID-19 and Business Survival/Customer Retention

The COVID-19 pandemic has affected businesses as well as the stock market in Nigeria. The Nigerian stock market lost about NGN2.3 trillion (US$5.9 billion) with possibility of further loss (Ozili and Arun 2020). Nigerian businesses were lost due to low patronage and sustained supply disruption (Nseobot et al. 2020). Retaining customers is more difficult as orders from customers are at its lowest. A lot of experts and economic analysts have predicted a very glooming picture regarding business survival in Nigeria and the study done by (Ozili and Arun 2020) looks at COVID-19 and economic crisis, but the study did not look at the effect on businesses survival neither was the study domesticated within the Fast-Moving Consumer Goods (FMCG) sector in Nigeria. This necessitated the formulation of hypotheses one and two to see if COVID-19 has affected the possibility of business survival and customer retention within the FMCG sector.

Ho1: COVID-19 pandemic affect business survival in the FMCG sector
Ho2: COVID-19 pandemic through business survival have indirect impact on customer retention in the FMCG sector

COVID-19 and Firm Productivity/Business Survival

The FMCG industry in Nigeria has faced series of challenges overtime. The decline in consumer purchasing power due to the 2016 recession in Nigeria is an example. The FMCG industry was one of the major hit industries by COVID-19, compounded by Dollar inaccessibility and weak macroeconomic conditions (Ogunlela and Lekhanya 2016). Among the challenge faced by firms in the FMCG sector is the issue of disruption in all facets of the firm causing many firms to lay off staff or enforce a compulsory leave without pay (Nseobot et al. 2020). The pandemic's effect on firm's productivity in the FMCG industry is evident in production rate, indirectly affecting their market share. Some research has focused attention on COVID-19 and how it has affected some selected industry and general outlook of events in Nigeria (Teriba 2020, Açikgöz and Günay 2020), but none of the research is yet to really domesticate the study within the FMCG industry, a gap this study intends to fill. Hypothesis three examines business survival and firm productivity in the FMCG industry, and the effect of COVID-19.

Ho3: COVID-19 pandemic through business survival have indirect impact on firm loss of productivity in the FMCG sector

COVID-19 and Unemployment/Business Survival in the FMCG Sector

Unemployment is a major problem, especially in Nigeria and Africa as a whole. The government and private sector in Nigeria collaborate to tackle unemployment and create opportunities for the working age bracket. Unemployment can lead to increase in poverty, and the COVID-19 pandemic is already showing signs that the gain made fighting unemployment maybe undone (Akanle and Omotayo 2020). The study done by Adu et al. (2019) assessed unemployment situation at some

selected industries in Nigeria, but the study did not include the FMCG sector. This informed the formulation of hypothesis four to x-ray the unemployment situation that maybe increased within the FMCG sector in Nigeria due to the COVID-19 pandemic.

> Ho4: COVID-19 pandemic through business survival have indirect impact on unemployment/job loss in the FMCG sector

COVID-19 and Technology Adoption/Business Survival

The outbreak of the novel COVID-19 virus was unexpected. It necessitated a halt to most activities and a need to adopt other forms of engaging remotely to sustain economic activities to avoid total shut-down (Ting et al. 2020). COVID-19 forced information technology (IT) adoption for many firms and government establishments (Allam and Jones 2020). Adoption of technology became a must, increasing operational cost. Share value of online video platforms like Zoom, Microsoft teams, Skype etc., increased (Ting et al. 2020). Did COVID-19 force IT adoption across firm value chain or was it just a mere coincidence? Hypothesis five looks at COVID-19, technology adoption and business survival.

> Ho5: COVID-19 pandemic through business survival have indirect impact on firm level of technology adoption in the FMCG sector

COVID-19 and the Nigeria Economy Outlook

Nigeria witnessed an economic crisis in 2009 caused by the global financial crisis, and 2016 caused by the sudden fall in the international oil price. Currently, the COVID-19 pandemic has affected price of crude oil, the major foreign currency earner for Nigeria. The difference in price of crude oil is already showing a major trouble for the Nigerian economy (Ozili and Arun 2020). Besides inadequate funds to support budget, business closure leads to a fall in taxes and income accruable to government (Nkengasong and Mankoula 2020). The study done by Nseobot et al. (2020) looks at the aftermath for businesses in Nigeria but did not highlight the effect of COVID-19 on Nigeria's economy and lessons from it. Hypothesis six investigates COVID-19 and Nigeria's economic outlook.

> Ho6: COVID-19 pandemic contribute negatively to Nigeria's economy outlook

Methodology

The study is descriptive in nature because it employs both primary and secondary methods to gather the needed data to test hypotheses. Hypotheses one to five used responses from survey data, while hypothesis six used data from National Bureau of Statistics (NBS) and Central Bank of Nigeria (CBN) to examine the effect of COVID-19 pandemic on Nigeria economy. The study sample- size consists of twenty FMCG firms from among the total population of

35 recognised FMCG firms by Nigerian Stock Exchange (NSE). The justification for selecting 20 firms from the list of 35 recognised FMCG firms in Nigeria is to have a representative whole from among the list of recognised FMCG firms. Simple random and stratified sampling techniques were employed to select forty senior employees in each of the selected FMCG firm, making a total of eight-hundred senior employees selected for sampling. Due to the COVID-19 pandemic that is restricting movement and causing social distancing, the questionnaire items were created in a google form and sent to the respondents (So et al. 2014). The data collation took up to four month (September to December 2020) for distribution and collation of data for this study. The justification for selecting senior level employees at each FMCG firms is to be able to assess the deep effects of the COVID-19 pandemic on business survival in Nigeria.

Instrumentation

Questionnaire items were adapted from literature; customer retention (Gustafsson et al. 2005), firm productivity (Buuri 2015, Leitão et al. 2019), unemployment (Arnout 2019), technology adoption (Ratchford and Barnhart 2012, Türker 2012), while questions on COVID-19 were adapted from (Caldera and Wirasinghe 2014, Udofia et al. 2020). To access the homogeneity and data adequacy before testing hypotheses using structural equation model (SEM), the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were employed. The study assessed the general reliability of the instrument by conducting a pilot study of one hundred respondents selected across ten FMCG firms and the result revealed 0.87 which is above the recommended threshold (Nunnaly 1978). The justification for using SEM is the need of the study to test the causal relationship existing between measured, observed and latent variable in the study. Within the four month duration of the data collection, only six-hundred and seventy return rate was achieved (83.8% return rate) and was used for the analysis.

Table 1. *Measurement Items*

COVID-19 (COV)		
COV1	My country experienced positive tests of the novel COVID-19 virus	Udofia et al. (2020)
COV2	My country has never experienced a pandemic of this magnitude	Udofia et al. (2020)
COV3	The virus has disrupted my company supply chains services	Udofia et al. (2020)
COV4	The COVID-19 virus is present in all parts of the country	Caldera and Wirasinghe (2014)
COV5	COVID-19 virus has made a serious impact to the way we conduct business	Caldera and Wirasinghe (2014)
Firm Technology Adoption (FTA)		
SD1	We have fully embraced technology adoption into all the company value chain	Türker (2012)
SD2	The pandemic led to wide spread automation of performance and service delivery	Ratchford and Barnhart (2012)
SD3	I find it difficult to deliver effectively using technology	Türker (2012)
SD4	The overall performance of the company was affected due to working from home policy	Türker (2012)
SD5	I am more productive using technology to deliver work from home	Ratchford and Barnhart (2012)
Business Survival (BS)		
OP1	The company is facing a high financial challenge due to the	Bates (1995)

	pandemic	
OP2	There is significant reduction in the production of goods and services due to the pandemic	Singh (2017)
OP3	We have recorded low sales and return as a results of low production in the past few months	Korunka et al. (2011)
OP4	We have had to lay off staffs to cushion the effects of the pandemic	Singh (2017)
OP5	We have had to reduce employees work hours per day to cushion salaries and or wages payment	Bates (1995)
Customer Retention (CR)		
CS1	We have remain consistent in retaining both new and current customers	Gustafsson et al. (2005)
CS2	Technology gives us the leverage we need to provide unwavering service needs to our consumers	Gustafsson et al. (2005)
CS3	Our effective online engagement has brought in more customers for the company	Vasic et al. (2019)
CS4	We struggle to retain customers during the pandemic	Chavez et al. (2016)
CS5	Our products and service demands skyrocketed during the lockdown	Vasic et al. (2019)
Unemployment (U)		
ORP1	The pandemic significantly reduced hours of jobs available	Furnham (1982)
ORP2	There is a mismatched between contemporary market needs and employees skill set	Furnham and Hesketh (1988)
ORP3	Inability of unemployed people to adapt to new working conditions	Feather (1990)
ORP4	There are lack of intelligence and ability among unemployed people	Furnham and Hesketh, (1988)
ORP5	Work from home strategy exposed many employees deficiency with regards to technology usage in the organization	Furnham (1982)
ORP6	There is a huge gap between the current job market realities and the educational system	Furnham and Hesketh, (1988)
ORP7	Low production capabilities result into loss of job opportunities	Feather (1990)

Data Analysis

Table 2. *Demographics of the Respondents*

		Frequency	**Valid Percent**	**Cumulative %**
Gender	Male	402	60.0	94.2
	Female	268	40.0	100
	Total	670	100	
Salary Range	Less than 5million per Annum	102	15.2	15.2
	5million-10million	383	57.2	72.4
	10million-15million	175	26.1	98.5
	15million & Above	10	1.5	100
	Total	670	100	
Highest qualification	BSc/HND	232	34.6	34.6
	MBA/MSc	300	44.8	79.4
	Postgraduate/Professional Certification	138	20.6	100
	Total	670	100	
Department	Production/ Supply chain	492	73.4	73.4
	Marketing & Sales	38	5.7	79.1
	Operations	140	20.9	100
	Total	670	100	

Assessing Multivariate Analysis Assumptions

In conducting structural equation model (SEM), assumptions of sample-size, normality, missing-values and multicollinearity were tested (Kline 2005). The recommended 200 sample size (Iacobucci 2010) was met given that the sample size used for this study is six hundred and seventy (670). To address normality, questionnaire items were assessed for skewness and kurtosis and the results were within the threshold of -1 to +1 (Amin et al. 2014). Frequency count revealed neither outlier nor missing values in the data set (Yana 2007). Multicollinearity was tested by correlation analysis. Correlation value above 0.5 is good (Field 2005), correlation for all the variable was above 0.5. Furthermore, we examine common method bias by looking at the second approach of Harman which is a more comprehensive and rigorous-technique (Podsakoff et al. 2003 and 2012) using CFA method. This was achieved by loading all twenty-five items used in the study into a single-factor using CFA. The result shows a poor fit as (chi-square=21.347, IFI=0.62, CFI=0.42, TLI=0.63, NFI=0.61, and RMSEA=0.24). Hence, the common method bias rule was not violated in this study.

Principal axis-factoring using EFA reduced redundant items and examined constructs loadings. Homogeneity was tested via Kaiser–Meyer–Olkin (KMO) and the Bartlett's-test of sphericity (BTS), recommended values of acceptance are 0.05 and 0.000 respectively (Orçan and Yang 2016). The KMO results from the EFA analysis is 0.828 and Bartlett's-test of sphericity (BTS) is (χ2=28155.593, p=0.000, and <0.05). Homogeneity and data adequacy were achieved.

Table 3. *Measurement Model*

Measurement Items	Constructs	CFI	R^2	Mean	SD	Factor Loading	Cronbach Alpha	CR	AVE
FTA1	Firm Technology Adoption	0.911	0.331	4.18	0.921	0.772***	0.763	0.711	0.656
FTA2			0.555	4.06	0.992	0.786***			
FTA3			0.441	4.00	0.818	0.852***			
FTA4			0.540	3.75	0.995	0.779***			
FTA5			0.507	3.84	1.121	0.828***			
FTA6			2.383	3.93	1.174	0.895***			
COV1	COVID-19 Pandemic	0.924	0.411	4.00	1.034	0.773***	0.752	0.738	0.545
COV2			0.941	3.75	1.171	0.846***			
COV4			0.655	4.04	1.074	0.778***			
BS2	Business Survival	0.910	0.443	4.03	1.062	0.804***	0.833	0.728	0.603
BS6			0.373	3.87	1.067	0.744***			
U1	Unemployment	0.915	0.359	4.05	1.053	0.660***	0.810	0.721	0.745
U2			0.775	3.99	1.068	0.710***			
U3			0.289	4.12	0.992	0.662***			
U4			0.686	4.09	0.818	0.704***			
U5			0.557	3.84	1.071	0.884***			
U6			0.949	3.96	1.074	0.774***			
FP1	Firm Productivity	0.912	0.299	4.05	1.009	0.562***	0.833	0.803	0.632
FP2			0.419	3.77	1.068	0.614***			
FP4			0.992	3.64	1.097	0.784***			
FP5			0.301	4.05	0.983	0.811***			
CR1	Customer Retention	0.905	0.432	4.13	0.905	0.670***	0.810	0.710	0.650
CR2			0.996	3.97	1.021	0.750***			
CR3			0.464	4.09	0.935	0.692***			
CR4			0.564	4.07	1.191	0.650***			

Note: CR: Composite Reliability, **AVE:** Average Variance Extracted, **CFI:** Comparative fit indices, χ^2**:** Chi-square Value.
Source: Field Survey, 2020.

A unidimensionality analysis was conducted to assess the fitness of the model for conducting SEM and the measures was assessed through composite reliability (CR), average variance extracted (AVE), Cronbach alpha, factor-loading, mean and standard deviation. The reliability of the construct was assessed using Cronbach-Alpha reliability technique and the results was above 0.70 as recommended by Nunally (1978) (see Table 1). The factor loadings for each of the twenty-one items have values greater than 0.5 as shown (see Table 1), hence, the data loaded very well and shows a good fit for the measurement model.

Comparative fit index (CFI) is used to assess whether the study model compare with the null-model supposing there are no correlations between the models constructs. As shown in (Table 2) the CFI value for all the constructs is greater than 0.90 and therefore shows a good fit for the measurement model (Bagozzi and Yi 2012). Hence, the CFI value shows acceptable model fitness. *Composite Reliability* is used to check the internal consistency of each constructs with regard to the variance from an observed variable from their latent factor. A composite reliability that is ≥ 0.70 has internal consistency, Table 1 shows all five constructs had consistency via higher values. AVE is the extent of the variance captured by a construct from the total amount of measurement error experience in a model. Maravelakis (2019) puts the threshold at 0.50, and Table 1 shows non-violation. Hence, homogeneity was achieved for the model used to test the hypotheses stated in the study through SEM. Thirty-one items were subjected to CFA and only twenty-five items were deemed fit. Customer retention, business survival, firm productivity, and COVID-19 pandemic had (CR5), (BS2, BS4), (FP3) and (COV3, COV5) deleted respectively.

Table 4. *Results of CFA*

	X^2	df	p	CFI	TLI	IFI	GFI	RMSEA
Measurement Model	2.328	290	0.000	0.915	903	0.920	0.911	0.06
Recommended Value	≤ 2 or 3			>0.9	>0.9	>0.9	>0.9	< 0.08

The model fit generally shows the comparative fit index (CFI=0.915), tucker lewis index (TLI=0.903), incremental fit index (IFI= 0.920), goodness of fit index (GFI=0.911), chi-square (X^2=2.328), degree of freedom (Df=290) and root mean square error of approximation (RMSEA=0.06), all of which shows that the model is above the recommended threshold for acceptance and is therefore fit to test the stated hypotheses see Table 2 (Nusair and Hua 2010, Hair et al. 2017).

Hypotheses Testing

Table 5. *Path Model*

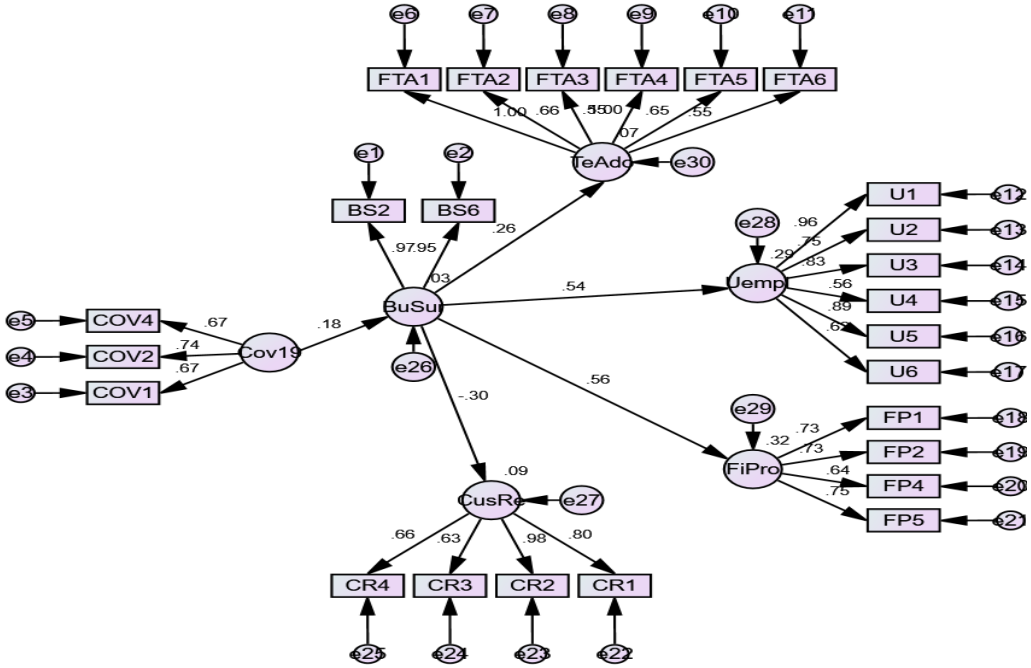
Hypothesized Model	R^2	Standardized Effect	t-value	P-value	Remark
COV⟶BS	0.034	0.18 (DE)	3.679	0.000	positive and direct effect
COV⟶BS⟶FP	0.316	0.56 (IE)	11.919	0.000	positive and indirect effect
COV⟶BS⟶U	0.289	0.54 (IE)	14.075	0.000	positive and indirect effect
COV⟶BS⟶CR	0.088	-0.30 (IE)	-6.946	0.000	negative and indirect effect
COV⟶BS⟶FT	0.067	0.26 (IE)	6.274	0.000	positive and indirect effect

P<0.05; Where: DE=Direct Effect, IE=Indirect Effect, BS=Business Survival, FTA=Firm Technology, FP=Firm productivity, U=Unemployment, CR=Customer Retention, COV=COVID-19 Pandemic.

Six hypotheses were examined; however, the first five hypotheses were analysed using SEM and the direct, indirect, and standardized regression weights are shown in Figure 2. The sixth hypothesis was analyzed using a narrative discourse that compare the third and fourth quarter of 2019 to the first and second quarter of 2020 using secondary data that was derived from NBS and CBN in order to examine the impact of COVID-19 pandemic on the Nigerian economy outlook. The result from the SEM analysis shows that (*H1)* there is a direct relationship between COVID-19 pandemic and FMCG firms' performance (t-value=3.679 at p=0.005), therefore, the hypothesis was accepted. This means that the sudden occurrence of COVID-19 pandemic have adverse impact on business continuity and survival in the FMCG sector. The indirect hypotheses (H2 to H5) examine the survival of businesses in the FMCG sector as a result of the impact of COVID-19 pandemic using firm performance measures such as firm productivity, unemployment, customer retention and firm technology adoption. The result shows that COVID-19 pandemic have indirect impact on all the performance measures used in the study and therefore, affect the operations of many organizations in the FMCG industry thereby determining the survival and or failure of this firms.

Although, the analysis shows a positive and indirect effect of COVID-19 pandemic on firm productivity, unemployment and firm technology adoption as the significant (t-value=11.919, 14.075 and 6.274 at p=0.05), making these hypotheses accepted. Hypothesis (*H2*) that examined the COVID-19 pandemic on customer retention and business survival of FMCGs show a negative, indirect, and significant effect (t-value=-6.946 at p=0.05). The significant impact therefore, make *H2* to be accepted. The negative relationship could be as a result of the lockdown which make it difficult for organization and customers to have a consistent transactional relationship among each other's thereby forcing customers to look for alternative firms whose online presence is strong and can immediately satisfy theirs needs during the lockdown.

Figure 2. *Standardized Hypothesized Structural Equation Model*



Ho6: COVID-19 pandemic negatively impact Nigeria's economy outlook

The Nigerian economy outlook can be measured by the gross domestic product, inflation rate and interest rate (Bello and Aliyu 2016). However, the study used the GDP and inflation rate to measure the Nigerian economic outlook in order to assess the impact of COVID-19 pandemic on the Nigerian economy when compared to the preceding year 2019. This would highlight the extent of damage the pandemic has caused on the Nigerian economy and would ascertain the acceptance or rejection of H6.

Table 6. *Nigerian Economy Outlook 2019 and 2020*

GDP	**2019 (%)**	**GDP**	**2020 (%)**
(Quarter 1)	2.55	(Quarter 1)	1.87%
(Quarter 2)	1.87	(Quarter 2)	-6.10%
(Quarter 3)	-6.10	(Quarter 3)	-3.62%
(Quarter 4)	-3.62	(Quarter 4)	0.11%
Annual	2.27	Annual	-1.92
Inflation		**Inflation**	
August	11.02%	August	13.22%
September	11.24%	September	13.7%
October	11.61%	October	14.23%
November	11.85%	November	14.9%
December	11.98%	December	15.8%

Source: National Bureau of Statistics (2020).

The Nigerian GDP grew by 1.87% in the first quarter of 2020, this represents a decline when compared to the growth of 2.55% of 2019 4th quarter. The decline

in GDP in 2020's 1st Quarter could be trace to halted international trading (National Bureau of Statistics 2020c, Adesoji and Simplice 2020). Similarly, the GDP in the second quarter experience a -6.10% decline as against the growth experienced in the preceding quarters. The third quarter also experienced a decline of 3.62% as against the preceding quarter. However, the fourth quarter shows a relief growth in the GDP with 0.11% and overall, put the GDP annual growth rate to a decline of 1.92 as against the preceding year. Hence, this decline shows the damage COVID-19 has had generally on the economic outlook of Nigeria.

Additionally, the Nigerian inflation rate shows that it has been increasing at an alarming rate from the last five month of 2019 through to the last five month of 2020. Although, the trend of these increase is consistent from the beginning of 2019 and therefore, cannot be categorically stated that the continuous increase in the year 2020 is as a result of the COVID-19 pandemic. However, given the annual decline in the GDP of Nigerian in 2020 (-1.92) amidst the global pandemic compare to the annual increase (2.27) experienced in 2019; then we can state that COVID-19 pandemic impact negatively the Nigerian economic outlook, thereby leading to the acceptance of the hypothesis.

Discussion of Findings

The study examined COVID-19 pandemic, business survival and FMCG firms' performance. Six hypotheses were examined, five hypotheses were analysed using SEM and the sixth hypothesis was analyzed using a narrative discourse. Among the five hypotheses (one direct and four indirect) examined with SEM; all the five hypotheses were supported. The study revealed that COVID-19 pandemic affected business survival in the FMCG industry due to compulsory lockdown by Nigerian government. This affirmed Bloomberg (2020a) report that businesses who are forced to lockdown face liquidation and survival challenge all over the world. Furthermore, findings revealed that COVID-19 pandemic exposed the level of firm technology usage and their survival in the FMCG industry. This aligns with survival-based theory and profit maximization as any firm who could not produce at optimum capacity nor maximize profit risk the chance of surviving and thriving. The 21st century business environment of today is currently working at a pace where firm can hardly get anything done without full integration of technology into its operations. This is the reason why many firms struggle to meets customer needs online while other competitor leverage technology to meets existing and new customers' needs using technology (Mutlu et al. 2015). It is evident that many FMCG firms had minimal technology adoption across its value chain as revealed by the finding. Hence, firms need to comprehensively integrate IT into its value chain to mitigate uncertainties that could adversely affect performance (Mutlu et al. 2015) as this is seen as one of the contribution to knowledge for this study.

Findings also revealed that the COVID-19 pandemic affect unemployment rate and or loss of job thereby affecting business survival in the FMCG industry. This finding aligned with reports by (International Labour Organization 2020, World Bank 2020a, Nkengasong and Mankoula 2020) that COVID-19 pandemic

affect the unemployment rate in many countries leading to the loss of jobs and income. The findings support the theory of profit maximization and survival-based as all organization are looking for the most effective ways to maximize profit, and hence, would do everything legally possible to keep the organization in operations. Since the finding of the study shows that COVID-19 pandemic affect business survival in the FMCG industry, it translates into more unemployment in the country (International Labour Organization 2020).

Furthermore, finding shows that COVID-19 pandemic affect firm's productivity and business survival in the FMCG industry. Firms had to reduce their manpower and production schedule especially those regarded as essential product producers, complicating optimal performance. This effect on firm productivity will affect customer needs, supply, firm revenue and profitability (World Bank 2020b, Nkengasong and Mankoula 2020). This finding also aligned with the submission of profit maximization and survival-based theory as profit and survival can only be achieved when organization produce at optimum capacity, otherwise, firms would look for every means possible to remain in business even if it means drastic manpower reduction.

Findings of the study show that COVID-19 pandemic has a significant negative indirect effect on customer retention and business survival. Developed nations contributes to citizens welfare during the lockdown by providing basic households needs in order to curtail the spread of COVID-19 pandemic and restrict the urge of citizens wanting to go out of their house (Nkengasong and Mankoula 2020, Açikgöz and Günay 2020). However, this is not the case in Nigeria as many citizens are left stranded without any provision for basic household's needs thereby making citizens to source for basic needs; hence, risking contact, exposure and the spread of COVID-19 pandemic. Thus, less physical and more virtual interface/engagement with customers must be implemented by firms to satisfy customers regardless of location (Mutlu et al. 2015).

Finally, finding showed that COVID-19 pandemic negatively affect the annual GDP of Nigeria's making the economy outlook to experience (-1.92%) decline as against the preceding year. This is not surprising given the halt to international trading and lockdown experienced by businesses across the country. COVID-19 pandemic affected 60% of the global-oil-prices and given the reliance of the country economy on oil revenue, then it is certain that the GDP will be adversely affected (National Bureau of Statistics 2020c). Also, the finding shows that as the country GDP is experiencing decline, inflation rate is also increasing at an alarming rate making the country currency to experience a major setback in valuation when compared to foreign currency such as dollar ($) (Nkengasong and Mankoula 2020, Nseobot et al. 2020).

Implications

COVID-19 pandemic brought a new normal to business operations all over the world and especially FMCG firms and has been able to expose organizations

directly and indirectly to their various weaknesses with regards to their operational flexibility, technology adoption and readiness to accept change as imposed by both internal and external pressures in the business environment (Michie 2020, Nkengasong and Mankoula 2020). The current business environment is dynamic and multifaceted, elevating uncertainty. Thus, IT integration to value chain operations is pivotal to customer satisfaction, retention and business survival.

Furthermore, the study revealed that COVID-19 pandemic affected jobs, firm productivity, and unemployment rate in Nigeria (and the world). Though, many countries and especially developed ones are supporting corporations to cushion the effect of COVID-19 pandemic. Hence, the government needs to also support FMCG firms in Nigeria to survive the effect of COVID-19 pandemic in order to manage job loss (Gössling et al. 2020). The study found a negative indirect relationship through COVID-19 pandemic and customer retention and business survival in the FMCG industry. COVID-19 pandemic exposed the weakness of many firms to re-assessing the level at which they can remotely attend to customer needs and keep customer engaged in the organization using technology. The world is changing so fast and this has made many firms to move from traditional means of engaging customers to digital means (Dadzie et al. 2017). Thus, firms who are able to survive the pandemic have to fully adopt digital content marketing communication strategy and fully integrate technology into firm value chains in order to keep firm customers engaged, satisfied and retained (Dadzie et al. 2017, Mutlu et al. 2015).

Furthermore, FMCG firms in Nigeria may also need to adopt pay per hours of work rather than monthly salary (9am to 7pm of work) as is the usual practice FMCG firms and other industry. This would enable firms to reduce the number of hours that all employees can work in a day in order to give opportunity to everyone thereby reducing the unemployment and hardship situation in the country especially as the pandemic as worsened for everyone (Açikgöz and Günay 2020, Allam and Jones 2020). Finally, finding also shows that COVID-19 pandemic has adverse effect on the Nigerian economy outlook considering the decline in GDP and continuous increase in the country's inflation rate. This has triggered continuous borrowing from other country in order to survive and avoid incessant recession, hardship and unemployment as worsened by the COVID-19 pandemic (Michie 2020).

Conclusion

COVID-19 has become a global phenomenon ravaging the entire globe and also a serious concern to various Businesses, Government and individuals at various levels. This paper examines the COVID-19 pandemic and business survival as a mediation on the performance of FMCG firms. Plus, the general economic outlook in the face of the COVID-19 pandemic. The study showed that there is a direct impact between COVID-19 pandemic and survival of businesses, firm productivity, unemployment, customer retention and firm technology adoption in the FMCG industry. Findings also show a drop in the growth of the Nigeria GDP when

examining the Nigeria economic outlook through the pandemic. This is as a result of halt in local production, international trading due to the compulsory lockdown of the economy to mitigate the impact and spread of the pandemic, although, major breakthrough has been recorded in the creation of vaccines across countries (UK, USA and Russia, among others) to mitigate the further spread of this virus and if possible to eradicate its existence across countries (Wang and Tu 2020, Liang and Litscher 2020). However, this study emphasise a serious need for workable policy frameworks and economic reforms by the Nigerian government to ensure the economy is revived and set on the path of growth and development towards reducing unemployment and the burden of job-loss. They also need to create avenue for businesses to thrive/survive in the country and create a means to prevent total economic collapse due to the COVID-19 pandemic especially in the FMCG sector.

Suggestions for Further Research

The study examined COVID-19 pandemic and business survival as a mediation on performance of FMCG firms. The study was able to recover only six hundred and seventy employee responses from the selected FMCG firms. Further research can be done on the same subject with a larger sample size. Also, the study focuses specifically on the impact of COVID-19 pandemic on the survival of FMCG firms, further research can extend to other industries to establish a holistic view of the effect of COVID-19 pandemic on the Nigerian economy and provide further insight to the future of business operations. Further research can also be done to look at a comparative impact of COVID-19 pandemic on business survival and performance in develop and developing economies. The findings would serve as guide to government especially in developing economies about the importance of supporting firms and building a sustainable and conducive business environment.

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Fighting Brain Drain: The Ecuadorian Scholarship

By Alice Sanna[*]

In 2007, the Republic of Ecuador introduced a new scholarship program for financing Ecuadorian students intending to study abroad. This program still exists and stipulates a compulsory return to the students' home country after completing their studies abroad. Statistical data shows a return rate of about 90%, which is somewhat surprising at first glance. This paper aims to introduce the Ecuadorian scholarship program as a case study in the literature of financing systems of students' mobility in higher education, while attempting to give a first analysis of its mechanism design.

JEL Codes: *F22, H52, I23*
Keywords: *brain drain, financing systems of students' mobility, higher education, students' mobility, developing countries*

Introduction

Globalization has several implications for the mobility of students and skilled workers. Over the last decade, the phenomenon of 'brain drain', a clear and peculiar consequence of the current globalized world, has gained the attention of many academic researchers. In conjunction with the increasing number of international students, the percentage of students staying in the country where they studied is also increasing. To give an example, Van Bouwel (2010)[1], who analyzed the migration behavior of a sample of European economics students who obtained a PhD in the US, stated that "64% are currently working in the US, whereas only 24% moved back to their home country, and an additional 10% moved to another European country". Among other factors, as argued by Lange (2009), technological changes could explain the general linear rise in the stay rate since communication has become cheaper and travel costs have also reduced, allowing students and graduates in their host countries to stay in touch with their relatives and friends abroad.

Particularly interesting for people from developing countries, brain drain arises when the general socioeconomic conditions to stay abroad (that is typically the country they chose to study in) are better than those in their home country. This phenomenon is highly disadvantageous to human capital, since the need for highly skilled workers and highly educated citizens is more significant than in developed countries. Geesen (1998)[2] states that brain drain makes developing

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[1]See also Van Bouwel and Veugelers (2014).
[2]See also Shahabadi et al. (2020)

countries less competitive than developed ones. In the same way, Docquier (2014)[3] argued that among different country-specific factors, the country's level of development determines whether a country gains or losses in terms of the brain drain effect[4]. But on the other hand, it is highlighted the importance of the general trend and the 'mimicking effect' among mobile skilled workers. In particular, "when a return is significant, it gives incentives to other waves of returnees to come home"[5].

One of the causes of the brain drain phenomenon could be attributed to a lack of efficiency in the financing systems of students' mobility, often discussed by Gérard (2007, 2008, 2012)[6], and Gérard and Uebelmesser (2014). In particular, if the so called *country of origin's principle* discussed by the same author seems to be more efficient than the *host country* one, it still incentivizes the brain drain phenomenon. The 'sending' country (i.e., country of origin), is often paying scholarship fees to their students to study abroad, in the false hope of seeing those students return once they have completed their studies abroad.

Scant literature seems to exist on the causes of returning or staying after studying abroad. Of course, one could say that it is logical and is directly related to economic possibilities and higher salaries, but this argument is not exhaustive. In this sense, the work of Baruch et al. (2007) offers a lot of interesting evidence regarding the inclination to stay abroad after having studied. In particular, they argue that "students' perceptions of ethnic differences and labor markets, their adjustment process to the host country, and their family ties in the host and home countries all affect their intention to stay". Combining the 'push-pull' model developed by Baruch (1995) and the theory of 'reasoned action' by Ajzen and Fishbein (1980), they examined the attitudes and perceptions of 949 foreign students who came to study in the UK and USA.

In an attempt to tackle brain drain, the Republic of Ecuador introduced a new and original scholarship program to finance Ecuadorian students intending to study abroad. The Ecuadorian model stipulates a compulsory return to the home country with the obligation of working 'at home' for double the length of time that they spent abroad. If students do not fulfil that condition, they have to repay the entire cost of the scholarship. In exchange, authorities help students to find a job if necessary. Statistical data shows a return rate of about 90%[7], which is somewhat surprising at first glance. On that basis, this work aims to understand that apparently successful outcome and, in particular:

- Brings the Ecuadorian scholarship as a case-study in the literature of financing systems of students' mobility.

[3]See also Djadjic et al. (2019).
[4]See also Kar-yiu and Chong (1999).
[5]Ireland after the fiscal reform of 1987 and Taiwan in the 1980s (see Docquier 2014).
[6]See also Gérard and Sanna (2017).
[7]SENECYCT 2019 (stands for 'Secretaría Nacional de Educación Superior, Ciencia, Tecnología e Innovación' and is the governmental institution that promotes scientific research and technological innovation).

- Attempts to analyse the mechanism design of this scholarship and see how the return conditions could be a contributing factor in solving the brain drain problem.

The paper is organized as follows: the second session gives a general analysis of the brain drain issue in Ecuador. The third session introduces the scholarship program in detail: data, facts, and institutions. Starting from the *country of origin principle,* the fourth session describes and attempts to analyze the mechanism design of Ecuador's policy. The fifth session proposes a detailed agenda for research as an extension of 'push-pull' model developed by Baruch (1995). The sixth session concludes this study and presents some tentative lessons for the management of the higher education system on students' mobility.

The Brain Drain in Ecuador

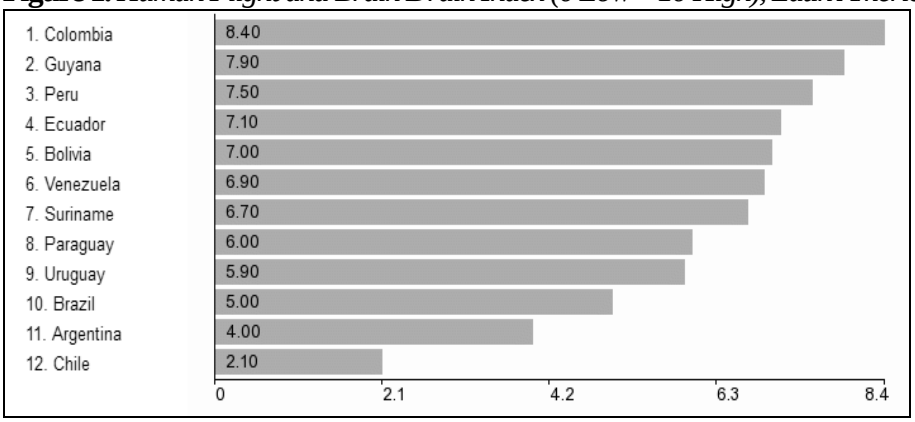
As previously discussed, brain drain is a worldwide phenomenon, especially problematic for developing countries that continue to lose skilled young people who decide to migrate to developed countries in search of better opportunities. Latin America is one of the regions where there are few incentives for highly skilled workers to stay in their home country, and Ecuador is one of them.

Ecuador is a developing country in the northern part of South America, with around sixteen million inhabitants. Between 2007 and 2014, it experienced a period of significant economic growth and consequent decrease in poverty which was mainly due to the boom in oil prices. It was precisely during this period that Ecuador introduced the scholarship program discussed in this paper, in order to try and invert the brain drain trend with new education policies, aimed at increasing the return rate after studying abroad.

Let me introduce some statistical data. If we look at Figures 1-3, we observe the human flight and brain drain indicator from 2007 to 2019. This indicator considers the economic impact of human displacement (for economic or political reasons) and the consequences on a country's development. The higher the index, the greater the human displacement. The average value is 6.56 index points with a minimum of 5.2 in 2019 and a maximum of 7.5 in 2010, and a shows decreasing trend since 2011.

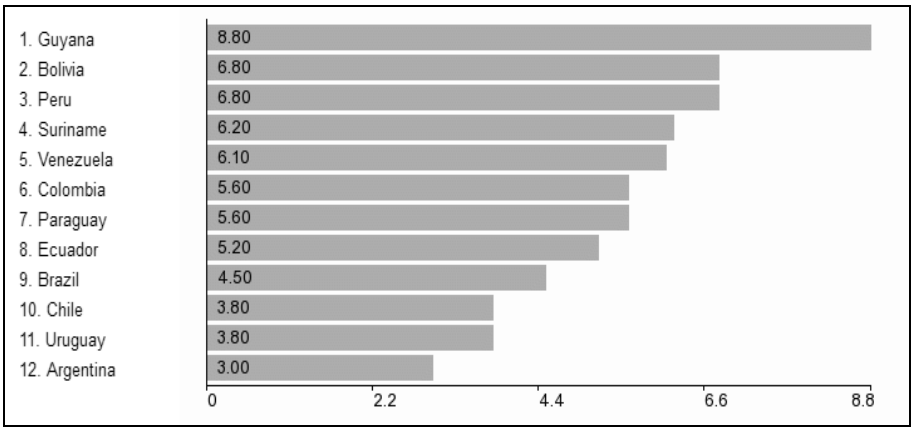
Observing figures for 2007 - Figure 1 - the government of the Republic of Ecuador realizes that among the twelve countries in Latin America, Ecuador ranked fourth, from the floor, when the human flight and brain drain index was at stake. Only Colombia, Guyana, and Peru behaved worse, while eight countries performed better: Bolivia, Venezuela, Suriname, Paraguay, Uruguay, Brazil, Argentina, and Chile. Twelve years later, in 2019 - Figure 2 - Ecuador has gained four places in that ranking; with only Brazil, Chile, Uruguay, and Argentina achieving better now.

Figure 1. *Human Flight and Brain Drain Index (0 Low – 10 High), Latin America, 2007*



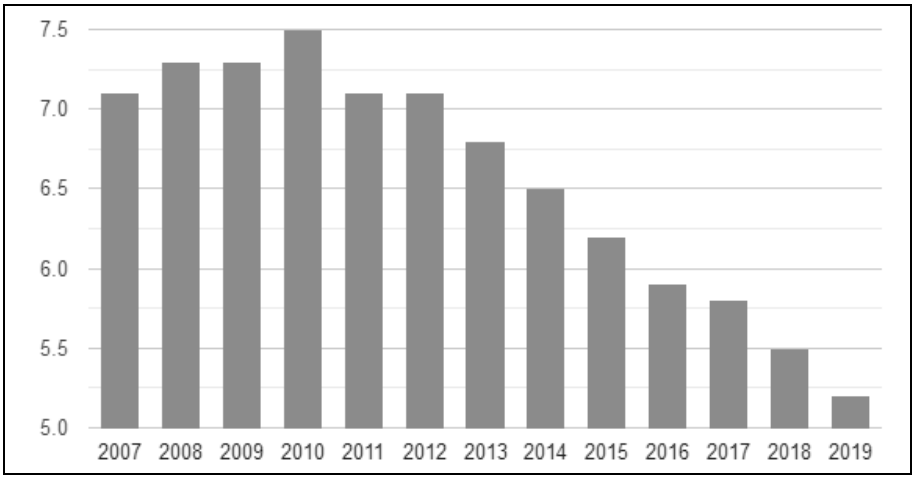
Source: Fund for Peace.

Figure 2. *Human Flight and Brain Drain Index (0 Low – 10 High) - Latin America, 2019*



Source: Fund for Peace.

Figure 3. *Human Flight and Brain Drain Index (0 Low – 10 High) - Ecuador, 2007-2019*



Source: Fund for Peace.

How can this phenomenon be explained? What happened in between these periods? Why did brain drain decrease- at least in relative terms? This is an interesting observation that calls for a better study of its causes. At first glance, this could be linked with two phenomena: a higher return rate after studies abroad, possibly boosted by the government's scholarship program introduced in 2007, as well as the increasing number of highly-skilled workers coming from Europe after the 2008 economic crisis whom were hired in Ecuadorian universities as professors or researchers.

What is certainly true is that if Ecuador wanted to improve the quality of its capital (e.g., human capital, intangibles), compared to that of its neighboring nations, it had to face a double challenge: on the one hand, to send more young graduates abroad to obtain a master or PhD degree; and on the other hand, to incentivize that extra capital to return home after graduating with their advanced degrees.

The Ecuadorian Scholarship: Data, Facts, and Institutions

In 2007, Ecuador introduced a new scholarship program for financing Ecuadorian students who intended to study abroad in order to transfer newly-acquired knowledge back to their own country after graduation. As mentioned in the program itself, higher education is one of the most fundamental pillars of the Ecuadorian development model, which has been created to tackle the main difficulties of a developing country: low-skilled workers, especially in the most sensitive and vulnerable sectors of the population. Moreover, the design of this particular type of scholarship has been designed in such a way as to avoid brain drain through a solid incentive to return to Ecuador after the completion of studies abroad.

The requirements of these programs are as follows: a natural person with Ecuadorian citizenship, ≤35 years old for master, ≤45 years old for PhD, certification of admission to a foreign university, a guarantor whose role is to pay back the entire amount of the scholarship in case the student decides to stay in the host country and does not have the means to repay the scholarship themselves. To obtain the scholarship there is a selection process that includes tests to verify a potential student's capacity for logic, mathematics, verbal expression, and English language ability. With a minimal result of 75% (60% for vulnerable categories), it is possible to progress to the final step- an interview, where the motivation level of the candidate is evaluated.

The Ecuadorian model stipulates a compulsory return to their home country with the obligation of working at home for twice the amount of time spent abroad. If students do not satisfy these conditions, they (or their guarantors) have to repay the entire scholarship plus a fixed amount of interest. In exchange, authorities help the students to find a job, if necessary.

To better understand the functioning of that scholarship device, let us focus on Figure 4 which explains the alternatives that the student faces once they finish their studies abroad.

Figure 4. *The Ecuadorian Scholarship Path*

It turns out that, *ceteris paribus*, if a student attains a good job abroad that allows them to repay the total amount of the scholarship, they will prefer to stay abroad. Vice-versa, they will choose to return to their home country.

The amount of the scholarship (see Table 1) depends on the country of destination, and takes into account the income level of the beneficiary.

Table 1. *Scholarship Maximal Amount according to the Destination Country*

Degree	**Latin America and Caribbean**	**US, Canada, and Australia**	**Europe, Asia, and Africa**
Master (max 2 years)	66,000 USD	103,000 USD	108,000 USD
Ph.D. (max 4 years)	162,000 USD	218,000 USD	204,000 USD
Professional Specialization in Medicine (per year)	38,000 USD	51,000 USD	57,000 USD

Source: SENECYCT[8].

Over the period of 2007-2018, the Ecuadorian Government funded 11,214 scholarships for both undergraduate and graduate-level students: 26% to study Engineering, 23% for Health and Medical Studies, 16% to Natural Sciences, Mathematics and Statistics, 11% for Social Sciences and Communication, and 7% for Information Technology Studies. For more details, see Table 2.

According to the available data (see Table 3), 43% of the beneficiaries chose a country in Europe, Asia or Africa, 35% a country in Latin America and Caribbean, and 22% opted for the US, Canada or Oceania.

The preferred host countries were: Cuba (16%), Spain (15%), UK (10%), US (10%), and Australia (8%) (see Table 4). The other destinations were below 5%. It may be useful to highlight the fact that there is a very good and well-known university for Medical Studies in Cuba, '*Escuela Latinoamericana de Medicina*' which is the most highly regarded in Latin America. The fact that the second most popular destination is Spain could be justified by a language-oriented choice.

[8]SENECYCT: https://siau.senescyt.gob.ec/proceso/becas/.

Table 2. *Field of Studies of Beneficiaries (2007-2018)*

Field of Studies	No. of students	% of total number of outbound students supported by the program
Engineering	2,570	26%
Health and Medical Studies	2,313	23%
Natural Sciences, Mathematics and Statistics	1,589	16%
Social Sciences and Communication	1,096	11%
IT	704	7%
Agriculture, Forestry, Fishery, and Veterinary	594	6%
Arts and Humanities	533	5%
Business, Management and Law	343	3%
Educational Sciences	236	2%

Source: SENECYCT.

Table 3. *Destination of Beneficiaries (Region of Studies)*

Region	No. of students	% of total number of outbound students supported by the program
Latin America and Caribbean	3,450	35%
US, Canada, and Oceania	2,209	22%
Europe, Asia, and Africa	4,319	43%

Source: SENECYCT.

Table 4. *Destination of Beneficiaries (Country of Studies)*

Country	No. of students	% of total number of outbound students supported by the program
Cuba	1,611	16%
Spain	1,519	15%
UK	1,047	10%
US	1,030	10%
Australia	801	8%
Canada	376	4%
Russia	358	4%
Honduras	343	3%
Netherlands	326	3%
Argentina	281	3%
France	276	3%
Chile	267	3%
Brazil	220	2%
Venezuela	212	2%
Mexico	211	2%
Costa Rica	168	2%
Germany	152	2%
Belgium	130	1%
Portugal	127	1%
Hungary	124	1%
Italy	102	1%

Source: SENECYCT.

As previously mentioned, statistical data shows a return rate of about 90%, which is somewhat surprising at first glance. Among the returnees, 34% work in

educational institutions, 18% in healthcare institutions, 15% in the private sector, and 14% for governmental institutions.

The 'Country of Origin Principle' and the Return Rate

As described in the literature by Gérard in 2007 and 2010, among others, we can distinguish two main ways of financing a student intending to study abroad: the *country of origin principle* and the *host country principle*. The first implies that the 'sending country' finances the student's expenses, while in the latter, the 'receiving country' pays for them.

The existing system for financing students' mobility, mostly based on the *host country principle*, is neither sustainable nor efficient (Gérard 2007, 2008, 2012, Haupt et al. 2011). One of the explored alternative solutions to the current *host country principle* is the *country of origin principle*. But, as argued by the same authors, it still appears to be inefficient because of the presence of a positive externality. However, the outcome of this design is more efficient than the previous one if the probability of returning home after completion of studies is higher than a given threshold.

To analyze the mechanism design of the Ecuadorian scholarship, we can start with the *country of origin principle* (see Gérard 2007) that is briefly described below, tracing the core parts of the model which are useful in understanding the discussed tool.

Under the assumption of a simple world consisting of two countries (*i* and *j*), the *country of origin* model is essentially based on the number of ECTS (European Credit Transfer System) obtained by the student, used as an indicator of the opportunity-cost related to the mobility. Each country wants to maximize their social welfare.

Supposing that the local production function of wealth (*f(x,z)*) is characterized by a technology using locally and internationally educated graduates, the objective function of the government of country *i* is:

$$W_i = f\left(e_{ii}, r\beta e_{ij} + (1-r)\beta e_{ji}\right) - c\left(e_{ii} + e_{ji}\right) - w(e_{ii} + e_{ij}) \quad \textbf{(1)}$$

where:

-e is the number of ECTS (European Credit Transfer Scale) where the first subscript indicates the origin country, and the second one indicates the destination country (for studying purposes).

$-\beta \geq 1$ is the ability to contribute to wealth production.

$-c$ is the cost of producing ECTS.

$-w$ is the opportunity cost of dedicating time to getting an ECTS rather than contributing to the current generation of local wealth.

$-r$ is the probability of returning home after the completion of studies abroad.

To determine the number of ECTS *eij* (financed students to send abroad), the government of country *i* has to maximize equation (1) with respect to that latter variable. The equilibrium numbers of ECTS for the *country of origin* principle (O) are then the following:

$$e_m^O = r\frac{\beta}{c+w}$$

where the superscript *O* refers to *country of origin principle*, and the subscript *m* refers to internationally mobile students.

The lack of efficiency of this system has to be appreciated with respect to the efficient benchmark below that derives from the joint maximization of W_i+W_j w.r.t $e_{ii}, e_{ij}, e_{jj}, e_{ji}$:

$$e_m^E = \frac{\beta}{c+w}$$

where the superscript *E* refers to *Efficient.* This lack of efficiency is then due to the presence of an externality:

$$e_m^E - e_m^O = (1-r)\frac{\beta}{c+w} \quad \textbf{(2)}$$

which is positive anyway and it is the 'present' made by the origin country to the host country and consists of a fraction *1-r* of the financed students remaining in the host country and being productive in the latter. Considering this, as discussed in the introduction, we know that the 'stay rate' in the U.S. is around 70% for international students, so it easy to appreciate the magnitude of this 'loss'.

As previously examined, this brain drain phenomenon is particularly important when students from developing countries decide to study in a university in a developed country, which is the case for Ecuadorian students. The question that then arises is the following: starting from this *country of origin model*, could we reduce the positive externality by increasing the *r* parameter i.e. the probability of returning home after the completion of studies abroad? The answer seems to be positive and implicitly included in the Ecuadorian program discussed in this paper[9]. In fact, it suggests that it is possible to eliminate the 'free-riding' phenomenon better described by Gérard (2012): a country, which may have the studies of the further contributors to its GDP financed by taxpayers of the other country.

Returning to the *country of origin model*, it turns out that if the Ecuadorian model is capable of achieving a targeted return rate r^* of about 0.90, as announced by the authorities, the analyzed inefficiency in equation (2) will be close to zero and completely eliminated as $r^* \to 1$.

[9]Other similar programs exist, for example the one applied in the US military force.

$$e_m^E - e_m^O = (1 - r^*)\frac{\beta}{c + w} = 0.1\frac{\beta}{c + w}$$

Then:

> Proposition 1: When a government financing a scholarship under a country of origin adopts a constrained scholarship capable of boosting the return rate (r), the generated externality decreases, and the efficiency of the system increases.

The question now is how does this constrained scholarship influence the students' final decision to stay or to return. What is the probability of a student who has completed their studies abroad returning to their country of origin? And how could that probability change with the presence of a constraint, such as the one provided by the Ecuadorian scholarship program?

To answer this question, 'Ecuadorian student behavior' can be described by utilizing a simple variation of the migration model proposed by Borjas (1987) and repurposed by many authors like Clark et al. (2007). Note that the focus here is only whether to stay abroad, or return home after studies. We do not take into account the first step of a student wanting to study abroad, which is choosing this funding or not.

Let us suppose that a student (*i*), resident of the country of origin (*O*), and studying in host country (*H*), has to decide whether to go back after they complete their studies. Let us suppose that for studying abroad, they received a constrained 'Ecuadorian-scholarship' (*S*). The utility function of the student, and the probability that they will return to their country of origin is described below:

$$U_i = w_H(s_i)(1 - \rho_i) + w_O(s_i)\rho_i - \frac{c^2}{2}(1 - \rho_i)^2 \text{ S}$$

where:

- ρ_i is the probability of returning home.
- $w_H\ (s_i)$ is the discounted value of the host country's salary, which depends on the students' skills (s_i).
- $w_O\ (s_i)$ is the discounted value of the country of origin's salary.
- *S* is the amount of the scholarship received plus interest.
- *c* is the 'stay-cost' (adaptability, cultural difference etc.).

Looking at the first order condition we have:

$$U_p' = -w_H(s_i) + w_O(s_i) + c^2(1 - \rho_i)S = 0$$

$$Sc\rho_i = Sc^2 + w_O(s_i) - w_H(s_i)$$

$$\rho_i = 1 + \frac{w_O(s_i) - w_H(s_i)}{c^2 S}$$

We can see that, for a given skill level:

- Higher wage rates in the host country, and lower mean wages in the country of origin increase the return rate.
- Higher stay costs increase the return rate.

So, the probability that a student who studied abroad returns home after graduation increases with the difference between the country of origin's wage and the host country's wage. Then:

> Proposition 2: Since the difference between the country of origin's wage and the host country's wage is likely to be negative (because we suppose that the student chose to study in a 'richer' country), the probability of returning home is higher in the presence of a constrained scholarship.

An Agenda for Research: The 'Push-Pull Model'

The push/pull model from Baruch (1995), used to explain the phenomenon of international migration, describes the forces that push or pull one decision or another: namely, whether to stay, or to migrate. The final decision will be a weighted combination of the nature and the direction of these forces. Baruch identifies two main categories that influence the decision; the person's environment, and their societal context and target environment. In particular, their personal background, which includes personal values, needs, preferences, and aspirations, as well as political, social, and economic factors. At the same time, the target environment will be represented by culture, the legal system, and economy, etc.

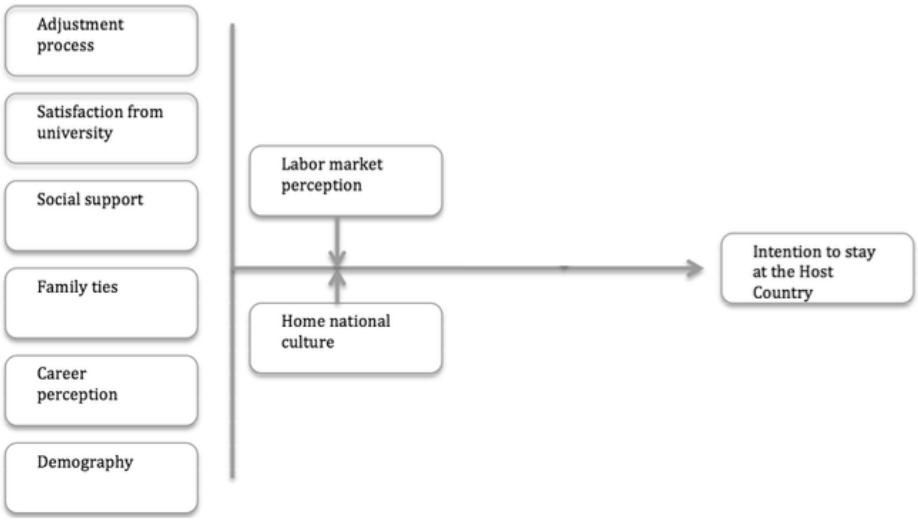
Baruch et al. (2007) developed a new model combining the push-pull model with the theory of reasoned action of Ajzen and Fishbein (1980) for emigration. The theory states that the student's decision to stay or return to their home country after studies will be "positively related to their inclination to do so, which, in turn, will be affected by their attitude. Different factors influence that inclination, for example, culture-shock" (Lee and Mauer 1999), the "adjustment process when moving to a different culture" (Shay and Baack 2004), "the students' orientation programs" (Martin and Dixon 1994), and "their level of satisfaction with the university" (Baruch et al. 2007).

Vaiman and Haslberger (2013) argue that another environment has emerged over the past few years: the transnational context. In particular, "whereas before it was a matter of weighing up the advantages and disadvantages of staying vs. (temporarily) migrating, now it is also a matter of the advantages and disadvantages of mobility in general (not any particular geography)". As they explain, having a 'mobile background' nowadays represents a positive quality on a worker's *Curriculum Vitae*. So the decision to move could also be influenced by this factor.

In particular, in their work, Baruch et al. examined the reasons for international students' inclination to stay in their host countries from a sample of 949 management students in the UK and US. Among this variety of factors (see Figure 5), their results support what they call a 'three-fold model of factors' that

influences the final decision: the student's perceptions of ethnic differences and labor markets, their adjustment process to the host country, and their family ties in their host and home countries.

Figure 5. *Factors Influencing the Decision to Stay Abroad (Baruch et al. 2007)*



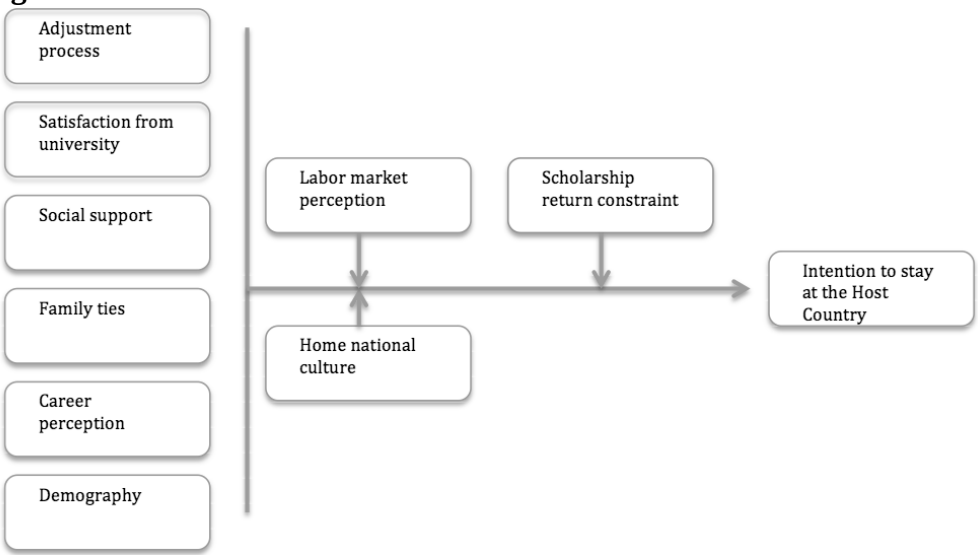
As previously discussed, the Ecuadorian scholarship model analysed in this paper could be a potential candidate for an efficient students' mobility financing system, since empirical data shows a high return rate, which is a key-parameter once we move to a *country of origin principle* financing system. The achievement of a high return rate could be explained by the presence of a compulsory return of the entire scholarship funding in the case the student decides to stay abroad after the completion of their studies. In terms of the push/pull model, the presence of the scholarship could be a key *push-factor* (in the sense that it 'pushes' the decision to return) that will positively influence the final decision to return to the country of origin. Then, the hypothesis to be tested in further research in the empirical model will be the following; which is Proposition 2 rewritten in a different way:

> A scholarship with constraint, i.e. a compulsory return to the country of origin after the completion of studies abroad, will be positively associated with the intention of the foreign student to return to their country.

If this hypothesis is empirically confirmed, we can affirm that a country's financing system that grants a scholarship obliging students to return after the completion of their studies, such as the Ecuadorian model, increases the return rate, internalizing the positive externality associated to the standard *country of origin principle* financing system.

The extended push/pull model of the Ecuadorian system will then consider, among other factors, the presence of this important constraint: the constrained scholarship. Then the following model is proposed to be tested (Figure 6).

Figure 6. *The Ecuadorian Push/Pull Model to be tested*



The main idea for the empirical part is to test whether the presence of this constraint represents the main *push-factor* for the Ecuadorian students who decided to study abroad taking advantage of the government's scholarship.

Conclusion

Globalization has several implications for the students' and skilled-workers' mobility, and fosters the phenomenon of brain drain that, as discussed, is especially disadvantageous for human capital in developing countries.

We have seen that, although the *country of origin principle* seems to be more efficient than the *host country principle*, it still produces an externality represented by a brain drain. A new case study was proposed with a detailed analysis of the Ecuadorian financing system of students' mobility that introduced an important incentive to return home once qualified. In theoretical terms, what follows has been shown, which constitutes a tentative lesson for public policy. The probability that a student who studied abroad returns home after graduating increases with the difference between the country of origin's wage and the host country's wage. Since this difference is likely to be negative (because we suppose that the student chose to study in a 'richer' country), the probability of returning home is higher in the presence of an Ecuadorian constraint. So it seems that the Ecuadorian device acts as a strong incentive that fosters the return rate and helps in combatting the brain drain phenomenon. It is necessary to remark that this paper did not intend to analyze the efficiency or the sustainability of the system. Additional research is required in order to answer these two questions.

Finally, an agenda was presented for research introducing the *push-pull model*, and a proposal for a new extension that includes the scholarship as a *push-factor*. More about this data needs to be said in order to test whether the presence of the scholarship constitutes a *push-factor* for Ecuadorian students. A database

with 500 observations is already available and will be used for this proposed further research.

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Hesiod's Place in the Economics Literature

By Gregory T. Papanikos[*]

This paper aims at putting Hesiod's book, "Works and Days" where it belongs in the economics literature: at the beginning. There are many reasons why Hesiod's work has been ignored by economists which are discussed in this paper. Hesiod's work is examined from the lenses of economic theory, economic history and history of economic thought.

Keywords: *Hesiod, ancient economy, history, Finley, justice, ethics, institutions*

Introduction

Hesiod is the first economic scholar in the world.[1] His book *Works and Days*,[2] written most probably in the latter part of the eighth century BCE, is considered here as the first world introductory textbook of economics. A textbook is a guidebook to be used for teaching purposes. It serves a didactic (educational) function. Hesiod's *Works and Days* served this educational purpose for centuries[3] and should be considered as the first known author of such an economics textbook. It was written as an applied economics textbook in the form of a poem because, at the time (almost 3,000 years ago), this was the most efficient and most effective method of writing a textbook.[4] However, as shown in this paper, Hesiod's applied

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[1]Rothbard (1995, p. 8) wrote, "The honour of being the first Greek economic thinker goes to the poet Hesiod". Hesiod is the first known world economic thinker as well. Gordon (1975) started, quite appropriately, his book on the history of economic analysis with Hesiod. Many other academic papers consider Hesiod as an economist; see for example an early paper by Singer (1958). I agree with all of them. In addition, I argue that Hesiod's *Work and Days* is the first known economics textbook. Earlier, Teggart (1947, p. 45) claimed that, "Hesiod is the first of European authors: the first poet, the first writer on religious subjects, the first moralist, the first authority on the practice of agriculture". He considered Homer as a non-European because he was born in Asia Minor! Hesiod might have been all these, but he was foremost an economist.

[2]I discuss elsewhere this book in detail; see Papanikos (2022a).

[3]West (1988), in his introductory remarks of the translation of Hesiod's works, gives an excellent account of Hesiod's legacy throughout the centuries and the influence he has had during the Hellenistic and Roman period. Judging from some recent publications on Hesiod, I can argue that Hesiod still does have a great influence.

[4]On the poem versus prose issue, Beye (1972, p. 24) wrote, "The general critical position toward Hesiod's Works and Days is that the poem clumsily attempts to develop an idea, that this attempt is in part marred by the poet's incomplete control of his materials so that he introduces elements completely foreign to his main idea. The apology for this has generally been the observation that Hesiod was an early intellectual who was constrained to use poetry because the prose medium was not at hand. Had there been a developed prose, goes the argument, he would certainly have used that. If, however, one accepts the nature of the poem's constituents and the manner of progression from one to the next and also their combination, a coherent reading of the poem very naturally results". This coherent reading of the text has also a hidden economic structure.

economic analyses were based on sound theoretical premises that a contemporary economist would feel very comfortable with if they were translated using contemporary economic jargon. This is not an easy task because of Hesiod's masterful use of words make *Works and Days* a difficult text to translate into English, or even to adapt it to Modern Greek.

Using the usual economics jargon, I would argue that in Hesiod's times there was a "market failure" for the transfer of knowledge because writing had to be invented. Thus, knowledge had to be transferred in time and space only in a memorial form.[5] The best way is indisputably by composing it in the form of a poem (rhythm or harmony as Aristotle would put it),[6] which was long before Hesiod's time. Hesiod and Homer had taken advantage of the newly invented technology of writing by putting their masterpieces down in script form for the eternity to learn from and cherish. It is very similar to today's digitalization process of old and new books which maximizes the largest possible circulation and readership.

However, there existed another economic problem. The market of reading a book was still underdeveloped. As is the process of a child learning to speak, read and write, the same was true about the human race in an historical context. People learned how to speak first, then to read, and then some of them how to write. The last two cannot be done if writing is not invented. But even so, as is the case with many new technologies, it takes time to be absorbed and there will always be some people who will be technologically left behind, i.e., technologically illiterate. I have examined technological progress within the context of economic policy in Papanikos (1994).

In Hesiod's time, very few people could read and even fewer could afford to buy a "book" even as short as Hesiod's 828 lines (verses). Publishing a book in Hesiod's time could not benefit from economies of scale. Fortunately, Hesiod's textbook, using the memorial form, was almost costless; pretty much like the e-books today.[7] It only required teachers and students with good memory, similar to today's memory sticks, which can store ("memorize") an e-book.[8] Hesiod himself, in his *Works and Days*, used the word "μεμνημένος" many times (I counted seven) which can be translated as "memorized" or "put something in your mind". Not "read and learn," but "memorize and learn"!

We know from ancient sources that students of the classical Greek period had to recite the entire Homeric poems of *Iliad* and *Odyssey* by heart. In the archaic

[5]In Modern Greek there is a proverb that all school children learn: "repetition is the mother of knowledge". This is very old and comes from the story mentioned in Hesiod that Memory (Mnemosyne) is the mother of all nine Muses. The muses were the protectors of all knowledge: arts and sciences. And the only way to remember human knowledge is through memory.

[6]Mair (1908, p. vi), in his introduction to Hesiodic works, stated, "Poetry, accordingly, in the earliest times counted nothing common or unclean, but embraced the whole range of experience". I would add experience and knowledge, if the latter is not included in the former.

[7]Robb (1994) has called this an oral culture which remained for centuries even after the Greeks achieved alphabetic literacy. However, this was not the result of culture, but the result of many people being illiterate, i.e., they could not read.

[8]Of course, the memory of a stick and the memory of a human being are not the same. The memory of a human brain not only stores, but produces knowledge. The stick cannot produce new knowledge, at least up to now. Artificial intelligence is not new knowledge.

years, some of these teachers were called rhapsodists. Most probably, Hesiod himself had been one of them; going around on different occasions and festivities reciting various verses with the accompaniment of some musical instruments. I assume at a price, which Hesiod had never mentioned, but he did, however, make a reference to the competition between singers ("ἀοιδοί"). What was this competition for? I guess it was for the best fee possible per performance. These singers and other artists were used in various private and public festivities. We know from Homer that during privately organized symposia artists were hired at a fee per performance. In ancient classical Athens, this fee was also regulated not to exceed a certain price. Hesiod offers no such information even though he did mention that there were clubs ("λέσχες") which most probably offered some type of entertainment at a cost. I am sure Hesiod would command a high fee since, as he mentioned in the *Works and Days*, he had gotten first prize in a reciting contest on the island of Euboea.

On the other hand, the effectiveness was achieved by the use of stories, paradigms, allegories, fables, parables, and myths taken from the rich Greek mythology of the time, including Hesiod's own outstanding cosmogony outlined in his book on *Theogony*. Even today, elementary school students can recall from their memory all the beautiful stories of Greek Mythology. As is the case with all stories, those of the *Works and Days* were relatively effortless to learn by heart. Some of these myths are really exceptional. They have had an everlasting effect on western thought and have fueled the imagination of many artists and writers, including the scripts of many movies and theater plays. In economics, such stories have been extensively used to teach introductory economics; the most famous of which is the Robinson Crusoe story, or more recently the story of the "helicopter money".[9] Both excite the fantasy of economics students. Hesiod's book was made for the wider possible circulation and therefore all people could learn from it, even those who could not read. This was very important at the time because most people were illiterate, but, literally speaking, not deaf.[10]

Hesiod had a mission; all good pedagogues (teachers) and authors of textbooks do (or should) have at least one, apart from the obvious which is making a living. He wanted to make individuals and polities (societies) better.[11] He was a moral

[9]Many cynics would argue that the most eloquent myth in economics is the general equilibrium model or the model of perfect competition. This is not true though because these models are useful yardsticks to measure how far any reality (timeless and spaceless) is from what some economists think as best or optimal for the efficient and effective use of scarce resources. Hesiod had developed a similar yardstick, that of the Golden Race. Also, the model of perfect competition would suit very well the archaic economy of Hesiod's times and space (geography).

[10]One should distinguish between illiteracy due to lack of opportunities and illiteracy due to lack of ability. I have met many people who were illiterate for many objective reasons (wars, extreme poverty of their family, etc.), but they had a tremendous ability to absorb new knowledge. Many such people thrived in peace years as businessmen, establishing and running their own successful small or large business much better if they had a Ph.D. in business administration from the best universities of the world. These people were auto-didactic. They learned by themselves. My belief is that Hesiod was one such a case, even though most probably, he had obtained a very good education from his father.

[11]There is nothing wrong if the textbook writers make money as well. This is also an indication that their textbook is good. I am sure Hesiod made a lot of money by "selling" his textbook using the

philosopher pretty much like Adam Smith. His economics reveal that he had a meticulous knowledge of all the fundamental tenets of what today is called economic theory; economic analysis and economic policy, including a theory of economic history;[12] a theory of economic growth; a theory of utility and private wealth creation; a theory of production and productivity based on the division of labor, and many others.[13] What differentiates his analysis from the contemporary[14] economic analysis is economic jargon. For example, he did not use the word "marginal", but other words which have the same meaning. In one verse [380] he used the word "ἐπιθήκη" to state his theory of the marginal effect on production by the use of additional workers ("πλεόνων") which maximizes income and wealth, or in Hesiod's economic jargon, "μείζων". Here the word "ἐπιθήκη" can be translated as marginal, "πλεόνων" as additional and "μείζων" as maximum. The two last words are still used to denote the same meaning in contemporary Greek economic jargon.

Hesiod's economic analyses had two purposes, which using today's economics terminology, they can be called microeconomic and macroeconomic. Firstly, he wanted to teach business people (individuals) how they could themselves and their property become more productive and therefore maximize the accumulation of their private wealth (property), if this was what was wanted, or as Hesiod so expressively stated in advising his brother, "if your soul or heart crave wealth". This is material wealth. Secondly, this individual economic prosperity can only be achieved if the basileis[15] (kings and judges) promoted peace (stability) and justice. Thus, any individual and any ruler (government) knew by reading Hesiod's textbook how individual and aggregate economic prosperity can be achieved: avoid wars and promote justice. The latter require good institutions. This is the essence of the didactic (textbook) nature of his book.

Economic prosperity was considered as a precondition for a good (happy) life, i.e., the enjoyment of leisure time with good and plenty of food, imported wine and going downtown (agora) to visit the entertaining clubs, as all these are mentioned in Hesiod's *Works and Days*. Isn't this what contemporary economics teaching is all about? In other words, individuals maximize a personal utility (happiness, or enjoyment, or eudemonic) function subject to an important constraint, which is the focus of Hesiod's book: the amount of time devoted to work to generate material wealth (income), but at the cost of less leisure time.

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distribution channels at the time such as in specific festivities and contests. We know from Odyssey that singers were used in at least two occasions of social gatherings.

[12]Hesiod's contribution to economic history is examined in Papanikos (2022b).

[13]I do no examine these theories here but some of them are examined in other papers previously mentioned. The most important economic contribution by Hesiod was his clear statement of the economic problem, i.e., the issue of scarcity. Hesiod's contribution to the economic notion of scarcity is examined in Papanikos (2022c).

[14]By "contemporary" I mean the economic analysis since Adam Smith. It is not chronological, but conceptual. It can also be called a textbook analysis.

[15]I use, as Hesiod did, the word basileis to mean the kings and judges who were responsible for providing the service of "ruling" people and "judging" differences between people, including economic differences such as the one Hesiod had with his brother Perses. Basileis can be also called archons and most probably in Hesiod's period there were seven such archons located in the city of Thespies.

Why? Because the scarce means of life can be acquired only with work. The more time devoted to work, the higher the income (wealth) and therefore the higher the consumption, but the lower the time spent on leisure. This is the essence of Hesiod's economic analysis. A trade-off between leisure and work.

Thus, the purpose of this paper is to show that Hesiod has a strong place in economics because economic theories and analyses are explicitly stated in his book of *Works and Days*. Of course, I am familiar with the literature which argues that nothing of importance on economic analysis was developed by ancient Greeks for various reasons. This paper argues otherwise. It is claimed that nothing important of economic analysis was left out in Hesiod's *Works and Days*. On the other hand, I do not ignore some "popular" economics books and papers published in "prestigious" journals which critically and unfoundedly have cited Hesiod's economic work. Nevertheless, I consider all these as an important first step of introducing Hesiod's economic analyses to a wider scientific economic audience. These are examined in the next sections of this paper.

But first, I must make a few comments to clarify some points which are important in understanding why Hesiod is not, as he should be, at the beginning of the history of economic analysis. Unfortunately, many economists are not able to distinguish between economic jargon and substance,[16] and this has also been affected by the English translations of Hesiod's works which have been done by non-economists and therefore they were unable to reveal Hesiod's important economic concepts and meanings.[17] In this paper, I have translated myself the excerpts from the original text which is cited along with my English translation. In many cases, I discuss the meaning of some important words because their correct interpretations can disclose Hesiod's significant economic meaning. This is not a literary translation per se, but an expression of Hesiod's writings as these should be understood by economists.

Following Hesiod's autobiographical approach, I should state my own personal experience with Hesiod. I read Hesiod's work for the first time during my junior high school years despite the fact that he was not part of our formal high school curriculum. Homer dominated the curriculum. Many teachers mentioned Hesiod as another poet almost contemporary to Homer, but not as elegant as Homer. Since I prefer substance (Hesiod) to elegance (Homer), I became curious to see what Hesiod had to say. I was impressed by the deep pragmatic nature of his thought. Coming from a village similar to the one Hesiod was living, even though the two cosmoses (mine and his) differ by 3,000 years, it seemed to me that

[16]Many economists are lost if instead of the word "marginal," someone like Hesiod uses the word "additional" or "incremental". Hesiod used many different words and concepts to describe the same straightforward, marginal concept both for the marginal utility of consumption, marginal utility of income and the marginal productivity of factors of production.

[17]A philologist or a classicist when faced with a word which might have more than one meaning, chooses the one which fits better the poetic aspect of Hesiod work. I choose the one that has a sound economic meaning. There are many cases like this which this approach of translation of Hesiod's works can be applied. On this issue of how many translations can be done, I have published a case study of the first five verses of *Odyssey* (Papanikos 2021a) and how these have been translated into English (two translations) and how these have been adapted to Modern Greek (five such adaptations). I ended up with 5,760 choices; some are important and change the meaning, but others are trivial.

Hesiod's economics were at the heart of what he was observing. I never read an economics textbook so close to my own real economic childhood surroundings as in Hesiod's *Works and Days*. However, Hesiod went beyond this and stated fundamental economic truths (theories) and put forward a number of important verifiable hypotheses.

Even the Department of Economics in the Greek university where I studied economics completely ignored Hesiod, and from what I know all departments did not pay their due respect to Hesiod's rich economic analysis. About the same time as the beginnings of my undergraduate studies, Gordon (1975) published a book entitled *Economic Analysis Before Adam Smith: Hesiod to Lessius.* He correctly put Hesiod's work at the chronological beginning of any historical account of economic analysis. Earlier, Gordon (1963) had written a paper on the economic thought of Hesiod and Aristotle. In this article, Gordon correctly pointed out the importance of the concept of the "scarcity" in Hesiod's economic analysis which is comparable to Lionel Robbins' definition of economics, if not more superior, as I demonstrate in Papanikos (2022c). However, he is wrong when he stated that Hesiod praised manual labor. He praised work in general, any work, and most importantly managerial work by the owners of a family farm business like the one he owned. He was against maritime trade not because he was against commerce in general, but because he was very risk averse in undertaking economic ventures with many uncertainties and risks. However, as he mentions in his book it is up to what the individual prefers to do, leading to a long passage in advising how to organize maritime commerce which includes an explicit discussion of economies of scale.

Gordon's book received a lot of attention and a lot of criticisms; some of them are discussed below along with my own critical points, but the main argument of all those critics is that there was no proper economic analysis before Adam Smith worth mentioning. My argument is that there is a lot in Hesiod's *Work and Days* which are economic in nature and of course worth mentioning.

Many economists, economic historians and historians of economic thought accept that there was nothing, or very little of, economic analysis in ancient Greece for the wrong reasons. It is one thing to claim that there was no economic analysis in Hesiod's work, but it is a completely different matter to state that his economic analysis was either insufficient or false. It seems to me that most critics argue that there was no economic analysis in Hesiod worth mentioning. Unfortunately, even those who do mention Hesiod's economic work, with very few exceptions, do not do justice to his economic analysis—they are used only occasionally to support other arguments which characterize the entire ancient period and not strictly Hesiod's economy or his economic thought.

My aim here is to do justice to Hesiod's work. This introductory paper to Hesiod's place in economics is organized in five sections (including this relatively long prelude), and aims to (a) provide some reasons to explain why Hesiod's economics are ignored by economists; (b) review selected economic history books and papers which cited fragments of Hesiod's work and (c) look at the history of economic thought textbooks and some selected papers on the history of economic thought which mentioned Hesiod as making at least some sort of a contribution to

economic analysis. The next section (section two of this paper) provides the reasons why Hesiod's work has been ignored by economists. Section three and four examine some of the most known books and papers of economic history and history of economic thought which make at least small references to Hesiod's work and thought. My review of this literature is very critical because I strongly believe that all these writings, to lesser or greater extent, have misused and misrepresented Hesiod's economic analysis. The last section summarizes.

The Reasons Economists Have Ignored Hesiod

Most economists ignore Hesiod's economic ideas.[18] Popular economics textbooks never mentioned any of Hesiod's firstly stated economic concepts such as his clear account of scarcity or his description of the accumulation of private property created by labor. Smith's (1776) makes no reference to Hesiod at all, even though he makes three references to Homer. Marshall (1890) who wrote the most popular textbook of the nineteenth century, *Principles of Economics*, did not mention Hesiod's work either.[19] Paul Samuelson's influential textbook of the twentieth century on *Economics* did not do any better either.

Even great historians of economic thought have paid little or no attention to Hesiod's work. Schumpeter (1954) wrote a monumental book on the *History of Economic Analysis* of almost 1,300 pages and cited nothing from Hesiod's work. Even Spiegel (1991), in his book on the *Growth of Economic Thought*, who devoted many pages to ancient Greek economic thought, made only one reference to Hesiod to support an argument which is actually a misrepresentation of Hesiod as I shall explain below in the fourth section of this paper.

[18]For me this is intellectually equivalent to philosophers ignoring Plato's and Aristotle's work. Most economists are more aware of Homer rather than Hesiod. Homer has no proper economic analysis, even though in Papanikos (2021b) I have demonstrated that Homer's *Odyssey* referred to ten decision making meetings which resemble business and political meetings today.

[19]This is unfortunate because in Book II, Chapter IV Marshall opened up the chapter with a statement which gives no reference at all to Hesiod, but Hesiod's *Works and Days* would have been a good one to support his position. Marshall stated, "In a primitive community each family is nearly self-sufficing, and provides most of its own food and clothing and even household furniture. Only a very small part of the income, or comings in, of the family is in the form of money; when one thinks of their income at all, one reckons in the benefits which they get from their cooking utensils, just as much as those which they get from their plough: one draws no distinction between their capital and the rest of their accumulated stock, to which the cooking utensils and the plough alike belong. But with the growth of a money economy there has been a strong tendency to confine the notion of income to those incomings which are in the form of money; including "payments in kind" (such as the free use of a house, free coals, gas, water), which are given as part of an employee's remuneration, and in lieu of money payments." Hesiod's economy can be considered as a transitional one from a primitive community to more advanced communities which combines both the elements of a pure primitive community and a community with money and division of labour. Marshall's "payments in kind" were one of many ways of compensating labor in Hesiod's times which are explicitly stated in his *Works and Days*.

Finally, economic historians either ignore[20] Hesiod or cite his work completely out of context to support some general arguments about the ancient economy which are misrepresentations of Hesiod's "ideology", economic thought, or most importantly his economy of the eighth century BCE. This part of the economics literature did not present Hesiod's economic ideas or his surrounding economy, but have used some fragments from his work to support an argument about the entire ancient economy, which in some cases included a period of one and half millenniums: from the archaic economy of the tenth century BCE to the fifth century CE. It is like citing a fifth century CE book to describe the one and half thousand years that have followed so far.[21] In addition, most of these references to Hesiod, as shown below in this paper, are literally and metaphorically "lost in the translation".

One particular book is a characteristic example and I will briefly introduce it here in order to put the whole discussion into perspective before I provide my detailed comments on it in section three below. Finley's work on *Ancient Economy* published in 1973 has been widely cited. The book has many contradictions and is based on what I call a "monomaniac ideological framework"[22] which is defined as an attempt by some monomaniac authors to fit all historical and logical "realities" into their framework (model). They end up explaining nothing and Finley's book is a good example of this monomaniac ideology. Finley cited Hesiod's *Works and Days* three times to support some of his general arguments about the ancient economies. He did not present Hesiod's economy or economic thought at all, even though he should have started from Hesiod. If Finley had appreciated the economic analysis of Hesiod, he would not have made so many mistakes in interpreting him. All three citations of Finley are completely out of the context of Hesiod's work and suffer in their English translation as shown below. Despite all this, it is still a recognition that Hesiod did write something about the ancient economies (actually, the economy of the eighth century BCE), which some economic historians, whose works are considered very important by contemporary economists, find worthwhile to cite and comment upon. It is better than ignoring Hesiod's work completely as many have chosen to do.

At this point, the reader might rightly ask why economists have ignored Hesiod's work, if it is as important as I claim here to be? Isn't this illogical? Or

[20]Anemiya (2007) wrote a book on *Economy and Economics of Ancient Greece* and had no reference to Hesiod, apart from a chart to indicate the dates of the Iron Age but he did not cite any of Hesiod's work.

[21]This is possible because they assumed that growth was very slow or even inexistent in the ancient economies. Or even worse, they claim that the ancients did not have the idea of economic growth. However, Hesiod's theory of economic growth is so relevant to what some twenty-first century economists have used to explain economic growth. This will be the subject of a future research work.

[22]Finley has a model in his mind, based on Max Weber and Karl Polanyi; hardly one can consider them economists. They emphasize status as opposed to social classes to explain a relatively large period of ancient economic development. As far as Hesiod's economy is concerned, social classes played a very important role and status is not even mentioned as this is implied by Finley and others likeminded. If the reality does not fit their status-based model, they are exemptions rather than the rule. I guess Hesiod is an exception, but Finley cited him to verify the rule. Either he made a bad choice or he had a bad model in mind. I believe the latter is the case.

what economists would say, irrational. I offer the following "rational" explanations. Firstly, as all human beings, most economists prefer style to substance.[23] It is a matter of choice and economists, as all individuals, are free to choose. Homer has dominated the minds and thoughts of educated people around the globe. Most economists have read Homer's work rather than Hesiod's writings which are more relevant to economics.[24] It minimizes their transaction costs of making their writings look sophisticated and deeply rooted in history of western thought.[25] Throughout history, Hesiod has always been, and still is, in Homer's shadow. It is true that myths and fictional stories are more popular to a wider audience and unfortunately many economists belong to this "wider" audience as far as economic history and history of economic thought are concerned. The "mechanization"[26] of economic analysis, which is more than welcomed, must first clearly state the *ceteris paribus* conditions which may not be the same in time and space.

The masses of ignorant and not so ignorant people prefer pleasurable myths to the sour facts of reality; so much so that the study and field of economics was called a dismal science by the well-known nineteenth century historian Thomas Carlyle. Most people find economics boring and many economists, especially Nobel Laureates, have tried hard to make it entertaining, at a price of course, because they sell their popular, so-called books usually at various crowded selling stands as in airports along with some popular fiction books; both are good to make

[23]I consider most of the models of General Equilibrium eloquently stylish. These models are very useful only for those economists who know how to use them.

[24]Finley (1973) cited five times Homer either his work or his period and three times Hesiod. He calls the period Homeric and not Hesiodic even though the former refers to a period three centuries earlier and Hesiod refers to his period circa eighth century BCE. He compares Hesiod's economy with all the economies thereafter in ancient times instead of comparing Hesiod's economy with all the economies that have followed thereafter in his own place. For example, Hesiod's village economy of the eighth century BCE had the same market development as the same village had up to the mid of the twentieth century CE which of course is different from the market economy of the USA economy of the same period. I state these as one or two examples of the many fallacies and contradictions of the book.

[25]It should always be kept in mind that academic economists are rational human beings and as all academics want to achieve one or more objectives (tenure, better institutions to be employed, funded projects, sell their textbooks, get a Nobel Prize etc.) subject to the minimum possible effort. Citing Homer and not Hesiod minimizes the effort. Similarly, citing the economics of Aristotle and Plato minimizes their effort as well because understanding the better economics of Hesiod requires effort. All these fit well with the rational model of economics about individual behavior.

[26]By "mechanization" I mean that like machines some economic models are assumed never to make mistakes and there are always "solutions". I am not against the use of mathematics in economic analysis which are everywhere as I have demonstrated by those economists who have been awarded the Nobel Prize in Economics which might be called Nobel Prize in Applied Mathematics (Papanikos 2020a). I know that even the best machines fail, but economists should continue to build such "machines". One of the best engineers of building such mechanical modes was Robert Lucas. In his excellent paper, "On the Mechanics of Economic Development," he constructs such well "lubricated" machines, but acknowledges previous "engineers" such as Solow and Denison. Lucas (1988, p. 6) wrote, "The example, or model, of a successful theory that I will try to build on is the theory of economic growth that Robert Solow and Edward Denison developed and applied to twentieth century U.S. experience." This is very similar to what I argue about Hesiod. He developed a model and applied it to his own reality.

travel entertaining and these economists are very rational and very logical human beings. Hesiod and Homer did the same thing.

Homer was good in entertaining the masses. Even in antiquity, in an alleged contest between Hesiod and Homer, the masses "voted" for Homer, but the rulers gave the prize to Hesiod for the (economic) usefulness of his poetry (Uden 2010, West 1967). I guess the rulers were most probably made up from the same material as Plato's philosopher kings. The mere fact that they organized an educational event of a poetry contest is by itself an attestation of what they were made of. That people prefer myths to truth and "easy" knowledge to acquired knowledge by hard work was well known in antiquity. Thucydides made a comment that he wrote history for those who prefer truth to amusement.[27]

Secondly, economists and economic historians have chosen to ignore Hesiod's works most probably because it was written in the form of a poem which was the standard method of writing a didactic book at the time, as I explained in the introductory section of this paper. Some economists prefer a pragmatic analysis of real economies; they associate poems with myths and fictions and thus choose not to read Hesiod's book on *Works and Days*. It is consistent with the economic theory of minimizing the cost of extracting information. If it is a poem, then it cannot be an economic analysis. The fact that many referred to Hesiod's works as didactic poetry and to Hesiod himself as a poet did not help either.[28] Hesiod suffered and suffers from this "bad reputation" effect. An economic explanation of this type of market failure can be found in the theory of asymmetric information or the "Market of Lemons" developed by Akerlof (1973). Economists prefer the "lemons" of the economic analysis of Homer to Hesiod's well-run machine of explaining economics. It is another market failure which unfortunately cannot be corrected by any intervention! At least in the very long medium-term.

Thirdly, one should blame *Works and Days* itself. It is not a well written book in terms of its structure. It requires herculean abilities in reading to put all its material into a systematic order; especially if an economist were to read it. West (1988, p. xv) stated, "It must be conceded that the *Works and Days* is a disorderly, often rambling text. It looks as if Hesiod several times extended its scope and added new sections, coming to conceive of the poem as a general compendium of useful advice."

I agree with West that it is quite possible that the *Works and Days* was revised many times and new editions would come out on various occasions. This supports the argument that *Works and Days* was a textbook or a didactic book. All popular contemporary textbooks are continuously revised and new editions are coming out to satisfy a different clientele.

[27]I have examined in Papanikos (2020b) this important Thucydidian distinction between myths and substance as applied to pandemics. Many myths surrounded the ancient Athenian pandemic of 430 BCE as is the case with the current COVID-19 pandemic.

[28]For example, West (1988, p. xiv), in his introduction of the English translation of Hesiod's works, stated, "Hesiod is writing a poem, not a technical manual." It is true that Hesiod did not write a technical manual (with the exception of detailed technical details how to construct a plough) of agriculture works which is what West refers to, but he did not write a poem either. He wrote an economics manual as explained above.

The structure of *Works and Days* is such that is suitable for reciting some parts or the entire work on various occasions.[29] I always wondered whether on such occasions there was the possibility of questions and discussions. In the alleged Euboea contest between Hesiod and Homer, the kings asked questions to both of them before they decided. Their answers affected the kings' decision.

There are many examples in *Works and Days* which show that Hesiod is carried away and the message does not come out clearly, at least to contemporary readers.[30] The book should be re-organized by reshuffling the verses back and forth to make the reading, and primarily the understanding, easier for contemporary economists. This is a task for further work and is not taken here.[31] Also, as mentioned above, an English translation for economists is required because the existing ones are done by philologists and classicists obscuring Hesiod's important economic analyses. West's translation is good, but not good enough for an economist. After all, he considered Hesiod as a poet not an economist, as I do here in this paper.

In sum, very few historians of economic life and economic thought, and even fewer theoretical economists have paid any attention to Hesiod's work. Even those who did, had only a cursory and careless look at his work. An example is the well-cited work by Finley which makes three citations of Hesiod's *Works and Days*. These three citations are examined in the next section of this paper along with some other economic historians who have cited Hesiod's works. My criterion of selecting them is the popularity (the masses of people who read them) of their publication and not their substance. Applying the popularity criterion, I also include well known journals and publishing houses.[32] These are the journals that the masses of economists read with religious zeal, similar to Hesiod's worship of Zeus and other Gods of the Greek Pantheon, who, Hesiod himself, so smartly created. Economists have created their own Gods of Journals and they worship them. After all, economists themselves are mortal human beings as Hesiod would have said!

The mere fact that the great mass of economists read these papers published in prestigious journals as well as citing them does not imply any irrational behavior. Economists, as all human beings, are rational and they want to publish and cite papers in good journals because it minimizes the cost of being accepted by their universities and future employers. I have exploited this "fakeness" of economics research many times in my career at the national and the European level. When I

[29]A long time ago, when I was teaching introductory economics during my graduate years, along with the chair of the department we did a comparative study of all popular and not so popular introductory textbooks of economics. I do not remember how many books we compared, but we were amazed by the similarity of their structure. They all looked the same.

[30]Particularly I have in my mind Hesiod's fable of the hawk and the nightingale. It takes some patience to understand what Hesiod really meant, which is that in the animal world there is no justice, but the human race cannot survive without it.

[31]Actually, there are two ways of reading Hesiod's *Works and Days*. The first is by citing some characteristic fragments of the work and the second by reshuffling the verses to conform to a specific concept, i.e., the scarcity issue.

[32]The popularity of a theme in history is what is history all about as I explained in my book on history (Papanikos 2020c). Also, how history is used as a tool of policy making in the European context has been examined in Papanikos (2005, 2006) and Papanikos and Pappas (2006).

wanted to support my prior (pre-determined) and very rational position, I was always able to find a "good" paper in a prestigious economics journal and this way I could silence my "opponents". I preferred Nobel Laureates, because the silence of my opponents made an even greater "noise". This way, I was also maximizing my utility function, subject to the minimum required effort. I do recommend this to my fellow economists, especially to those who aspire to become policy-makers. I should warn the reader that this approach does not apply to economists who serve as business consultants. Business people do not like very much the immunization of any criticism that the *ceteris paribus* assumptions provide. If you want to become a business consultant, then you better start with Hesiod's *Works and Days*. You can make a lot of money!

Hesiod and Economic History

There are many economic history books and papers which used Hesiod's *Works and Days* as a testimony of the structure and development (growth) of the archaic or even the entire ancient economy. This section consists of an eclectic review of a few contributions to this literature of economic history that used Hesiod as a source.

One of the most influential books on ancient economy of the last century was Finley's *Ancient Economy*, first published in 1973. It is well cited in the mainstream economics literature. Morris (1999, p. xi), in his introduction of an updated edition of Finley's work, wrote, "… but by the 1970s he was the *central figure* in rethinking ancient social and economic history, and the Ancient Economy cemented the new structure. In essence it redefined the terms of the debate" (italics added).

Lowry (1979) calls Finley, "[O]ne of the most *prolific* writers on the economic history of the ancient Greek world is the classicist and ancient historian" (italics added). As will be clear from my criticism of Finley's treatment of Hesiod, his work is prolific (quantitatively productive), but as the ancient Greeks would say, the good is not in the many, but the many in the good, "οὐκ ἐν τῷ πολλῷ τὸ εὖ, ἀλλ᾽ ἐν τῷ εὖ τὸ πολύ". I think Finley's work was lost in the quantity.

Lowry (1979) himself, to prove the prolific nature of Finley's work, gave fourteen references of his work including one with the characteristic title, "The Use and Abuse of History"! At least Finley did have what Chilon of Sparta, one of the seven sage men of the archaic Greece, said: know yourself, "γνώθι σαυτόν". Finley definitely did abuse Hesiod's work! In general, his main thesis was that contemporary economic analysis is not applicable to the ancient world (1000 BCE to 500 CE) and therefore does not apply to Hesiod's economy and his textbook of economics which is what the *Works and Days* actually is. In this paper, the focus is on Finley's abuse of Hesiod and not his theory of economic history. This relatively small monograph by Finley made only three references to Hesiod's works with regards to (a) poor people and poverty; (b) labor and the working class; and (c) family size. All three are problematic to say the least. These three references are examined below.

a) Hesiod on Poor People and Poverty

The first of Finley's citations is made in chapter two of his book entitled "Orders and Status". Finley (1973, p. 39) said:

> The very poor aroused little sympathy and no pity throughout antiquity. "Give to one who gives, but do not give to one who does not give" advised the poet Hesiod in the seventh century B.C. [Works and Days 355] and Hesiod, of all ancient writers, was no mere mouthpiece for upper-class values. What was lacking was a sense of sin.

A number of comments must be made on this really disappointing citation of Hesiod's work. Firstly, Finley's claim that Hesiod was not a "mere mouthpiece" for the upper-class values is wrong. Actually, he was the most sophisticated mere mouthpiece of his class: the upper class. This shows that Finley did not understand even Hesiod's social and economic class. Hesiod was a member of the upper class and he cared very much about his class and not so much about his "status" in society. The upper class did not include the basileis (kings and judges) of Thespies. They and their families belonged to aristocracy.[33] The upper class of Hesiod's time, as in Solon's time two centuries later, was divided. Hesiod represented the upper class that believed in justice and peace. On the other hand, his brother, we can infer from what Hesiod stated, represented the corrupted members of the upper class.

From a class analysis point of view, *Works and Days* does not examine the class conflict between rich and poor or upper class and lower class, but looked at the conflict between those members of the upper class who wanted fair (just) rules of economic[34] competition and those who thrived on corruption and bribery. Hesiod did not want to overthrow aristocracy, but to make them honest. As I have explained in my book about the current social situation in Greece (Papanikos 2014), nothing has changed since Hesiod's times in Greece. As in Hesiod's era, still today in Greece, the parasites, like Perses, rule Greece by bribing the archons (the executive and the judiciary). In other words, Hesiod wanted a different value system to be followed by the upper class and the basileis who at the time were also the judges. There was no separation between the executive and the judiciary.

However, isn't the above analysis actually true for any society for any of its classes? There are bad and good members of any class.[35] Unfortunately, there are many economists, anthropologists, sociologists, political scientists, social scientists in general and of course philosophers who identify the concept of the social category "upper class" as being almost synonymous, if not tautological, to

[33]The same social structure appears in Homer's Odyssey. Aristocracy was one class but here was an upper class which owned productive property or were merchants. Hesiod himself acknowledges that people can make money through shipping but considered as a very risky business to pursue.

[34]The reader must always keep in mind that Hesiod was an economist and all his analyses refer to economic issues. The difference with his brother was an economic one. It was about their inherited private property.

[35]This dichotomy of good and bad is everywhere in Hesiod's works: bad and good men, bad and good judges, bad and good women, bad and good workers, etc.

corruption and unethical behavior. These "pseudo-progressive"[36] scientists not only are flatly wrong, but they have undermined their own cause of changing society towards a more moral human society.

Finley cites Hesiod on poor people and poverty completely out of context. There are many parts in the *Works and Days* which clearly state the ideology and the practical dimensions of Hesiod's position on poor people, poverty and giving. Finley used the above citation from Hesiod to support his argument that wealth and property was welcome in ancient times, and to prove his case that poor people were not sympathetic in ancient world. It is true and there are many and better fragments of the *Work and Days* which clearly show Hesiod's position on wealth and income. After all, contrary to what Finley stated, Hesiod was a mere mouthpiece of the upper class and this class wanted profits, money (income) and property (wealth) as Hesiod had so eloquently stated. Hesiod did not mention status as Finley would like him to have done to fit his model. However, Hesiod wanted fair profits with justice and peace.

On the issue of poverty, Finley was flatly wrong. He interpreted the citation as Hesiod suggesting not giving to the poor people. The above excerpt from Hesiod is cited out of context because Hesiod talked about not giving to stingy members of his own class and not to the poor. In other words, do not give to people who have money and can afford to give (loan) to you, but they do not because they are tightfisted. This is obvious from the entire text of *Work and Days*, but most importantly from the previous line which Finley had chosen to ignore. This is what Hesiod said in the *Works and Days*:

> And give to those who give and not give to those who do not give
> One gives to those who give, but not to the ones who do not give
> καὶ δόμεν, ὅς κεν δῷ, καὶ μὴ δόμεν, ὅς κεν μὴ δῷ.
> δώτῃ μέν τις ἔδωκεν, ἀδώτῃ δ' οὔτις ἔδωκεν [354-355]

The reader should remember that Hesiod wrote a textbook, i.e., a didactic book and gave concrete advice on what people should do in managing their economic affairs. In this context, we should interpret whatever Hesiod wrote in his book. The critical word of the above quotation is the beautiful word "ἀδώτῃ" which means those who do not give even though they have the means to give, i.e., stingy persons and not poor people because the poor cannot give because they do not have anything to give. A poor person cannot by definition be "ἀδώτῃς". These two lines refer to borrowing and lending and not giving something for free such as a philanthropic donation (gift) to the poor as is evident from the few lines preceding these two verses.

Thirdly, Hesiod made a clear distinction between lending money and giving money for philanthropic purposes. Hesiod considered free giving as part of one's utility function; an act that brings delight and joy:

[36]Many so-called Marxists consider corruption as being in the DNA of capitalism and bourgeois class. They are wrong!

If someone wants to give, even many gifts,
he pleases himself and his heart is full of joy
ὃς μὲν γάρ κεν ἀνὴρ ἐθέλων, ὅ γε, κεἰ μέγα δοίη,
χαίρει τῷ δώρῳ καὶ τέρπεται ὃν κατὰ θυμόν [357-358]

The word of essence here is the gift (τῷ δώρῳ). In this verse, Hesiod talks about free giving and not loaning money or other valuable things. Hesiod's advice is to give gifts if this is what satisfies the giver. This is exactly how economists explain such giving. People give because "giving" maximizes their utility function. Hesiod uses the verb "τέρπεται" which is still used in modern Greek and means deriving pleasure or satisfaction or happiness or any other word which modern economists use to describe the meaning of a utility function.

Fourthly, on the poverty issue, Hesiod's position becomes even more unambiguous and contrary to what Finley thought Hesiod said. Hesiod wrote:

never dare vituperate the catastrophic and stressful
poverty of men, the eternal Gods gives it.
μηδέ ποτ' οὐλομένην πενίην θυμοφθόρον ἀνδρὶ
τέτλαθ' ὀνειδίζειν, μακάρων δόσιν αἰὲν ἐόντων. [717-718]

This definitely does not support Finley's claim that, "the very poor aroused little sympathy and no pity throughout antiquity." At least this is not the case in Hesiod's work; he held exactly the opposite view. He believed that poverty is not people's fault. Gods (bad luck) send poverty. This is consistent with his opening remarks of the *Works and Days* on the power of Gods (bad or good luck) where he stated:

easy strengthen someone, easy the powerful harm
easy the eminent diminish and raise the invisible
easy straightening the unfair and humiliate the arrogant
ῥέα μὲν γὰρ βριάει, ῥέα δὲ βριάοντα χαλέπτει,
ῥεῖα δ' ἀρίζηλον μινύθει καὶ ἄδηλον ἀέξει,
ῥεῖα δέ τ' ἰθύνει σκολιὸν καὶ ἀγήνορα κάρφει [5-7]

What a better statement to his fellow upper-class members that they are blessed and not talented because Gods had decided to make them powerful and eminent, but they must be humble and fair because Gods could as well destroy them. The new political trend of the "Tyranny of Meritocracy" (Sandel 2020) explains the success of some individuals in society along the above lines taken from Hesiod's *Works and Days*, but not citing Hesiod's work. I think that good luck can be considered as tautological to Gods' intervention in human's lives.

Fifthly, there is a strong exception in Hesiod's work. Poverty should not be the result of idleness, and again this is a warning to the upper-class members. Hesiod was a strong critic of the people (like his brother who was a member of the upper class) who did not work and therefore they were "poor", i.e., they begged to their neighbors, friends and relatives to borrow the means of life. Even in this case Hesiod informs his readers that even in these cases of idleness, people including Hesiod himself would give, but would not do it repeatedly. This very much relates

to Hesiod's theory and ideology of labor and working class which Finley claims that Hesiod lacked.

b) Hesiod on Labor and Working Class

Hesiod's ideology was very clear: only honest labor and work should be used to increase wealth and private property. Finley (1973, p. 81) claimed otherwise. In chapter three of his book on "Masters and Slaves", he wrote:

> The nature and conditions of labour in antiquity precluded the emergence of such general ideas, as of the idea of a working class. "Men never rest from toil and sorrow by day, and from perishing by night" said Hesiod (*Works and Days* 176-178). That is a descriptive statement, a statement of fact, not of ideology; so is the conclusion, that it is therefore better to toil than to perish, and better still to turn to the labour of slaves if one can.

A general comment must be made about the idea of a working class. In Hesiod's *Works and Days* and in *Theogony* there is not a single reference to slaves (δούλος). There is a clear reference to workers and how they should be employed, but his work was not about them. His book dealt with the upper class and not with working people that did exist, but not in such numbers as to form a mass of working class. Did Finley want Hesiod to talk about something that did not exist? Hesiod chose otherwise. Hesiod's exact verses are as follows:

> Now it is the iron race; never a day passes without toil and pain,
> not a night without perishing
> νῦν γὰρ δὴ γένος ἐστὶ σιδήρεον• οὐδέ ποτ' ἦμαρ
> παύονται καμάτου καὶ ὀιζύος, οὐδέ τι νύκτωρ
> φθειρόμενοι [176-178]

Finley had again cited something out of context. Hesiod compares his age with the preceding Golden Age. Hesiod's depiction of Iron Race is harsh because his book is didactic. He lives in the Iron Race and he wants to change humanity's future course because he was a strong believer (ideology) that in any social system, good and bad co-exist. His ideology (morality) tells him that the long-run survival of the human race should be based on peace, justice and honest work to solve the problem of scarcity, i.e., acquiring the means of living and accumulating wealth. Hesiod had a very simple ideology: he glorified work.[37] He thought only honest work of free men can create wealth; wealth which will last. This is the central thesis of his book and this is the reason why the word "work" appears in the title of the book. It is about work, all kinds of honest works of his time and there were many, too many actually, including the general categories of those who worked in the primary sector as he did, those who worked as artisans and those who were engaging in commerce with an emphasis on maritime trade.

[37]There are many references to Hesiod's work which state that Hesiod either supported manual labor and/or agricultural work. This is not true.

Hesiod's ideology about work is consistent with the labor theory of value. He thinks that wealth is produced by hard work which includes the management of one's family business. How much more clearly could Hesiod express his ideology than in the following verses:

> if your soul inside your mind craves wealth, do as I say,
> and one work after another work do
> σοὶ δ' εἰ πλούτου θυμὸς ἐέλδεται ἐν φρεσὶν ἦσιν,
> ὧδ' ἔρδειν, καὶ ἔργον ἐπ' ἔργῳ ἐργάζεσθαι [381-382]

This is an ideological statement. Wealth is important as long as this is what people desire. Hesiod's economic model is very clear. The model has an objection function which is the maximization of a utility function based on many elements, including wealth. There are two constraints or means to achieve this. Firstly, at the level of the individual, the time spent throughout the year on well-planned work is necessary. Hesiod proposes such a plan day by day throughout the year. "Days" is a term which is included in the title of the book along with "works". Secondly, at the social and political level, the upper class (social) and the archons (political) must provide peace (stability) and justice. It is then that societies blossom. Honest wealth accumulation is desirable, but it can be done only through honest work. This requires institutions which promote justice and peace. I do not know if Finley was correct about the ideology of ancients, but he was definitely wrong about Hesiod's ideology. It is unfortunate that Finley cited him to prove his case for the entire ancient world. He should have looked for a "better" citation to support his claims.

c) Hesiod on Family Size

The third citation of Hesiod is when Finley made a point about the one-child attitudes of the ancients. Finley (1973, p. 106) in chapter four of his book on "Landlords and Peasants" wrote:

> What Hesiod said, in his characteristic fashion, in the seventh century B.C. remained valid for the whole of ancient history: "There should be an only son to feed his father's house, for so wealth will increase in the home; but if you leave a second son you should die old." [376-378]

This is an egotistical scientific statement, "…remained valid for the whole of ancient history." In other words, Finley found something in Hesiod that remained true for more than one-thousand years. This was revealed by Hesiod! What a contribution! Unfortunately for Finley's work and Hesiod's fame, this was not the case. What Finley translated is the following three verses of the original text:

> Only one child should be maintaining the family business
> Because this way wealth increases in the estate
> Dying old another child must be left behind
> μουνογενὴς δὲ πάις εἴη πατρώιον οἶκον

φερβέμεν ὣς γὰρ πλοῦτος ἀέξεται ἐν μεγάροισιν.
γηραιὸς δὲ θάνοις ἕτερον παῖδ' ἐγκαταλείπων [376-378]

Finley here is completely and literally lost in the translation. West translated it as, "and to die in old age leaving another child within," and he made the correct note that Hesiod meant a grandson. After all, Hesiod talked about family business and as any introductory textbook in business teaches, the inheritance issue deserves a separate important chapter, if not an entire course. Hesiod knew it. Finley apparently did not. Similarly, Girgenis translation-interpretation of this part is similar to West and makes the same note. On the other hand, Lekatsas put it straight into his translation-interpretation as "the son of your son", i.e., a grandson because this was exactly what Hesiod meant. Finley's translation missed the entirety of Hesiod's meaning. He was lost in his own false translation.

As the reader may notice by comparing Finley's misinterpretation (and not translation) with all other interpretations mentioned above, the meaning is completely different. Finley's interpretation completely missed this point, and even worse, he reversed Hesiod's cause-effect argument. Hesiod did not state that if you have a second[38] son you should die old because it would have been a stupidity, a great nonsense for the simple reason that you cannot foretell when you will die. The phrase "should die" is silly. "Ha, I have a second child, I must die late." "Ha! I have only one child, I can die young!" Here the causality should be reversed. If you live long (die old), then you must see (take care) that another child is left behind. Why? This has puzzled many readers of Hesiod because it contradicts the alleged one-child recommendation. On the other hand, it becomes biologically very complicated to have a second child when you are old because presumably you must have a wife at a fertile age, but also yourself at an old age may not be fertile anymore. My own interpretation with his patrimony of the family estate is that what Hesiod stated here is one grandson also must be available to take over the family business. Finley simply missed it.

A number of comments will show that Finley's translation is completely out of context. Firstly, the word "μουνογενὴς"[39] appears only one time in the *Words and Days* and two times in the *Theogony*. For some strange coincidence in both cases, it relates to heritage of wealth; a strictly economic term. It is true that "μουνογενὴς" can be translated as one-child, but there is another interpretation of it as "unique" or "single".[40] Thus, an interpretation can be that you should leave your property to only one child; preferably the oldest. I can only guess that Hesiod was older than Perses and he inherited half of his family business (property), if these were the only two children. If his father had followed Hesiod's advice, Perses would have inherited nothing. So, Hesiod had a pecuniary incentive to suggest such a policy.

Secondly, the word "φερβέμεν" comes from the verb "φέρβω" which in Hesiod's works should be translated as "save" (σώζω) or "maintain" (διατηρώ)

[38]Finley translates the diachronic Greek word "ἕτερος" as second and not as the correct one which is "another".
[39]Hesiod writes "μουνογενὴς" instead of "μονογενὴς" which is the choice of other ancient writers.
[40]See the Ancient Greek dictionary by Dimitrakos (2008/09, vol. 6, p. 4741).

and not as "feed" which was Finley's choice. It does not really make sense when it is related to the wealth as an economic concept. West translated it as "nourish" which is equally wrong. On the other hand, the philologist Girgenis translated it as "save" and Lekatsas used a word from his own Modern Greek dialect from the island of Ithaka to translate the word with the meaning "increase-grow" (αξαίνω). The correct translation or interpretation of the word is "to manage" or to run the family estate, because this way the family estate (business) would increase. This translation makes perfect economic sense and it is consistent with any contemporary approach to family business.

Thirdly, the word "οἶκον" should not be translated as "home", but as "business" or "economy", and the word "πατρώιον" as "family". So, what Hesiod stated here is that one child must take care of the family business, family property or family economy. Not that the family should have only one child or one son. The two Greek translations and the translation by West missed this important point. This is clear because Hesiod used the phrase, "in the estate" (ἐν μεγάροισιν), which includes all property and wealth. If he wanted to mean house or home, he would have said "ἐν οἶκω".[41]

Fourthly, what is certain is that Hesiod did not suggest a one-son or one-child policy, but a policy of one manager of the family business. Two lines right after the ones Finley had cited, Hesiod said:

> but if more children exist then easily Zeus can provide greater wealth if many, more of the needful will be done, maximizing the additional accumulation
> ῥεῖα δέ κεν πλεόνεσσι πόροι Ζεὺς ἄσπετον ὄλβον.
> πλείων μὲν πλεόνων μελέτη, μείζων δ' ἐπιθήκη. [379-380]

Finley had ignored these two verses. It is true that they are difficult to translate. It is obvious that Hesiod meant that in a family business more people (children or workers is a matter of interpretation) would bring prosperity and indescribably great (ἄσπετον) accumulation of wealth (ὄλβον). Why? Two reasons are put forward by Hesiod; one is metaphysical and the other economic. Firstly, God (Zeus) will provide for them. Secondly, more people provide the opportunity for greater allocation of tending (responsibilities) (πλεόνων μελέτη) and therefore maximize (μείζων) the marginal accumulation (ἐπιθήκη) of revenue or wealth. This excellent economic statement by Hesiod might make no sense to philologists who try to translate Hesiod's work either to Modern Greek or English, but it makes perfect sense to someone trained in economics. Hesiod was an economist and he taught basic economic principles. Of course, it is up to the manager of the family business of the eighth century BCE to find out when the "ἐπιθήκη" is not positive, at which point he stops "hiring" new labor or stops having additional children.

My own understanding or guess is that Hesiod talked here about additional children that can work in the family business and therefore he is in favor of more

[41]Even this would not have been clear what Hesiod would have meant because the word "οἶκος" sometimes means house/home and sometimes it has the meaning of what today we call economy or the economics of family business.

than one child.[42] I base this interpretation on the fact that these two verses come right after his argument of one head of the family business. In any case, here we have a theory of optimal employment of labor by a business: hire labor up to a point where your "ἐπιθήκη" is positive, or an optimal family size which is the one that makes the "ἐπιθήκη" zero. Aristotle (*Politics 2*, 1274b) refers to a lawmaker in Thebes (Hesiod's village was part of this area) who refers to a law which regulated the number of children in terms of inherited wealth. Hesiod's work may echo this tradition before it became law as Aristotle stated.

In concluding my comments on Finley's three citations from Hesiod's work, all of them misrepresented Hesiod's position on poor and poverty, labor and family size. This is not the exception, but the rule. Hesiod either is ignored or misinterpreted as I continue to show below in this section.

Bresson (2015) made four[43] citations of Hesiod in his book. He does better than Finley on the absolute number of citations, but his book has 648 pages. Finley cited Hesiod three times in his book of 222 pages. Proportionally, Finley outperformed Bresson.

I should start with a remark Bresson made about Finley. Bresson (2015, p. 108) said the following about Finley:

> Finley, making use solely of the discussion of the division of labor in Xenophon's Cyropaedia (8.2.5) and ignoring that in Plato's Republic, is thus proved wrong …

However, both Bresson and Finley are wrong because they ignored the excellent and extensive division of labor outlined in Hesiod's *Works and Days*. This is demonstrated in Table 1.

Despite the size of the economy and population at the time, there was an extensive division of labor which is given in Table 1. All these different professions and types of industries are mentioned in Hesiod's *Works and Days*. This division of labor does not differ much from what one can find in a contemporary Greek village. The only thing that differs is technology of doing all these works.

The only difference between Hesiod's model of economic analysis and contemporary models is the scale. Hesiod's model is for smaller (population wise) economies with different technologies. Thus, the economic model should not be different, but it should be scaled down. It is similar to my mother's excellent homemade pies that I am sure Hesiod used to eat as well. The whole area is famous for what they call "village pies". The first question my mother asked is, how many people will this pie be for? The model of making the pie remains the same. The scale (pan used) differs. When making comparisons economists should use the two important dimensions: time and place. Hesiod did, and very well indeed, when he developed his excellent theory of economic history.

[42]Hesiod considered it a curse for a family if women cannot have children. He stated that many bad things can happen to a city including "women who not bear children, reducing the family size" "οὐδὲ γυναῖκες τίκτουσιν, μινύθουσι δὲ οἶκοι" [244]. This definitely would never be stated by someone who supported one child per family.

[43]In comparison, he made twelve citations of Homer.

Table 1. *The Division of Labor and Economic Stratification in Hesiod's Works and Days*

Work	Names	Verse	Class	Type of Product or Service provided	Type of Income / Means of Life
Archons-Judges	βασιλῆς	248 261 263	Aristocracy	Peace, Civil stability and justice	Fees/Gifts/bribes
Business Owners of farms, flocks, beekeeping, cloth making, clubs (entertaining) etc.	ἐσθλὸς ἄοκνος μελίσσας λέσχην ἀοιδός	26 214 233 493 501	Upper	Managerial	Profits
seafaring merchants	ναυτιλίης ἐμπορίην	618 646 649	Upper	Service	Profits
Artisans: potter carpenter, bronzesmith ship-builders	κεραμεὺς, τέκτων, Ἀθηναίης δμῳός, χάλκειον θῶκον, νῆας πήγνυσθαι	25 430 493 809	Middle	Ornaments, bronze tools, pottery	Revenue from selling their goods
Artists (Singers)	[ἀοιδὸς] [ἐπαλέα λέσχην]	493	Middle	Entertainment	Fee per performance
sailors	ἄνδρας	666	Lower	Service	
woodcutter	ὑλοτόμον	807	Lower Middle	Timber for building houses and ships	Price per piece of wood (?)
Skilled Farm Workers	αἰζηός	441	Lower Middle	Plow-users	Wages
Servants and Auxiliary Personnel	[θῆτά] [ἔριθος]	602 602 603	Lower Middle	Unskilled labor services	Wages
In-house Workers	[δμῳος]	430 459 470 502 573 597 608	Lower		In kind (food and shelter) [ἁρμαλιὴν]
Idle People	[ἀεργὸς] [κεχρημένον]	44 302 303 305 310 311 312 498 500	Lumpen upper	Nothing	Use up savings/property – Borrowing – claims (compensation) awarded by the judges
Thieves	ἡμερόκοιτος ἀνὴρ	605	Lumpen low	Stealing	Food and Valuables
Beggars-poor	Χατίζων [πτωχὸς] ἱκέτην	21 26 327	Lumpen low	Begging	Food and valuables

If the division of labor is determined by the extent of the market, then it is really amazing the extent of the division of labor that existed in Hesiod's little village economy as is so colorfully described in the *Works and Days*. This provides further evidence to the correct thesis that the difference between Hesiod's economy and contemporary economies is a difference of only two things. Firstly, a difference of what Hesiod hoped with his Prometheus Myth for the human race: continued accumulation of new technologies. Secondly, today's economies are larger in numbers: population, capital goods and workers.

Bresson makes his first reference to Hesiod to support his arguments of the development of the market as a result of the division of labor and the production of surplus in the agricultural events from the Hesiodic years. Bresson (2015, p. 109-110) made the following comment:

> We see the outline of this around 700 BCE in Hesiod's poem Works and Days, despite the presence of basileis, kings (at that time, noblemen ruling the city), whom the poet call: "gift-eaters".

Firstly, the presence of basileis relate to justice because they were the judiciary power as well. This had nothing to do with the division of labor or the development of the market. There is not a single verse in Hesiod's *Works and Days* that related basileis to the market. Secondly, basileis were charging a fee for any court judgment and in that sense, they were bribed. Hesiod was not against the basileis, but against the unfair judgments which are the result of bribery and corruption. This is very important and is related to the conditions of city-states economic growth.

Bresson (2015, p. 119) made the second reference to Hesiod in the opening remarks of his chapter on agricultural production. Mentioning the various sources, he correctly made a reference to Hesiod's book as being the first "… which offers a representation of the peasant world around 700 BCE."

This is true, but Hesiod does more than that in his book. Actually, he presented a theoretical model of production in a family agricultural business which is diachronically applicable to any production process that is based on the private property of land, capital and the use of hired labor. Hesiod was able to extract from his peasant world what Bresson mentioned as some fundamental principles of the economics of production which are timeless and spaceless under the same conditions mentioned above. Bresson missed this important analytical point in Hesiod's work.

Bresson (2015, p. 155) made a note that "Hesiod's peasant" had many slaves. First, it is true that Hesiod's farm was a large one and employed about ten people, which even today in a Boeotian farm would be considered a very large farm. Hesiod never mentioned the word slaves (δούλος) and it is very controversial if he employed forced labor in the sense that Homer makes a note of them.

Bresson (2015, p. 161) makes his last reference to Hesiod to support his thesis on the tradition and innovation in agriculture and in animal husbandry. He makes a general reference to *Works and Days* to show the role of technical knowledge acquired through empirical experience which did not favor rapid innovation. Hesiod, of course, made explicit reference to how the productivity of land can increase by (a) using the right workers; (b) using the appropriate equipment made of the proper material of wood and metal; (c) the right time of the year and month for each job to be done; and (d) the right management by the owner of the farm estate. These four important factors are missed in Bresson's reference to Hesiod with the exception of setting the "calendar for each task".

There are many other books and papers which cited Hesiod or their subject is on Hesiod.[44] However, they do not deal with Hesiod's economy which is the focus of this section. Some books and papers on the history of economic thought have mentioned Hesiod. This literature is examined in the next section of this chapter.

Hesiod in the History of Economic Thought Textbooks

As I have already mentioned in the introduction of this paper, the influential book of Schumpeter of 1,300 pages does not make a single reference to Hesiod's works. In general, very few books on the history of economic thought present Hesiod's economic analysis. There are, though, a number of papers which do examine some aspects and present the important elements of Hesiod's economic theories and analyses. As was the case with the previous section, in this section I have chosen a few textbooks and a few papers which present or mention Hesiod's economic thought. The criterion of having selected them is the "masses" and not the substance of their analysis, which for some spurious metaphysical reasons the two are negatively related—at least as far as Hesiod's coverage is concerned.

Most history of economic thought textbooks consider the works of Plato and Aristotle as representing the ancient Greek economic thought even though neither of them wrote any monograph on economics. Xenophon who is also mentioned did write some economic treatises including the one on sources of public revenues (*Poroi*). Economics was treated as part of their general analysis of politeia and philosophy. Rothbard, who has been already mentioned above as considering Hesiod the first European economist, in his book on the "Economic Thought Before Adam Smith" is very critical about the treatment of Hesiod's economic analysis by the history of economic thought writers. Rothbard (1995, p. 523) correctly pointed out that:

> The only histories of economic thought that do justice to the Greek contribution are Spiegel, The Growth of Economic Thought and Barry Gordon, Economic Analysis Before Adam Smith (New York: Barnes & Noble, 1975). Spiegel is particularly good on Democritus and Gordon is good on Hesiod and deals extensively with Greek economic thought.

But Rothbard himself in his book of 572 pages book devoted less than two pages (8 and 9) on Hesiod, but he at least emphasized one of the most important contributions of Hesiod's economic analysis which is the problem of scarcity. He concluded these two pages by making an important observation about Hesiod's theory of economic growth. Rothbard (1995, p. 9) wrote:

> It should already be clear that Hesiod had a far more sanguine view of economic growth, of labour and of vigorous competition, than did the far more philosophically sophisticated Plato and Aristotle three and a half centuries later.

[44]For example, Van Noorden (2014) published a book on the *Playing Hesiod: The 'Myth of the Races' in Classical Antiquity*.

This is true. Hesiod's theory of economic growth is compatible with the twenty-first century theories of economic growth which emphasize the role of formal and informal institutions in explaining differences in growth trends. Rothbard (1995, p. 15) made a contrast of Hesiod's economic theories with that of Plato and Aristotle:

> Aristotle, like Plato, was hostile to economic growth and favoured a static society, all of which fits with his opposition to money-making and the accumulation of wealth. The insight of old Hesiod into the economic problem as the allocation of scarce means for the satisfying of alternative wants was virtually ignored by both Plato and Aristotle, who instead counselled the virtue of scaling down one's desires to fit whatever means were available.

Unfortunately, Rothbard did not present Hesiod's important theory of economic growth or his unique use of the scarcity problem even though he mentioned its importance to the history of economic analysis. Hesiod's contribution to the scarcity issue and theory of economic growth are very important and deserve a thorough and detailed analysis.

On the other hand, Spiegel (1991) mentioned Hesiod only once without any citation of his work and only in 1-2 lines. Spiegel (1991, p. 9) wrote:

> Credit transactions … which earlier writers such as Homer and Hesiod had not mentioned in their works, began to be reported in the second half of the seventh century B.C.

If Spiegel had said that Hesiod did not analyze credit and interest, then I would have accepted it, but writing that he does not mention it is wrong. Hesiod did mention interest payments when someone borrows not only money, but any type of good. Hesiod wrote:

> If you borrow from your neighbor, you should give it back
> the same and even more if you can
> εὖ μὲν μετρεῖσθαι παρὰ γείτονος, εὖ δ' ἀποδοῦναι,
> αὐτῷ τῷ μέτρῳ, καὶ λώιον, αἴ κε δύνηαι [349-350]

In Hesiod's little village even today, there is no bank or any other credit institution. As was the case for centuries in small Greek villages, but elsewhere in the world as well, credit was arranged between relatives and friends for sound economic reasons which go beyond the scope of this analysis here. This is the reason Hesiod said to his brother, I am not going to lend you anything, because it was a very common practice to borrow money and other valuables (food, equipment, etc.) from friends and relatives. Spiegel, from all of Hesiod's work, found only this to mention! Truly amazing! It really is a pity! No wonder then when such popular textbooks do such an injustice to Hesiod's important economic contributions why so many economists have ignored Hesiod's work.

Rothbard mentions another book that does justice to Greek economic growth: Barry Gordon's 1975 book on "Economic Analysis Before Adam Smith: Hesiod

to Lessius". Gordon's book received many negative reviews. One reviewer, Padgug (1976, p. 215) made the following preposterous comment:

> In addition, Gordon's conception of "economic analysis" is rather broad, including much that would not ordinarily be included in that category, such as the economic observations implicit in the works of Hesiod, Solon, the Greek dramatists, and the Roman legal theorists, who can hardly be considered economic analysis in any technical sense.

I mention this excerpt because he mentioned Hesiod who had the most comprehensive economic analysis in both descriptive and technical sense. What is really absurd is that this reviewer mentioned Solon who was the first known in economic history who designed the most comprehensible and integrative economic policy reform that the world has ever known. He was an economic policy maker. He was a practical political "animal". Solon did not leave any work of economic significance, but some fragments in poetry form were saved for us to cherish. To use today's jargon, all his intervention had the form of twittering and only some of his tweets have survived. The purpose of the tweets was to persuade ancient Athenians about many things including the implementation of his economic policy reforms.

Gordon's analysis of Hesiod is based on an earlier article in where he wrote on, "Aristotle and Hesiod: The Economic Problem in Greek Thought," published in 1963 in the not so popular and "entertaining" the masses journal *Review of Social Economy*. The journal re-published the article in 2005.

Gordon devotes the first pages of his first chapter of the book on "Before Plato" to Hesiod. His treatment of Hesiod is correct when he comes to the scarcity issue, however is wrong when it comes to the mechanics of economic growth. Gordon (1975, p. 3) stated:

> Notably, the poet has only a faint grasp of the mechanics of economic growth. Yet in his Works and Days, he gives an exposition of the "economic problem" as it appears to be understood by many writers of economics textbooks today. In fact there are strong affinities between Hesiod's account of the matter and that provided by Lord Robbins in his influential, An Essay on the Nature and Significance of Economic Science (1932).

Furthermore, in his early paper, Gordon discussed the economic problem (scarcity) in the works of Aristotle and Hesiod. Gordon (1963, p. 147) argued that Hesiod provided a "striking anticipation of a predominant modern viewpoint" and he makes a reference and comparison to Robbins's definition of economics. This is important. Apart from these comments, Gordon missed the important contributions of Hesiod to economic analysis. At least with the title of his book he put Hesiod's name where it belongs in the history of economic analysis: in the beginning.

Many papers on the history of economic thought which were published in very prestigious (mass entertaining) journals do not do justice to Hesiod's economic analysis to say the least. Leshem (2016) published such a paper in one of the prominent journals of the American Economic Association: *Journal of Economic*

Perspectives. One of the objectives of the journal is "to provide insights and readings for classroom use." One can only hope that Leshem's paper will not be used in any reading list to teach students either economics or economic history. If used, it should be done as a good example of what to be avoided. One only wonders who really reviews these papers before they are published. On page 226, Leshem makes a strange claim, providing no references at all to any ancient source:

> In this way, the most striking difference between ancient oikonomia and contemporary economics is their relationship to ethics. Contemporary economics is "fundamentally distinct from ethics" (Robbins 1932, p. 135), and its theory "is in principle independent of any particular ethical position" (Friedman 1953, p. 4). In addition, contemporary economists typically hold that the natural situation for humans is to live in a world in which means are scarce. On the contrary, the ancient Greek writers on oikonomia believed that humans live in a world of natural abundance that is sufficient for what people need for subsistence. From their perspective, the main task of economic rationality is to advance the good life as they understood it, which means support for philosophy, for involvement in public life, and also for not giving in to what they viewed as the unnatural urge to pursue economic goals or luxuries for their own sake. The oikonomia literature was rooted in the society of its time. It focused on well-to-do, land-owning male citizens, and it included unthinking acceptance of slavery as well as archaic and demeaning attitudes toward women. However, the discussions in the oikonomia literature concerning how to manage slaves offer some embryonic examples of discussions about how to provide incentives for labor; while the figure of the matron, more than any other figure in the ancient Greek oikonomia literature, shares traits with the modern homo economicus. That oikonomia is so rooted in ethical judgments raises questions about whether or in what ways modern economics should be linked to a more explicit consideration of what constitutes a good life.

The above long citation shows the scientific arrogance of some economists who claim to represent "contemporary" economists. It seems to me simply citing Robbins and Friedman favorably is sufficient to get published. The above citation is full of inaccuracies and contradictions. Firstly, he cites Robbins and Friedman to prove that contemporary economics do not care about ethics. It may be that Leshem, Robbins and Friedman do not care about the impact of ethical behavior on economics, but there are many contemporary twenty-first century economists who do care and consider it an important economic determinant of how scarcely resources are allocated at the individual and social level. These true contemporary economists have published many papers in the prestigious journals of the *American Economic Association* to demonstrate how informal (culture) and formal (judiciary) institutions affect how scarcely resources are allocated. In other words, my ethics and values affect how my scarce resources are allocated and having *ceteris paribus* two identical individuals, but one loves his parents and the other hates them, definitely affects the allocation of their scarce resources. Contemporary economists care about these cultural effects on choices. Hesiod is one such contemporary economist. Leshem, Friedman and Robbins are not; they have become obsolete.

Secondly, the next two sentences are really amazing. Hesiod's *Works and Days* was about scarcity and the means of living. Many economists who read Hesiod make a note of that. For some unknown reason, Leshem would never have made such a mistake if he had read Gordon's paper on Hesiod mentioned above or an earlier one by Singer. The latter paper gives a concise and clear description of Hesiod's economic analysis. Singer (1958, p. 33) wrote:

> The words *oikonomia* and *oikonomos*, are absent in Hesiod's *Works and Days* although the poem (written probably in the eighth or early seventh century B.C.) seems built around the central problem of economic thought: the fundamental fact of human need, and follows the implications of that primordial fact into all its ramifications in the life of a Greek peasant. The problem, Hesiod teaches his litigation-loving brother, is to be solved not by means nowadays labelled political: by force and fraud, bribery and willful appropriation, but by incessant work in fair competition, by moderation, honesty and knowledge how and when to do the things required in the course of seasons; how to adjust wants to the resources available; and above all, how to shape attitudes and actions of all men (and the more difficult problem: women) in order that a viable, enduring pattern of peaceful social life may be established which assigns to every part its place in a well-ordered whole.

The concept of *oikonomia* and *oikonomos* were not absent from Hesiod's work at all. The actual words were absent.

Thirdly, Leshem claims that ancient Greeks thought that, "the main task of economic rationality is to advance the good life as they understood it." Isn't this what contemporary economics are telling us that every individual does? Individuals maximize their own utility function (as they understand it) which is tautological to what one means by a good life. The most important is that just in the same paragraph, Leshem makes two antithetical statements. On the one hand, he claims that economists make no value judgments, but he stated that ancient Greeks cared about philosophy and public life, an extreme value judgment statement. I care about philosophy and public life and I allocate my scarce resources to philosophy and public life in a way that maximizes my utility function, i.e., my good life! Leshem seems to disagree. As for the statements that individual ancient Greeks considered the consumption of luxury goods "unnatural" (what an unnatural word!), even if it was, this squares well with basic microeconomics. Personally, and I know many other individuals, I do not like luxuries. They do not enter into my utility function. Is this "unnatural"? I also think that it is "unnatural" when other people run after luxury goods. I consider very natural my thought of the "non-naturality" of other people's consumption behavior. Hesiod thought the same way. Leshem seems to disagree. We can only praise Milton Freedman who gave us the "Freedom to Choose".

Fourthly, Leshem is completely derailed on the issue of slavery. The Greeks and Hesiod himself used many words which might be interpreted as meaning slaves. There was no Ancient Greek word for slave. This is the reason that in Modern Greek the English word is used: sklavos. A doulos is not a slave. The

word "doulos" comes from the Greek verb *δουλεύω* which means I work.[45] Hesiod never used the word doulos. As a matter of fact, he was managing his relatively large estate without having "slaves". He used the word "δμῳος" which has many meanings. In Homer, it meant a war-slave which can be considered equivalent to hard or forced labor. In Hesiod, the word is also used metaphorically to mean an artisan: Ἀθηναίης δμῳος [430]. It can also mean house servants and the word has been used in Modern Greek for centuries. I can report eye-witness evidence. In the 1960s in Athens the rich families had house servants, usually young girls from the country-side who were called "doulika," which a literal translation meaning "little slaves," but the actual work can be captured by the word home-servants because they were free to leave and by no means were they related to war-slaves.

Leshem cited Hesiod's *Works and Days* as being a book on the management of the "oikos". Hesiod devoted 12% of his book to his amazing theory of economic history and almost one-third of his book to the production processes of agriculture and seafaring. *Works and Days* is a full-fledged economics and business textbook with microeconomic and macroeconomic approaches and theories and is contrary to what Leshem (2016, pp. 226–227) claimed:

> … Hesiod's *Works and Days* (circa 700 BCE) is dedicated to the management of the oikos and is full of advice about agricultural production, however, in this 800-line didactic poem, the term "oikonomia" does not arise. It seems as if the tacit assumption in writings during this time was that all of life that mattered took place within the bounds of one's oikos. Thus, it was not necessary to offer a separate discussion of economic matters under the subject matter of oikonomia, nor was it necessary to distinguish between the economic and the political sphere.

Leshem's claim that the term "oikonomia" does not appear in Hesiod's work is true, but irrelevant because the concept of "oikonomia" is ubiquitous in the *Works and Days*. It is also not true that all that mattered took place within the "oikos". There was a great division of labor and many things were produced outside the economy of the family business which is the correct translation of "oikos" in Hesiod's *Works and Days*.

However, contrary to what Leshem claimed above, in Hesiod's *Works and Days* there was a clear distinction between economic and political matters, between the economic sphere and the political sphere. Hesiod's textbook is addressed to individuals as economic units and to basileis (kings-judges) as a political unit. Individual economic (business) activities must take place within a political environment that secures peace and justice. Isn't this what contemporary (21st century) economists would argue? Leshem and many others seem to disagree. Hesiod's *Works and Days* was the first to integrate the two into a system of decision making at the micro (individual) and macro (policy) level.

[45] At its glory years of the fifth and fourth centuries BCE, Athens had many "doulous" who worked as pedagogues, policemen, miners, artists, house-servants etc. Technically speaking a doulos is someone who has a boss.

Conclusions

This paper is the introduction of a larger research project which aims at recovering Hesiod's many economic theories which are hidden in his didactic textbook of *Works and Days*. This is a very difficult research task because as many credible economists have claimed, Hesiod's book is not an easy read. Using the English translations of the book does not help either. In this paper and the others to follow I use my own reading of the ancient text from an economist's perspective which I argued in this paper is different from the perspective of classical philologists.

My main conclusion of this paper is that Hesiod deserves to be placed in the beginning of economic analysis. *Works and Days* is a first principle economic textbook which includes both microeconomic and macroeconomic aspects.

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