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An Empirical Assessment of the Nexus between Sectoral Structure, Inflation, Exchange Rate and Economic Growth in Ghana

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Abstract

The study examined the relationship between inflation and exchange rates in Ghana, the sectoral structure of the economy of Ghana and also explored how this structure influences economic growth when inflation and exchange rates are under consideration. The study gathered data over the sampled period of 1980- to 2019 and used appropriate techniques to test for unit roots and co-integration in the data. After applying the appropriate regression techniques results obtained, it was identified that there was a negative relationship between inflation and exchange rates in Ghana from 1980- to 2019. Also, results obtained from the descriptive analysis and correlation results showed that the current structure of the economy was dominated by services value-added, followed by industry value added and then agriculture value-added. Finally, results showed different impacts of interactions between inflation and sectoral structure on economic growth in Ghana, as compared to the interactions between exchange rates and sectoral structure in Ghana. The study concluded that the structure of the economy of Ghana has also evolved—from one dominated by agriculture value added to one that is now dominated by services value-added. This change in the structure has resulted from changes in economic policies and the adoption of liberalization policies that have allowed for more trade and free markets. It was recommended that the real issue for policymakers should not be how to control inflation or the exchange rate. Instead, policymakers should focus on how to structure the economy of

Ghana to take advantage of the dynamics of the global marketplace and reduce the influence of the exchange rate on the economy of Ghana. Also, there is a need for more public education on the importance of consuming and patronizing locally manufactured goods and services.

Keywords

Sectoral Structure, Inflation, Exchange Rate, Economic Growth

1. Introduction

The paper examines the nexus between inflation, exchange rates, structural change and economic growth in Ghana. The research also explores the correlation between inflation and exchange rates in Ghana as connected over time; examines the sectoral structure of the economy of Ghana over time, and also assesses how the sectoral structure of the economy mediates the influence of inflation and exchange rates on economic growth in Ghana.

Economic Growth as well as the drivers or determinants of the concept are still topical issues in the economics literature (Acemoglu, 2012). This is because economic development is important for human development and further knowledge of the paths, processes and drivers of economic growth can prolong livelihoods. Two of the economic growth-related determinants, inflation and exchange rates are important for small and open economies like Ghana because of the contribution they each make to the domestic economy.

Fundamentally, inflation and exchange rates can influence the growth process. However, the empirical literature has found differing effects over the years in different economies (Razzaque et al., 2017). This is because both determinants result from market signalling in which demand and supply forces determine a common price(s) at which goods and services are exchanged for the other.

Inflation was described by Razzaque et al. (2017) as the persistence in the rise of prices of goods and services. Theoretically, inflation can be fuelled by excess demand or result from an excess supply of money (Bagus et al., 2014). The persistence that follows price increases is at the root of inflation as an economic problem, because it decreases the purchasing power of income and decreases the real value of assets and investments.

The exchange rate, on the other hand, can be conceptualized as another measure of the price level and its movements have consequences for small and open economies such as Ghana (Adu et al., 2015). The exchange rate is simply the price at which the currency of one nation trades for another, and if modified, it may affect the value of the exchanged goods and the type of services provided. Since people in different economies have been trading over time, market forces and capital movements determine the exchange rates, in nominal terms (Ashour & Yong, 2018). Hence, the exchange rate results from trade and for small open economies, trade contributes to production and consumption.

Inflation and exchange rates are linked at a macroeconomic level because economies are open to trade. Since small and open economies depend on imports from other countries, exchange depreciations can influence the domestic prices of goods and services (Baum & Turner, 2004). As a result, where the exchange rate depreciations persist, inflation can be expected if policymakers do not respond adequately to the macroeconomic shock that is causing the depreciation.

Swings in exchange rates impact most macroeconomic indicators like Imports and exports, inflation, and the number of jobs (Adewuyi & Akpokodje, 2013; Bobai et al., 2013; Doyle, 2001; Tenreyro, 2007; Wang & Barrett, 2007). In the case of Ghana, inflation and exchange rates have long contributed to growth (Chiaraah & Nkegbe, 2014). A recent analysis of the growth of the Ghanaian economy showed an expansion from 3.4% in 2016 to 6.2% in 2019 (Ministry of Finance, 2020). Over this same period, inflation dropped from about 15% to 7.9% in December 2019.

Despite movements in the exchange rate, the economy gained a trade surplus of $2.6 billion in August 2019, after recording a trade deficit of $1.8 billion in 2016 (Ministry of Finance, 2020). Despite these observations, there are further issues that come out of the nexus between economic growth, inflation and exchange rates that have recently been discussed in the policy arena. One of such issues is the sectoral structure and its transformation and the role that it can play in sustaining the path of Ghana (Constantine, 2017; Vasile & Ungureanu, 2014).

Although the economy of Ghana is reported to be achieving some success, inflation and exchange rates are still key threats to growth because of issues like exchange rate pass-through (Nortey et al., 2015). However, the influence of these challenges is based on the sectoral structure of the economy. Recent studies like Haraguchi et al. (2019) support the argument that a faster-growing economy promotes manufacturing value-added, and by extension, technology-based industrialization. In other words, an economy that pursues an export-led industrial path can achieve sustainable growth. However, earlier literature on the economic growth of Ghana suggests that the economy depends largely on imports from developed countries, exports of primary goods and external debt (Nomfundo & Odhiambo, 2017). This suggests that adverse fluctuations in inflation and the exchange rate can influence growth, based on the response of policymakers (Asafu-Adjaye, 2008).

Depending on the macroeconomic context, higher inflation rates may be beneficial for some economies whiles reducing the real value of incomes in others (Mothuti & Phuri, 2018). Hence, other studies advanced the literature on determinants of economic growth by arguing that inflation has a neutral, non-linear or threshold effect on economic growth (Eggoh & Khan, 2014; Ibarra & Trupkin, 2016). However, the influence of inflation can be viewed as an outcome, which results from the contribution of several input factors in the economy, such as the sectoral structure of the economy. In this sense, reviewing the interactions be-

tween inflation and the sectoral structure of the economy generate a renewed need for empirical research into how economic growth will be influenced.

Similarly, the influence of the exchange rates on economic growth can be viewed as mixed, depending on the macroeconomic conditions that prevail. Some studies showed a positive influence of the exchange rate on economic growth (Rodrik, 2008; Razmi et al., 2012) whereas others found that the exchange rate negatively influences growth (Rajan & Subramanian, 2011). Given that the exchange rates are outcomes that result from other growth factors in the economy, the mixed results in the literature are not surprising. In particular, a review of the interaction between the exchange rates and the sectoral structure of the economy may generate new knowledge about the effect of the exchange rate on growth, creating a refreshed need for empirical research.

Hence, a newer problem emerges by examining the interplay between inflation, exchange rates and the sectoral structure of the economy because these three factors could affect economic growth. The sectoral structure of the Ghanaian economy and its potential to induce the volatile connection between inflation, exchange rates and economic growth is the research problem.

In particular, the study examines the mediating role that the sectoral structure has on the relationship between inflation, exchange rates and economic growth, as this relationship has importance for macroeconomic stability and growth.

The sectoral structure focuses on the relative shares of sectors in an economy. This is important because each sector contributes to total output in the economy and can be influenced differently by inflation and exchange rates. This forms the premise of the research problem in this study.

The study, therefore, examines the nexus between inflation, exchange rates, structural change and economic growth in Ghana from the perspectives of the determination of the correlation between inflation and exchange rates in Ghana as connected over time, examining the sectoral structure of the economy of Ghana over time; and the determination of how the sectoral structure of the economy mediates the influence of inflation and exchange rates on economic growth in Ghana.

2. Literature Review

2.1. The Theoretical Underpinnings

The influence of the exchange rates on economic growth is subject to the macroeconomic conditions that prevail. Whilst some studies have indicated a positive influence of the exchange rate on economic growth (Razmi et al., 2012; Rodrik, 2008); others found the exchange rate to have a negative influence on economic growth (Rajan & Subramanian, 2011). Given that the exchange rates are outcomes of other growth factors in the economy, the mixed results in the literature are not surprising. But, it is a fact that the theories underpinning the concept of the exchange rate, inflation and economic growth are diverse but less researched as a conglomerate of interations.

Exchange rate models according to Frenkel (1976) emphasize financial asset markets. According to Frenkel (1976) rather than the traditional view of exchange rates adjusting to equilibrate international trade in goods, the exchange rate is viewed as adjusting to equilibrate international trade in financial assets. Rajan & Subramanian (2011) on their part noted that exchange rate models emphasizing financial-asset markets typically assume perfect capital mobility. In other words, capital flows freely between nations as there are no significant transaction costs or capital controls to serve as barriers to investment. Rajan & Subramanian (2011) continued that within the family of asset-approach models, there are two basic groups: the monetary approach and the portfolio-balance approach. In the monetary approach, the exchange rate for any two currencies is determined by relative money demand and money supply between the two countries. Relative supplies of domestic and foreign bonds are unimportant. The portfolio-balance approach allows relative bond supplies and demands as well as relative money-market conditions to determine the exchange rate (Mussa, 1976).

Backus (1984) points out that the essential difference is that monetary-approach (MA) models assume domestic and foreign bonds to be perfect substitutes, whereas portfolio-balance (PB) models assume imperfect substitutability. If domestic and foreign bonds are perfect substitutes, then demanders are indifferent toward the currency of denomination of the bond as long as the expected return is the same. In this case, bondholders do not require a premium to hold foreign bonds—they would just as soon hold foreign bonds as domestic ones—so there is no risk premium, and uncovered interest rate parity holds in MA models. With imperfect substitutability, demanders have preferences for distributing their portfolios over the assets of different countries. That is, asset holders have the desired portfolio share for any particular country's assets due to the portfolio diversification incentives. If the supply of one country's assets increases, they will hold a greater proportion of that country's assets only if they are compensated. This requires a premium to be paid on these assets. In general, then, PB models have risk premiums in the forward exchange rate that are a function of relative asset supplies. As the supply of country A's financial assets rises relative to B's, there will be a higher premium paid on A's assets. This premium implies that uncovered interest rate parity will not hold because risk premiums will exist in the forward market. This premium is missing in the MA model because there, it is assumed that investors don't care whether they hold country A or country B bonds or in what mix they are held.

Monetarism maintains the view that inflation is a result of a higher rate of growth of money supply from the rate of growth in the economy, aimed at regulating the quantity, cost and allocation of money and credit in the whole economy. Moreover, it aims at achieving a set of objectives to maintain growth and stability in the economy. Therefore, any monetary policy seeks to stabilize both the exchange rates and prices, raise the level of employment, stable economic

growth and interest rate smoothing. Marchionatti (2020) spelt out his famous equation of exchange viz. MV = PT. This and other equations, such as the Cambridge cash balance equation, which corresponds with the emerging use of mathematics in neo-economic analysis, define precisely the conditions under which the proportional postulate is valid. Fisher and other neo-classical economists, such as Arthur Cecil Pigou (1877-1959) of Cambridge, demonstrated that monetary control could be achieved in a fractional reserve-banking regime via control of an exogenously determined stock of high-power money. Guillermo and Vegh (2012), note that if balance-of-trade deficits are financed by depleting domestic stocks of foreign currency, trade surpluses are associated with increases in domestic holdings of foreign money. If the exchange rate adjusts so that the stocks of domestic and foreign money are willingly held, then the country with a trade surplus will be accumulating foreign currency. As holdings of foreign money increase relative to domestic money, the relative value of foreign money will fall, or the foreign currency will depreciate.

2.2. Exchange Rate

The exchange rate is defined by Lucy et al. (2015) as the price of the currency of a country in terms of another country's currency. Being a price, it is determined by demand and supply. According to Mankiw (2010), the exchange rate is divided into Spot exchange rate which is the present rate in any the market at a given specific period, and Forward exchange rate which is the speculated exchange rate at a future time. Its existence creates the potential for speculation and an Effective exchange rate also known as the Sterling Index or Sterling trade-weighted index which is an average exchange rate derived from a basket of currencies.

There also exists a Free or Pegged Exchange rate in which if a currency is free-floating, its rate is allowed to vary over other currencies and is determined by the market forces of demand and supply (Mankiw, 2010). On the other hand, a movable or an adjustable peg system is one of the fixed exchange rates but with provisions for devaluation and revaluation of the currency. Nominal and Real Exchange rates—the nominal exchange rate is the domestic currency of one unit of a foreign currency. The Real exchange rate is defined as RER = e(P*/P) where P is the domestic price level and P* is the foreign price level. P and P* must have the same arbitrary value in some chosen base year. Hence in the base year, RER = e. (Mankiw, 2010).

2.3. Implications of Appreciation and Depreciation/Exchange Rate Fluctuations

Each time either of the two-component currencies changes in value, a market-based exchange rate will change as well. Any time the demand for a currency is greater than the available supply, the currency will appreciate or tend to become more valuable. However, if the available supply is more than the demand,

then the currency will face depreciation (become less valuable), and this implies that people prefer holding wealth in other forms, possibly other currencies, it does also not mean that the people no longer want money. An increase in speculative and transaction demand for money both cause an increase in demand for a currency. The transaction demand for money corresponds highly to the country's business activity level, gross domestic product (GDP), and employment levels. High unemployment rates imply less expenditure on goods and services by the public (Khan, 2018). The transaction demand for money is easy to manage by central banks because all they need to do is to adjust the available money supply to accommodate changes in the demand for money. On the other hand, by adjusting the interest rate, the speculative demand for money is managed albeit with difficulty by a central bank.

A higher interest rate leads to increased demand for a currency by investors, hence an investor is more likely to buy that currency in such a scenario. It is an agreed fact that speculation of currency can slow down economic growth especially when those investors who speculate in large currency quantities deliberately create a decrease in a currency to make the government sell it to maintain stability. After this, the speculator can buy the currency from the bank at a profit. According to Tai et al. (2012) for a country to pursue an independent economic policy, it is appropriate to operate with a system of the free rate as is the opinion of the advocates of flexible exchange rates. Its monetary policy has to deflate its currency and hinge the country into depression and unemployment. A country should allow the exchange rate to vary freely while at the same time focusing on internal stability of unemployment, output and prices since internal stability is a better objective for a country to pursue as it would do away with economic interference from external sources. To curtail the invasion of inflationary and deflationary forces, it is necessary to let exchange rates vary. Fixing exchange rates rigidly causes the transmission of shocks of inflation and deflation from abroad into the economy. This is because fixed exchange rates act as a shock absorber (Tai et al., 2012).

2.4. Application of Inflation

As a general rule, a country with a consistently lower inflation rate exhibits a rising currency value, as its purchasing power increases relative to other currencies. Those countries with higher inflation typically see depreciation in their currency concerning the currencies of their trading partners. This is also usually accompanied by higher interest rates. Gottschalk et al. (2008) in their paper on analyzing determinants of inflation when there are data limitations in the case of Sierra Leone, used the structural vector autoregression approach to help forecast inflation and find out that domestic inflation increases with higher oil prices, higher money supply and leads to nominal wage depreciation. The purchasing power of the poor may shrink if commodities rise and making it harder for the poor who may be surviving on a limited budget. This would be because their in-

comes do not increase at the same rate as prices increase. In analyzing the inflation in Uganda, Kabundi (2012) uses the error correction model to analyse the dynamics of inflation and found out that in the short-run and long-run external and domestic factors contribute to inflation causation with the agricultural sector being affected by the demand and supply of its commodities.

2.5. Differentials in the Exchange Rate on Inflation

Allor (2019) explained that a change in the exchange rate can result in imported inflation. The price of imported goods will go up because they are more expensive to buy from abroad. This is most likely to occur in periods where a country's currency is greatly devalued. A primary effect occurs when residents of a country consume more export goods (domestically produced) than import goods. This depends on the importance of the foreign sector in the economy and the marginal propensity to import. The increase in the price of domestic goods will induce a further rise in imports (as they are cheaper), which is higher the elasticity of substitution of import goods for home goods.

Sowa & Kwakye (1993) explained that inflation in Ghana could be explained more by the monetary factors and formulated a model showing the sources of inflation as monetary factors, real factors and expectations i.e. P = f(M, Y, E, Pe). Inflation is seen as dependent on both the growth of money and output and the rate of exchange that is the domestic price of foreign currency and price expectations. They found out that monetary pressure was a strong force in Ghana's inflation and exchange rate devaluations have an effect on inflation but supply factors constituted a much stronger inflationary force than monetary factors but exchange rate adjustments did not show a strong influence on inflation therefore a multifaceted issue with many causes.

2.6. Differentials in Interest Rates

Interest rates, inflation and exchange rates are all highly correlated. By manipulating interest rates, central banks exert influence over both inflation and exchange rates, and changing interest rates impact inflation and currency values (Calvo & Reinhart, 2002). Higher interest rates offer lenders in an economy a higher return relative to other countries. Therefore, higher interest rates attract foreign capital and cause the exchange rate to rise. According to the Mundell-Flemming model, a higher interest differential would attract capital inflows and result in exchange rate appreciation. According to Sargent and Wallace (1981), a high-interest rate policy may lead to a reduction in demand for money and an increase in price level because an increase in interest rate implies an increase in government debt which, in turn, would be financed by seignorage. Similarly, an increase in interest rate may adversely affect the future export performance which would reduce the future flow of foreign exchange reserves and thereby, leads to the depreciation of currency (Furman & Stiglitz, 1998).

Countries may undermine exchange rates due to the government or public

debt as governments engage in large-scale deficit financing to pay for public sector projects and governmental funding (Ehigiamusoe & Lean, 2019). While such activity stimulates the domestic economy, nations with large public deficits and debts are less attractive to foreign investors. A large debt encourages inflation, and if inflation is high, the debt will be serviced and ultimately paid off with cheaper real dollars in the future. In the worst-case scenario, a government may print money to pay part of a large debt, but increasing the money supply inevitably causes inflation. Moreover, if a government is not able to service its deficit through domestic means (selling domestic bonds, increasing the money supply), then it must increase the supply of securities for sale to foreigners, thereby lowering their prices. Finally, a large debt may prove worrisome to foreigners if they believe the country risks defaulting on its obligations.

As a result, foreigners will be less willing to own securities denominated in that currency if the risk of default is great. For this reason, the country's debt rating (as determined by Moody's or Standard & Poor's) is a crucial determinant of its exchange rate (Ehigiamusoe & Lean, 2019). Political stability and economic performance also tend to impact key economic indicators including the exchange rate. Hussain (2019) explains that foreign investors inevitably seek out stable countries with strong economic performance in which to invest their capital. A country with such positive attributes will draw investment funds away from other countries perceived to have more political and economic risk. Some researchers have studied the nexus between the interest rate and exchange rate in a broader international crisis.

In this context, Goldfajn and Gupta (1999) have examined 80 currency crisis episodes between 1980 and 1998. By using fixed effect panel regression, they conclude that an increase in interest rate is associated with an appreciation of nominal exchange rates. They also found that the probability of choosing a high-interest rate policy during the post-crisis period was low if the country was faced with a banking crisis. While analyzing the effect of political stability on inflation, Aisen & Veiga (2008) assert that inflation leads to the reduction of the welfare of people in the society and economic growth and found out that political instability can lead to higher inflation levels, especially in developing nations. Moreover, political instability affects the efficiency of the tax system and hence government revenues used due to tax evasion and people holding the government responsible for economic outcomes and rising demand for public expenditure which may end up being financed by inflation tax however he adds that inflation control measures should be undertaken together with other policies (Hussain, 2019). Bernanke et al (2004) is of the view that the consumer price index portrays the increase in price for poor households and is mostly confined to food, fuel, medicine, and some essential commodities. This would therefore mean inflation for the poor is the increase in the price of the most essential commodities.

If speculators believe the sterling will rise in the future, they will demand more

now to be able to make a profit. This increase in demand will cause the value to rise. Therefore movements in the exchange rate do not always reflect economic fundamentals but are often driven by the sentiments of the financial markets. For example, if markets see news which makes an interest rate increase more likely, the value of the pound will probably rise in anticipation. Kraay (1998) has examined whether an increase in interest rate policy can defend the speculative attack by using monthly data for 75 developed and developing countries over the period 1960-99 and found that the high-interest rates policy doesn't defend the currencies against speculative attacks. Therefore, he concludes that there is a striking lack of any systematic association between interest rates and the outcome of a speculative attack.

2.7. Empirical Arguments

Sowa and Kwakye (1993) concluded that inflation in Ghana could be explained more by the monetary factors and formulated a model showing the sources of inflation as monetary factors, real factors and expectations i.e. P = f(M, Y, E, Pe). Inflation was seen as dependent on both the growth of money and output and the rate of exchange that is the domestic price of foreign currency and price expectations. They found out that monetary pressure was a strong force in Ghana's inflation and exchange rate devaluations have an effect on inflation but supply factors constituted a much stronger inflationary force than monetary factors but exchange rate adjustments did not show a strong influence on inflation therefore a multifaceted issue with many causes.

Bowa (1994) concluded that the inflationary process in Zambia was attributed to monetarist and structuralist schools of thought and changes in money supply and exchange rate adjustments were found to be significant determinants of inflation. Tightening monetary and fiscal policies were essential to reduce money supply changes. His findings revealed that an increase in money supply led to a 1 per cent rise in the rate of inflation within two years.

Adam (2009) studied the conduct of monetary policy in Uganda using an assessment. The study discussed aspects of the conduct of monetary policy in Uganda with the starting point being the perception held by some that while Uganda had been amongst the most consistently successful countries in Africa in controlling inflation since the early 1990s, this had come at a high fiscal cost and that the conduct of monetary policy had stifled rather than encouraged the development of the financial sector.

Chhibber (1991) after analyzing the economies of some African countries concludes that inflation is caused by four main factors; cost-push factors emanating from currency devaluations, demand-pull forces created by excessive credit expansion in the economy, the balance of payment problems and controlled prices that deviate from the prevailing market prices and the readjustment of these prices cause inflationary shocks.

Canetti and Greene (2000) studied ten African countries namely, Ghana, The

Gambia, Kenya, Nigeria, Sierra Leone, Somalia, Tanzania, Uganda, Zaire and Zambia. Their study tested the existence of a causal relationship between the growth of money supply or exchange rate depreciation and inflation. They used both VAR and the Granger causality tests. The appropriate lag length of four was set based on the Schwarz Criteria; the minimum value of the criteria was found at lag four after an experimental exercise. In the VAR method, they established that in four countries, changes in money supply majorly influenced levels of inflation, in three countries, rates of inflation were dominantly influenced by the depreciation of exchange rates, while in the other three countries, the effect on one another as equal.

These results were consistent upon conducting granger causality tests using a lag length of four and eight, this meant that there exists feedback causality between M3 growth and CPI, and the causality from the supply of money to exchange rate and from exchange rate to CPI were unidirectional. They further indicated that in as much as they used large lag lengths, this could cause a spurious equation.

Alba and Park (2005) analysed if PPP exists between the Turkish Lira and German Mark. For the Turkish Lira and German Mark situation, the findings showed that PPP exists especially for years closer to the date the analyse was done. Özkan (2013) analysed PPP for Turkish Lira—Euro and Turkish Lira—US Dollar cases. The study showed that for the Dollar—Turkish Lira case the Dollar's purchasing power has an effect on the parity while for the Euro—Turkish Lira case the Turkish Lira's purchasing power has a greater effect.

Albuquerque and Portugal (2005) studied the relationship between exchange rate and inflation volatilities. They used a bivariate GARCH model for the test and found a relation between exchange rate and inflation variances. Berument (2002) examined the effects of foreign exchange rates on inflation. He found that the foreign exchange rate affects inflation. In addition, he tested the effects of CPI and producer price index separately. The results showed that the producer price index is affected by foreign exchange rates more than CPI.

Achsani et al. (2010) in their analysis of the link between real exchange rates and inflation levels in Asia (ASEAN + 3) and Non-Asia (EU and North America) countries adopted the model of Kamin and Klau (2003). Using the model they found out that in Asian countries there is a strong link that exists between real exchange rates and inflation, but there is no such relation in the EU and North America. Additionally, Asian countries seemed to feel the impact of the Asian financial crisis locally, contrary to what was being experienced in the EU and North America where there was no significant impact felt.

Tai et al. (2012) analyzed the relationship between exchange rate flexibility and monetary policy of inflation targeting using the GARCH model. Their results showed a significant correlation between exchange rate movements and inflation and output movements. They also concluded that inflation targeting (IT) has significant impacts on the movements of inflation, output and exchange rate.

Comparing the performance of IT across countries, they observed that volatility in exchange rate increases and is higher in Asia compared to developed countries

3. Methods

To aid in achieving the objectives of the study the research adopted the explanatory research design. This design focuses on establishing the causal links between the main variables in the study and helps present the findings in a well-structured format (Van Wyk, 2012). This type of research design is usually used for analytical studies that are solely interested in establishing the relationship between a given set of variables. Therefore this approach helps the study by providing a framework in which the researcher is guided to connect research questions and the research analysis to achieve the objectives of the study.

The research design involves the use of quantitative data, collected through a survey of potential respondents who were confirmed as social media patronisers and radio listeners. With this data, the study uses quantitative analytical techniques such as correlation analysis to determine the extent to which social media usage influences radio listenership for the selected sample of respondents. The sections that follow discuss the population and sample used in this study.

The population of the study refers to a group of individuals or elements with common characteristics, which is important for the study project (Weeks, 2020). For this study, the population of interest is all macroeconomic variables of the economy of Ghana. This population was chosen because this population contained accurate measures of the macroeconomy of Ghana, which could be used to understand the dynamics between variables like inflation, exchange rates and economic growth. According to the World Bank (2020), 1429 macroeconomic variables can be used to capture the macroeconomy of Ghana.

Sampling is an important part of data collection. Sampling is the part of the statistical procedure concerned with the collection of a sub-set of individual observations within a population of individuals intended to provide some information about the population of concern, in particular, to make statistical inference-based predictions. The sample size used in qualitative research methods is often smaller than that used in quantitative research methods according to Strauss & Corbin (1997). This is because qualitative research approaches often concentrate on acquiring an in-depth understanding of a phenomenon or on meaning. However, quantitative research methods are focused on estimating the causal relationships and showing trends of variables over time. Either way, the sampling procedures are mainly probability and non-probability based (Alvi, 2016: p. 12). This study opts to use a non-probability based sampling approach in which some units of the population have a zero chance of being selected to participate in the study.

In particular, the study used the purposive sampling approach to draw out the sample. The purposive sampling approach involves drawing out a sample using

elements that meet specific criteria that are determined based on the objectives of the research (Alvi, 2016: p. 22). This approach is useful because it focuses the resources of the researcher on selecting the important elements of the population that relate to the study. This suggests that the purposive sampling approach is cost-effective. In using this sampling approach, data availability and the relevance of the study were the main criteria used to select the sample. The study, therefore, sampled data on inflation, exchange rate, economic growth, sectoral value-added and other control variables like capital and labour for Ghana from 1980- to 2019. The choice of 1980-2019 was significant because 1980 saw a new political turnround in the history of Ghana when a military leader took over and overturned the leadership of a constitutionally elected government. This period saw a massive change in the political landscape as well as the economic fortunes of Ghana, thus becoming a good baseline to examine these economic indicators. The year 2019 was also used as a cap because the year 2020 was an election year in Ghana. A period that is occasioned by various developments including overspending, laxity in applying existing economic controls as well as the reluctance on the part of government to allow key insnitutional frameworks to apply suitable and recommended economic paths for the country. Hence, data was capture for the period of 1980 to 2019. This suggests that the sample size will have 40 data points per variable.

To attain the data for this study, online databases of the Bank of Ghana and the World Bank were visited. These databases publish reliable time-series data on the economy of Ghana. The researcher queried data on key macroeconomic variables from the sample period and compiled the data into a single spreadsheet for analysis. After compilation, the data was cleaned and then checked for consistency, so that errors in the data would be cleared. The spreadsheet that resulted showed a dataset that had valid figures representing key and annual macroeconomic variables for the economy of Ghana.

The main instruments of the study were Stata and Microsoft Excel software applications, which were used to analyse the data gathered. The software was useful to generate descriptive and inferential statistics, which were used to answer the research questions of the study. Data for this study was obtained from secondary sources. Secondary data on the macroeconomic variables considered in the study and other descriptive statistics on the Ghanaian economy were obtained from the Bank of Ghana online databases and the World Development Indicators databases, published by the World Bank.

The validity of this study is anchored on accurate measures of macroeconomic variables desired for the analysis, which were obtained from the sources earlier indicated (Heale & Twycross, 2015). The measures used in the analysis were valid and reliable and were consistent with known theories of growth when used in empirical research. The findings were compared with the results of earlier studies to check for the validity of the measures used.

Reliability was also determined using Factor analysis and the Cronbach's Al-

pha test statistics. The purpose of this activity is to ascertain whether the measures used in the questionnaire were good enough to produce unbiased results. To achieve reliability, the study estimated the Cronbach's alpha coefficient test, noting that a coefficient above 0.6 would be ideal for confirming the reliability of the variables or measures used in the study. In addition, confirmatory factor analysis was used to determine the variables that were to be included in the model.

In this study, the econometric model used by Ibrahim and Alagidede (2019) is followed and adapted. Ibrahim and Alagidede (2019) model economic growth in Ghana as a function of financial development and domestic capital. However, this study considers the influence of inflation, exchange rates and sectoral value-added. The model used in the study follows the growth literature (Solow, 1956) and controls for labour and capital, in addition to the influence of other independent variables selected for the study.

The model to be estimated can be specified in its econometric form as follows:

$$ECO_t = \omega_0 + \omega_1 K_t + \omega_2 L_t + \omega_3 \pi_t + \omega_4 E_t + \omega_5 X_t + \epsilon_t \tag{1}$$

where ECO_t represents economic growth, K_t represents a fixed capital investment, L_t refers to population growth or labour, E_t refers to the nominal exchange rate, and X_t refers to the value-added of three main sectors in the economy of Ghana—agriculture (AVAs), industry ($INDt$) and services ($SERV_t$)—and π_t refers to Non-food inflation in Ghana. In addition, ω_{0-5} are coefficients, which are to be estimated whiles ϵ_t representing a normal white noise process.

Regarding the analysis technique, the study first used the Ordinary Least Squares (OLS) and threshold regression to estimate the model. The OLS regression will present a standard econometric perspective of the influence of inflation, exchange rates and the structure of the economy based on several assumptions about the linear relationship between the variables in the study (Greene, 2003). After cross-checking the regression estimates for issues such as multicollinearity, autocorrelation or heteroskedasticity, robust standard errors are used to control for some of these issues. Prior checks for unit roots are also conducted using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests following the work of Dickey and Fuller (1979), Phillips and Perron (1988). After determining the order of integration, the Johansen cointegration test is used to establish the existence of cointegration between the variables.

However, the literature that has examined the relationships between inflation, exchange rates and economic growth has pointed out the influence of non-linearity and sectoral imbalance, which may be persisting in the long run. Given that the structure of the economy also evolves at different times, this study places a focus on the long-run interactions between inflation, exchange rate and sectoral structure of the economy of Ghana. To achieve the objectives of the study, interactions between inflation and sectoral value-added shares and those between the exchange rate and sectoral value-added shares are introduced into the model. This results in the following equations that will be estimated:

$$ECO_t = \omega_0 + \omega_1 K_t + \omega_2 L_t + \omega_3 \pi_t + \omega_4 E_t + \omega_5 X_t + \rho_6 \left(X_t * \pi_t \right) + \epsilon_t \qquad (2)$$

$$ECO_t = \omega_0 + \omega_1 K_t + \omega_2 L_t + \omega_3 \pi_t + \omega_4 E_t + \omega_5 X_t + \rho_6 \left(X_t * E_t \right) + \epsilon_t \qquad (3)$$

where the variables maintain their representations as in Equation (1). The coefficient of interest however is the coefficient of the interactive terms, which is expected to be positive or negative based on the existing structure of the economy of Ghana.

With the application of these approaches, the study can generate expected outcomes in line with the objectives set out. The Fully Modified OLS (FMOLS) approach is adapted to estimate Equations (2) and (3) given the existence of cointegration between the variables. Hence, it is possible to show that the influence of inflation and the exchange rate on economic growth can be different with differing structural compositions of the economy.

The FMOLS technique is useful to estimate the model because it controls for endogeneity and serial correlation issues (Phillips & Hansen, 1990). This technique modifies OLS to address serial correlation and endogeneity challenges that exist in cointegrating relationships. FMOLS also can be used for small samples to produce consistent estimators, after accounting for the cointegration between the variables.

Mathematically, the FMOLS estimator is calculated using the following formula:

$$\hat{\theta}_{FME} = \left(\sum_{t=1}^{T} z_t z_t' \right)^{-1} \left(\sum_{t=1}^{T} z_t y_t^+ - T \hat{J}^+ \right)$$

where $\hat{y}_t^+ = y_t - \hat{\lambda}_{0x} \hat{\lambda}_{xx}^{-1} \hat{\lambda}_{xx} \Delta x_t$, and $\hat{J}^+ = \hat{\Delta}_{0x} - \hat{\lambda}_{0x} \hat{\lambda}_{xx}^{-1} \hat{\lambda}_{xx} \hat{\Delta}_{xx}$ are the terms for correcting endogeneity and serial correlation, respectively. Also captured in the terms are the kernel estimates of the long-run co-variances $\left(\hat{\lambda}_{0x}, \hat{\lambda}_{xx} \right)$ and the kernel estimates of the one-sided long-run co-variances $\left(\hat{\Delta}_{0x}, \hat{\Delta}_{xx} \right)$.

4. Results and Discussions

In this chapter, the results from the analysis of data are presented and discussed. In the first section of the chapter, summary statistics of the variables are explained. In the second section of the chapter, the results from the regression analysis are discussed.

4.1. Summary Statistics of Key Variables

Table 1 shows the summary statistics of variables analyzed in this study. These variables are captured in the model equation that is to be estimated, as part of addressing the objectives of the study. These variables are represented as follows: ECO_t represents economic growth, K_t represents a fixed capital investment, L_t refers to population growth or labour, E_t refers to the nominal exchange rate, and X_t refers to the value-added of three main sectors in the economy of Ghana—agriculture (AVA_t), industry ($INDt$) and services ($SERV_t$)—and π_t refers to Non-food inflation in Ghana.

Table 1. Summary statistics.

Variable	N	Mean	Std. Dev.	Min	Max
ECO_t	40	23.17	0.995692	22.12	24.93
K_t	40	21.36673	1.336438	18.8403	23.59731
L_t	40	2.587479	0.25595	2.162578	3.045216
π_t	40	26.48066	25.0208	7.12635	122.8745
E_t	40	1.045074	1.444773	0.000275	5.217367
AVA_t	40	36.48434	11.8958	17.30634	59.7306
IND_t	40	21.83544	7.179017	6.24747	34.85999
$SERV_t$	40	35.8022	7.092555	26.2464	48.18116

Source: Fieldwork, 2020.

The first variable considered in this descriptive analysis is the dependent variable, which is economic growth. The results showed that on average, economic growth over the sample period was 23%, with a maximum growth of 24.9% and a minimum growth of 22.12%. This result suggests that the economy of Ghana has grown significantly over time.

Furthermore, summary statistics for the measure of fixed capital investment in Table 1 suggests that on average, fixed capital investment in Ghana was 21.4% for the sample period of the study. Within this time, fixed capital investment peaked at a maximum of 23.59%, which occurred recently in the 2019 fiscal year. In addition, over the sample period, the minimum rate of fixed capital investment was found to be 18.84%, which was recorded in 1983.

On the other hand, the average population growth in Ghana over the sample period is shown in Table 1 to be 2.58%, which is consistent with the known rate at which the population of Ghana is known to develop. Over the sample period also, the lowest population growth was found to be 2.163%, which was recorded recently in 2019. The highest population growth however is shown to be 3.04%, which was recorded in 1984.

In addition, regarding summary statistics on inflation, the results from Table 1 suggest that the average inflation over the sample period has been 26.48%. Further results from the table also show that the lowest inflation experienced in Ghana over the sample period is 7.13%, which was recorded in 2012.

Regarding the exchange rate, the results from Table 1 suggest that the mean the period average exchange rate was GHC 1.04 per dollar. Further results also showed the maximum and minimum period averages of the exchange rate. The maximum exchange rate over the sample period was found to be GHC 5.2 per dollar, which was recorded recently in 2019, suggesting that the exchange rate had depreciated the most in recent times. The lowest exchange rate over the sample period, however, was GHC 0.000275 per dollar, which was recorded in

1980.

Further summary statistics on the structural composition of the economy of Ghana are presented in Table 1. First, the share of Agricultural value-added in total output is captured and the results from the table show that the average Agricultural value-added share in total output has been 36.48% over the sample period. The results further showed that the maximum value-added of agriculture in total output was 59.73%, which was recorded in 1983. Over time, however, the structure of the economy has evolved, causing agriculture's contribution to total output to reduce. Hence, the lowest share of agriculture value-added in total output was found to be 17.3%, which was recorded recently in 2019.

Similarly, the share of industry value added in total output is captured and the results from the table show that the average industry value-added share in total output, over the sample period, is 21.83%. The results from Table 1 also show that the maximum share of industry value added in total output is 34.86%, which was recorded in 2014, confirming the steady increase of industry contribution to total output in Ghana. On the other hand, the lowest share of industry value added in total output is 6.25%, which was recorded in 1982.

The results show that the average services value-added share in total output is 35.8% over the sample period. The results further show that the maximum share of industry value added in total output is 48.18%, which was recorded in 2010. On the other hand, the lowest share of services value-added in total output is 26.25%, which was recorded in 1996.

4.2. Correlation Analysis

The study further went on to estimate the correlation coefficients between the dependent and independent variables in the study. This approach was used to assess the objective of determining the correlation between inflation and exchange rates in Ghana over the sample period. The pairwise correlation technique was adopted and controlled for other independent variables in the model equation that the study adopted. These results are presented in Table 2.

The results shown in Table 2 are the correlation coefficients between the independent variables in the study. The variables and their representations are as follows: These variables are represented as follows: ECO_t represents economic growth, K_t represents a fixed capital investment, L_t refers to population growth or labour, E_t refers to the nominal exchange rate, X_t refers to the value-added of three main sectors in the economy of Ghana—agriculture (AVA_t), industry ($INDt$) and services ($SERV_t$)—and π_t refers to Non-food inflation in Ghana. Furthermore, statistically, significant correlations are identified by the stars (*). The different levels of significance of the correlations (1%, 5% and 10%) are identified by the number of stars assigned to the correlation coefficients.

In line with the first objective of the study, the correlation coefficient between inflation and exchange rates is captured. The results showed that there is a negative correlation between inflation and the exchange rates over the sample period,

based on the sign of the correlation coefficient shown. The value of the correlation coefficient is 0.384, which is indicative of a weak correlation between inflation and the exchange rates. The results also showed that the correlation coefficient was statistically significant at the 5% level of significance. This result suggests that increases in inflation are associated with a 38.4% decrease in the exchange rate. This result is intuitive if one considers decreases in the exchange rate as a depreciation of the local currency. Ghana is a small open economy and it depends largely on imports of goods and services. Therefore, where the cost of imports rises, the exchange rate depreciates and the higher cost of imports is passed on through inflation to consumers. This finding is consistent with earlier studies such as Alagidede et al. (2013) that have identified the import-dependent nature of the economy of Ghana.

Following this, the second objective of the study was to examine the sectoral structure of the economy of Ghana over time. The correlation coefficients presented in Table 2 can be useful as they show the degree of association between the sectoral structures over time. From the table, it can be shown that the share of agriculture value-added in total output is negatively correlated with the shares of industry value added in total output and services value-added in total output.

This finding is based on the sign of the correlation coefficients shown in Table 2. The results from the table show that the correlation between the share of agriculture value-added in total output and the share of industry value added in total output is negative and statistically significant at the 1% level of significance. The value of the correlation coefficient is 0.860, which is indicative of a strong correlation between the two variables. Based on the correlation coefficient and its sign, the results suggest that decreases in the share of agriculture value-added in total output are associated with increases in the share of industry value added in total output. This result is intuitive as it suggests that increases in the contribution of industry value added to total output have been associated with decreasing contributions of agriculture value added to total output.

Table 2. Pairwise correlation estimates.

	K_t	L_t	π_t	E_t	AVA_t	IND_t	$SERV_t$
K_t	1						
L_t	-0.772^{***}	1					
π_t	-0.609^{***}	0.349^{*}	1				
E_t	0.849^{***}	-0.758^{***}	-0.384^{*}	1			
AVA_t	-0.971^{***}	0.767^{***}	0.608^{***}	-0.811^{***}	1		
IND_t	0.846^{***}	-0.731^{***}	-0.555^{***}	0.675^{***}	-0.860^{***}	1	
$SERV_t$	0.544^{***}	-0.311	-0.308	0.545^{***}	-0.517^{***}	0.0668	1

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. Source: Fieldwork, 2020.

Similarly, the result from Table 2 shows that there is a negative correlation between the share of agriculture value-added in total output and the share of services value-added in total output. This finding is based on the sign of the correlation coefficient, shown in the table. From the table, the correlation coefficient is shown to be 0.517, which is indicative of a strong correlation between the variables. This correlation coefficient is also shown to be statistically significant at the 1% level of significance. The results suggest that over the sample period and based on the degree of association, the contribution of agriculture value added to total output has been declining whiles the contribution of services value added to total output has been increasing. This result is also intuitive given that the services and industry are known to be leading contributors to the total output of the economy of Ghana, whiles the contribution of agriculture has been declining steadily over time.

Further to the correlation estimates, the trends in the sectoral shares of the economy were examined and placed into a descriptive chart. Figure 1 presents the trends in sectoral shares of the economy and helps present a picture of the changing structure of the economy.

Figure 1 shows the trends in the sectoral shares of the economy of Ghana over the sample period in this study. The trends in the share of agriculture value-added in total output are seen to be decreasing over time consistently while the shares of industry value-added and services value-added make their way up over time. The trends shown in the chart support the findings from the correlation analysis and show how the sectoral structure of the economy of Ghana is positioned. The sectoral structure of the economy has shifted from periods where agriculture contributed more to total output than industry and services to recent periods where agriculture has the lowest value-added share in total output. These results are intuitive and confirm earlier findings of studies such as Alagidede et al. (2013) and Pauw (2018) that have examined the sectoral structure of the economy of Ghana. However, this study argues the sectoral structure of the economy interacts with inflation and exchange rates and delivers a resultant effect on economic growth in Ghana. This analysis is presented in the next section using regression methodology.

4.3. Regression Analysis

The regression analysis conducted was to determine how the sectoral structure of the economy mediates the influence of inflation and exchange rates on economic growth in Ghana. To capture the nature of the mediation, the inflation and exchange rates each interacted with the sectoral valued-added shares and the results are presented. This modification is necessary because it allowed the researcher to accurately determine the extent to which inflation and the exchange rates influence economic growth when the structure of the economy is accounted for, which earlier studies do not explicitly show.
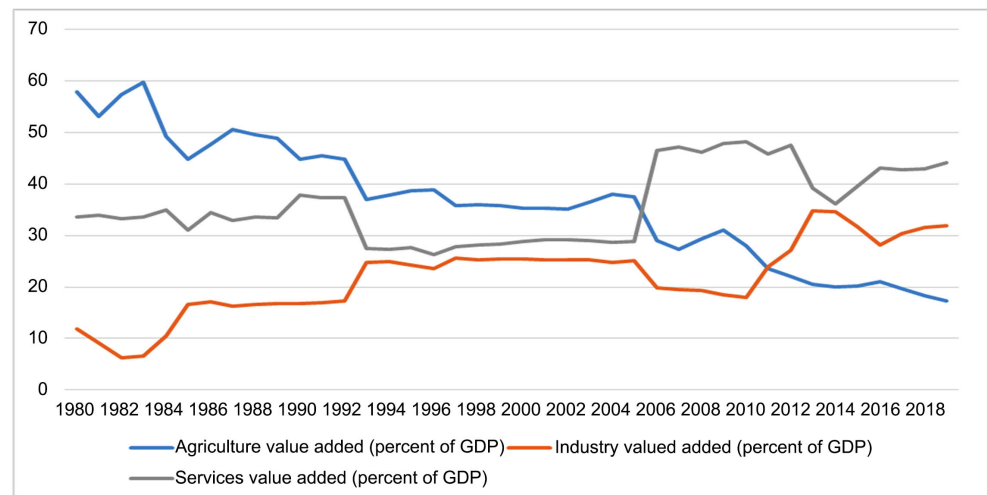
Figure 1. Sectoral Structure of the economy of Ghana from 1980 to 2019. Source: Fieldwork, 2020.

Before estimating, the study conducted a series of unit roots tests, as part of preliminary tests to ensure that there would be no spurious regressions. Both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are conducted. The unit root tests used estimations with and without the trend and the results were used to determine the order of integration of the variables selected for the study. The difference operator (D.) was used to generate the first differences in the variables.

Based on the order of integration of the variables, further tests for cointegration were also conducted. In Table 3, the results from the ADF and PP tests for unit root are shown;

The results from Table 3 present the results of the unit root tests of the variables. Both the ADF and the PP tests confirm that the variables are integrated of the first order and therefore, they are I (1) variables. This was determined after testing for unit roots in the first differences of the variables and determining whether the first differences had unit-roots. The results from both tests showed that the first differences of all variables had no unit roots, thus making all the variables obtain the I (1) classification. These findings are consistent with earlier studies like Agyapong et al. (2016) who also test for unit roots in economic growth and other macroeconomic variables in Ghana.

In line with the order of integration of the variables obtained, the study further tested the hypothesis that all the variables were cointegrated. This is necessary because in most cases, variables that have the same order of integration are cointegrated, that is, they move together in the long run, despite displaying upwards or downwards trends (Greene, 2003). To test for long-run association, the study opted to use the Johansen cointegration test to determine whether the variables were cointegrated. The test compares calculated statistics against critical values at a 5% level of significance to determine whether the null hypothesis of no cointegration can be rejected. The decision criterion is therefore to reject the null hypothesis when the calculated statistic is greater than the critical values.

Following this approach, the results from the cointegration test are presented in Table 4. Both the trace statistics and max statistics are estimated and the results obtained are in agreement.

The results obtained from the cointegration test confirm the existence of cointegration among the variables in the study, suggesting that the variables may move together in the long run and may converge even if there is a shock to their integration. These results were the basis for conducting further regression analysis to achieve the third objective of the study. The study first estimated a regression using the Ordinary Least Squares (OLS) approach as a baseline to determine the nature of the linear relationship between the variables and the statistical significance of the interaction between inflation, exchange rates and the sectoral value-added shares of total output captured in the study. However, OLS estimates can be affected by econometric issues such as autocorrelation, heteroskedasticity and multicollinearity. These problems would generate biased estimates and therefore suggests that another technique would be appropriate. The study, therefore, used robust standard errors to control for such problems but used another estimation technique to address other issues.

In addition, the OLS technique does not control for the long-run association between the variables. Therefore the study opted to use the Fully Modified OLS (FMOLS) approach, which is one of the forms of cointegration regression techniques, which address the challenges that plaque the OLS procedure and also control for the long-run association between the variables in the study.

Table 3. Unit root tests.

Variable	ADF		PP	
	No Trend	Trend	No Trend	Trend
ECO_t	0.5399	−1.664	0.426	−1.748
D. ECO_t	−5.358***	−5.449***	−5.356***	−5.439***
K_t	−0.502	−2.943	−0.373	−3.021
D. K_t	−7.094***	−6.997***	−7.205***	−7.098***
L_t	−0.596	−6.828***	−1.332	−5.073***
D. L_t	−6.155***	−5.161***	−4.913***	−4.295***
π_t	−4.694***	−6.622***	−4.738***	−6.614***
D. π_t	−14.520***	−14.530***	−17.204***	−18.152***
E_t	−3.620***	−1.855	−3.690***	−1.858
D. E_t	−3.636***	−4.573***	−3.675***	−4.525***
AVA_t	−1.036	−3.757***	−0.874	−3.596**
D. AVA_t	−6.051***	−5.960***	−6.516***	−6.372***
IND_t	−1.174	−2.054	−1.274	−2.327
D. IND_t	−4.746***	−4.686***	−4.654***	−4.580***
$SERV_t$	−1.543	−2.130	−1.614	−2.220
D. $SERV_t$	−6.111***	−6.061***	−6.114***	−6.063***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Source: Fieldwork, 2020.

Table 4. Johansen tests for cointegration.

Trend: Constant					Number of obs = 38
Sample: 1982-2019					lags = 2

Maximum Rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	72	−219.45533	-	299.6082	156.00
1	87	−165.154.86	0.94261	191.0072	124.24
2	100	−139.76059	0.73725	140.2187	94.15
3	111	−115.10511	0.72683	90.9077	68.52
5	120	−97.0904675	0.61254	54.8785	47.21
4	127	−73.75344	0.54967	24.5634	29.68
6	132	−70.412831	0.34982	8.2044	15.41
7	135	−70.412831	0.161123	1.5232	3.7
8	136	−69.651238	0.0392		
0	72	−219.45533	-	108.6010	51.42
1	87	−165.154.86	0.94261	50.7885	45.28
2	100	−139.76059	0.73725	49.3110	39.37
3	111	−115.10511	0.72683	36.0293	33.46
5	120	−97.090475	0.61254	30.3150	27.07
4	127	−81.932952	0.54967	16.3590	20.97
6	132	−73.75344	0.34982	6.6812	14.07
7	135	−70.412831	0.161123	1.5232	3.76
8	136	−69.651238	0.03929		

Source: Fieldwork, 2020.

Using the FMOLS approach, the study estimated regression equations using the interactive terms of inflation and sectoral value-added shares first to determine the extent to which changes in the sectoral structure of the economy and inflation influence economic growth in Ghana. The results from these estimations show results from both techniques. However, only estimates from the FMOLS technique are appropriate for inference. Table 5 shows the results from the interactions of inflation with the sectoral value-added shares.

The results from Table 5 show the regression estimations of the interactions between inflation and sectoral value-added shares of total output and how these variables affect economic growth in Ghana. First, control variables like the rate of fixed capital investment (K_t) are found to have a positive and statistically significant influence on economic growth. The results suggest that the influence persists in the long run, so that a one per cent increase in fixed capital investment influences economic growth positively, between 0.762% and 1.066%, holding all other factors constant. Similarly, population growth (L_t) is shown to

have a positive and statistically significant influence on economic growth, based on the results shown in Table 5. The results show that a per cent increase in population growth has a positive and statistically significant influence on economic growth, holding all other influences constant. Particularly, in the long run, the results suggest that a one per cent increase in population growth will positively influence economic growth, between 0.255% and 0.724%, holding all other factors constant.

Table 5. Regressions Estimates with Inflation and Sectoral shares.

VARIABLES	(1) OLS	(2) FMOLS	(3) OLS	(4) FMOLS	(5) OLS	(6) FMOLS
K_t	0.849***	0.888***	1.051***	1.066***	0.762***	0.794***
	(0.0937)	(0.138)	(0.0580)	(0.0224)	(0.0554)	(0.0611)
L_t	0.237	0.724*	−0.130	0.255***	−0.221	−0.221
	(0.243)	(0.382)	(0.218)	(0.0907)	(0.135)	(0.215)
π_t	−0.0419***	−0.0512***	0.00870***	0.0110***	0.00577	0.00266
	(0.00752)	(0.0114)	(0.00259)	(0.000955)	(0.0108)	(0.0125)
E_t	−0.142***	−0.132***	−0.0816**	−0.0514***	−0.0946***	−0.101***
	(0.0297)	(0.0479)	(0.0313)	(0.0110)	(0.0218)	(0.0253)
AVA_t	−0.0336**	−0.0427**				
	(0.0148)	(0.0173)				
$AVA_t*\pi_t$	0.000836***	0.00103***				
	(0.000135)	(0.000208)				
IND_t			−0.0333***	−0.0285***		
			(0.0103)	(0.00363)		
$IND_t*\pi_t$			−0.000620***	−0.000723***		
			(0.000191)	(6.91e-05)		
$SERV_t$					0.0433***	0.0435***
					(0.00812)	(0.00802)
$SERV_t*\pi_t$					−0.0000927	0.00000913
					(0.000346)	(0.000379)
Constant	5.547**	3.819	1.693	0.313	5.675***	4.965***
	(2.490)	(3.664)	(1.425)	(0.604)	(1.304)	(1.627)
Observations	40	39	40	39	40	39
R-squared	0.959	0.955	0.968	0.942	0.980	0.958
Dependent Variable	ECO_t	ECO_t	ECO_t	ECO_t	ECO_t	ECO_t
Sectoral Share	Agriculture	Agriculture	Industry	Industry	Services	Services

Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Source: Fieldwork, 2020.

Furthermore, the exchange rate is found to have a negative and statistically significant influence on economic growth in the results shown in Table 5. The results show that a per cent increase in the exchange rate (period average) would cause a decrease in the economic growth of between 0.0514% and 0.142%, holding all other factors constant.

Now regarding the influence of sectoral value-added shares on economic growth, these shares interacted with inflation to determine their mediating effect on economic growth. The results first show that the net influence of the share of agriculture value added to total output is negative on economic growth. The effect of this variable is the sum of its coefficient and the coefficient of its interaction with inflation, which is both statistically significant at the 1% and 5% levels of significance.

The results suggest that a one per cent increase in the share of agriculture value-added in total output would reduce economic growth by 0.042%, holding all other influences constant. These results are intuitive and suggest increasing shares of agriculture value-added in total output is not beneficial for economic growth in Ghana. This finding is in lines with earlier literature like Szirmai (2012) and Haraguchi (2015) who argue that agriculture cannot influence growth strongly because it cannot establish proper forward and backwards linkages in the economy. Also, other literature like Pauw (2018) emphasises the negative relationship between agriculture value-added share and growth

Similarly, the effect of the share of industry value added to total output is presented in the results shown in Table 5. The effect of this share of value-added in total output is also obtained by summing its coefficient and the coefficient of its interaction with inflation, which is both statistically significant at the 1% level of significance in the long run. Therefore, the net effect of the share of industry value added in total output on economic growth is shown to be negative. The results suggest that a one per cent increase in the share of industry value added in total output will reduce economic growth by 0.029%, holding all other influences constant. These results are intuitive as they suggest that increased shares of industry are associated with declining economic growth over the sample period in the study.

These results are in line with earlier studies such as Dahal (2017), Rodrik (2008), Tregenna (2015) and Chang and Andreoni (2020), who focus on the declining nature of manufacturing and industry in developing countries and the need for industrial policy in developing countries. Furthermore, the effect of the share of services value-added in total output is presented in the results shown in Table 4.

The effect of this share of value-added in total output is also obtained by summing its coefficient and the coefficient of its interaction with inflation, one of which is statistically significant at the 1% level of significance in the long run. In effect, the net effect of the share of services value-added in total output on economic growth, after accounting for inflation, is positive and statistically sig-

nificant, such that a one per cent increase in services value-added in total output will increase economic growth by 0.0435%, holding all other influences constant.

This finding is intuitive as it supports findings of earlier studies such as Dasgupta and Singh (2005), Alagidede et al. (2013), and Aryeetey and Baah-Boateng (2015) that suggest that services have become a dominant engine of growth for developing countries in Africa and other literature that show that the economy of Ghana is largely dependent on value-added services like finance and banking.

The effect of inflation however is seen to be non-linear, in line with the literature that has examined the effect of inflation on growth. The net effect of inflation is determined by summing up its coefficients and the coefficients of its interactions with sectoral share variables. The results, therefore, show that inflation has both a positive and negative effect on the economic growth of Ghana in the long run, which is indicative of a non-linear effect. This result is similar to findings of earlier studies like Ehigiamusoe and Lean (2019), Ahiabor and Amoah (2019), Ibarra and Trupkin (2016) and Nortey et al. (2015), who examine the relationship between inflation, exchange rates and economic growth.

Furthermore, the results show that the regressions can explain between 94% and 98% of the variations in economic growth over the sample period in this study.

Having determined the mediations between sectoral value-added shares and inflation, the study further estimated regressions to show the mediating effect of sectoral value-added shares and the exchange rates, using the same methodology. The results from these estimations are presented in Table 6.

Consider now the results from Table 6, which show the regression estimations of the interactions between exchange rates and sectoral value-added shares of total output and how these variables affect economic growth in Ghana. First, control variables like the rate of fixed capital investment (K_t) are found to have a positive and statistically significant influence on economic growth. The results suggest that the influence of fixed capital investment persists in the long run, so that a one per cent increase in fixed capital investment influences economic growth positively, between 0.568% and 1.060%, holding all other factors constant. Similarly, population growth (L_t) is shown to have a positive and statistically significant influence on economic growth, based on the results shown in Table 6.

The results show that a per cent increase in population growth has a positive and statistically significant influence on economic growth, holding all other influences constant. Particularly, in the long run, the results suggest that a one per cent increase in population growth will positively influence economic growth, between 0.570% and 1.325%, holding all other factors constant.

Furthermore, the regressions control for the effect of inflation and the results show that inflation has a positive and statistically significant influence on economic growth in the results shown in Table 6. The results show that a per cent increase in inflation would cause an increase in the economic growth of between 0.0023% and 0.0027%, holding all other factors constant.

Regressions Estimates with Exchange rates and Sectoral shares.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	FMOLS	OLS	FMOLS	OLS	FMOLS
K_t	0.574***	0.568***	1.060***	1.052***	0.727***	0.734***
	(0.120)	(0.0811)	(0.0793)	(0.0564)	(0.0723)	(0.0430)
L_t	0.835***	1.325***	−0.0828	0.570**	−0.201	−0.161
	(0.240)	(0.211)	(0.258)	(0.236)	(0.129)	(0.143)
π_t	−0.000163	0.00139	0.00138	0.00229*	0.00259	0.00271***
	(0.00197)	(0.00126)	(0.00274)	(0.00121)	(0.00188)	(0.000884)
E_t	0.432***	0.463***	−0.120**	−0.110***	−0.281**	−0.306***
	(0.104)	(0.0785)	(0.0544)	(0.0240)	(0.126)	(0.0803)
AVA_t	−0.0424***	−0.0478***				
	(0.0121)	(0.00892)				
$AVA_t * E_t$	−0.0103***	−0.0102***				
	(0.00181)	(0.00123)				
IND_t			−0.0466***	−0.0391***		
			(0.0101)	(0.00731)		
$IND_t * E_t$			0.00316	0.00655***		
			(0.00353)	(0.00182)		
$SERV_t$					0.0446***	0.0454***
					(0.00513)	(0.00310)
$SERV_t * E_t$					0.00577	0.00658***
					(0.00398)	(0.00243)
Constant	10.08***	9.142***	1.564	−0.0613	6.309***	6.041***
	(3.011)	(1.995)	(1.678)	(1.323)	(1.629)	(1.102)
Observations	40	39	40	39	40	39
R-squared	0.962	0.909	0.962	0.947	0.981	0.943
Dependent Variable	ECO_t	ECO_t	ECO_t	ECO_t	ECO_t	ECO_t
Sectoral Share	Agriculture	Agriculture	Industry	Industry	Services	Services

Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Source: Fieldwork, 2020.

Consider now the influence of sectoral value-added shares on economic growth, after interacting the shares with the exchange rate. These shares interacted with inflation to determine their mediating effect on economic growth. The results first show that the net influence of the share of agriculture value added to total output is negative on economic growth. The effect of this variable is the sum of its coefficient and the coefficient of its interaction with the ex-

change rate, which is both statistically significant at the 1% level of significance. The results suggest that a one per cent increase in the share of agriculture value-added in total output would reduce economic growth by 0.053%, holding all other influences constant. These results are intuitive and suggest increasing shares of agriculture value-added in total output is not beneficial for economic growth in Ghana.

Similarly, the effect of the share of industry value added to total output is presented in the results shown in Table 6. The effect of this share of value-added in total output is also obtained by summing its coefficient, which is statistically significant at the 1% level of significance in the long run, and the coefficient of its interaction with the exchange rate. Therefore, the net effect of the share of industry value added in total output on economic growth is shown to be negative.

The results suggest that a one per cent increase in the share of industry value added in total output will reduce economic growth by 0.047%, holding all other influences constant. These results are intuitive and in line with earlier studies as they suggest that increased shares of industry are associated with declining economic growth over the sample period in the study.

Furthermore, the effect of the share of services value-added in total output is presented in the results shown in Table 6. The effect of this share of value-added in total output is also obtained by summing its coefficient, which is statistically significant at the 1% level of significance in the long run and the coefficient of its interaction with inflation, which is not statistically significant. In effect, the net effect of the share of services value-added in total output on economic growth, after accounting for exchange rates, is positive and statistically significant, such that a one per cent increase in services value-added in total output will increase economic growth by 0.0504%, holding all other influences constant. This finding is intuitive as it supports the findings of earlier studies that suggest that services have become a dominant engine of growth for developing countries in Africa and other literature that show that the economy of Ghana is largely dependent on value-added services like finance and banking.

Finally, the effect of the exchange rate is also seen to be non-linear, in line with the literature that has examined the effect of the exchange rate on growth. The net effect of the exchange rate is determined by summing up its coefficients and the coefficients of its interactions with sectoral share variables. The results, therefore, show that the exchange rate has positive and negative effects on the economic growth of Ghana in the long run, which is indicative of a non-linear effect.

This result is similar to findings of earlier studies like Ehigiamusoe and Lean (2019), Ahiabor and Amoah (2019), Mothuti and Phiri (2018), Ibarra and Trupkin (2016) and Nortey et al. (2015), who examine the relationship between inflation, exchange rates and economic growth. Furthermore, the results show that the regressions can explain between 90% and 98% of the variations in economic growth over the sample period in this study.

5. Discussion of Results

The results obtained in this analysis chapter infer the sectoral structure of the economy of Ghana and show how the structure interacts with inflation and the exchange rates to influence economic growth. The results have first shown that there is a negative relationship between inflation and exchange rates in Ghana, over the sample period that has been used in this study. This finding is well situated and intuitive based on the fact that the economy of Ghana is small and open and higher depreciation of the exchange rate will result in increases in the domestic price level. In this sense, the negative relationship is seen in that the value of the exchange rate decreases while inflation goes upwards. This relationship is detrimental to economic growth as it suggests that changes in the world marketplace for goods and services can easily influence domestic prices of goods and services and affect the real value of incomes.

Unfortunately, the structure of the economy has not changed much over time and the current discourse among policymakers focuses on how to use industrial policy to promote structural change (Chang & Andreoni, 2020). Until that fully materializes, the results from this study confirm that the economy of Ghana is largely driven by value-added services, which are currently contributing more to total output than industry and agriculture. Industry value added also makes some significant contributions to total output, although most of it comes from the mining of oil and other natural resources (Pauw, 2018).

With such a structure, inflation and exchange rates then have different effects on economic growth based on the sectoral structure of the economy in the long run and the results point to this issue. The results suggest that inflation impacts economic growth more through agriculture and industry and not through services. This can be seen from the statistical significance of the coefficients of interactive terms between inflation and the shares of agriculture value-added and industry value-added. This finding is also plausible in light of the structure of the economy in which most imports of agriculture and industry are mainly to support consumption and fixed investment. However, the interaction between services and inflation is not statistically significant, implying that inflation is not an issue for value-added services and economic growth over the sample period.

The results of the interactions with the exchange rate show a different picture. The interactions between the exchange rate and the value-added shares of agriculture, industry and services are statistically significant in the long run. This result confirms that the exchange rate works through all sectoral structures of the economy to affect economic growth in the long run whereas inflation only works through agriculture value-added and industry value-added.

With this picture, the real issue for policymakers should not be how to control inflation or the exchange rate. Instead, the focus should be placed on how to structure the economy of Ghana to take advantage of the dynamics of the global marketplace and reduce the influence of the exchange rate on the economy of

Ghana. In line with recent studies on the relevance of industrial policy and the need to position a developing country to be a net exporter, the power lies in the hands of the economic managers of the country to ensure that the macroeconomic policies work towards achieving the objective of sustainable growth.

6. Conclusion

The research concludes that there is a negative relationship between inflation and exchange rates in Ghana, over the sample period used in the study. This negative relationship is intuitive as it reflects the effect of the dependence of the economy on imports of final goods and services. Further, the sectoral structure of the economy of Ghana is dominated by services value-added, followed by industry value added and then by agriculture value-added. This structure is not unique to Ghana, as most economies follow this classification. However, the extent to which each of these types of value-added contributes to economic growth and development is important for human development.

The structure of the economy of Ghana has also evolved—from one which was dominated by agriculture value added to one that is now dominated by services value-added. This change in the structure has resulted from changes in economic policies and the adoption of liberalization policies that have allowed for more trade and free markets. Inflation and exchange rates have an impact on growth in Ghana when the sectoral structure is considered.

Each exchange rate, inflation and the sectoral dynamic have different influences on growth when the sectoral structure of the economy is considered. Inflation mainly influences growth through value-added in sectors that have more final consumables (agriculture and investment), but exchange rates influence growth through all the types of value-added in the economy of Ghana. These interactions, therefore, have implications for policy and macroeconomic management.

It is suggested that the real issue for policymakers involved in managing the economy of Ghana, should not emphasise how to control inflation or the exchange rate. Instead, policymakers should focus on how to structure the economy of Ghana to take advantage of the dynamics of the global marketplace and reduce the influence of the exchange rate on the economy of Ghana. In line with recent studies on the relevance of industrial policy and the need to position a developing country to be a net exporter, managers of the economy of Ghana need to consider all implications of generating a productive macroeconomic structure to ensure that growth is sustainable in the future. The government can also be very practical on the issue of structural change by using industrial policy to provide more incentives for domestic exports of products and services. These incentives will encourage firms to work hard and export their products so that they can reach a wider international market, whiles earning foreign exchange for the country. The government must take steps to reduce its import bill of goods and services. As the larger employer and the largest spender in the economy, the

government contributes to the unbalanced structure of the economy by paying colossal sums of foreign currency to foreign companies for its goods and services. Instead, the government can save up on the foreign currency, retain this as foreign reserves and use a bit of it to support the local companies and entrepreneurs. This will help citizens also develop a taste for goods and services produced locally.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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