Impact of Macroeconomic Fundamentals on the Performance of Automotive Industry in Selected African, Middle Eastern and European Countries

A Masters Dissertation
By
NANCY MOODLEY
Student Number: 32894163

Research Supervisor
PROFESSOR RAFIU ADEWALE AREGBESHOLA

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College of Economic and Management Sciences
University of South Africa

THE DECLARATION OF ORIGINALITY

I, Nancy Moodley, (Student no: 32894163), declare that the research dissertation titled: ***Impact of macroeconomic fundamentals on the automotive industry in selected African, European and Middle Eastern countries,*** is my original work, and no such work has been submitted to any other institution except for work obtained from other authors through the sources that I have used and quoted, duly acknowledged by means of complete referencing throughout the document.

Nancy Moodley   *May 2023*

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Signature: Nancy Moodley   Date

ABSTRACT

This study investigates the impact of the economic fundamentals on the performance of the automotive industry in selected countries within Africa, Europe, and the Middle East. The selection of countries allows for a comparison of more mature markets (in Europe) as opposed to developing countries (in Africa and the Middle East). Literature suggests that there is a direct correlation between an adverse macroeconomic environment and poor automotive industrial performance. It is widely accepted that the automotive industry is one of the most important industries that drive the economy. The degree in which a country is able to enhance its own citizens' quality of life is the fundamental metric to measure growth, of which ease of transportation is central.

Using various econometric techniques, this study investigates the impact of economic variables (macroeconomic fundamentals) on the performance of automotive industries through vehicle sales and production, in selected countries that span both advanced fiscal and monetary systems as those in the European region, as opposed the more fledgling economies in Africa and the Middle East. The macroeconomic fundamentals that were considered relevant in this study include inflation, per capita economic growth, exchange rates, interest rate and unemployment. Human capital and skills development also play notable roles within this industry – as suggested in the review of literature.

The empirical results from various statistical analyses suggest that the performance of automotive industry – either measured through production or sales volume, are characterised by regional specificity. That is, the factors that influence the performance of this industry varies widely across the sampled regions. For instance, the results suggest that income level, unemployment, exchange rates volatility and inflation play significant roles in influencing the performance of automotive industry in Africa region, while exchange rates and skills development are central to the performance of automotive industry performance in the Middle East. However, none of the macroeconomic variables deployed in this study is found to play any significant role in the performance of automotive industry in Europe region.

In practice, the uniqueness of Europe region in both problem identification and solution-seeking distinguished the market's advancement from the other two emerging regions. Based on the results, this study suggests that unemployment, exchange rates volatility and inflation should be

curbed in Africa to improve the performance of the industry. The role of skills development is also documented, thereby requiring strategic government intervention. The need to grow the economy in a sustainable way is also identified as one of the influencing factors of the performance of automotive industry in Africa. In the Middle east however, the role of exchange rates volatility is prominent. It is therefore suggested that the exchange rates regime should be stabilised in order to grow the industry. The factors that influence the performance of automotive industry in Europe are unique and falls outside of the measurable indicators used in this study. This suggests that governments in the European countries should look beyond macroeconomic fundamentals to grow the industry.

DEDICATION

This research is dedicated to the Faculty of Economic and Management Sciences at the University of South Africa, in the hope that it will add some value to the pool of research within the automotive industry.

I dedicate this study to my dad in heaven, and my mum, who both endured difficult challenges, lived an extremely humble life, and sacrificed a great deal to ensure that my sister and I received an education. Thank you for empowering me.

ACKNOWLEDGMENTS

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CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction

Transportation is one of the most significant and essential of commercial products in modern civilization (Rahim et al., 2021). To make it possible for people to move about and for goods to be carried in a safe and timely way, it is necessary to have a method of transportation that is dependable and efficient. In order to address this need and customer demand, automotive manufacturers have created a wide variety of automobile variations and models and variations within those models, particularly with regard to passenger cars. Passenger cars continue to be in high demand; according to the Organization of International Automobile Manufacturers (OICA), the global output of passenger vehicles increased by 56 per cent between 1997 and 2011. Just 38 million automobiles were created worldwide in 1998, while 60 million were manufactured in a single year during the 2000s (Akampumuza, Wambua, Ahmed, Li & Qin, 2017).

It is widely accepted that the car industry is one of the most important industries in any nation, and that it contributes significantly to a nation's economic growth. This industry is often referred to as the 'industry of industries', since it has economic effects both 'backward' and 'forward' (Myer, 2019). In this age of globalisation, the performance of this sector has taken on special relevance owing to its dependence on macroeconomic factors at play in the worldwide flow of goods and services. The rising significance of the automobile industry to the overall economy of every nation has driven researchers and decision-makers to examine the sector's many complex dynamics, particularly the role that it plays in the stability of the economy. Due of its relevance, administrators and decision-makers have placed considerable attention this industry. Some earlier research on the automobile sector have examined the impact of macroeconomic environmental fundamentals on the industry's performance. According to Dargay and Gates (2018), most research has been conducted in developed countries and regions, while developing markets have been largely ignored, despite the high potential for growth in these countries. In addition, the bulk of research has concentrated on a small number of macroeconomic indicators. For these reasons, the current research examines African markets among other more established markets and strives to employ stringent and trustworthy data on which to base its findings.

The study seeks to give a comprehensive evaluation of the automobile industry in a variety of African, European, and Middle Eastern nations. The degree to which a country is able to enhance its own citizens' quality of life is the fundamental metric by which its prosperity is judged (Peres, Barata, Leitao & Garcia, 2019). This variable is generally evaluated through the metrics of the national accumulation of capital, the growth of human capital, and per-capita income. In this study, other macroeconomics fundamentals will be considered like inflation, interest rates, currency exchange rates, and unemployment rate. In Chapter Three, which covers the Rresearch mMethodology, the relevancerelevance, and method of acquiring data on each of these measurable indicators, are further explained.

Human capital is crucial to the functioning of any sector in a nation's economy, since skilled human capital leads to the enhanced competitiveness of this industry (Pavlínek, 2020). Similarly, technological progress and a country's adoption of newer, more modern technologies is crucial to the evolution of a national economy – and to the evolution of the automotive industry. This is due to the fact that technical progress and the adoption of newer, more sophisticated procedures have the potential to cut costs and boost production (Fagerberg & Verspagen, 2018).

1.2 Background to the Study

According to Fraga-Lamas and Fernández-Caramés (2019), the best way to evaluate the status of an economy is through the use of macroeconomic metrics. Important components of the macro economy include gross domestic product, consumer price, interest rate, exchange rate, the stock market index, and the consumer price index. In addition, currency rates and government expenditure are crucial. There is a correlation between the state of an individual national economy and the many macroeconomic variables that influence it, so that for a national economy to flourish, macroeconomic factors have to remain relatively stable. In addition, a variety of macroeconomic factors and national economic factors will affect the individual firm, preventing or supporting its expansion. Of course, the success or lack of it of individual firms has a reciprocal effect on the economy as a whole. Thus, macroeconomic issues have a significant impact on the car sector (Rahim et al., 2021).

There has not been a great deal of studies on how the automotivecar sector influences macroeconomic aspects, and vice versa, particularly in Middle Eastern nations. A review of

existing literature reveals that changes in fuel prices, loan interest rates, unemployment rates, and income levels affect the car manufacturing sector, and, naturally, the economy.

According to Fraga-Lamas and Fernández-Caramés (2019), a significant rise in the price of gasoline might have a negative impact on the overall performance of the sector. It has been determined that this component makes it difficult for consumers to anticipate operating expenses, which could affect the entire cost of manufacturing a car. The costs of manufacturing a car affect the value of the asset and the numbers of cars that buyers are willing to purchase. This finding was reached in Lee and Ni's (2002) analysis of 14 industrialised nations.

It has been determined that rising fuel prices affect the industrial sector's capacity to deliver commodities and alter consumer demand for industrial goods, particularly automobiles, according to Pichler, Krenmayr, Schneider and Brand (2021). Their study Pichler, Krenmayr, Schneider and Brand (2021)further showed that as the price of fuel has risen, European customers' interest in purchasing smaller vehicles has increased. Other factors examined by Pichler et al. (2021) were level of income, interest rate, financial aggregate, and unemployment rate. Sharma, Kumar, and Park's (2018) research on local and international sales of personal care goods is one of the studies that also pays attention to macroeconomic factors. According to Sharma et al. (2018), albeit a different industry but still derives relevance, mentions, any variable might have a significant impact on the success of a business.

Pavlínek (2020) investigated the relationship between monetary policy and the quantity of automobiles sold, which was believed to be influenced by the availability of auto loans. It was shown that a rise in the prime interest rate has a significant negative impact on automobile sales, which in turn affects the overall performance of the automotive industry. Dargay and Gately (2018) explain that this is owing to the inability of commercial banks to provide auto loans when prime interest rates are high. According to research conducted by Sharma et al. (2018) on automobile ownership in 26 countries between 1960 and 1992, the predicted rate of car ownership in low-income nations during the two decades to 2015 was high. It was also anticipated that economies such as Saudi Arabia, Iran and Italy would experience a similar rise in car sales (Brenner & Hermann, 2017). This is because these nations had great prospects for rapid economic expansion in that period.

In contrast, while per-capita wealth increased in Morocco, Germany and South Africa, the number of automobile owners increased by a ratio of two. Dargay and Gately (2018), using data from the Family Expenditure Survey from 1970 to 1995, discovered that the number of automobile owners increased as wages rose. Conversely, when incomes declined, there was a substantial reduction in automobile sales. This correlation is to be expected, and expresses how customers behave on a personal level, since an automobile is seen as a necessity in contemporary life and is a priority purchase when consumers have the necessary income.

In Africa, Europe and the Middle East, however, very little research has been conducted on this issue. Currently, most research in these regions focuses on policy- and development-oriented matters, and not on the automobile manufacturing sector.

The primary objective of this study is to determine how macroeconomic fundamentals influence the success of the car sector in selected African, European and Middle Eastern countries.

1.3 Problem Statement

In~~According to~~ the literature reviewed, there is a considerable correlation between an adverse macroeconomic environment and poor industrial performance. This is owing to the fact that a poor macroeconomic environment may significantly increase the risk of loss and make it difficult for enterprises to retain their capital (Dargay & Gately, 2018). According to Maldonado-Guzmán, Garza-Reyes and Pinzón-Castro (2020), changes in the general price level have a detrimental effect on the pricing of assets such as automobiles. According to Buruzs and Toma (2018), the arbitrage pricing theory demonstrates that the primary sources of risk for the majority of enterprises are macroeconomic factors. Therefore, the performance of every organisation is dependent on the variation of macroeconomic factors (Gromova, 2019).

Additional study into the link between the success of the automotive sector and macroeconomic issues reveals that inflation, currency rates and interest rates have all had a negative impact on the industry's performance in South Africa. Gromova (2018) conducted research to determine how various macroeconomic conditions influenced the performance of firms on the Johannesburg Stock Exchange (JSE). He discovered that interest rates, inflation, money supply, GDP (per capita) all had a strong and substantial positive link, but the

exchange rate had a strong and significant negative association with these variables. It is crucial to note, however, that littlenone of the previous studies have addressed the topic of whether or not macroeconomic factors influence the performance of the automotivecar sector. Thus, this study tries to fill the gap by addressing the specific question: What is the influence of macroeconomic fundamentals on the performance of the automotive industry?

1.4 Research Objectives

The main objective of this study is to investigate the influence of macroeconomic fundamentals on the performance of the automotive industry, in specifically for a few selected African, European and Middle Eastern countries. The sub-objectives are as followsto:

1. ETo establish the possible relationship between economic growth and the performance of the automotive industry.
2. ETo establish the possible relationship between fiscal policies and the performance of the automotive industry.
3. ITo investigate the possible relationship between monetary policy and the performance of the automotive industry.

1.5 Research Questions

1. What is the relationship between economic growth and the performance of the automotive industry?
2. What is the relationship between fiscal policies and the performance of the automotive industry?
3. What is the relationship between monetary policies and the performance of the automotive industry?

1.6 Research Design and Methodology

This section of the study describes the overall methodology used in the research. It includes the research design, target population and methods of data collection and analyses with respect to collecting and analysing data when investigating the influence of macroeconomic fundamentals on the performance of the automotive industry in selected African, European and Middle East countries.

1.6.1 Research Design

A research design is a plan, roadmap or blueprint that may be used when conducting an investigation in order to provide answers to the research questions (Gaber, 2020). This study makes use of a descriptive design and a quantitative approach in order to fully explore the topic in question. A descriptive design was used for this research as it allowed for an evaluation of macroeconomic variables that affect the performance of the automotive industry.

The overall research methodology was quantitative rather than qualitative, although some degree of qualitative data was used, especially in Chapter Two, the literature review. Qualitative research is a descriptive research paradigm in which the researcher explores a phenomenon holistically (Dzwigol, 2020). Therefore, a qualitative study is often exploratory in nature, because the subjective, descriptive approach to data collection allows a researcher to cast a wide net that ensures the capture of all relevant issues (Schulz, Niero, Rehmann & Georg, 2021). By asking open-ended questions that do not presuppose answers and continuing to conduct research until the perceptions of the population of interest have been thoroughly explored, qualitative research allows the researcher to create a very complete depiction of the underlying subjective reality (Grodal, Anteby & Holm, 2021). With This makes the qualitative approach especially ~~well suited~~well-suited to examining perceptions (Gaber, 2020) and to answering research questions of 'what' or 'how'.

In this study, most of the 'what' and 'how' questions, however, were answered by drawing conclusions based on quantitative data. Due to nature of this study deducing a relationship between the independent and dependant variables, quantitative approach is a more ideal fit. Very few earlier studies have explored the African, European and Middle Eastern automotive industry and how it is affected by macroeconomic fundamentals, so that there was little known already through which to operationalise constructs.

Quantitative research is, by nature, an empirical, closed-ended type of research that is suited to examining numerical or quantifiable issues (Benoit, Watanabe, Wang, Nulty, Obeng, Müller, & Matsuo, 2018). Furthermore, the quantitative approach allows a researcher to achieve a degree of certainty in the results of a study through statistical power and sample size (Patel, Shah & Shah, 2020). By selecting an appropriate sample size through power

analysis, the quantitative researcher may achieve results that can be assured to hold true with a high degree of certainty.

This makes quantitative research a strong choice when large sample sizes are available, as was the case in this study. However, a disadvantage to keep in mind of quantitative research is that it requires a significantly deeper theoretical grounding than other studies might require, so that the variables under study are both well understood and easily quantifiable (Kabukcu & Chabal, 2021). All of this made quantitative research a good fit for the study. Large sample sizes were available in terms of national and international data on the performance of auto-related industries at the national level for various African, European and Middle Eastern countries. However, it must be admitted that the advantage of using both the qualitative and quantitative approach is that each approach is able to offset the weaknesses of the other. However, the suitability of methodology would also tilt towards a preference at the expense of the other – in this case, quantitative rather than qualitative.

1.6.2 Data Sourcing

The data of interest in this study was ould be automotive industry specific performance indicators linked to both the manufacturing and new vehicle sales. Quantitative research requires a large sample size that is accurate, official, regulated and across a period. With Europe & Middle East, which are more established or advanced markets the stability and integrity of the automotive data is well maintained. The maturity of the market does play a critical part in sustaining the industry bodies and& data integrity, where policymakers and officials are integrally involved in the process of regulating, supporting and overseeing the automotive industry.

In Africa, however with varying degree of maturity levels across the various countries sourcing the most accurate and widely accepted data will be critical to this study. As quantitative research is more scientific and mathematical in nature, the objective of a quantitative study is to deduce relationships or investigate a hypothesis through statistical analysing a relationship or trend of one data set to another. (Gaber, 2020).

Thus, the data was drawn from specific countries selected across Africa, Europe and the Middle East, taking into consideration the availability, maturity level and integrity of the data to represent their continents. In Africa, South Africa, Nigeria, Algeria and Egypt were

selected; In Europe, Germany, Italy, the Netherlands, Turkey and the United Kingdom were selected, and in the Middle East, Pakistan and Iran were selected.

These countries were chosen as the focus of the study because they allow for varying degree of maturity levels within the auto industries with the available data required. Having these auto industries with a significantly higher number of cars per capita makes within their respective continents, these countries are useful examples that may be studied to guide the development of other nations in terms of both developing an auto industry and managing the influence of macroeconomic fundamentals.

1.7 Chapter Summary

This chapter has introduced the problem and the background toef the study and the problem statement. It has briefly discussed the factors that may affect the performance of the automotive industry in the selected countries and as well highlighted the objectives and research questions of the study.has presented the research questions and objectives. The chapter has also examined covered the methodology used in the study, details of which are presented in Chapter Three. The next chapter (chapter two) discusses the literature review in line with the area of interest and objectives of the study. would present a review of the literature in the area of interest.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Few studies have been conducted that examine the link between the success of the automobile sector and the performance of macroeconomic indicators, particularly in the Middle Eastern and African nations. After examining the studies that do exist, the researcher was able to identify a number of elements that have the potential to impact the performance of the automobile sector. These include gasoline price changes, variations in interest rates, unemployment rates, and family income levels (Hanaysha, Saleh, Hussain, Lee & Bakar, 2021).

According to research conducted by Smith, Coleman, Bacardit and Coxon (2019) and Shedlock and Vos (2018), a considerable rise in the price of gasoline might influence the overall performance of the sector. It has been shown that this component may cause unpredictability in operational expenses, which may have an effect on the overall costs of automotive production. This has repercussions not just for the value of assets, but also for consumer demand.

In addition, it has been established that a rise in the price of gasoline produces supply problems in the industrial sector and has a detrimental effect on consumer demand for industrial goods, notably vehicles. This is because people are less inclined to acquire expensive items when prices are high. Smith et al. (2019) offer evidence that a rise in the price of fuel has encouraged European consumers to shift their preferences toward smaller automobiles. This preference change might be ascribed to the desire of customers to minimise their total fuel use. Several other parameters, including the interest rate, the total income of households and the unemployment rate were also evaluated. Some of these factors are listed in the findings of a study conducted by Shahabudin, Mofijur, Fattah, Kalam, Masjuki, Chowdhury and Hossain (2022) on local and international sales of automobiles. According to Shahabudin et al. (2022), the performance of the automotive sector can be impacted by numerous other environmental factors, which have been highly prevalent in recent times.

Borg, Englund, Wnuk, Duran, Levandowski, Gao, Tan, Kaijser, Lönn, and Törnqvist (2018) conducted a study to examine the effects of monetary policy on automobile sales, finding that the number of bank loans available for the purchase of automobiles had a direct effect on sales. According to this research, a rise in the prime interest rate has a considerable negative effect on automobile sales, which in turn affects the overall performance of the automotive sector. Borg et al. (2018) stated that this was due to the incapacity of commercial banks to give loans to those seeking to purchase automobiles. According to Sharma et. al, who conducted research on vehicle ownership in 26 countries between 1960 and 1992, reported that the estimated rate of car ownership in low-income nations during the two decades to 2015 was anticipated to be high. The researchers reached this result after analysing the data from 1960 to 1992. Researchers have also anticipated that equivalent statistics would be reported in other economies, such as Saudi Arabia, Iran and Italy, among others (Brenner & Hermann, 2017). The reason for this is that these nations have great hopes that their economies will see tremendous growth in the next few years.

In contrast, in Morocco, Germany and South Africa, the number of car-owning households has climbed by a factor of two, proportional to the increase in per-capita income in those countries. The reason for this is the improving quality of life in these developing nations. Using data from the Family Expenditure Survey gathered between 1970 and 1995, Butsing (2022) is covered that automobile ownership statistics showed a positive upward trend in tandem with a growth in family income, based on data gathered by the US Census Bureau. In addition, the researcher revealed that a negative association exists between the two variables (car sale and family income) when incomes decrease. This is related to the personal practises of consumers, since car ownership is often seen as a critical need in the context of modern life.

On the other hand, Africa, Europe and the Middle East have not been the subjects of much study on this topic. The limited number of studies that are currently accessible mostly investigate policy-oriented research and development (Manello & Calabrese, 2019). Little empirical research has been conducted to study the link between the success of the automobile sector (which may be assessed by analysing a company's vehicle sales figures) and macroeconomic factors, and those that have been conducted have produced inconclusive results. The purpose of the current research was to examine the connection between the performance of the automobile sector and key macroeconomic indicators. An

examination of previous studies reveals a number of different elements with the ability to affect the performance of the automobile sector, including fluctuations in the cost of gasoline, interest rates on loans, unemployment rates and income levels.

This chapter gives a comprehensive analysis of the findings of other researchers regarding the relationship between the automotive sector and macroeconomic factors. The chapter begins by presenting a review of historical trends in the automotive industry in Africa, Europe, and the Middle East.

2.2 Historical and Trend Analysis of the Automobile Industry in Africa

Comparing Africa automobile market to Asia and Europe, Africa ~~In comparison to markets in other continents, such as Asia and Europe, Africa's aa~~utomobile market is underdeveloped. In 2014, Africa, which has over one billion inhabitants, had little more than 42.5 million registered automobiles. Currently, there are only 44 vehicles per 1000 persons on the whole continent (Goelles, Schlager & Muckenhuber, 2020). However, in 2015 alone, around 1.55 million brand-new automobiles were purchased or registered in Africa. Together, the well-established and rapidly expanding auto industries of South Africa, Egypt, Algeria and Morocco sold more than 80 per cent of all new automobiles produced worldwide in 2015 (Goelles et al., 2020).

According to some experts,~~-~~ based on current sales trends, Africa might sell up to 10 million passenger automobiles per year during the next 15 years (Arenas & Palacios, 2022). This estimate was derived by analysing data from the previous several years. The number of new automobiles (both passenger and commercial vehicles) sold and registered on the continent increased at a compound annual growth rate (CAGR) of 3.6 per cent between 2005 and 2015 ~~The whole market expanded at the same time~~ (Arenas & Palacios, 2022).

~~While~~Although these figures predict well for the automotive industry, African consumers continue to have less purchasing power than consumers in other emerging economies. In addition, there has been a recent decline in the rate of motorisation, sales and registrations of new automobiles. Long-term, the automobile market on the continent offers enormous untapped potential and t~~. This~~ is the most crucial aspect b~~. Be~~cause new automobiles are costly and consumers have little discretionary income, the used car market is the largest in the continent's automotive retail business (McKinsey, 2016).

The majority of these second-hand automobiles have been imported from foreign nations. Bai (2017) believes that at least eight out of ten of the vehicles shipped into Ethiopia, Kenya and Nigeria are sold as new vehicles which are referred to as grey imports. A critical point to take note of is that these grey imports are not documented or registered as a new vehicle or subjected to duty fees. The researcher investigated the market and reached this conclusion based on his or her findings (ACEA, 2017; Bai, 2017). This is a typical occurrence in the region, since Africa imports four times as many car components as it exports. Imports of car components in 2014 reached $48 billion, whilst exports were just $11 billion (Stoycheva, Marchese, Paul, Padoan, Juhmani & Linkov, 2018). A considerable number of automobiles travelling to East Africa pass through the Middle East en route. As in the United States (US), Europe and Japan, used vehicles and trucks are a major industry in Africa and has a direct impact on performance of the new car sales and production.

From 2003 and continuing to the current day, the middle class in Africa has increased substantially. This has occurred at the same time as the per-capita GDP has increased. The high pricing of commodities has lent credibility to this notion. In 2014, South Africa was the source of 75 per cent of Africa's car exports and 15 per cent of Africa's vehicle imports. This made South Africa the leading auto-trading nation in Africa (McKinsey, 2016). South Africa, Egypt, Morocco and Algeria all have significant automobile manufacturing and assembly businesses.

In 2015, fewer than 900,000 automobiles were manufactured on the African continent, despite the fact that South Africa and a number of North African nations had produced automobiles for decades. This represented little more than 0.9 per cent of all automobiles manufactured worldwide. Therefore, less than 0.1 per cent of the world's automobiles were manufactured on the continent (Goelles et al., 2020). In the majority of the remainder of the continent, the retail sector dominates the automobile industry. As a consequence, there is a reoccurring trend of a limited number of brand-new automobiles and a significant rise in the number of old automobiles entering the nation (Goelles et al., 2020).

Despite the fact that the manufacture and assembly of automobiles in Africa has the potential to wield a significant positive effect on the economy and help industrialise and diversify it, this aspect of growth is still at a nascent stage. Because of this, the sector has become an excellent option for governments that wish to create more manufacturing employment, earn

more money from exports in various ways, and ultimately industrialise their economies (Arenas & Palacios, 2022).

South Africa is the continent's crown gem when it comes to automobile manufacturing, since other African markets have not yet produced significant investment prospects. Over the next five to 10 years, it seems that the majority of OEM's (Original Equipment Manufacturer) and policy makers will strive to attract additional skilled individuals to run the automotive sector. The North African countries of Morocco, Tunisia and Algeria have also performed well in this field. This is partly because exports in the Strait of Gibraltar are strong and there are free trade agreements in place, which has boosted international investments in these nations (Dynaquest & Berhad, 2018). However, South Africa's performance remains the best on the African continent. In 2017, the nation sold over 356,000 new light automobiles, far more than second-place Morocco, which sold around 155,000 units. Egypt and Nigeria are now the two most significant markets, each selling around 100,000 units per year (Dynaquest & Berhad, 2018).

 Although it is difficult to estimate how many new light automobiles are sold annually in some African markets (Ludvigson, 2017). However, what is clear is that owing to the limited purchasing power of most African customers, the number of second-hand automobiles imported from other nations is high. This indicates that assembly and manufacturing facilities in Africa are not only in competition with one another, but also with the secondary market to a significant degree. As stated in Stoycheva et al., when the organisation looks at nations such as Nigeria and Kenya, it considers both new and used automobile sales (Stoycheva et al., 2018). Furthermore, their Their study also estimates the total number of new and used automobiles sold in Kenya is approximately 67,000, whereas in Nigeria, where the economy is in disarray, the number of cars registered each year has fallen to approximately 10,000 units, (Stoycheva et al., 2018).

2.2.1 Consumer dynamics

Even after a developing market economy has failed to recover from the aftershocks of an economic crisis, sales of premium and luxury vehicles often remain robust. This is particularly true for developing economies. Even after a developing market's economy has failed to recover from whatever shocks it may have experienced, sales of premium and luxury vehicles often remain robust. This is particularly true for developing economies (Tubaro & Casilli,

2019). This pattern is still apparent, although to a lesser extent, in several regions of Africa today. In Africa, the concept of what constitutes a luxury car is somewhat different from in other markets. Some Nigerian consumers, for instance, classify a full-size Toyota SUV as a luxury car rather than an SUV. In reality, the market for sport utility vehicles (SUVs) in Africa makes a major contribution to overall vehicle sales. According to, Sinha and Matharu (2019), South Africa performance in the luxury front seems to be doing fairly well, despite the South Africa economy not being as as strong as other growing economies such as Russia (Sinha & Matharu, 2019).

Moritz et al. (2019) observed that brands such as BMW and Mercedes-Benz are producing a significant number of vehicles, with both companies thriving in South Africa. Mercedes-Benz has also pledged to increase its investment in domestic manufacturing, and the business plans to manufacture a number of AMG models in the United States. The topography of various African nations has a small but discernible impact on the demand for sport utility vehicles and pickup trucks (Tubaro & Casilli, 2019), since roads are generally considered poor.

The Toyota Hilux was the most popular new car sold in South Africa for the month of February 2018, reflecting the company's dominance in many market areas. 'SUVs do extremely well in Africa since there are few quality roads in some areas,' states Gatwabuyege, cited in Sinha and Matharu (2019). 'As a consequence, many consumers choose SUVs or crossovers for their greater comfort and ride height' (Sinha & Matharu, 2019, pp.34). Poor roads are also one of the reasons that the pick-up market in Africa is strong, with vehicles such as the Ford Ranger, Nissan Navara and the Toyota Hilux selling well, including in South Africa.

2.2.2 Assembly operations

The typical buying power in the majority of African nations is still fairly low, and the great majority of vehicles registered in these markets as local production is mostly based on CKD's (Complete Knocked Down) are new vehicle parts importeded and assembled locally. This is despite the fact that these Africa areas is are home to some of the world's most rapidly expanding automobile markets and is seen as the last frontier for growth. Nonetheless, government funding & policies across Africa is supporting and directed is available that might to assist with the expansion of local manufacturing ventures and with a reduction of reliance on imported automobiles and components. Gatwabuyege (cited in Sinha & Matharu, 2019)

made the remark that many African nations are leaning toward the policy of aiming to increase their own local vehicle production and are considering placing higher taxes on imports brought into their country. By implication, efforts are being directed in many African countries towards adopting a strategy to nurture local automobile supply chains and to cultivate the culture of local automobile production (Gatwabuyege, cited in Sinha & Matharu, 2019).

The vast majority of automobiles sold in Africa are still assembled using the complete knock-down (CKD) technique as opposed to full line assembly, despite the fact that localisation is a topic that has received considerable attention over the past years (Tubaro & Casilli, 2019). On the continent, there are probably no more than a few dozen factories capable of producing full-size automobiles. BMW's Rosslyn facility in Pretoria, South Africa, is one of Africa's most renowned vehicle manufacturing sites. This facility is responsible for manufacturing of all six previous iterations of the BMW 3 Series (Dynaquest & Berhad, 2018). BMW decided to terminate manufacture of the 3 Series after the first half of 2018 and to release the X3 as a straight successor.

The Renault-Nissan manufacturing complex in Tangier, Morocco, which includes a press shop, body assembly facility, paint shop and final assembly building is also a significant facility (Dynaquest & Berhad, 2018). The plant is responsible for manufacturing a variety of Dacia models; however, almost all of them are shipped through Tangier Port, destined for Turkey, various nations in Europe, the United Kingdom, and other parts of Africa. Large assembly plants for Ford and Mercedes-Benz are located in South Africa. Volkswagen and PSA also have substantial assembly factories in southern Africa, located respectively in Algeria and Namibia (Faisal, Yigitcanlar, Kamruzzaman & Paz, 2021).

InAt addition, Ford runs a factory in Struandale in the city of Port Elizabeth, for the production of engines for the Ranger pick-up truck and the Everest SUV. However, Gatwabuyege (2018) concurs with other authors in observing that in the vast majority of African markets, components are imported and assembled. This applies to countries such as Nigeria, Kenya, and Ethiopia, among others. Since production and assembly plants have little incentive to invest in specialised manufacturing facilities, it is doubtful whether this technique for car production in Africa will change in the near future (Tubaro & Casilli, 2019).

Given the present economic environment, the majority of African markets are better served by producing their own automobiles from components than by importing fully assembled new vehicles, as this method is both more efficient and less expensive. There is also the natural competition between the sales of new and used automobiles. Gatwabuyege, cited in Tubaro and Casilli (2019), is of the opinion that automobile manufacturers should keep assembly operations for at least the next five years.

Several macro trends affect the economic growth of key areas in Africa, but the anticipated construction of a continent-wide free trade zone is one of the most critical variables that might have far-reaching effects on the African automobile sector (Babayemi, Nnorom, Osibanjo & Weber 2019). During an official summit held in Kigali, Rwanda's capital, at the start of March 2018, 44 of the 55 African Union members agreed to the formation of the African Continental Free Trade Area (AfCFTA) (Secinaro, Brescia, Calandra & Biancone, 2020). It is anticipated that the agreement will increase the volume of trade between African nations by more than fifty per cent. This is because member countries would eliminate import taxes on ninety per cent of diverse products.

The deal has not yet been approved by all parties. It is significant that Nigeria has expressed objection to the pact, and has not yet signed the document committing itself to comply with the terms of the treaty. Many interested parties have also brought up the fact that South Africa did not sign; however, the South African Minister of Trade and Industry subsequently informed the media that the nation had 'no objections or disputes' and delayed the process for purely technical reasons. The President of Nigeria, Muhammadu Buhari, is concerned about the possible detrimental effects that the AfCFTA may have on his nation's industrial production capacity. On March 21, 2018, he tweeted, 'We will not agree to anything that undermines local manufacturers and entrepreneurs or makes Nigeria a dumping ground for completed products' (Secinaro et al., 2020). On one hand tThe government of Nigeria has made it clear that more conversations on the topic are necessary. On other hand, the Nigerian law firm Kusamotu & Kusamotu has emphasised the advantages of growing intra-African business, which now accounts for around 17 per cent of Africa's total trade. According to research from March 2018, quote: 'the African continent has historically traded more with the rest of the world and very less with itself'. This was said in the context of the research that "the African continent has historically conducted greater commerce with the rest of the world. In addition, a rise in foreign direct investments in local firms is anticipated. Fabrice

Gatwabuyege (2018), research analyst at BMI Research, is quoted as stating in *Automobile World*: 'Should the AfCFTA enter into force, it would have far-reaching advantages for the African automobile sector.' If the AFCFTA is passed, it will benefit the African car industry in a variety of ways (Babayemi et al., 2019).

2.2.3 Localisation

Several African nations' marketplaces have implemented measures to foster the development of their industrial sectors. In most cases, these policies entail levying tariffs on imported completed automobiles and providing funding to domestic automobile manufacturers. Johan Gemback, Sales Director, Sales Trucks Africa and Asia-Pacific for Scania, said in 2017 that the business would not establish small-scale local manufacture if import taxes were not reduced (Miglani, 2019). He is quoted as saying, 'Since it would often increase our expenses, we would not engage in low-volume local manufacturing", (Miglani, 2019, pp.12). The idea of localisation was also supported by Karim Tinawi, head of Portfolio Planning and Programme Management at General Motors North Africa. He said, 'Regardless of the project we're working on, we want to increase local content with our Egyptian vendors' (Lamb et al., 2021, pp.54).

Vehicles are often exported to Africa as CKD ('completely knocked down') assembly kits rather than being constructed from start on the continent. Many individuals believe that more of these kits should be produced on the African continent as opposed to being imported from other continents. In 2017, the executive director of the National Association of Automotive Component and Allied Manufacturers, Renai Moothilal, said, 'We want more CKD kits to come from South Africa' (Babayemi et al., 2019, pp.8). According to Miglani (2019), all South African assembly factories use CKD kits. He, too, has expressed the desire for more CKD kits to originate in South Africa.

2.2.4 Consumer spending

As a direct result of the fact that most African consumers are still attempting to overcome poverty, their purchasing power is severely constricted. In 2017, the International Organization of Motor Vehicle Manufacturers (OICA), which has its headquarters in Paris, announced that the number of new passenger cars sold in Africa in 2017 decreased by 12 per cent, falling from 979,014 in 2016 to 862,014 in 2017 (OICA, 2017).

As a consequence, the market for new autos in many African countries is undercut by imports of used vehicles from other nations. According to an article published in *Automotive World* in 2018 and written by Indraneel Bardhan, of EOS Intelligence (Bao & Bardhan, 2018), 'Most consumers struggle to finance new vehicle purchases due to their lower purchasing power, a challenge that is exacerbated by the lack of appropriate vehicle financing options (pp.43).' Sutherland (2020) also observed that people are flocking to imports of pre-owned automobiles from the United States, Europe and Asia, as opposed to buying brand-new automobiles. It is anticipated that a growing middle class in more industrialised African nations will stimulate e-commerce, which will in turn stimulate the growth of the market for commercial automobiles; however, stakeholders are uncertain as to when this influence will be realised.

2.2.5 Dealing with emissions

There has been a rise in the number of older automobiles imported from other nations into Africa, which has affected the air quality in Africa. Currently, this issue is garnering growing attention. Increasing the cost of imported cars is one possible measure that governments of a number of nations are considering in order to reduce the amount of pollution caused by automobiles (Kongsberg, 2019). Gatwabuyege (2018) states that as a result of this problem, a number of East African markets have begun to impose import restrictions on automobiles, including restrictions on the kinds of vehicles that may be imported into the country. These previously owned vehicles are responsible for a great deal of air pollution.

Urban regions are seeing a move away from the use of private automobiles. Accra, the capital of Ghana, is seeing an increase in both the volume of traffic and the amount of pollution caused by vehicles, both of which are exerting a tremendous negative effect on the ecosystem of the city. Through cooperation between the Ghanaian government and the company Scania, a bus rapid transit system (BRTS) has been constructed in Accra and the local administration has implemented a variety of measures to promote the use of public transit (Kongsberg, 2019). In similar vein, the South African government is under intense pressure to adopt fuel efficiency standards for newly manufactured automobiles. It is predicted that if such standards were to take effect, there would be an immediate reduction in the volume of emissions produced by vehicles, (Vanderschuren & Jobanputra, 2005)

According to a study undertaken by the International Council for Clean Transportation (ICCT), a brand-new passenger vehicle in South Africa produced an average of 148 grammes of carbon dioxide per kilometre in 2015. This figure is 22 per cent more than the average CO_2 emissions produced by a new passenger car in Europe, which is 121g CO_2/km (Cilliers, 2018). If original equipment manufacturers in South Africa were required to satisfy a 95g/km CO_2 emission target by 2030, the typical South African vehicle would use 36 per cent less fuel than current models. In addition, this would result in an annual decrease of 4.1 per cent in the average CO_2 emissions created by South Africa's passenger vehicle fleet (Cilliers, 2018).

2.2.6 The situation in Morocco

South Africa is the largest market for new automobiles in Africa. It is also home to a large number of foreign automakers (Kongsberg, 2019). On the other hand, Morocco has lately received a substantial amount of investment in the automobile sector and is rapidly becoming a major exporter of automobiles. Despite the fact that there are only two automakers in the country – Nissan and PSA Group – many suppliers from all sections of the value chain have established themselves there (Kongsberg, 2019).

In reality, there is a possibility that the country's export links will be used, and there is also a possibility that these assembly firms will be supplied with the necessary components. Tangier Port is located near one of the major shipping channels, the Gibraltar Strait. It is from Tangier that almost all of the Morocco-made Dacia automobiles are sent to destinations across the globe (Kongsberg, 2019). Ficosa, a Tier 1 supplier, discovered that it can generate revenue by exporting from its Rabat factory and announced that it would export every camera it produce for sophisticated driving assistance systems (Kongsberg, 2019). South Africa is the only other African nation with a larger market for brand-new automobiles than Morocco's.

2.2.7 Future opportunities

In order to diversify their sales and reduce their risk in light of the ambiguity surrounding the future composition of the North American Free Trade Agreement (NAFTA) and the lack of clarity surrounding the potential effects of Brexit, global manufacturers across the value chain are eyeing investment opportunities in new emerging markets. This is occurring at a time when there is also a lack of information around the potential consequences of Brexit (Sutherland, 2020). Those seeking not only to reduce their dependency on previously established markets but also to capitalise on the prospects given by a market undergoing

rapid expansion, global manufacturers may decide to consider Africa as a feasible option. South Africa and Morocco will continue to be attractive investment destinations for the foreseeable future, and other markets, such as Namibia, Kenya and Ghana, will also be on the radar of some investors (Sutherland, 2020).

2.3 Historical and Trend Analysis of the Automobile Industry in the Middle East

The global automobile sector is volatile, often characterised by diminishing growth in developing regions and stable development in industrialised markets. This scenario is typically characterised by the turbulent state of the global automobile sector. The global car industry is often characterised as being in a state of flux. In the Middle East, the demand for heavy trucks is often stronger than that for medium trucks and consumer automobiles, but it is also highly volatile, partly as a result of the region's high population density (Dynaquest & Berhad, 2018). In order to have a better grasp of the automotive sector in the Middle East, the researcher sought to understand the Middle East within a broad context.

Even though sales in the Middle East are relatively low compared to other regions of the world, these markets are of vital importance to the car industry. Dynaquest and Berhad (2018) stated that manufacturers must take this perspective into account when creating goals and priorities for their companies. They are of the view that car sales in the region are insufficient to sustain commercial success on the local, regional or international market.

The Middle East market accounts for just 4.8 per cent of global truck sales in the medium segment, and 6.5 per cent of global truck sales in the heavy segment (Dynaquest & Berhad, 2018). Manufacturers need to have a thorough understanding of this industry and, specifically, its development potential in order to capitalise on available prospects. Overall, the Middle Eastern truck industry is rising, mostly as a result of two factors: first, the improved political situation with Iran; and second, the economic diversification of a significant number of governments that were reliant on petroleum exports (Dynaquest & Berhad, 2018).

Dynaquest and Berhad (2018) were of the opinion that this tendency would continue over the decade to 2028, and that as the situation in Syria and Iraq improves, it would generate more opportunities for economic growth. Dynaquest and Berhad (2018) also held the view that there was great potential in the Middle East, which would continue to increase in importance

in terms of truck sales and technical development. It would also generate opportunities for Western brands and other manufacturers of premium vehicles.

This is particularly relevant because there are discernible trends and advances for medium- and heavy-duty vehicles in industrialised markets. The average growth rate of heavy vehicles is predicted to be substantially greater than that of medium vehicles. This is owing to the fact that bigger vehicles have higher fuel economy (Bai et al., 2017). In addition, the market for big trucks is far greater than the market for medium-sized vehicles. Two-thirds of the total worldwide sales are comprised of sales of heavy vehicles, while one-third is comprised of sales of medium-sized cars. When seen from this angle, Europe's sector split is the most pronounced of the three industrialised areas, s; in NAFTA, Japan and Korea, while the medium and heavy industries are more evenly separated (Bai et al., 2017).

In Europe, long-distance and regional haulage needs trucks; however in North America and the North American free Trade Area (NAFTA), truck transportation is more equally distributed across the two haulage categories. These divisions represent the national transportation patterns in each country. Because of limited available operational areas in Japan and Korea, large trucks are at a competitive disadvantage. Consequently, medium-sized trucks continue to dominate the market, which disadvantages huge vehicles (Bai et al., 2017). In each of the three categories, the majority of the market share in each of the two sectors is held by domestic producers in the respective countries.

It is anticipated that Europe will experience the greatest increase in the number of heavy vehicles of the three areas. It is probable that this has something to do with the market's capacity for recovery, as well as the constant rise of market activity in all Central and Eastern European countries. In Europe, the medium sector will continue to recover and grow to new heights as a consequence of increased pressure on regional distribution trucks to comply with environmental regulations as per ACEA (2017) (Bai et al., 2017). The North American Free Trade Agreement will reach a stable state when there is no further increase in the number of large or medium autos.

Bai et al. (2017) state that because the medium segment has not yet hit a recovery peak, but has grown at a more constant pace over the last several years, it will not be greatly damaged in the near future by the market cooling phase that is currently affecting the heavy vehicle

segment. This is due to the fact that the medium sector has grown at a more constant pace in recent years. Japan and South Korea have more stable marketplaces than Europe and the North American Free Trade Area (NAFTA). In the last several years, there has been a slight decline in the market for medium-sized automobiles. This growth is the consequence of continued operator efficiency gains and a stable economic environment. This market category has a preponderant share. The expected trends for mature markets are considerably different from those for developing markets and those experiencing rapid economic growth (Bai et al., 2017).

2.4 Historical and Trend Analysis of the Automobile Industry in Europe

The European automobile sector had faced some substantial headwinds, which is a problem in and of itself, despite the fact that it is still a phenomenal success story. Recent incidents, such as the diesel emissions crisis, have damaged consumer confidence, slowly shifting the demand to more eco-friendly options. Thus, income are moving substantially toward Asia, new competitors are entering the market, and the industry is experiencing unprecedented disruptive megatrends (Schaufuss et al., 2019).

In recent years, the European automobile sector has developed to become a worldwide leader in addition to being a major contributor to Europe's economy and prosperity. This has happened as a result of the sector's rising tendency. The private car, which is the foundation of human mobility, and the commercial vehicle, which is the pillar of the European economy, both contribute significantly to Europe's sociological, environmental and economic wellbeing, as well as to the continent's overall development. The creation of the passenger vehicle is among the most notable of these accomplishments (McKinsey, 2019).

The evolution of the automobile industry has provided people with the freedom and accessibility that come with mobility, and has made transportation safer, cheaper and more efficient. The private automobile accounts for more than seventy per cent of all voyages taken in the modern world, while buses account for more than fifty-five per cent of all public transportation trips. With safer technologies since 2005, Since 2005, the frequency of fatal incidents involving passenger vehicles has decreased by forty per cent. In addition, since 2001, the frequency of fatal incidents involving commercial vehicles has decreased by fifty per cent. The average price per kilometre driven by a car has also decreased by 65 per cent

over the course of the last four decades. As a consequence, a greater proportion of the European population is now able to profit from individual mobility (McKinsey, 2019).

Despite what may seem to be an apparent contradiction, at first look, owing to the fact that the number of vehicles in Europe has risen by more than 50 percent over the last two decades, the automotive sector does contribute to improvements in the environment. The sector has certainly had some success in minimising the negative environmental effect of the rapid increase in the number of automobiles on the road. This has been affected largely via the deployment of effective emission reductions. Since 1995, the CO_2 emissions of newly manufactured automobiles in Europe are around 36 per cent lower than those of automobiles manufactured in the area 20 to 25 years ago, making the more recent vehicles much more fuel-efficient than their predecessors. The amount of CO_2 emitted per kilometre driven by commercial vehicles has decreased by 14 per cent during the same time period. Since the beginning of the 1990s, CO_2 emissions for new private automotives have decreased by around 90 per cent, while they have decreased by nearly 95 per cent for commercial vehicles. However, there has still been an increase over the last two decades in the proportion of the transportation sector's total emissions that are supplied by a larger share of the sector's total emissions, due to the increase in number of vehicles on the road. This is still the case despite the fact that the quantity of pollution created by commercial cars has decreased significantly. The transportation industry is now responsible for 24 per cent of the EU's greenhouse gas emissions, which is an increase from the 17 per cent that it was responsible for in 1995. McKinsey's 2019 report reveals that the global economy is expected to grow at a rate of 3.2 per cent, which will bring an inevitable increase in private car use (McKinsey, 2019) .

The automobile industry is a big enterprise that not only offers enticing employment opportunities but also drives the expansion of the European economy. Countries that are members of the EU-15 have collected a total of €410 billion in taxes linked to the industry. This sum is about equivalent to 6 per cent of the total tax income received by these nations. In 2017, the European automotive industry exported 5,4 million automobiles, giving it a value share of more than 40 per cent of the global automotive market. The sector as a whole is robust, but it pales in contrast to really successful individual enterprises, which have an average return on sales of 22 per cent. 2017 was an overall lucrative year for the industry, with an average return on sales of 7 per cent (McKinsey, 2019).

The European automotive sector is in a position to become a leader in the development, testing, and eventual acceptance of cutting-edge mobility technologies owing to the extraordinary circumstances under which it works. This growth will help companies to build on previous accomplishments and capitalise on industry growth-prospects. However, Europe's leadership position in mobility is in jeopardy owing to the rapid acceleration of non-automotive sectors and players, as well as the rapid evolution of the fundamental competencies required for success. This puts Europe in a perilous situation. Because of this, Europe's ability to maintain its position is being tested (McKinsey, 2019).

Current developments in the automotive and transportation industries are far more sophisticated, dynamic and disruptive than developments of the past. Since 1980, with the exception of the economic recession of the early 1990s and the global financial crisis of 2009, the European vehicle industry has seen constant growth. This contrasts with the growth that happened during the economic recession of the early 1990s (Padhi, 2019). However, the economy did not really recover from the financial crisis until 2017, and recovery is still not complete. Some expansion was made possible by technological developments such as fuel-efficient automobiles and alternative powertrains. Technical advancements, including the development of hybrid vehicles, allowed for growth to occur.

From the review of literature, it is clear that, despite its currently robust position, the European automobile industry is at a crossroads that could move in any direction. Padhi (2019) observedcontents that along the path of disruption that lies ahead, there will be a significant shift of value pools to new business models, and existing market leaders will need to re-evaluate their position in the new ecosystem. This re-evaluation will be necessary because companies' technological leadership will be threatened by new commercial models, which will alter their positions in the ecosystem. In other words, the success story of the European automobile industry is being put to the test by the convergence of two revolutionary forces that are radically transforming the industry: electric cars (EVs) and autonomous vehicles (AVs). In addition to disruptive megatrends, momentum is being generated outside of the normal group of people and places (Padhi, 2019).

In addition, the materials and products used in vehicles are undergoing development, and electronics and software play an increasingly important role, accounting for a significant portion of the car's worth. This transformation involves the development of skills that have

not been traditionally recognised as essential competencies of automotive engineering, but which are necessary owing to shifts in vehicle design. For instance, one may predict the degree to which the relevance of car electronics has expanded over the last several years based on the fact that sales of automotive semiconductors have multiplied by three over the past two decades (Schaufuss et al., 2019). For example, Tthe software content of a typical vehicle in the D category, which is classified by the EU Commission as big passenger automobiles, is projected to expand at a compound annual growth rate of 11 per cent and account for 30 per cent of the vehicle's value in 2030. This growth is anticipated to persist for the foreseeable future. The upgraded electronic and electrical components of the car will result in a value increase equal to 25 per cent of the vehicle's original price. In addition, the software development process in the automobile sector is not nearly as current as it ought to be. This concept is shown by the following illustration: 100 million lines of code are contained in the average high-end automobile of today, which is 15 times more than the avionics found in a Boeing 787 (Schaufuss et al., 2019).

2.5 The Macroeconomic Environment in Africa

The decline in economic growth that started in 2015 remained across Africa in 2016, mostly because of falling commodity prices. Those African countries most reliant on exports of raw materials have suffered the most from this trend. Despite this tendency, the vast majority of African nations that do not participate in commodity trading have maintained healthy development (Mpofu & Nikolaidou, 2019). The optimistic expectations for Africa's economic development in 2017 and 2018 are supported by anticipated improvements in domestic demand and commodities prices. Domestic demand in Africa is the key driver of the continent's economic expansion. 2016's overall lacklustre performance may be attributed to a number of factors, including the fact that the downturn hit commodity exporters the hardest (Oppong, Jie, Acheampong & Sakyi, 2020).

Beginning in the middle of 2014, the dramatic decrease in commodity prices had a catastrophic effect on the economies of many African nations, especially those whose economies were dependent on the sale of commodities. The prices of non-energy commodities decreased by 6 per cent in 2016 compared to 2015, with the price declines of metals and automobiles playing a particularly significant role (Adedoyin, Ozturk, Agboola, Agboola & Bekun, 2021). China's economic growth slowed, which is the key reason for the decrease in average annual metal prices in 2016 compared to the previous year's level.

Despite the price index for agricultural raw materials decreasing from $83 in 2015 to $80 in 2016, agricultural commodity prices remained unchanged. The bulk of this increase was attributable to an increase in the overall number of subsidies, in addition to increasing production levels (Uzum, Ikpefan, Omankhanlen, Ejemeyovwi & Ehikioya, 2021).

In most situations, the cost of energy decreased in 2016 compared to 2014. In June 2014, the price of a barrel of crude oil reached a record high of $114.8 before plunging to a record low of $28.9 in January 2016. This was the lowest price per barrel of crude oil ever recorded (Mpofu & Nikolaidou, 2019). During the same time frame, the price of crude oil decreased dramatically, falling from 203.05 to 56.06 on the index. In 2016, the average price of a barrel of crude oil was $43, or 16 per cent less than in 2015. In 2015, the cost per barrel was $52. Despite the fact that the price of crude oil rose during the second half of 2016, the year's growth performance was significantly affected.

The decline in oil prices may be attributable to several variables, including the equilibrium between supply and demand. The production of shale in the United States was a contributing factor to the supply. Saudi Arabia's determination to boost oil production in order to maintain the country's current share of the world market also contributed to the supply (Oppong et al., 2020). Both the slowdown in developing economies and the fall in US oil imports contributed to the drop in demand. In 2016, the growth rate of oil-exporting nations such as Algeria, Angola, Nigeria and Sudan decreased substantially to 1.6 per cent, from 3.3 per cent the previous year.

It was anticipated that the real GDP of Equatorial Guinea would shrink by -8.2 per cent in 2016, while that of Libya would fall by -8.0 per cent. 2016 predictions included both of these events. On the other hand, the real GDP growth for Chad and Nigeria was predicted to be 3.4 per cent and 1.5 per cent, respectively. In South Africa, one of the most important economies in Africa and an exporter of non-energy commodities, a slowdown in mining and quarrying, together with other factors, was expected to result in a 0.4 per cent growth rate in 2016. This was in contrast to the 0.6 per cent growth rate seen in 2015. This pace of growth was considered to be below average (Adedoyin et al., 2021).

The Arab Spring in 2010 had a ripple effect that expanded from Tunisia to Egypt and Libya, resulting in a dramatic regression of North Africa's economic progress. This obstruction was

the second element impeding forward progress. In the years immediately after this event, Egypt and Tunisia made significant headway toward economic recovery; however Libya was mired in a recession during this period, despite a minor improvement in growth from -10.1 per cent in 2015 to -8.0 per cent in 2016. Egypt and Tunisia also achieved some economic recovery.

The Arab Spring upheavals and the removal of Muammar Gaddafi as Libya's leader were directly responsible for the country's persistent economic decline. These events resulted in both political unrest and a drop in oil output, which in 2018 was one-third of its potential level. The problem was exacerbated by the fact that Libya's economy was not significantly diversified (Geda & Yima, 2018).

The continuation of armed conflict in a number of African nations is a serious impediment to the spread of economic activity and, as a direct result, to economic progress. Africa continues to account for the largest proportion of the world's violent wars, despite the fact that this proportion has declined over the last decade (Nissanke, 2019). In 2016, Burundi, the Central African Republic, the Democratic Republic of the Congo, Libya, Mali, Nigeria, Somalia and South Sudan were all actively involved in armed conflict. In addition, Cameroon and Ethiopia have had localised outbreaks of violence (Nissanke, 2019).

Another contributing factor that supports Africa's economy is exports. Because China receives the great majority of Africa's exports to developing nations, but the continent is subject to fluctuations in the global market for its own commodities, which consist mostly of oil and metals. Currently, China accounts for 27 per cent of all of Africa's exports to the global market, with primary commodities accounting for around 83 per cent of all of Africa's exports to China (Edo, 2022). Trade between various African nations has the greatest potential of any single activity to foster sustainable economic growth over the long term. Recent economic growth in Africa has been followed by a corresponding increase in the volume of trade between the continent's various nations (Asafo, Matuka & Dominic, 2019).

In the last two decades, both the continent's gross domestic output and its volume of domestic commerce have increased significantly (Edo & Nnadozie, 2022). In addition to driving economic development, intra-African commerce is far more robust than trade with other areas. Since 2011, both the United States and China have seen significant drops in the

number of goods delivered to them, with the United States seeing a fall of 65 per cent and China a loss of 48 per cent (Geda, 2018). The drop in intra-African trade has been less severe than first predicted, and it seems to correspond with the global trade slowdown. Observers noted that during the global financial crisis of 2007–2008, commerce in Africa was far less affected than trade between Africa and the rest of the world (Edo & Nnadozie, 2022).

2.6 The Macroeconomic Environment in Europe

The European economy has so far shown a remarkable ability for resilience in the face of obstacles presented by external causes; economic growth and labour market health have been retained. However~~On the other hand~~, the bulk of the most recent assessments and figures made public have been detrimental to the EU economy (Anton, 2019). There have been recent indications of not just a slower pace of global activity and commerce, but also a more modest rate of economic expansion in Europe. A slower pace of global activity and trade may be part of the reason for this. It was predicted in the Autumn 2019 Economic forecast by the European Union in a press release, that the key issue for Europe's economic situation in the autumn of 2019 was whether the current slowdown in economic growth would continue, whether it could be halted, or whether it could be reversed. This was adjudged a possible influencing factor on the automotive manufacturing sector.

Globalisation, which has been propelled by foreign direct investment (FDI), technical innovation and market liberalisation, has resulted in a high degree of interdependence between states. This has resulted in the expansion and deepening of global value chains, which has led to increased efficiency but also increased fragility, as national economies have become more vulnerable to disruptions in transnational supply networks owing to the increased interconnectedness of global value chains (Rios & Gianmoena, 2020).

In line with the unbridled integration of markets, improvements in the British automobile industry occurred concurrently with the growth of the single market in the European Union. Access to the single market is essential for firms in the United Kingdom (UK), considering that exports to the European Union accounted for 15 per cent of the UK's GDP in 2014 (Anton, 2019). According to La Rocca, Staglianò, La Rocca, Cariola & Skatova (2019), as a direct result of the United Kingdom's participation in the European Union, its per capita gross domestic output (GDP) grew from 8.6 per cent to 10.0 per cent. This figure was estimated as

23.7 per cent in other studies (Rios & Gianmoena, 2020). Because of the complexity of European supply chains, corporations have grown highly dependent on single market access as a consequence of the high level of integration that has developed across member states. Thus, UK firms have long been reliant on the European single market.

The United Kingdom is the fourth-largest manufacturer of automobiles in Europe and the thirteenth-largest producer of automobiles in the world by volume, producing more than 1.8 million vehicles, of which 1.72 million were passenger & commercial vehicles. This identifies the United Kingdom as a prominent producer in the vehicle industry relative to the global total production (Campos, De Grauwe & Ji, 2018). The UK workforce has contributed significantly to the sector's success. It has been stated that the flexibility offered to businesses in the United Kingdom to adapt to alterations in their demands and surroundings has significantly contributed to the growth of the industry (Briglauer, 2019).

However, the EU remains the most important market for British-made autos, accounting for about half of all British vehicle exports. This is because the EU has one of the greatest populations on the planet (Briglauer, 2019). The United Kingdom has been essential in establishing a relatively free market environment for the sector in the European Union and in serving as a platform for manufacturing that stretches deep into the interior of Europe. Serrano (2021) states that in 2014, the United Kingdom produced goods worth £53.9 billion, which constituted 14.7 per cent of the sector's overall value in Europe (Anton, 2019). Between 2010 and 2014, the vehicle manufacturing sector in the United Kingdom saw a compound annual growth rate of 5.6 per cent, resulting in sales of $53.9 billion in 2014. During this time frame, the whole industry grew at a pace of 5.6 per cent. The manufacturing industry in the United Kingdom performed well compared to other big manufacturers. Between 2010 and 2014, the German industry's revenue was $122.4 billion, indicating a compound annual growth rate of 1.3 per cent, whereas the French industry's revenue was $50.3 billion, indicating a compound annual drop rate of -3.0 per cent. The French industry generated 3.6 per cent less income than the German industry (Serrano, 2021).

Vehicle manufacturers in the United Kingdom have had consistent growth over the last several years, hitting highs in 2016 that were over 25 per cent higher than their pre-recession peak. In recent years, the automobile industry in the United Kingdom has surpassed the whole manufacturing sector in terms of growth. Automobile (passenger/commercial)

production accounted for 94.5 per cent of the overall output produced by the automotive manufacturing sector in the United Kingdom (Briglauer, 2019). Because of this, automobile's (passenger & commercial) vehicle manufacturing has become the most vital aspect of the business (the rest being trucks and motorcycles). It is controlled by five major corporations, which account for more than two-thirds of the industry's overall output.

In total, 153,000 people are employed in the bigger motor vehicle manufacturing sector in the United Kingdom, which accounts for 6.3 per cent of manufacturing employment and 0.5 per cent of total employment in the country (Anton, 2019). Briglauer (2019) concurs, stating that the United Kingdom's manufacturing sector is driven by the car industry, which is a major employer. As mentioned previously, the workforce in the United Kingdom due to their advanced skillset, iis one of the primary contributors ofto the growth within theof the automobile industry in the nation (Rios, 2020), which is contrary to most African countries lack. According to the OECD -(The Organisation for Economic Cooperation & Development), Employment Protection Index, the United Kingdom has the fourth most competitive employment law among industrialised nations. The United Kingdom rates even higher than some countries on the rise, including Brazil, Russia and China (OECD, 2021).

There is evidence to show that the flexibility of British workers has led to an increase in production and a more efficient use of available resources. Employers in the automotive sector in the United Kingdom are increasingly able to use temporary labour, agency staff, fixed term contracts, flexible working hours, 'down-days,' and 'time-banking,' allowing them to respond to the environment in a more direct way (Pluskota, 2021). Employers are able to keep a competitive edge as a consequence, since this allows them to maximise output by regulating capacity utilisation efficiently. Compared to significant automakers in Western Europe, the United Kingdom is able to maximise productivity by regulating capacity use efficiently (Campos et al., 2018). One may argue that, as a result, they have been obliged to maintain the same capacity levels, resulting in a rise in overcapacity.

2.7 The Macroeconomic Environment in the Middle East

SSince 2011, substantial portions of the Middle East region have been consumed by political and economic crises, which have had devastating effects not just on individual lives but also on the regional economy as a whole since 2011 (Alsharari, 2017). Currently, a crescent of insecurity stretches from Libya through Syria, Iraq and Yemen to the Sinai and the occupied

Palestinian territories (Singh & Gal, 2020). This instability ~~are~~ was originally seen in Libya. The region's economy continues to see sluggish development as a direct consequence of regional warfare and the negative impact of dropping oil prices linked to~~on~~ the region's oil exporters (Musibah, 2017). This is directly attributable to the fall in oil prices.

As a direct result, the Middles East as a region's real GDP growth, which had averaged nearly 4 per cent per year over the preceding two decades compared to 5.5 per cent for emerging economies and developing nations as a whole, has slowed to roughly 2.8 per cent per year (less than 1 per cent per capita) since 2012 (Yousseff, 2020). This is far lower than the average growth of rising economies and developing nations, which has been 5.5 per cent. It is also a significant decline compared to the average growth of rising economies and developing countries, which is 5.5 per cent. The economic slump has made the region's already fragile financial structure even more susceptible, which has led to a rise in poverty and unemployment among the region's youth (López-Escolano & Campos, 2017). The Middle East has thus far been effective at 'muddling through' these challenges. As has already happened in parts of the area, if this trend continues, there is possibility of a deeper economic stagnation and, recession, with contagion repercussions for the rest of the globe (Alsharari, 2017).

Egypt, Saudi Arabia, Turkey and Iran, which together account for nearly 70 per cent of the region's US $4 trillion economy and are home to approximately 285 million of the region's 485 million people (Singh & Gal, 2020), may take a leading role in stabilising the situation and resolving the underlying macroeconomic issues, especially the erosion of growth and stability. About 285 million of the region's residents reside in these four nations. Owing to their size and power, these four countries are the major players in the region (El-Chaarani, 2019). Global and regional megatrends such as shifting demographics, altered climatic patterns, and the introduction of disruptive technologies has meant that the difficulties now faced by MENA (Middle East/North Africa) governments are expected to become much more severe in the near future. If these countries do not agree to work together to find solutions to the socioeconomic problems they confront, the economic reality in the region may worsen, and this may affect the performance of the automotive industry in the entire region (Ifaei, Karbassi, Jacome & Yoo, 2017).

Alsharari (2017) identified a few macroeconomic challenges/fundamentals that may further unnerve the skittish business environments, as well as the purchasing power of the people. According to this author, poor governance and weak institutions, a poor business environment, inadequate infrastructure, slow economic growth, high unemployment rates, especially among educated youth, growing disparities in income and wealth, and shortages of water and emerging food insecurity may continue to pose a threat to the region's long-term stability in the majority of the Middle East. These elements may continue to be the most prominent contributors to the destabilisation of macroeconomic fundamentals and poor performance of automotive industry in the Asian region (Alsharari, 2017).

2.8 Chapter summary

Based on this literature review, it is apparent that the current economic slowdown and financial crises have harmed Africa's automobile sector. Damage to the sector harms the many individuals who perform vital functions in the industry. The sector's businesses have reduced workhours by shifting to a four-day workweek, reduced headcount workforce, and in some instances, some of the operators in the sector have liquidated. In contrast, the need for vehicles in the Middle East may expand significantly during the next decade. This potential to grow demand may enhance the growth of manufacturing capacity if strategic approaches are deployed to ameliorate the shocks and disturbances in the macroeconomic fundamentals. From the review of literature, cities in Europe are found to be designed for ease of accessibility. To that extent, there are already car-free city centres, and there are efficient public transit systems. The majority of urban dwellers utilises 'micro-mobility,' which includes walking, riding bikes, using the subway, etc. these approaches do reduce the need to own a car, and to an extent, automotive sales as per the population. This notwithstanding, the production and sales of automotives in the Europe region remains the highest in our sample, and there is potential to improve the performance of the industry by inventing and promoting environmentally friendly automotives, while reducing the prices of fuel concomitantly.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The objective of this study was to determine the impact of macroeconomic fundamentals on the automotive industry's performance in selected countries in Africa, Europe and the Middle East. The regions and countries chosen for this study were selected to achieve a balance of mature and emerging markets. As illustrated in ~~the previous~~ chapter 2, the vulnerability to changes in macroeconomic fundamentals is quite different for a stable market than for an emerging market. These markets range from leading economies in Africa to those that rank highly on the criteria stipulated above in Europe and the Middle East. It must be stated, too, that the availability of usable data also influenced the choice of sampled countries. As illustrated in the previous chapter, the susceptibility of countries to macroeconomic volatility varies widely amongst developed and developing economies. Even within developing economies, macroeconomic shocks, such as a sudden rise in inflation or interest rates, may reduce the sales volumes of new automotive in some countries more than in another.

This chapter examines~~outlines~~ the methodology used this research. It covers the research strategy, data collection methods, types of data collected, and the data analysis methodology used. It also describes the research methodology used to establish a link between macroeconomic fundamentals and the automobile sector in Europe, the Middle East and Africa. In addition, the chapter describes the econometrics approach.

3.2 Research Design

A research design is a strategy or plan that may be used to guide data collection and analysis in order to elicit responses to the research questions (Kothari, 2014). In addition, it serves as a general strategy for resolving some of the issues faced during the research process (Kothari, 2014). Many research designs employ a combination of qualitative and quantitative approaches. This study employed ex post factor research design and involved obtaining data on automotive & relevant economic indicators that were sourced from various official databases which are qualitatively and quantitively analysed using statistical techniques. The statistical techniques were used to analyse the obtained data in line with the objectives of the

study. ~~was quantitative in nature, thus employs a quantitative technique to investigate the topic under discussion. in the discussion in Chapter Two, which discussed findings in the literature. The quantitative dataset that was used were in the form of secondary data that were sourced from various databases.~~

Research designs are created to satisfy the specific requirements of a particular research investigation to ultimately achieve the research objectives. When conducting a research project, the researcher is required to pay attention to the methodological approach used, data analysis method and presentation of findings. Given the objectives of this research as presented in chapter one, the quantitative approach was deemed the most suitable. Statistical tests (a quantitative approach technique) are generally used to determine whether two variables are linked in a statistically significant way based on observable and quantifiable events (Lorenzetti 2007). In this study, the relationships between the fundamentals of the macroeconomic environment and the automotive sector were examined.

In addition, the structure of quantitative research serves to increase objectivity. A quantitative research project is predicated mostly on the use of numbers aggregated into statistics, which allows the researcher to understand and draw conclusions from the data collected (Cormack 2016). Consequently, in order to determine the impact of macroeconomic fundamentals on the performance of the automotive industry, a quantitative research approach was considered to be ideal. This is essentially because the use of quantifiable data would improve the precision of the measurement of the influence of the former on the latter.

3.3 Research Method

According to Apuke (2017), a quantitative research method involves quantifying variables; that is, it is a procedure that involves putting numeric values on variables of interest in a way that makes it easy to conduct scientific analysis through an appropriate statistical package, and to make meanings from the outputs. More accurately, Aliaga and Gunderson (2002), suggest that a quantitative research technique is 'the process of clarifying a topic or occurrence through the collecting of numerical data and exploration of such data through the use of mathematical approaches' – or, more precisely, statistics. The definition provided by Aliaga and Gunderson (2002) is considered relevant because it points out important concepts that are pertinent to this study.

First, the quantitative method explains an issue or phenomenon. In this case, the issue or phenomenon is the influence of macroeconomic fundamentals on the performance of the automotive industry. The issue under investigation is the performance of the automotive industry and the ways in which macroeconomic fundamentals influence it. Second, the quantitative method goes further to assign values in numerical form to each of the variables of interest; in this case, the measurable indicators of automotive performance, namely automotive manufacturing and automotive sales. The explanatory variables – that is, the macroeconomic fundamental indicators such as economic growth, unemployment, exchange rates, interest rates, and inflation – are subjected to statistical analysis. In this study, Stata statistical software was used. As indicated earlier, statistical models were used in this study, in alignment with guidance provided by Williams (2011), to support or refute the *a priori* expectation that macroeconomic fundamentals affect the performance of the automotive industry in the selected countries. According to Johnson and Christensen (2008), the quantitative research method is concerned with specific variables, unlike the qualitative method, which concentrates on the whole phenomenon in general.

Variables are defined as 'a trait or characteristic of things and people that varies in quality and quantity', according to (Apuke 2017). A variable is not just a property that can be measured, but also something that can be controlled or modified (Apuke, 2017). When a researcher conducts an experiment, an independent variable (sometimes referred to as an exploratory variable) is altered in order to analyse the impact this has on a dependent variable (also known as the predictor variable or outcome variable). The dependent variable is simply a variable that is affected by the behaviour of other identified variables, the explanatory or independent variables (Apuke, 2017). Given the topic at hand, the econometrics technique used in this study was appropriate, comprising the application of proper statistical procedures to the selected panel data. This allowed the researcher to create empirical inferences between the independent and dependent variables in the three regions examined.

The econometric diagnostic tools applied in this study ranged from descriptive statistics to testing for normality of data distribution as an important precursor to the regression analysis, taking a lead from previous studies (Aregbeshola, 2018; 2019). To start with, descriptive statistics were estimated in order to gauge the distribution pattern of the dataset. This is considered important, because statistical analysis that does not conform to the principle of normal distribution would yield meaningless or exaggerated results that could be misleading.

In addition, a correlational test is generally performed to test the interplay of the dependent and independent variable(s). This is done to ensure that the variables do not trigger autocorrelation, which may nullify the stability of the regression analysis. The dataset was also subjected to unit root tests to verify its stationarity. Data stability is important because any dataset that does not revert to the mean may yield misleading result (Baltagi, 2013). Also, the correlation statistics indicate the relationship between variables by showing the extent to which one variable is related to the other. The strength of this relationship may determine if there is a possibility of autocorrelation between the variables (Couchman & Dawson 2005; Aregbeshola, 2019; Lu, Q, et. el. 2022) which is required to support the objectives of this study.). As indicated earlier, the possibility of autocorrelation is further tested through the unit root tests.

3.4 Data Type and Sample

Data comprises facts, views and statistics that have been recorded for reference or study (Saunders, Lewis & Thornhill, 2007). The collection of data is a fundamental aspect of statistical analysis. In research, data collection techniques fall into two categories, namely primary and secondary data (Mazhar et. el. 2021). Primary data comprises those datasets that are collected afresh by the researcher for a specific purpose and under a specified condition or circumstance. Secondary data comprises information that has already been gathered or generated by researchers for a previous purpose and that may be used for the current research objectives. In this study, secondary data was used.

A thorough examination of the relationship between economic indicators and the performance of the automotive industry necessitates a sufficient amount of credible historical data to support the empirical evidence required for this study, since the focus is on the relationship between economic indicators and automotive industry performance. In this regard, it is essential to consider the variables of relevance to the study, particularly given the strategic importance of the automobile industry to every economy.

To begin with, the global automobile industry is an essential part of the global economy, as it forms the backbone of every country's transportation system. Evidence has shown the strong contribution the auto industry makes to the overall economy, but studies have also proven the negative impacts of macroeconomic variables on the efficiency of the automotive industry

in all economies. Some of the determinants identified in the literature are political instability, weak consumer buying power, inflation and interest rate volatility, amongst others (Organization for Economic Co-operation and Development, 2010 (OECD). Rathi, Kkaduja and Sharma (2016), Razaeinejad (2021) and Mattioli, Roberts, Steinberger and Brown (2020) all corroborate the observation that macroeconomic factors greatly affect the automotive industry in every country. This study pays particular attention to the state of the automotive industry in light of the global financial crisis experienced during 2008 to 2010, depicting the impact during and after the economic recession globally (OECD, ~~Economics Department Working Papers, No. 745,~~ 2010).

Numerous domestic and global variables affect the key performance indicators of the automotive industry, including domestic market sales, exports and vehicle production (Lamprecht, 2009: 36). In this study, two research variables are central to the empirical investigation; namely, the set of measures of macroeconomic fundamentals (the independent variable) and the set of key performance indicators of the automotive industry in the selected countries (the dependent variable).

The independent variable identified in the topic is a compound of sub-variables. These are:
Une_r = Unemployment rate
ExR = Exchange rate
$IntR$ = Interest rate
GDP_p = Gross domestic product per capita
Inf_r = Inflation rate
$\mathcal{E}_t$ = Error term

The dependent variables chosen in this study are key performance indicators that apply in the automotive industry. These are:
Avp = Automotive vehicle production
VHs = Vehicle sales

These variables are~~will be~~ further explained later in this chapter.

3.5 Data Sources

In this study, an attempt was made to use reports from institutional documents and official public sources as indicated in chapter two. These sources, as well as peer-reviewed publications, were used to lay a background for the model development, data generation and identification of suitable databases. The review of literature also supports the researcher's scope, which is Africa, Europe and the Middle East. These publications were consulted to shed light on the macroeconomic conditions that are prevalent in these regions, in order to establish essential inferences resulting from the correlational tests. These publications elucidate on the sector's performance in general, and comparatively.

The source of data for the economic indicators or independent variables was the World Development Indicators, an arm of the World Bank. This source was used because it is reliable, and the dataset is considered valid because of the stringent process followed by member countries that supplied the dataset (World Bank, 2020). The World Bank database is also in the public domain and the dataset is freely accessible.

The second source of data for both the sales and production of automotives was the International Organisation of Motor Vehicles (IOMV). The dataset from this source is also considered reliable because the source is a credible industry-specific association that was establish in 1919 with the sole purpose of galvanising communication and advancing transparency in the interest of the automotive industry. Linked to national automobile associations across the world, it also applies stringent standards and collection processes to ensure credible automotive-specific data.

3.6 Data Collection

The study makes use of quantitative data that already exists in the relevant databases. Owing to the easy availability of relevant data and the credibility of the data sources, the study makes use of cross-sectional time series (panel) data. This dataset is historical in nature, covering a long range of years. The use of historical data in this research, in the form of econometric estimations, was important in order to be able to denote the relationship or correlation between the variables of interest over a period of time. The dataset covers a period of 10 years, from 2000 to 2019. More specifically, the dataset covers some African, European and Middle Eastern countries in order to highlight the geopolitical and cultural differences between

these regions. At present, domestic industries in most African countries are fragmented, representing only partial auto firms (Komarasamy & Hoque, 2015: 974). This necessitates the use of aggregate datasets from the industry. Therefore, since some units of data are unavailable from a few countries in Africa, a five-year moving average technique was applied.

Panel datasets were used because the study incorporated both time series and cross-sectional data. One of the major advantages of panel data is its ability to model individual and common behaviour of data groups, and measure statistical effects (Baltagi, 2013). The panel approach also minimises estimation biases that may arise from aggregating a group of data into a single time series. The collection of data applied a balanced panel data set, with the same time period used across all regions. Sul (2019) states that panel data is best suited, as panel data can model individual and common behaviours of data groups and measure statistical effects. When a researcher wishes to account for changes over time that cannot be observed within the individual variables and given the individual heterogeneity across a population, panel data is best suited (Sul, 2019). The collections of data were compiled using Excel spreadsheets, on which the data was cleaned, stored, and presented for analysis.

3.7 Population and Sampling

The study focused on three regions, the Middle East, Africa, the Middle East and Europe, in order to capture a mixture of mature and emerging markets. In each of the regions under consideration, the countries included in the sample were determined by the performance of the automobile industry in the regional pool, the maturity of the automotive industry, the country's overall economic performance, and the level of fiscal stability prevailing in the country. Moreso, the choice of countries was influenced by data availability and trend of automotive production and sales in the country. The above approachis approach was considereddeemed helpful for determining the extent to which the performance of the automotive industry is influenced by macroeconomic indicators. The countries used in the sample are as follows: Pakistan and Iran (Middle East), Algeria, South Africa, Egypt and Nigeria (Africa), and Germany, Netherlands, Turkey and the United Kingdom (Europe). As indicated above, the study covers a series spanning 2000 to 2019.

3.8 Data Analyseis

After collecting and arranging the relevant dataset from the identified sources, the next step was to analyse it to ensure that the information was relevant in relation to the research topic (Stewart & Kamins, 1993). According to Stewart and Kamins (1993), the best way to analyse secondary data is by following a 'stepwise fashion'. The process begins with a diagnostic approach, and proceeds to various regression analyses, through which reasonable conclusions are drawn and policy recommendations are made. The Stata statistical package was employed for the analysis, based on its superiority in econometric estimations. Pre-estimation diagnostics were conducted to establish the data behaviour through normal decision yardsticks. As a result of the pre-estimation diagnostic, the dataset's behaviour dictated the method of data analysis. In this study, the pre-estimation diagnostics included:

- Descriptive statistics
- Correlation analysis
- Unit root test, and
- Hausmann test

3.8.1 Descriptive statistics

Initially, descriptive statistics are employed to characterise the data. Statistics is a set of processes for collecting, quantifying, categorising, processing, computing, synthesising, analysing and interpreting quantitative data that has been collected in a scientific manner (Schaufuss et al., 2019). There are two components of statistical analysis, namely, descriptive and inferential statistics. While inferential statistics provide the process to extrapolate meanings about a population from a sample, descriptive statistics provide numerical and graphical information on a collection of data in a clear and understandable manner. This approach also enables researchers to determine how the dataset is distributed. However, inferential statistics enables a researcher to deduce a behavioural pattern of a population through a sample. Given that this study adopted both descriptive and inferential statistical approaches, it became possible to draw inferences on the characteristics of the automotive industry in the sampled countries that were chosen to represent each of the regions (Schaufuss et al., 2019).

According to Olive (2017), researchers may choose one of two possible descriptive methods, namely numerical or graphical. Through the numerical approach, computation of statistics that enables the determination of the data distribution becomes possible. For instance, researchers may compute simple statistics such as the mean, median and standard deviation. This set of statistics depicts information about the dispersion of the dataset, such as the average and the dispersion from the average. In addition, the diagrammatic plots contain information about the pattern of data distribution. Some researchers maintain that graphical approaches are better at revealing patterns in data than numerical methods, yet this is a flawed argument, because numerical procedures are more exact and objective (Olive, 2017). It is recommended that researchers use both numerical and graphical approaches, given that they are complementary to one another (Schaufuss et al., 2019). As such, in this research the two methods were applied depending on the statistical approachused in some instances, but the numerical approach was favoured because of its accuracy, precision and objectivity.

3.8.2. Unit root test

Stationarity in a time series can be examined with the help of unit root tests. In a time series dataset, stationarity is defined as the condition in which a change in time does not result in a change in the form of the data distribution (Baltagi, 2008). In this study, the test was conducted in order to investigate whether the passage of time caused a shift in the distribution of the dataset. Shifts in time need to be analysed because time is relevant to both the dependent and independent variables and can drastically alter the stability of the models being estimated, thereby rendering the results spurious. The order of integration of the series thus determines the necessary diagnostic that is required to convert the dataset into a usable format (Aregbeshola, 2018). In addition, the order of integration of the dataset determines the kind of estimation approaches to be used in the regression analysis.

3.8.3 Cointegration test

Cointegration occurs in a set of data when two or more series are individually integrated (in the sense that the variables relate meaningfully with one another over a period), but some linear combinations of the variables have a lower order of integration than the individual series themselves. It is not uncommon for stationary linear combinations to be formed from series that are first-order integrated, yet the series exhibits some vector of coefficients. For example,

the quantity of automobiles sold in a certain segment and demographics can both fluctuate over time, both following a random path, i.e., mean-reverting. The hypothesis that there is a statistically significant relationship between demographics and a certain car segment may be tested by looking for a cointegrated combination of the two series.

3.8.4 Hausman test

This test measures an estimator's consistency by comparing it to another, less efficient one that has been shown to be consistent in the past. It aids in determining if a statistical model is in accordance with the dataset and if the data fits the model suitably.

An example of this scenario is a linear model, such as:

$$\gamma = \beta\chi + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.1$$

In this model, γ depicts the dependent variable, while the vector of regressors is denoted by χ. In addition, the vector of coefficients is depicted by β, while the error term is represented by ε. The model specified above contains two estimators for β: β_0 and β_1. Both estimators are presumed to be consistent under the null hypothesis; however, β_1 is considered to be more efficient (with the lowest cumulative variance) than the β_0 set of estimators. This assumption is predicated on the alternative hypothesis that suggests a consistent β_0 estimator at the expense of β_1, which is presumed to be inconsistent.

Mathematically, the Hausman statistic is expressed as:

$$h = (\beta_1 - \beta_{0)^1}(var(\beta_0) - var(\beta_1) + (\beta_1 - \beta_0)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.2$$

The '+' is introduced to capture the Moore–Penrose pseudoinverse, the chi-squared distribution. Under the null hypothesis in Hausman tests, the chi-square statistic is considered asymptotically distributed, in which the degrees of freedom is equated to the rank of the matrix $Var(\beta_0) - Var(\beta_1)$. The hypothetical decision process is primed on the consistency of the estimators. For instance, we reject the null hypothesis when the β_1 estimator is found to be inconsistent, and vice versa. In this study, the Hausman test is used as a guide to determine which of the estimators may be considered valid instruments in the series. That is, estimators may be considered valid in a random series rather than in a fixed effect environment.

By extension, the establishment of instrumental validity also helps to determine the strength of correlation between the estimator variables, namely the dependent and independent variables. In this instance, the level of correlation between the valid instrumental variables would determine the kind of regression analysis to adopt in the study. For instance, if the instruments are considered invalid, i.e., if there is a strong correlation between the dependent and independent variables (endogeneity), the estimation approach would then be modified to cater for possible endogeneity in the estimation.

3.8.5 Regression analysis

This study set out to investigate the relationship between macroeconomic fundamentals and the operational efficiency of the automotive industry. To this extent, regression analysis, which is a statistical approach that analyses the degree to which different variables are linked or related to one another, was used. Using a simple linear regression model, one can examine the relationship between two variables.

The formula for a simple linear model is depicted as follows:
$$Y = \alpha + \beta X + \varepsilon \quad or \quad Y = \beta\theta + \beta 1x + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3$$

In~~From~~ equation 3, 'α' ~~–~~denotes the constant term or the intercept, β is the slope of the coefficient and ε is the error term in the model. Furthermore, y depicts the dependent variable, while χ denotes the explanatory variable. In this study, the independent variables are the key macroeconomic factors that are deemed impactful on the automotive industry in the sampled countries. As aforementioned, the selected variables include exchange rates, interest rates, inflation rates and unemployment rates, with each variable tested individually for a correlation to the performance of the automotive industry.

3.9 Model Specification and Definition of Variables

This section identifies and explains the variables used in the study as units of analysis. The variables are expressed in line with the *a priori* expectation that macroeconomic fundamentals influence the performance of the automotive industry. Research objectives and explanations in the a~~a~~literature analysis led to the selection of factors for this study's variables. T~~Below, t~~he components of the performance of the automotive industry are explained below,

after which we , ~~then we~~ will proceed to generate the models and ~~explain~~clarify the components of each model.

The model specification follows a basic regression approach in which the two dependent variables are interchanged with the same set of explanatory variables in a system environment. To answer the research questions and to therefore achieve the research hypothesis, the two equations were calibrated by following the example of Zervos (1998), in which the role of macroeconomic fundamentals was investigated with regard to investment performance:

$$LogAvp_{it} = \alpha_1 + \alpha_2 MCF_{it} + \mathcal{E}_{it}\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 4$$

Where:

The logarithm of *Avp* (automotive vehicle production) is expressed in terms of time (*t*) and across countries (*i*). The panel format is depicted as a lag of time (Avp_t / Avp_{t-1}) in country *i* and at time *t*; *MCF* is a composite depiction of the explanatory variables (macroeconomic variables) while $\mathcal{E}_{it}$ depicts the error term at time *t*, across sampled countries (*i*). The same approach is replicated for the second dependent variable in the equation where the only difference is the substitution of auto vehicle production for vehicle sales:

$$LogVHs_{it} = \alpha_1 + \alpha_2 MCF_{it} + \mathcal{E}_{it}\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 5$$

To fully represent the panel components, Equation 4 is decomposed into panel expression in a system format:

$$LogVHs_{it} = \alpha_1 + \alpha_2 Une_{rit} + \alpha_3 ExR + \alpha_4 IntR + \alpha_5 GDP_p + \alpha_5 Inf_r + \mathcal{E}_{it}\dots\dots\dots\dots\dots\dots\dots\dots\dots 6$$

As was done in Equation 5, the same model is replicated for the second dependent variable, which is presented in Equation 7:

$$LogAvp_{it} = \alpha_1 + \alpha_2 Une_{rit} + \alpha_3 ExR + \alpha_4 IntR + \alpha_5 GDP_p + \alpha_5 Inf_r + \mathcal{E}_{it}\dots\dots\dots\dots\dots\dots\dots\dots\dots 7$$

In view of the subject being investigated, the econometrics technique used in this study applies relevant statistical procedures to the selected panel data, allowing the researcher to

draw empirical inferences about the independent and dependent variables. The panel data method assists in enhancing the power properties of observation across time series and cross sections (countries).

3.9.1.1 Dependent variable: The performance of the automotive industry

This research aimed to explore the impact of macroeconomic indicators on the performance of the automobile industry in the aforementioned regions. The automobile industry is highly diverse (Karmokolias, 1990). While various key performance indicators are used in the automotive sector, car sales and vehicle production are the most significant and critical data panels as they represent the foundation upon which the industry is constructed. The International Organisation of Motor Vehicle Manufacturers (OICA), one of the most established and long-standing institutions in the automotive industry, maintains records of vehicle sales and vehicle production by country or market, which act as the basis of their studies and provides insight to support the industry's interests. Based on these two industry-specific statistics, further research has been generated. For instance, the Organization for Economic Cooperation and Development produced a study which demonstrated the impact of the economic downturn on car sales and the manufacturing of automobiles and parts (OECD, 2010). In the current study, the main goal is to show how macroeconomic fundamentals affect the automobile industry. The measure of production and motor vehicle sales are identified as the optimal instruments to understand supply and demand, in an historical perspective, in order to demonstrate the trends of performance in the industry. As a result, the dependent variables employed in this study to measure the success of the automotive industry are annual vehicle production and total new car sales.

3.9.1.2 The independent variables

A number of potential influencers of vehicle sales and manufacturing were identified through the literature review, as presented in Chapter Two. The review revealed that macroeconomic variables play a role in the operational efficiency of the automotive industry – as measured through production (supply) and sales/revenue (demand) (Johan, 2019). However, Johan's (2019) study was considered deficient because of the narrow focus on only aggregate demand and supply. Some of the macroeconomic variables included in the current study that expand on the scope of previous investigations include shifts in the rate of inflation, changes in lending rates on loans, unemployment levels, labour skillsets, income rates and GDP. All these factors are considered influential on how the automotive sector performs in terms of

both sales and output. It has been demonstrated in research (Shahabudin, 2009) that sales of automobiles could be affected by macroeconomic variables, especially inflation and economic growth.

In a similar study, Muhammad et al. (2012) concluded that economic variables had a significant impact on the sales of automobiles in five ASEAN countries. Using samples from Malaysia, Singapore, Thailand and the Philippines between 1996 and 2010 in aggregate estimations, the study demonstrated a significant long-term link between car sales in these ASEAN countries and GDP, and the unemployed labour force participation rate. Muhammad et al's (2012) study thus lends credence to the suitability of the macroeconomic variables chosen in the present study. Each of the variables used in this study are discussed further in the paragraphs that follow.

GDPp: New vehicle sales and nominal GDP have a high correlation. Despite the substantial link between new vehicle sales and nominal GDP, the correlation between the overall number of cars in use and GDP is stronger. According to Automotive Research (Smith & Chen, 2009), a historical correlation between annualised GDP and vehicle sales growth in the US reveals that positive vehicle sales growth depends on three per cent or higher GDP growth. This is the conclusion that may be drawn from the correlation's historical data. As a result, a decrease in automobile sales is to be anticipated if the yearly growth rate of GDP is less than one per cent. In a similar study, it was found that there is a strong correlation between GDP and car sales in the European Union. Babatsou and Zervas (2011) also suggest that car sales in European Union countries have a strong association with economic growth.

Interest Rate (IntR): Considering the fact that interest rates directly affect consumer purchasing power, the performance of the automotive industry may depend heavily on changes in interest rates. According to the findings of Sammadar and Bachman (2022), an increase in interest rates was found to have considerably and detrimentally affected vehicle sales, which in turn influenced the overall performance of the automotive industry. Evidence (Sammadar & Bachman, 2022) further suggests that a reduction in lending rates creates an impetus to buy new cars – even in the face of uncertainties like those created by the Covid-19 pandemic. However, that study found that decisions by the Federal Reserve to manipulate interest rates in the face of skyrocketing inflation would curb a new demand for automotives and thereby reduce production.

Unemployment Rate (UNEMP): Investors and policymakers alike keep a careful eye on unemployment, which is a very important economic indicator, according to Bondarenko (2018). The rise and fall of unemployment rates can have varied effects on various economic indicators, such as growth and propensity to consume luxurious products like automotives. Plache (2013) shows the negative impact of the unemployment rate on new car sales in the US in 2013. In the study, a long-term upsurge in automotive sales was recorded, which suggests a labour market recovery. Another spin-off from the high unemployment rate was support for the US Federal Reserve Bank's monetary decision to lower the interest rate and stimulate borrowing and lending in order to shore up employment and job creation. This intervention also spurred long-run demand for new cars shortly after the global financial crisis of 2007/08, as well as shortly after the Covid-19 pandemic.

Exchange Rate (ExR): This refers to the price of a country's currency in relation to another country's currency (Tikkanen, 2010). According to a documented study (Picardo, 2021), exchange rates were found to have a deterministic effect on the economy both in the short term and long term. In this era of globalisation, the importation of goods is a common occurrence, and in some cases, the importation of goods undercuts domestically produced goods. Picardo (2021) further illustrates that the price of imported items, as well as domestic products that rely on imported components and raw materials, is directly affected by fluctuations in the value of the currency, i.e., exchange rate volatility. Thus, in the automotive industry which depends on manufacturing and supply chain maturity, price can be affected by the price of imported parts and materials, required to support vehicle production as well the percentage of imported vehicles, CBU's (complete built units). Prices, in turn, affect the demand for automotives. In a previous empirical study (Barumwete & Rao, 2008), the direct impact of exchange rates on the automotive industry in Europe was analysed, using three different currencies. The study found a strong relationship between exchange rates and sales of automotives in the sampled countries.

Inflation (Inf_r): Inflation refers to a notable increase or surge in the prices of a basket of staple food items as categorised by an apex bank of a country. To qualify as inflation, the sudden rise in prices of the food basket should not be accompanied by a proportional increase in the volume of those commodities. Inflation is used to measure the stability of macroeconomic fundamentals, especially with regard to consumer confidence (Aseidu, 2006). According to

Doucet (2010), unemployment and inflation are significantly related. Further evidence from the study supports the hypothesis that there is an inverse link between the two variables; specifically, that higher unemployment rates are associated with lower inflation rates. Ultimately, unemployment levels do have effects on consumption patterns, as household consumption pattern is determined by the level of disposable income available to members of the household who are employed. The effects of inflation on the performance of consumer goods has been documented in a handful of studies. For instance, Ahmed (2022) examined the rise in interest rates and inflation rate on the Pakistan automotive industry and documented statistically significant inverse relationships.

3.10 Chapter summary

This chapter has provided an overview on the processes that were used to collect and analyse the data used in this study. The research was designed to used secondary data, and the chapter has describedcovered the data that was applied, an explanation of the kinds of data used, the sources of data and reasons for the using the particular dataset that wasere selected for this study. In addition, the statistical approaches that are considered appropriate to analyse the data were proposed and justified. The chapter also presented a discussion on the pre-estimatedion diagnostics that were considered relevant for the study, further delved into the and information on the ppossible estimation approaches that would help achieve the research objectives and answer the research questions.

Lending credence to the literature review conducted in the previous chapter (chapter two), tThise chapter also discussed each of the variables of interest – both dependent and independent variables. Motivation was advanced in support of the choice of variables that were considered appropriate through reference to previous studies. The next chapter (chapter four) would present a series of statistical analyses, preceded by a description of the pre-estimation approaches and their interpretations. Analyses and interpretation of data obtaind are presented in the chapter four of the study.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the data analysed by discussing the analyses in line with the research questions and objectives of the study. The previous chapter detailed the research design and methodology deployed in this study. In that chapter, mention was made of the data collection approach, the sample size and justification for the choice of approach, various pre-estimation diagnostic approaches, as well as the estimation approaches adopted. In this chapter, Chapter Four, the focus shifts to data analysis and interpretation. Thus, the he data analyseis approach is intended to help answer the research questions and to achieve the research objectives as set out in Chapter oOne of this dissertation.

To reiterate, the focus of this study is the impact of macroeconomic variables on the performance of the automotive industry in selected countries in Africa, Europe and the Middle East, using vehicle sales and vehicle production as the key instruments to measure automotive performance. The selected countries in the three regions are:

- African region: Algeria, Nigeria, South Africa and Egypt;
- European region: Germany, Netherlands, Turkey and the United Kingdom (UK);
- The Middle East region: Iran and Pakistan.

As explained in the previous chapter three, all the data used in this study wereas retrieved from public sources. The macroeconomic fundamentalsindicators across the countries were sourced from the World Development Indicators (World Bank), while the dataset for the dependent variables, namely automotive vehicle sales (*VHs*) and annual vehicle production (*Avp*), wereas sourced from the International Organisation of Motor Vehicles (OICA). The dataset is arranged in a panel format with both cross-sectional and time series characteristics.

As a remindera refresher, the detailsreasons for the selection of the dependent and explanatory variables were discussed in chapter three in detail in Chapter Three. In the paragraphs that follow, the results are presented in the sequence of pre-estimation diagnostic

tests and regression analyses. The pre-estimation test was conducted to uncover the data behaviour. This process began with the descriptive statistics to ascertain if the data passed the test of normal distribution, with the major measures of central tendency applied. Thereafter, the data was tested for unit roots to uncover the order of integration and to ascertain if the data was mean-reverting. In addition, the Hausman test was performed to choose the appropriate estimation effect based on the data behaviour, and finally, the regression analysis was conducted. Results of the descriptive statistics, unit root tests, ARDL estimations, Hausman tests, and GMM estimations for both Models 1 and 2 are presented in that order in the paragraphs that follow.

4.2. Data Analyseis

In the paragraphs that follow, data analysis was conducted, with the results presented in tables.

4.2.1: Descriptive statistics for Model 1

A summary of the behaviour of the data collected is presented using descriptive analysis. Descriptive statistics is used to describe the important features and behaviour of data, and to ensure the stability and usability of the data as suggested by the normal distribution assumptions (Clarke & Cooke, 2004). The mean of the dataset is presented, along with standard deviations that capture the variance between minimum and maximum values. More specifically, this section is a summary of the centralisation and variation of the data series used in the study. It is essential to investigate descriptive statistics in quantitative research before engaging in any regression modelling. It is the first step in understanding the parametric and non-parametric comportment of the dataset, indicating how normally distributed the sample is. It can also indicate if there are outliers in the data (wide/strong standard deviations) (Chen, 2021). Furthermore, the standard deviation for each of the variables indicates how wide apart the measurement units are to the mean. In cases where the spread is so wide as to raise concerns, efforts have to be made to diagnose the data before use. Panel descriptive statistics for model 1 is presented in table 4.1.

Table 4.1: Model 1: Panel Descriptive Statistics

	Variables	Obs.	Mean	SD	Min	Max
Africa (Model 1)	AVP	78	153877.3	225647.8	1.000000	631983.0
	GDPp	78	3162.248	1012.981	1383.660	4830.190
	UNER	78	14.46731	9.141039	3.530000	33.29000
	EXR	78	63.05297	69.69774	3.472050	306.0800
	INTR	78	3.850303	5.884859	-10.3318	21.56933
	INFR	78	7.769689	5.136551	-0.69203	29.50661
Europe (Model 1)	AVP	78	2120195	2148430	29183.00	6213460
	GDPp	78	36117.39	15186.16	7631.559	55689.99
	UNER	78	6.795138	2.675155	2.119000	13.49000
	EXR	78	1.108762	0.865131	0.499772	5.673819
	INTR	78	2.516072	2.634885	-1.50935	8.250000
	INFR	78	5.409540	9.986686	0.312738	54.91537
Middle East (Model 1)	AVP	78	548339.6	505989.0	17196.00	1649311
	GDPp	78	3519.361	2593.400	820.2256	6948.704
	UNER	78	6.665900	5.199939	0.398000	13.52000
	EXR	78	8225.956	12024.52	53.64819	42000.00
	INTR	78	0.336187	6.641976	-18.1219	16.13351
	INFR	78	12.71875	8.632628	2.529328	39.90735

Note(s): The descriptive statistics include observation, mean, standard deviation, and minimum and maximum of the dependent and explanatory variables used in the study across regions. Specified are the scores for Africa, Europe and the Middle East in terms of annual vehicle production (AVP), gross domestic product per capita (GDPp), unemployment rate (Uner), exchange rate (Exr), interest rate (INtr) and inflationary rate (Infr)

Table 4.1 presents the results of descriptive analysis for Model 1 (annual vehicle production, as depicted in Equations 4 and 7 in Chapter Three). Furthermore, Model 1 is cascaded down into various sub-regions, namely Africa, ~~Europe and~~ the Middle East and Europe. In each of

the sub-regional models, there are 78 observations. In each of the sub-regional models, the descriptive statistics are kept to mean, standard deviation, minimum and maximum values. It was considered unnecessary to look beyond measures of central tendency because the unit roots analysis will further unfold the mean-reverting characteristics of the dataset, as well as its level of integration.

Looking at the behaviour of each of the variables, the average of economic growth is lowest in Africa (3162.25), with a value of 3519.36 posted for the Middle East. As expected, the average growth in Europe is the highest, at 36117.39. Apart from annual vehicle production, economic growth posted the second-largest mean value in all the regions. The huge variation expressed by *AVP* and *GDP* at purchasing power parity level is expected because of the characteristics of the sampled countries, which are composed of economies at varying degrees of industrialisation. For instance, the African region is composed of Nigeria, Egypt, South Africa and Algeria. This economic grouping contains the three largest economies and Africa in respective order, and Algeria is simply dwarfed in that group. By implication, vehicle production is contingent on the level of industrialisation of these economies, and the level of industrialisation may also have a spill-over effect on the growth imperatives of the country.

Still concerning economic growth, it is important to point out that Nigeria recorded the lowest growth in 2000, while Algeria experienced the highest growth in 2016. Interestingly, Egypt posted the highest volume of vehicle production in 2011, while Nigeria posted the lowest vehicle production in the African sample in 2008.

In the Middle East, the model that comprises Pakistan and Iran, showed that Iran produced more vehicles than Pakistan. In more specific terms, Pakistan produced the lowest number of vehicles in 2011, while Iran produced the highest number of vehicles in 2017. Also, Pakistan recorded the lowest economic growth in 2000, while Iran recorded a better economic performance in 2017.

In the European model, the Netherlands recorded the lowest volume of vehicle production in 2013, while Germany consistently topped the European countries with the highest volume of vehicle production throughout the sample period. The relationship between economic growth and vehicle production is also apparent here. In the European sub-region, the Netherlands posted the highest growth in 2019, while the United Kingdom posted the lowest growth in 2000. In this analysis, a relationship could be drawn between vehicle production and

economic growth, as suggested in the literature review ~~in Chapter Two~~, and as buttressed in the ~~research~~ methodology ~~chapter (Chapter Three)~~. More importantly, it is evident that industry maturity plays an important deterministic role in adding nuance to the regional dynamics of the automotive industry's performance (measured through *AVP*), especially because of the regional categorisation of automotive industries by the parent companies. For instance, Africa is often grouped with other regions, which may reduce the production volume recorded for Africa as a region.

In more specific terms, highly mature markets such as the Netherlands in the Europe region, record a *GDPp* of 55,689 in 2019, as opposed to a number of emerging markets that fall on the other side of the spectrum. One such country is Pakistan, which recorded the lowest economic growth of 820 in the year 2000. This ~~would~~ explains the high standard deviation in both economic growth and vehicle production shown in Table 4.1. This result reaffirms a postulation that there exists a strong correlation between economic growth and the performance of the automotive industry (using vehicle production as an indicator). These results are in agreement~~lignment~~ with the findings of McKinsey (2016), who found that imports of vehicles grew rapidly from 2003 onwards, coinciding with *GDPp* per capita growth and a growing middle class in European.

The rest of the economic variables – *IntR* (interest rate), *Uner* (unemployment rate), *Infr* (Inflation rate) and *ExR* (exchange rate) – show very moderate standard deviation, which indicates that the dispersion from the mean across the regions is not as vast as that of vehicle production and economic growth. However, all these measurable indicators of macroeconomic fundamentals still have a notable impact on the performance of the automotive industry in the three regions.

4.2.2 Unit root test for Model 1

As explained in cChapter tThree, unit root tests are conducted to investigate if the dataset reverts to the point of equilibrium. The data behaviour would normally be determined either to estimate the data in current form or to manipulate it through differencing. Also, the data behaviour will reveal if there is a long-run equilibrium relationship in the series (mean-reversion), absence of which will render the data unusable in its current form. As is standard practice in basic econometrics, the study performed the unit root test on the series. This was estimated per region for clearer inference. The Levine, Lin and Chu t*, Im Pesaran,

Augmented Dickey Fuller (ADF) Fisher test and Philip Perron (PP) Fisher tests of the first stage of the panel unit root were used. Pesaran, Shin and Smith (2001), Gujarati and Porter (2009) and Baltagi (2013) are among authors who support this basic econometric path. To augment its efficiency, the test was instrumented with a Monte Carlo simulation. The results of the unit root tests are presented in Table 4.2.

Table 4.2: Model 1: Panel Unit Root Test

		LLC t*		IM Pesaran		ADF-Fisher		PP-Fisher		Order
	Series	Stats	Prob.**	Stats	Prob.**	Stats	Prob.**	Stats	Prob.**	
Africa (Model 1)	AVP	-4.768	0.000	-2.9954	0.001	26.107	0.001	13.312	0.1015	I(0)
	GDPP	-3.530	0.000	18.154	0.047	18.154	0.020	16.782	0.032	I(0)
	UNER	-4.262	0.000	-2.830	0.002	22.328	0.004	27.014	0.000	I(1)
	EXR	-4.662	0.000	-3.753	0.000	28.011	0.000	28.704	0.000	I(1)
	INTR	-3.972	0.000	-5.666	0.000	43.627	0.000	201.514	0.000	I(1)
	INFR	-4.051	0.000	-3.416	0.000	26.226	0.001	26.748	0.000	I(0)
Europe (Model 1)	AVP	-2.478	0.006	-3.239	0.000	25.452	0.001	39.447	0.000	I(1)
	GDPP	-4.590	0.000	-3.806	0.000	29.457	0.000	41.291	0.000	I(1)
	UNER	-2.697	0.003	-2.461	0.006	19.865	0.010	15.752	0.046	I(1)
	EXR	-2.360	0.009	-1.915	0.027	18.409	0.018	20.0267	0.010	I(1)
	INTR	-3.379	0.000	-4.059	0.000	31.330	0.000	71.262	0.000	I(1)
	INFR	-5.502	0.000	-4.774	0.000	37.001	0.000	20.337	0.009	I(0)
Middle East (Model 1)	AVP	-2.438	0.007	-2.276	0.011	12.306	0.015	14.446	0.006	I(1)
	GDPP	-1.487	0.06	-2.357	0.009	13.017	0.011	13.397	0.009	I(1)
	UNER	-3.604	0.000	-2.729	0.003	14.720	0.005	33.957	0.000	I(1)
	EXR	-1.639	0.050	-2.927	0.000	-7.153	0.012	7.153	0.011	I(1)
	INTR	-7.810	0.000	-7.070	0.000	38.243	0.000	51.141	0.000	I(1)
	INFR	-4.215	0.000	-3.871	0.000	20.333	0.000	20.410	0.000	I(1)

The results shown in Table 4.2 suggest ~~that~~ that the variables are characterised by a mixed order of integration across all the regions. For instance, in Africa, *AVP*, *GDPP* and *INFR* are integrated of order zero. *UNER*, *EXR* and *INRT* are integrated of order one. This indicates a mixture of two different orders of integration, namely of orders I(0) and I(1). Similarly, in Europe, a mixture of order of integration is also recorded. According to the results contained in Table 4.2, *AVP*, *GDPP*, *UNER*, *EXR* and *INTR* are integrated of order one while, *INFR* is integrated of order zero. Just as in the African region, the unit root results for Europe suggest that the fundamentals~~variables~~ under consideration in this study are a mix of orders I(1) and I(0). However, in the Middle East, all fundamentals (*AVP, GDPP, UNER, EXR, INTR* and *INFR*) ~~variables~~ that were subjected to the unit root test ~~, namely *AVP, GDPP, UNER, EXR, INTR* and *INFR*,~~ are integrated of order one. With this outcome, the study proceeded to ascertain the extent of the long-run relationship existing among the series.

It must be recalled that the unit root tests show clearly that the variables are integrated of different orders. As such, it becomes appropriate to adopt the Autoregressive Distributed Lag

(ARDL) Bounds approach (Pesaran, Shin & Smith, 2001) to test the short- and long-run relationship between the variables, because other forms of estimation may not yield stable and consistent result. However, other approaches were also used for a robustness check.

4.2.3 Panel estimations for Model 1

Having determined the form of the stationarity outcome of the series, the researcher proceeded to estimate the short-run and long-run relationship. As indicated in the preceding paragraphs, a few estimation approaches were used to ensure that the results generated were reliable and robust with regard to estimation errors. The analysis began with the ADRL approach and was followed by tests to determine the effects of time and country-specific characteristics. The results of the ARDL estimations (short-run and long-run effects) are presented in Table 4.3.

Table 4.3: Model 1, Panel Short-run / Long-Run Estimation Results

	Africa (Model 1)		Europe (Model 1)		Middle East (Model 1)	
	Short-Run	Long-Run	Short-Run	Long-Run	Short-run	Long-run
GDPP	0.201	0.000***	0.5979	0.2009	0.0000***	0.0000***
UNER	0.058***	0.392	0.0106***	0.0158***	0.0000***	0.0006**
Exr	0.710	0.066	0.4241	0.0044***	0.0032**	0.1235
Intr	0.346	0.341	0.2554	0.0002***	0.0121**	0.1303
Infr	0.507	0.730	0.4541	0.0495**	0.0032**	0.0032**

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ {Emphasis is placed on *** $p<0.01$, ** $p<0.05$}

The ~~It is important to recall that~~ estimations were carried out on a regional basis in order to understand the regional dynamics in the performance of the automotive industry (through the measures of automotive production and car sales), which is influenced by the macroeconomic fundamentals~~environment~~ of each region. Table 4.3 suggests that in the African region, *GDPP*, *Exr*, *Intr* and *Infr* are statistically insignificant in explaining *AVP*, save for *Uner* in the short run, just as *GDPP* is significant in explaining *AVP* in the long run.

These results suggest that annual vehicle production is influenced notably in the short run by unemployment in Africa, while economic growth becomes an important determinant of automotive production in Africa in the long run. As is uncovered through the descriptive

statistics, the panel estimation results reveal some level of relationship between economic growth and vehicle production. Further to that, unemployment is now found to have a deterministic effect on vehicle production in Africa. It may thus be inferred that economic growth in some countries may possibly help to reduce unemployment, which by extension, increases vehicle sales, and then vehicle production. To some extent, exchange rates play a role in influencing vehicle production in Africa, but the statistical significance is weak.

In Europe, apart from unemployment that is statistically significant in the short run, all other macroeconomic variables such as economic growth, exchange rate, interest rate and inflationary rate are not statistically significant – as in the Africa model. However, in the long run, variables such as unemployment, exchange rate, interest rate and inflationary rate proved to be statistically significant in explaining *AVP*, except for economic growth. This may suggest that unemployment is a key determinant of disposable income in both Africa and Europe. That is, unemployed people may not be able to buy new vehicles, which may serve as an impetus to manufacture more vehicles.

A cursory glance at the Middle East showed a more expansive influence of the macroeconomic environmentenvironment on vehicle production. For instance, the results contained in Table 4.3 show that all fundamentalsvariables, including *GDPP, UNER, EXR, INTR* and *INFR,* are statistically significant both in the short run and in the long run in explaining AVP, except for exchange rate and interest rate, which are not statistically significant in the long-—run. This result may suggest that the macroeconomic fundamentalsenvironment in the Middle East has a strong elasticity effect on vehicle production. One possible explanation may be that the region produces mainly for the regional market. That is, the region retains most of its vehicle production for domestic use, rather than for export markets.

The results presented in Table 4.3 lend credence to the notion that vehicle production has to bear the burden of short-term equilibrium correction to achieve long-term stability. In a study conducted by Hördahl, Tristani and Vestin (2004), it was shown that fluctuation of certain macroeconomic indicators, such as exchange rates and interest rates, may negatively influence the short-term performance of the automotive industry, especially vehicle production. This happens because the market volatility created by these macroeconomic variables may reduce yields with short maturities, although the longer-term exposures may also be affected negatively (in the long run). A conclusion could be drawn from the regional

analysis that the level of short-term correlation between these macroeconomic variables and vehicle production varies, and as well depending on the maturity of the market.

Having looked at the short- and long-run effects of macroeconomic variables on vehicle production, the researcher turned to the Hausman test, discussed in point 3.8.4. The Hausman test detects the deterministic properties of endogenous regressors in thea model. This is why authors such as Bongomin and Ntayi (2019) refer to the test as the Hausman specifications test. The Hausman test is frequently considered a model failure test. This is so because the null hypothesis emphasises the failure of one approach in comparison with another. That is, the null hypothesis proposes that the selected model is arbitrary, and the assumption goes further to suggest that the alternative model is fixed.

Table 4.4: Model 1: Fixed Effect / Random Effect

	Africa (Model 1)		Europe (Model 1)		Middle East (Model 1)	
	FE	RE	FE	RE	FE	RE
GDPP	0.0000***	0.0000***	0.3110	0.0903	0.0000**	0.0000**
UNER	0.9726	0.3397	0.3082	0.0831	0.8839	0.0030***
EXR	0.7783	0.0001***	0.0030***	0.1091	0.0018**	0.4945
INTR	0.7137	0.3967	0.0007***	0.0672	0.8547	0.1959
INFR	0.5758	0.0816	0.0003***	0.2235	0.0379**	0.1774
Hausman Test (HT)		0.3349		0.2756	0.0000	
Appropriate		RE		RE	FE	

*** p<0.01, ** p<0.05, * p<0.1 {Emphasis is placed on *** p<0.01, ** p<0.05}

Table 4.4 shows results for the effects estimation, and the decision criteria in support of either fixed effect or random effect is highlighted. It is noteworthy that the acceptance or rejection of either of these two assumptions (FE or RE) is predicated on a further test, called the Hausman test (HT). The HT proposes a H_0/H_a assumption of RE/FE appropriateness where H_0 = RE (accept when it is true) and H_a = FE (accept when it is false).

Looking at each region in Model 1, economic growth is observed to be the only variable that is statistically significant in explaining *AVP* in the fixed effect category for the African region. However, *UNER, EXR*, *INTR* and *INFR* are all statistically insignificant in explaining *AVP* in the fixed effect category. Conversely, the random effect outcome showed otherwise. In radom effectHere, both *GDPP* and *EXR* are statistically significant in explaining *AVP,* whereas *UNER* and *INTR* are not statistically significant. The statistical significance effect of *INFR* may be considered anaemicanemic. Going forward, the fixed effect results for Europe showed that only *EXR, INTR* and *INFR* are statistically significant in explaining *AVP*. That is, *GDPP* and *UNER* are not statistically significant in explaining the dependent variable.

Conversely, the random effect results suggest that all variables, including *GDPP, UNER, EXR, INTR* and *INFR,* are not statistically significant in explaining *AVP*.

Similarly, the Middle East fixed effect results show that three variables, *GDPP, EXR* and *INFR,* are statistically significant in explaining *AVP,* whereas *UNER* and *INTR* are statistically insignificant in explaining *AVP*. However, the random effect result reported a different outcome. ~~Accordingly, two variables,~~ *GDPP* and *UNER,* are the two macroeconomic fundamentals that are ~~only~~ statistically significant ~~variables~~ in explaining *AVP*, while *EXR, INTR* and *INFR* are not statistically significant in explaining *AVP*.

Based on the inconclusiveness of both the FE and RE in this estimation, the acceptance of any significant relationship based on the effects estimation parameters becomes challenging. For instance, RE is accepted as the most appropriate approach in the Africa region – where only economic growth and exchange rates are statistically significant in explaining *AVP*. Likewise in Europe, RE is accepted as the most appropriate, where the RE outcome showed that neither *GDPP, UNER, EXR, INTR* nor *INFR* are statistically significant in explaining *AVP*. In the Middle East, FE is accepted as the most appropriate approach, where three variables, *GDPP, EXR* and *INFR,* are statistically significant in explaining *AVP* while, *UNER* and *INTR* are statistically insignificant.

Having determined the most efficient model between the fixed and random effect, the researcher then turned attention to regression analysis. It must be recalled that an ARDL estimation had already been conducted. However, it was considered appropriate to also use another approach to ensure the robustness of the analysis. The results of the dynamic panel are presented in Table 4.5. The dynamic panel is favoured because of its ability to robustly predict relationships in a series by allowing for variations in trends without necessarily altering the stability of the outcome. That is, variables are shown to interact in a flexible manner across a time horizon, in a way that keeps the effects of stochastic terms at bay (Javeed, Ong, Latief, Muhamad & Ni Soh, 2021).

It must be acknowledged that there is a general opinion that cross-sectional observations breed endogeneity and/or exogeneity problems. It is also argued by ~~(~~ Arellano & Bond, (1991) that ~~there is,~~ more often than not, the presence of heteroskedasticity and autocorrelation in the residuals of the dependent series owing to the fact that observations are collected across different time zones and across sections. These variations on the data collection process and

time horizon simply suggest that events that are time related cannot be held to be constant, which increases the possibility of an error term affecting the system. To cater for this observations, Javeed, et al. (2021), Babar, Latief, Ashraf and Nawaz (2019), and Javeed, Latief, Jiang, Ong and Tang (2021) affirmed the adoption of the system GMM mechanism. Arellano and Bond (1991) explain that this is one of the best estimation approaches to tackle any of these observation errors in a panel estimation. On the premise of the motivation advanced above, the results of the system GMM estimation are presented in Table 4.5 for Model 1.

Table 4.5: Model 1: Dynamic Panel (SGMM) Results

	GMM (Model 1) Africa		GMM (Model 1) Europe		GMM (Model 1) Middle East	
	Coef	Prob**	Coef.	Prob**	Coef	Prob**
GDPP	3.2506	0.0000***	13.2047	0.3110	736.2434	0.0000***
UNER	4067.526	0.1699	-16634.9	0.3082	-2022.7	0.8839
Exr	-139.285	0.6427	142583	0.0030***	-9.8100	0.0018***
Intr	-302.883	0.6897	73388.0	0.0007***	691.84	0.8547
Infr	1249.407	0.2665	-13358.5	0.0003***	-6050.14	0.0379***
AR(1)	-0.030941	0.0276	-0.060149	0.5475	0.583411	0.5351
AR(2)	-0.661723	0.8272	-0.833235	0.4047	-0.755531	0.0885

*** p<0.01, ** p<0.05, * p<0.1 {Emphasis is placed on *** p<0.01, ** p<0.05}

The results of the dynamic panel SGMM estimation presented in Table 4.5 were generated through a two-step differenced system estimation. The system GMM was deployed because it augments the power property of differencing by simultaneously estimating a system equation in both differences and levels (Gujarati & Porter, 2009). In this approach, the two equations are instrumented separately with valid instruments that are determined by Sargan tests (not reported because of the structure of the table). Sargan tests are generally used to ensure that the variables used in the model do not suffer from over-identifying restrictions which may constrict the variation of the instruments (Sargan, 1958).

The AR(1) and AR(2) are robust checks of Arellano-Bond Serial correlation. These statistics are deployed to check for first- and second-order serial correlations in the estimation. The underlying assumption is that the idiosyncratic error term in the model is serially correlated. For this reason, the test is conducted to detect whether the specified model suffers from first-differenced errors as a baseline decision criterion. If the error term in levels is serially uncorrelated [AR(1)], this may imply that idiosyncratic error in the first difference is characterised by negative first-order serial correlation – detectable through a negative coefficient. With the possibility of no first-order serial correlation, one may rule out the

presence of higher-order serial correlation [AR(1,2,3…n)]. As shown in Table 4.5, the null hypothesis of no first-order serial correlation in the first difference [AR(1)] is rejected, based on the coefficients of the estimations, and so also is the second-order serial correlation hypothesis. To a reasonable extent and based on the results contained in Table 4.5, that the presence or otherwise of heteroskedasticity and autocorrelation as opined in Arellano and Bond (1991), and as showed by the AR(1) and AR(2) outcome allays any fear of absence of heteroskedasticity and autocorrelation in the series. It can thus be safely concluded that the series is free from possible heteroskedasticity and autocorrelation.

Looking at the estimated results, it was further confirmed that the earlier outcome of the FE/RE Hausman test in Africa is valid. As reported, economic growth is found to be statistically significant in explaining *AVP* in the region. It is considered important to mention that all other macroeconomic indicators, namely *UNER, EXR, INTR* and *INFR,* are not statistically significant. Similarly, in Europe, the outcome of the GMM report showed that three of the five macroeconomic variables, namely *EXR, INTR* and *INFR,* are statistically significant, while *GDPP* and *UNER* are not statistically significant. Further, the dynamic panel outcome for the Middle East also confirms that only three macroeconomic variables, namely *GDPP, EXR* and *INfr,* are statistically significant in explaining *AVP* while, *UNER* and *INTR* do not show statistically significantly impacts on *AVP*.

4.3.1 Descriptive statistics for Model 2

Having completed the statistical analysis for Model 1, the researcher shifted attention to an analysis and presentation of results for Model 2, following the same pattern used in Model 1. The results of the analysis conducted for Model 2 are presented in the tables that follow, along with the interpretation of results.

Table 4.6: Model 2: Descriptive Statistics

	Variables	Obs	Mean	SD	Min	Max
Africa (Model 2)	VHS	78	248873.1	218482.1	8200.0	714315.0
	GDPP	78	9.1010	1.61.11	1383.6	430166.9
	UNER	78	14.346	9.062	3.5390	33.291
	EXR	78	65.527	74.218	3.472	306.921
	INTR	78	3.8379	5.8133	-10.331	21.5693
	INFR	78	7.7179		-0.6920	29.5066
Europe (Model 2)	VHS	78	1846063.	128926	450330	404935
	GDPP	78	36117.39	15186.16	7631.55	55689.9
	UNER	78	6.795138	2.6751	2.11900	13.4900
	EXR	78	1.10876	0.86513	0.49972	5.67381
	INTR	78	2.51607	2.63488	-1.50935	8.2500
	INFR	78	5.4095	9.98668	0.31273	54.91537
Middle East (Model 2)	VHS	78	1846063	128926	450330.0	4049353
	GDPP	78	36117.39	15186.16	7631.559	55689.99
	UNER	78	6.795138	2.67515	2.11900	13.49000
	EXR	78	1.108762	0.865131	0.49977	5.67381
	INTR	78	2.516072	2.63488	-1.5093	8.25000
	INFR	78	5.40954	9.98668	0.312738	54.9153

Note(s): The descriptive statistic include observation, mean, standard deviation, and minimum and maximum of the dependent and explanatory variables used in the study across regions. Specified are the scores for Africa, Europe and the Middle East. Vehicle sales (VHS), gross domestic product per capita (GDPP), unemployment rate (Uner), exchange rate (Exr), interest rate (INtr) and inflationary rate (Infr) are shown.

Table 4.6 shows that in Africa, a strong relationship between economic growth and the dependent variable that measures the performance of the automotive industry is indicated, through vehicle sales. Although vehicle sales recorded the highest level of standard deviation (218482), this was closely followed by economic growth and exchange rate, respectively. In previous results, the relationship between the performance of the automotive industry and growth was prominent in Africa, and the role of macroeconomic variables (such as interest rate and exchange rate) was meaningful. Specifically, the highest vehicle sales were recorded by South Africa in 2006, and the same country recorded the highest growth in 2019. Furthermore, while the lowest growth was recorded by Nigeria in 2000, the same country recorded the lowest vehicle sales in 2017. By implication, the strong relationship between

these two variables is reinforced by the country-specific dynamics found in this analysis. Although all other variables are considered important, their standard deviations are moderate and there is no notable deviation from the analysis contained in Table 4.1.

It is, however, important to note that most African economies, especially Nigeria, rely heavily on the export of natural resources, especially crude oil. This is consistent with the finding that Africa's economic growth deteriorated sharply in 2016, mainly because of lower commodity prices, with commodity exporters most adversely affected (Smith, 2019).

The pre-estimation diagnostics continue with unit root tests, shown in Table 4.7.

4.3.2 Unit root tests for Model 2

Table 4.7: Model 2: Panel Unit Root

		LLC t*		IM Pesaran		ADF-Fisher		PP-Fisher		Order
	Series	Stats	Prob.**	Stats	Prob.**	Stats	Prob.**	Stats	Prob.**	
Africa (Model 2)	VHS	-4.955	0.0000	-3.7004	0.0001	28.517	0.0004	39.277	0.0000	I(1)
	GDPP	-3.5303	0.0002	-1.6710	0.0474	18.1543	0.0201	16.7822	0.0325	I(0)
	UNER	-2.6440	0.0041	-1.7324	0.0416	15.2175	0.0551	27.0145	0.0007	I(1)
	EXR	-4.3679	0.0000	-3.6933	0.0001	28.3643	0.0004	28.7048	0.0004	I(1)
	INTR	-5.6660	0.0000	43.6279	0.0000	43.6279	0.0000	201.514	0.0000	I(1)
	INFR	-4.05123	0.0000	-3.4165	0.0003	26.2268	0.0010	26.7489	0.0008	I(0)
Europe (Model 2)	VHS	-1.9040	0.0285	-3.5654	0.0002	28.9985	0.0003	72.5476	0.0000	I(1)
	GDPP	-4.5900	0.0000	-3.8065	0.0001	29.4572	0.0003	41.2916	0.0000	I(1)
	UNER	-2.6974	0.0035	-2.4618	0.0069	19.8653	0.0109	15.7524	0.0461	I(1)
	EXR	-2.3604	0.0091	-1.9152	0.0277	18.4099	0.0184	20.0267	0.0102	I(1)
	INTR	-3.3792	0.0004	-4.0597	0.0000	31.3309	0.0001	71.2624	0.0000	I(1)
	INFR	-5.5025	0.0000	-4.7745	0.0000	37.0010	0.0000	20.3373	0.0091	I(0)
Middle East (Model 2)	VHS	-1.9040	0.0285	-3.5654	0.0002	28.9985	0.0003	72.5476	0.0000	I(1)
	GDPP	-4.5900	0.0000	-3.8065	0.0001	29.4572	0.0003	41.2916	0.0000	I(1)
	UNER	-2.6974	0.0035	-2.4618	0.0069	19.8653	0.0109	15.7524	0.0461	I(1)
	EXR	-2.3604	0.0091	-1.9152	0.0277	18.4099	0.0184	20.0267	0.0102	I(1)
	INTR	-3.3792	0.0004	-4.0597	0.0000	31.3309	0.0001	71.2624	0.0000	I(1)
	INFR	-5.5025	0.0000	-4.7745	0.0000	37.0010	0.0000	20.3373	0.0091	I(0)

In the second model, the researcher also performed the panel stationarity test on the dependent variable (VHS), and on the other independent variables, as in Model 1 (M1). Again, the LLC t*, Im Pesaran, ADF-Fisher and PP-Fisher test of the first-stage parameter estimation was used. The outcome of the stationarity tests in Model 2 followed a similar pattern to the one deployed in Model 1. In Africa, the series showed a mix of I(0) and I(1) outcomes. From the report, *VHS, UNER, EXR* and *INTR* are all integrated of order 1, whereas *GDPP* and *INFR* are integrated of order zero. Similarly, in Europe, variables report a I(0) and I(1) order of integration. As such, they are equally a mixed order of integration. Specifically, *VHS, GDPP, UNER, EXR* and *INTR* are all of order 1 integration while, *INFR* is integrated of order zero. Likewise, in the Middle East, the series equally showed a mixture of I(0) and I(1). In other words, *VHS, GDPP, UNER, EXR, INTR* are integrated of order one while *INFR* is integrated of order zero. The variation in the order of integration, as in Model 1, suggests that we may use ARDL as the dominant estimation approach, with GMM deployed for a robustness check. The results of the ARDL estimation are presented in Table 4.8.

4.3.3 Panel estimations for Model 2

Following the approach adopted in Model 1, the estimations conducted for Model 2 begin with the ARDL approach, followed by the FE/RE effects determination and it concludes with the GMM analysis. Table 4.8 contains the results for Model 2, using the ARDL approach.

Table 4.8: Model 2: Short-run/ Long-Run Result

Variables	Africa (Model 2)		Europe (Model 2)		Middle East (Model 2)	
	Short-Run	Long Run	Short-Run	Long-Run	Short-run	Long-run
GDPP	0.8407	0.0069***	0.0517	0.4121	0.9003	0.6759
UNER	0.0114***	0.1130	0.4329	0.2260	0.1734	0.7634
EXR	0.6136	0.0368	0.5624	0.5883	0.5895	0.7515
INTR	0.7353	0.1079	0.8886	0.1695	0.0048***	0.7124
INFR	0.8527	0.3904	0.7149	0.1749	0.4210	0.7538

*** p<0.01, ** p<0.05, * p<0.1 {Emphasis is placed on *** p<0.01, ** p<0.05}

Having examined the level of stationarity in Table 4.7, the researcher proceeded to ascertain the existence of short-run and long-run relationships between the variables in the series. As shown in Table 4.8, the Africa model showed that macroeconomic variables, such as *GDPP, EXR, INTR* and *INFR,* are statistically insignificant in explaining *VHS* in the short run, while *UNER* shows a statistically significant explanatory power over vehicle sales. In the long run,

only *GDPP* is reported to have a statistically significant explanatory power over *VHS,* while *UNER, EXR, INTR* and *INFR* generated results that are statistically insignificant in explaining the dependent variable. In Europe, results show that none of the explanatory variables used in this study (which include *GDPP, UNER, EXR, INTR* and *INFR*), is statistically significant in explaining *VHS* in the short run. A similar outcome is reported in the long run. Thus, in the long run, in Europe, *GDPP, UNER, EXR, INTR* and *INFR* are not statistically significant determinants of vehicle sales. Likewise, the report of the short-run and long-run estimations for the Middle East showed that, in the short run, only *INTR* is statistically significant in explaining *VHS*, while *GDPP, UNER, EXR* and *INFR* are not. Also, in the long run, results indicate that none of the variables is statistically significant in explaining *VHS*.

Looking at the results, it could be inferred that unemployment (in the short run) and economic growth (in the long run) are important determinants of vehicle sales in Africa, while none of the estimated predictors exhibit notable deterministic power over vehicle sales in Europe. The situation is not very different in the Middle East, where only interest rates were found to influence vehicle sales in the short run. These results may suggest that a derivative of other factors that may be closely aligned to household consumption pattern or disposable income (which are derived from unemployment and growth in the case of Africa) may play a role. For instance, the findings of Smith et al. (2019), and Shedlock (2018) revealed that a significant increase in fuel price could impact the performance of the automotive industry, especially vehicle sales. This factor was found to induce uncertainty in the market, and it may spark an increase in household spending, which may have a corresponding negative effect on decisions to buy new vehicles.

Furthermore, a notable hike in fuel prices, such as the one experienced for many months after the outbreak of the Russian/Ukrainian war in February 2022, are practical testimony to the fact that fuel prices may disrupt the supply chain of the industry, while at the same time negatively influencing consumer demand for luxury products such as new vehicles (Smith, 2019). Smith further suggests that an increase in fuel prices may sway consumer preferences for lightweight vehicles or even cause them to abandon the plan to buy a new vehicle altogether, especially in Europe. Shahabudin (2019) conducted a similar study on domestic and foreign car sales, where it was discovered that the inflation rate can significantly influence the performance of the automotive industry, especially the number of new cars sold.

Attention is focussed on the determination of specific effects that would influence the estimation, whether fixed effects or random effects. The results of the estimation, which follows the procedure adopted in Model 1, are presented in Table 4.9.

Table 4.9: Model 2: Fixed Effect/Random Effects

	Africa (Model 2)		Europe (Model 2)		Middle East (Model 2)	
	FE	RE	FE	RE	FE	RE
GDPP	0.0776	0.0000***	0.0160***	0.9005	0.0160***	0.9101
UNER	0.4252	0.0004****	0.0449***	0.2192	0.4450	0.2202
EXR	0.8161	0.0000****	0.7694	0.0276***	0.7704	0.0306***
INTR	0.7650	0.3559	0.9459	0.5806	0.9510	0.5810
INFR	0.7454	0.4089	0.3810	0.0809	0.4010	0.0810
Hausman	0.0002			0.1483		0.1503
	FE			RE		RE

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ {Emphasis is placed on *** $p<0.01$, ** $p<0.05$}

As indicated under Model 1, this approach is meant to essentially allow for individual country-specific characteristics across the regions. In order words, this takes into account the heterogeneous assumptions both in the fixed effect assumption of arbitrarily fixing country-specific and time-invariant effects. On the other hand, the random effects are tested on the basis of arbitrarily randomising the uncorrelated time-invariant series in the estimations. However, the acceptance or rejection of either of these two assumptions (FE/RE) is predicated on a further test, called the Hausman test (HT). The HT proposes a H_0/H_a assumption of RE/FE appropriateness where H_0 = RE (accept when it is true) and H_a = FE (accept when it is false).

The Africa model in the FE result suggests that none of the macroeconomic variables has notable predictive power over the dependent variable. That is, *GDPP* is statistically insignificant in explaining *VHS*. Furthermore, *UNER, EXR, INTR* and *INFR* showed that they are statistically insignificant and thus did not show notable explanatory power over the dependent variable. However, the RE report showed that *GDPP, UNER* and *EXR* are statistically significant in explaining *VHS,* but *INTR* and *INFR* are not. ~~Also, i~~In Europe, results of the FE show that *GDPP* and *UNER* are the only ~~statistically~~ significant variables that have ~~are characterised by~~ explanatory powers over the dependent variable (*VHS*), while *EXR, INTR* and *INFR* are not statistically significant. Conversely, the RE results showed that only *EXR* is statistically significant in explaining VHS, while *GDPP, UNER, INTR* and *INFR* are not. The FE test results for the Middle East showed that only *GDPP* is ~~statistically~~ significant in explaining *VHS,* while *UNER, EXR, INTR* and *INFR* are not. Likewise, the RE result

showed that *EXR* is the only statistically significant variable in explaining *VHS*, while *GDPP*, *UNER, INTR* and *INFR* are not.

Based on the inherent weakness of both the FE and RE, the acceptance of any significant relationship based on this parameter in the study between the dependent and independent variables needs to be backed up by the Hausman test outcome. As shown, for Africa, the FE is accepted and, as such, it is therefore the most appropriate model. By implication, the FE report shows that neither *GDPP,* nor *UNER*, *EXR, INTR* and *INFR* are significant in explaining *VHS*. Also, based on the Hausman test for Europe, RE model is accepted and, it is the most appropriate. The result showed that only *EXR* is statistically significant in explaining *VHS,* while other variables are not. Similar result is recorded for the Middle East. As shown, the RE is accepted and, it is the most appropriate. By implication, only *UNER* is statistically significant in explaining *VHS* while, *GDPP, UNER, EXR, INTR* and *INFR* are not statistically significant.

The results generated from Table 4.9 above may suggest that of the given macroeconomic fundamentals, it is only the changes in the exchange rates regime and possibly unemployment that influence the performance of the automotive industry when measured in terms of vehicle sales. It may be argued that unemployment may reduce household income levels, and thereby reduces the marginal propensity to buy a new vehicle. Also, there is an indication that appreciation or devaluation of the domestic currency may lead to an increase in the average price of automotive's. This finding may align with the work of Swart (2016), where a relationship between car sales, interest rates and exchange rates volatility was investigated.

These results further reinforce the findings of Ratanapakorn and Sharma (2017) who, using Family Expenditure Survey from 1970 to 1995, showed~~found~~ that the statistics of vehicle ownership recorded a positive upward trend, with an increase in household income caused by an increase in employment. That study also found a negative correlation when there is an income reduction. This is associated with the personal habits of individual consumers, with a vehicle seen as an important necessity for daily commuting. However, this consideration is only important when consumers are in a favourable financial position, which increases their marginal propensity to consume.

Having established the specific effects that are appropriate for the panel estimation, the researcher shifted attention to an analysis and interpretation of results for Model 2. The statistical results are presented in Table 4.10.

Table 4.10: Model 2: Dynamic Panel Data (SGMM)

	GMM (Model 2) Africa		GMM (Model 2) Europe		GMM (Model 2) Middle East	
	Coef	Prob**	Coef.	Prob**	Coef	Prob**
GDPP	7.8530	0.0000***	-2.0498	0.9308	2.5757	0.9005
UNER	5993.2	0.0004***	-18741.04	0.4179	110042.9	0.2192
EXR	-840.87	0.0000***	-7819.82	0.2216	-4876.0	0.0276***
INTR	1292.19	0.3559	22248.2	0.4282	-5297	0.5806
INFR	1449.03	0.4089	-5609.05	0.2010	-3422.09	0.0809
AR(1)	0.030941	0.0276	0.601491	0.5475	-0.073837	0.0821
AR(2)	-0.661723	0.8272	-0.833235	0.4047	0.086857	0.9308

*** p<0.01, ** p<0.05, * p<0.1 {Emphasis is placed on *** p<0.01, ** p<0.05}

As in Model 1, dynamic panel estimation was performed for Model 2 performed a dynamic panel estimation.. Based onFollowing the same estimation diagnostics performed in Model 1, (as contained Table 4.5), the results of the system dynamic panel estimation (SGMM) of Model 2 that that iis presented in Table 4.10, were generated through a two-step differenced system estimation. As described insuggested under Table 4.5, the system GMM was deployed because it augments the power property of differencing by simultaneously estimating a system equation in both differences and levels (Gujarati & Porter, 2009). Through this approach, the two equations are instrumented separately, with valid instruments that are determined by Sargan tests (not reported here because of the structure of the table). Sargan tests are generally used to ensure that the variables used in the model do not suffer from over-identifying restrictions which may constrict the variation of the instruments (Sargan, 1958).

Similar to the results contained in Table 4.5, Table 4.10 shows that the AR(1) and AR(2) are deployed as robust checks of Arellano-Bond Serial correlation. As informed by the results of the AR91) and AR(2) coefficients, the presence or otherwise of heteroskedasticity and autocorrelation (Arellano & Bond, 1991), is tamed. It can thus be safely concluded that the series is free from possible heteroskedasticity and autocorrelation.

The results of the system estimation as revealed by the dynamic panel approach, presented in Table 4.10, show that in Africa, *GDPP, UNER, EXR* are statistically significant in explaining *VHS,* while *INTR* and *INFR* are not. In Europe, none of the variables, namely *GDPP, UNER,*

EXR, INTR and *INFR,* is statistically significant in explaining *VHS*. Likewise, the result of the system GMM in the Middle East clearly shows that *EXR* is the only macroeconomic fundamental that is statistically significant variable that influences *VHS*, while other variables (*GDPP, UNER, INTR* and *INFR*) are not.

From the results shown in Table 10, it is observed that exchange rates are an important consideration that influences the performance of the automotive industry in emerging markets (in this case, in African and certain Middle Eastern countries). Also, economic growth and unemployment (or household disposable income) may have a strong deterministic effect on the performance of the automotive industry in emerging markets. However, it is important to note that the African automotive market is relatively small compared to other continents such as Asia and Europe. This is supported by the fact that in 2014, there were just over 42.5 million registered vehicles in use in the whole of Africa – a continent of approximately one billion people. As a result, the motorisation rate on the continent was only 44 vehicles per 1 000 inhabitants in 2014 (Smith et al, 2019). This is far below the global average of 180 vehicles per 1 000 inhabitants, and lower than other developing regions such as Latin America (176) and developing Asia, Oceania, and the Middle East (76) (Smith et al, 2019).

Even though domestic vehicle production and assembly may have substantial multiplier effects for African economies and could possibly act as a catalyst for industrialisation and economic diversification, the entire continent remains a fledgling market for automotives. As a result, the industry has been categorised as a strategic focus for policymakers seeking to boost manufacturing employment, diversify sources of export revenue, and ultimately industrialise their economies (KPMG, 2015).

Another point of note is that sales of vehicles in the Middle East are low on a global scale, but nevertheless of strategic significance for all automobile manufacturers. The region offers automotive manufacturers the opportunity to reap location-specific advantages in costs and proximity to bigger markets. In the heavy vehicle segment, the Middle East market accounts for only 6.5 per cent of global truck sales, and in the medium segment, the figure reduces to 4.8 per cent (Dynaquest & Berhad, 2018). This market, especially the growth potential it bears, needs to be captured in a systematic manner in order for manufacturers to leverage the expanding market opportunities, especially in emerging markets. The demand for trucks in the Middle East is generally increasing, mainly for two reasons – first, the significantly

improved political situation with Iran, and second, the economic diversification of many petroleum-dependent countries (Dynaquest & Berhad, 2018).

The findings for Europe as a region are consistent with the findings of McKinsey (2019), which reports that although the automotive industry in Europe is huge, the industry continues to face new challenges. These include dwindling consumer confidence in the automotive industry, especially as a result of the diesel scandal that clouded the transparency of the industry. Also, Asia continues to pose strong challenges to Europe as a source of cheaper and more affordable automobiles, with the likes of KIA, Hyundai, Toyota, Mahindra, GWM, Nissan, Honda, Haval, and Wuling Hongguang entering the European market in stiff competition with the established brands.

A general conclusion may be drawn from the set of results reported in this chapter. From the study, it is observed that unemployment has a negative relationship with car sales. This means that when unemployment increases, the volume of car sales also decreases. So, in order to increase the volume of car sales, governments would have to intervene by tackling the unemployment rate. In the automotive sector, where specialist skills and talent are needed, investment in producing the right level of labour would be a benefit to further establishing this industry and would, in turn, create the requisite consumer market that would support the overall economy, and the automotive industry specifically.

4.4. Chapter Summary

In this chapter, the researcher examined ~~has analysed possible relationships between selected~~ macroeconomic variables and the performance of the automotive industry in ~~the~~ three regions (~~of~~ Africa, Europe and the Middle East) from~~er the period~~ 2000 to 2019. The analysis focused on two measurable indicators of industry performance, namely automotive production and automotive sales. For the explanatory variables, economic growth, unemployment, exchange rate, interest rate and inflation were considered. In addition, various pre-estimation, estimation and post-estimation approaches were deployed to ensure the stability of the models and the validity of the results.

The findings from this research show that just a few of the explanatory variables, namely economic growth, unemployment and interest rates, have notable explanatory powers over the dependent variables in Africa and Asia, while the results for Europe generated an

inconclusive verdict. For instance, the *GDPp* variable was found to have a positive relationship with vehicle sales and vehicle production. This proves that national income level, especially the disposable income of households, is an important determinant of the performance of the automotive industry. In contrast, spikes in the unemployment rate and exchange rate were found to have a negative effect on ~~both performance indicators (~~vehicle sales and vehicle production~~)~~.

In this regard, financial and fiscal policies must be implemented carefully to prevent macroeconomic instability, especially policies that could impinge negatively on household income level and disposable income. The findings also illustrate that market and industry maturity may play a role in determining the effect of macroeconomic variables on the performance of the automotive industry. For instance, Africa and the Middle East were found to exhibit a drastic response to issues of economic growth, unemployment and exchange rates, while these issues were structurally unimportant in the European model. This may suggest that other closely related variables, possibly derived from mainstay macroeconomic considerations, such as fuel prices, household disposable income and consumer confidence in the automotive industry, may play a more deterministic role in advanced economies.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This study set ~~out~~ to investigate the ~~possible~~ relationship between macroeconomic fundamentals ~~variables~~ and the automotive industry's performance (sales and production) in three regional groupings of countries. The study ~~intended to~~ uncovered the impact of macroeconomic variables, namely economic growth, inflation, exchange rate and employment rate on the automotive industry. ~~To reiterate, the automotive performance indicators used were vehicle sales and production.~~

Thus the study's primary objective was to investigate the influence of macroeconomic fundamentals' on the automotive industry's performance, for selected African, European, and Middle Eastern countries. These economic groupings were categorised according to the global structures of automotive strategic formation. The secondary objective was to investigate the relationship between fiscal and monetary policies and the automotive industry's performance.

This chapter brings the study to a close by providing a summary of the most important research findings based on the analysis completed in Chapter Four. Possible recommendations linked to the results are highlighted, the limitations experienced during this study are explained, and suggestions for further studies are made.

5.2 Practical Outcomes of the Study

The main objective of this study was to determine the impact of macroeconomic fundamentals on the automotive industry's performance in selected countries in Africa, Europe and the Middle East. The quantitative research project was predicated mostly on numbers aggregated into statistics. The researcher used a statistical approach to examine the impact of macroeconomic fundamentals on the automotive industry's performance. Statistical models were used to support or refute the *a priori* expectation that macroeconomic fundamentals affect the automotive industry's performance.

It was believed that the strength of this relationship would shed light on whether there w~~ereas~~ere a possibility of autocorrelation between the variables. Data was drawn from institutional documents from public entities such as the World Bank, the International Monetary Fund, the World Trade Organization, the National Association of Automobile Manufacturers of South Africa, OICA (the International Organization of Motor Vehicle Manufacturing) and other sources. The study used a cross-sectional time series (panel) dataset, which is historical in nature, covering several years. The use of historical data in econometric estimations is imperative in order to denote the relationship or correlation between the variables of interest over a period. Thus, the~~The~~ study covered a period spanning 2000 to 2019.

The countries used in the sample were Pakistan and Iran (Asia), Algeria, South Africa, Egypt and Nigeria (Africa) and Germany, Netherlands, Turkey and the United Kingdom (Europe). Some researchers believe that graphical presentations are better at revealing patterns in data than the numerical methods. ~~used in this study;~~ however ~~,~~numerical procedures are more exact and objective and were therefore u~~sed~~tilised in this study. For instance, researchers can compute simple statistics like the mean, median, and standard deviation.

Under the null hypothesis Hausman tests, the chi-square statistic is generally considered asymptotically distributed. In this study, the hypothetical decision process was based on the consistency of the estimators. That is, estimators were considered valid in the random series rather than in a fixed effect environment. A simple linear regression model can examine the relationship between two variables.

The independent variables in this study comprised key macroeconomic conditions that affect the overall automotive industry. S~~The s~~elected variables were exchange rates, interest rates, inflation rates and unemployment rates in the various countries. The econometrics technique used in this study applied relevant statistical procedures to the selected panel data, allowing the researcher to draw empirical inferences between the independent and dependent variables. The International Organization of Motor Vehicle Manufacturers (OICA), ~~-~~maintains consistent and official records of vehicle sales and production ~~records~~ by country or market which is easily accessible, ~~. T~~therefore, the measure of production and motor vehicle sales were identified as the optimal instruments to understand supply and demand from a historical perspective.

The macroeconomic variables considered included shifts in the rate of inflation, changes in lending rates on loans, unemployment levels, labour skillsets, income rates, and overall GDP. A decrease in automobile sales was anticipated if the yearly growth rate of GDP was less than one per cent. A reduction in lending rates creates an impetus to buy new cars – even in the face of uncertainties like the Covid-19 pandemic.

The literature review revealed that importation can undercut domestically produced goods and that the prices of imported items and products that rely on imported components and raw materials are directly affected by fluctuations in a currency's value. The literature review also supported the hypothesis that unemployment and inflation have an inverse link. Ultimately, unemployment levels have an effect on consumption patterns, as household consumption is determined by the level of disposable income available to members of the household.

From the findings, it became clear that to sustain a healthy pace of development in the automotive industry, it is vital to implement fiscal and monetary policies that grows the economy sustainably, reduce unemployment and stabilises the fiscal and monetary environments. Clearly, this is the conclusion that can be reached from the available evidence. Historically and in the previous few decades, no nation has been able to attain economic success as measured by significant improvements in its people's quality of life without sustainable economic growth that translates into household-level development. This is a performance indicator known as the living standard gap.

More importantly, people with lower incomes often gain the most from sustainable growth that translate into improvement in household consumption patterns. It must be admitted that since the beginning of this century, there has been a general trend towards decreasing inequality across nations through the Millennium Development Goals (MDGs) of the United Nations, reflecting the more rapid economic growth in developing countries that has occurred as a direct result, in part due to sustainable economic growth and development – mainly in Asia.

5.3 Summary of Findings

Results of the descriptive statistics, unit root tests, ARDL estimations, Hausman tests, and GMM estimations for both Models 1 and 2 reveal that average economic growth is lowest in Africa (3162.25). The figure for the Middle East is 3519.36 and, as expected, average growth in Europe is the highest at 36117.39. Apart from annual vehicle production, economic growth posted the second largest mean value in all the regions. Nigeria recorded the lowest growth in 2000, while Algeria experienced the highest growth in 2016.

Egypt posted the highest vehicle production volume in 2011, while Nigeria posted the lowest vehicle production in 2008. In the European sub-region, the Netherlands produced the lowest number of vehicles in 2013, while Germany produced the highest in 2015. The dispersion from the mean across the regions is not as vast as that of vehicle production and economic growth. However, all these macroeconomic indicators still notably impact the automotive industry's performance in the three regions. Two variables, GDPP and UNER, were the only statistically significant variables in explaining AVP.

With regard to regression analysis, in the Middle East, the FE was accepted as the most appropriate approach, where three variables, GDPP, EXR and INFR, were statistically significant in explaining AVP, while UNER and INTR were statistically insignificant. System GMM is one of the best estimation approaches to tackle any of these observation errors in a panel estimation.

The study also examined the relationship between VHS, GDPP, EXR, INTR and INFR. In the short run, only INTR was found to have significant explanatory power over VHS. However, the long-run results show that none of the variables is statistically significant in explaining VHS in either Africa or Europe. The inflation rate can significantly influence the automotive industry's performance, especially the number of new cars sold. Smith et al. (2019) suggest that an increase in fuel prices may sway consumer preferences for lightweight vehicles or cause them to abandon the plan to buy a new vehicle altogether.

GDPP is statistically insignificant in explaining *VHS. UNER, EXR, INTR* and *INFR* showed that they are statistically insignificant and thus did not show notable explanatory power over the dependent variable. For Africa, the FE was accepted, and was the most appropriate

model. Unemployment may reduce household income and the marginal propensity to buy a new vehicle. Also, appreciation or devaluation of the domestic currency may lead to an increase in the average price of automobiles.

BThus, and based on the estimated results, it was further confirmed that the earlier outcome of the FE/RE Hausman test in Africa was valid, because . As reported, economic growth was found to be statistically significant in explaining *AVP* in the region. All other macroeconomic indicators, namely *UNER, EXR, INTR* and *INFR*, were not statistically significant. Similarly, in Europe, the outcome of the GMM report showed that three of the five macroeconomic variables, namely *EXR, INTR* and *INFR*, were statistically significant, while *GDPP* and *UNER* were not statistically significant. Further, the dynamic panel outcome for the Middle East also confirms that only three macroeconomic variables, namely *GDPP, EXR* and *INfr*, were statistically significant in explaining AVP, while *UNER* and *INTR* did not show statistically significant impacts on AVP.

This finding may align with the work of Swart (2016), who demonstrated a relationship between car sales, interest rates and exchange rate volatility. The system dynamic panel estimation (SGMM) results were generated through a two-step differenced system estimation. AR (1) and AR (2) were deployed as robust checks of the Arellano-Bond Serial correlation. The African automotive market is relatively small compared to Asia and Europe. In 2014, there were just over 42.5 million registered vehicles in Africa – a continent of approximately one billion people. This means that the motorisation rate on the continent was only 44 vehicles per 1 000 inhabitants. Unemployment has a negative correlation with car sales, which means that when unemployment increases, car sales volume decreases. Governments would have to intervene by tackling the unemployment rate in the automotive sector. Investment in producing the right level of labour, i.e., highly skilled, would be a benefit to further establishing this industry.

5.4 Conclusion

TIn conclusion, the findings from this research showed some of the macroeconomic fundamentals (economic growth, unemployment, and interest rate) drive or influence vehicle production and vehicle sales in Africa and Asia. However, the influence of the fundamentals showed a departure from the results of Africa and Asia regarding Europe. that just a few of

the explanatory variables, namely economic growth, unemployment, and interest rates, have notable explanatory powers over the dependent variables in Africa and Asia, while the figures for Europe generated inconclusive results. This implies that there are other macroeconomic fundamentals outside the scope of this study that influence vehicle production and vehicle sales in Europe. The GDP however, variable has showed a positive relationship with vehicle sales and production. This proves that the national income level, especially the disposable income of households, is an important determinant of the automotive industry's performance. In contrast, unemployment and exchange rate spikes were found to negatively impact both performance indicators (vehicle sales and vehicle production). Therefore, it is conceivable for expansionary fiscal policy to increase aggregate demand in one of two ways: increasing government spending or reducing tax receipts. Moreover, an expansionary fiscal policy is the most effective remedy for an economy experiencing a recession and generating less GDP than it is capable of creating.

Strategic analysis and planning in the automobile sector has become fraught with uncertainty as a result of seismic transformations in the economies of the world, technological breakthroughs, government regulations and relative pricing market dynamics. At the same time, planners are tasked with planning in an environment characterised by more rapid change than has ever been the case in the past. The imponderables have overtaken the typical obstacles that automobile manufacturers faced in the past. These typical problems included which items would be popular in the future, the locations that would create the most growth, and the need to invest in consumer-friendly technology. Changes in the world have introduced more uncertainty than ever, making these traditional concerns difficult for planners to predict.

Rapidly changing country demographics and customer demands are driving automakers to revise their business strategies in order to flourish in the new environment. In mature markets, the pace of unit sales growth is anticipated to decelerate as these regions see a shift in their consumer demographics.

Finally, it is probable that the sector's profitability will decline, not only because excess capacity will be permitted to stay in place but also because demand will shift toward low-margin sectors as a consequence of the many programmes that favour affordable smaller

cars. This shift in demand toward segments with lower margins is a result of the numerous programs that favour affordable automobiles.

5.5 Problems and Recommendations

- *Sustainability*. A rising number of customers are worried about the capacity to safeguard the environment. Therefore, manufacturing facilities in all nations must aim to produce automobiles that are less damaging to the environment while simultaneously improving their overall manufacturing efficiency.

- *Cost*. As a direct result of greater global competition, the costs of a wide range of automobiles have decreased. However, vehicle manufacturers' manufacturing lines still need to boost total productivity. To promote demand for locally manufactured products, the governments of certain emerging countries are now limiting or outright prohibiting the use of imported vehicles on their public roads. This is being done to promote demand for domestically made items.

- *Excessive capacity*. The production of automobiles, like commodities in all other industries, fluctuates between expansion and contraction. Overcapacity is the issue that arises when a manufacturer has already committed the necessary resources (such as labour and materials) to create a specific number of items, only to discover later that they do not need to create as much as they anticipated. This causes the firm to have an excess capacity relative to the amount it intends to produce. As a direct consequence, there is an excessive quantity of spending, which may be detrimental to cash flow and may lead to waste. Investing in better production floor responsiveness and enhanced master production scheduling is the most effective method for preventing a production facility from having excess capacity.

- *Attracting top talent.* As the automotive industry continues to transform, manufacturers will need to continue attracting the most talented people in the sector to preserve their market leadership position and adaptability to changing circumstances.

- *Urban demands*. As a direct result of urbanisation, modern customers have a certain set of criteria for the automobiles they buy, and a considerable portion of these needs are urbanisation related. These advancements include cars with a lower overall carbon footprint, enhanced manoeuvrability, and increased fuel economy.

In the current global economic situation, currency depreciation will increase economic activity and give countries a stronger position in the international competitive arena. As a direct result

of the widespread use of the dollar as a medium of exchange, there is now a financial channel of exchange rates via global trade finance. This channel reduces the effectiveness of earlier commerce channels.

The extension of global value chains (GVCs), which necessitates using more financial resources to sustain countries' growth, has increased the importance of trade finance. This is because the growth of GVCs necessitates the use of additional financial resources. The ratio of global commerce to global gross domestic product is a measure that may be used to characterise the frequency of GVC activity. Because trade is a measure of total production and GDP is a measure of value-added, the ratio of total trade to GDP is a reasonable proxy for gross value creation (GVC) activities. This is because commerce measures total output, while GDP measures value added. Currency depreciation has an expansionary impact on a country's exports, although this benefit is partially tempered by the fact that a stronger US dollar is typically associated with tighter financing conditions for EMEs. This is because currency devaluation has an expansionary impact on a country's exports, which explains this fact. In a case where global value chains are constrained as a result of stricter financing limitations, currency depreciation may have the opposite effect than that desired, causing a decrease in the number of goods exported. The inverse relationship between the ratio of worldwide trade to global GDP and the strength of the US dollar is an indicator that such processes remain significant in today's global economy and that globalisation is a significant macroeconomic condition.

The connection between domestic financial circumstances and exchange rates is a contributing element to the deterioration of domestic financial conditions. As traditional trade channels continue to degrade, monetary policy is strongly affected. In contrast, a depreciation of the home currency would have a small effect on domestic production when seen through conventional ways of trade, at least in the near future, since currency rate pass-through boosts inflation. A drop in the currency exchange rate value would, via several financial channels, further contribute to a general tightening of financial conditions. This would have a contractionary impact on a domestic economy. When the exchange rate falls, the central bank is more likely to be placed in a position of having to deal with both growing inflation and a struggling real economy. This would be a dangerous circumstance. In addition, there may be a short-term trade-off between inflation and output stabilisation, which would make

monetary policy administration and communication more challenging. This would increase the likelihood of a trade-off between inflation and production stabilisation.

Changes in the currency exchange rate drive inflation and debt in opposing directions, which is another advantage of a well-developed financial system: efficient money-flow conduits. This makes an intertemporal trade-off possible for the central bank, which seeks to maintain stable prices. This cost-benefit analysis is simple to comprehend in the context of an appreciating currency. An increase in the value of one currency compared to another reduces inflation. Still, it also makes it easier to amass debt by easing financial regulations, making the economy more vulnerable to shocks over the medium run. Given that concerns about financial stability also pose dangers to longer-term price stability, this generates an intertemporal trade-off for central banks between short- and medium-term output and price stability. Given that concerns about financial stability also pose dangers to longer-term price stability, this position forces central banks to choose between short-term and medium-term monetary policy.

5.6 Measures being Implemented by Countries to Boost Growth in the Automotive Industry

As a direct result of the fact that the bulk of African consumers are still attempting to overcome poverty, their purchasing power is severely constricted. The International Organization of Motor Vehicle Manufacturers (OICA), which has its headquarters in Paris, announced that the number of new passenger cars sold in Africa in 2017 decreased by 12 per cent, falling from 979,014 in 2016 to 862,014 in 2017. This is a drop compared to the previous year's total of 979,014 (Covarrubias & Pérez, 2019).

Unlike in South Africa, a relatively developed country, consumers in nations such as Nigeria and Kenya lack the discretionary income required to acquire new vehicles (Gatwabuyege, 2014). Consequently, the market for new autos in many African countries is being undercut by imports of used vehicles from other nations. Bardhan, Demirkan, Kannan, Kauffman and Sougstad (2010) observe that the majority of customers struggle to finance new vehicle purchases owing to their lower buying power, a problem exacerbated by the absence of suitable car financing choices. The lack of viable automobile finance options exacerbates the

issue. As a result, people are flocking to imports of pre-owned automobiles from the United States, Europe and Asia instead of buying brand-new automobiles.

Despite Gatwabuyege's (2014) misgivings as to how or when the middle class in Africa will have an appreciable effect on Africa's spending patterns, it is predicted that a growing middle class in more developed African countries will eventually boost e-commerce, which will, in turn, promote growth in the commercial vehicle industry. Unfortunately, previously owned vehicles, still in the majority in Africa, are responsible for a substantial amount of air pollution. For this reason, many urban regions in Africa are ~~seeing a~~ mov~~ing~~e away from the use of private automobiles, which is already a trend in Europe. Accra, the capital of Ghana, is experiencing~~seeing~~ an increase in both the volume of traffic and the amount of pollution caused by vehicles and has implemented a bus rapid transit system (BRTS) based on cooperation between the regional government and Scania. These efforts are a component of the government's larger drive to encourage more people to use public transportation.

The South African government is under intense pressure to adopt fuel efficiency standards for newly manufactured automobiles. Action of this nature would ultimately lead to a reduction in the volume of vehicle emissions. According to the International Council for Clean Transportation (ICCT) (Tietge, Diaz, Yang & Mock, 2017), the average CO_2 emissions per kilometre produced by a new passenger car in South Africa in 2015 was 148~~g, 22~~g, 22 per cent more than the European average of 121g CO_2/km (Tietge et al., 2017).

If original equipment manufacturers in South Africa were required to satisfy a 95g/km CO_2 emission target by 2030, the typical South African vehicle would use 36 per cent less fuel than current models (Tietge et al., 2017). In addition, this would result in an annual decrease of 4.1 per cent in the average CO_2 emissions created by South Africa's passenger vehicle fleet.

5.7 Limitations

Because of the structure of the automotive industry, traditional geographical boundaries and national borders have an impact on the business strategies that are adopted. It is clear that globalisation of production has happened along with the globalisation of markets and the intensification of competition. As a result, vehicle manufacturers are continually seeking technological, organisational and production arrangements that would allow them to increase

their competitiveness by achieving higher economic and industrial performance (production and sales) levels. These factors may result in new investments in technology, the re-engineering of business processes, the relocation of production, the outsourcing of work, and modifications to ways of working. As a direct result of this, the capacity for regulatory control over national-level labour relations may be questioned. This is particularly true when investment and location decisions are involved. At the same time, firms' bargaining power increases with the potential use of cross-country comparisons in terms of internationalisation.

In the context of this study, various limitations are documented that requires to be noted in the body of the dissertation. First, data availability constitutes a major challenge. It would have been ideal to extend the longevity of the dataset beyond the period covered in this study, but unavailability of usable and suitable dataset made it impossible. In specific case of African countries and the Middle East, various challenges were face with missing data points, which necessitated the use of moving averages (5-year moving averages – forward or backward). Furthermore, the data behaviour limited the methodological approaches that can be used in the study. Probably the use of error correction models (especially vector approach – VECM) might have yielded a different approach. In conclusion, the sample of the countries included in this study was limited by availability of data, as well as the visibility of these countries on automotive production. Given that automotives are used in every country, it is essentially that every country document their contribution to manufacturing processes (no matter how marginal), as well as sales.

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