The Potential Impact of an African Automotive Pact on the Economic Community of West African States

A Report for the African Association of Automotive Manufacturers (AAAM)

Submitted to:

AAAM
African Association of Automotive Manufacturers

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Acronym List

AAAM	African Association of Automotive Manufacturers
CAGR	Compound Annual Growth Rate
CBU	Completely Built Up
CET	Common External Tariff
CKD	Completely Knocked Down
DKD	Disassembly Knock Down
ECOWAS	Economic Community of West African States
EPA	Economic Partnership Agreement
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GVA	Gross Value Add
LCV	Light Commercial Vehicles
M&HCV	Medium and Heavy Commercial Vehicles
OICA	Organisation Internationale des Constructeurs d'Automobiles
SEZ	Special Economic Zone
PEM	Production Equivalency Model
P&A	Parts and accessories
SKD	Semi-Knocked Down
SME	Small and Medium Enterprise
SSA	Sub-Saharan Africa
TRIMs	Trade-Related Investment Measures
WTO	World Trade Organisation

Foreword

This study has been commissioned by the African Association of Automotive Manufacturers (AAAM). It reviews the potential economic impact of an African Auto Pact on the Economic Community of West African States (ECOWAS). It does so by modelling the potential impacts of the Pact on ECOWAS members and by interrogating its potential framework and modalities. Given the challenges of data availability and the significant structural changes brought about by introducing an automotive manufacturing industry into an economy, it is essentially an exercise in scenario building rather than a precise economic prediction. It is also modelled in a manner that allows comparisons with a similar exercise done for Ethiopia and the East African Community (EAC).

As the service providers commissioned to complete the African Auto Pact project; Ubu Holdings and B and M Analysts SA (Pty) Ltd ('B&M Analysts') are responsible for the content presented in this report. In this regard, special acknowledgement needs to be given to Mr Christopher Grant, who was responsible for the Auto Pact demand modelling, and to Mr Dirk Van Seventer, who was responsible for the Social Accounting Matrix (SAM) modelling. While a team worked on the project, the individual authors acknowledge that all omissions or errors in the report are theirs alone.

While every care has been taken to ensure the accuracy and integrity of the information and analysis presented in this report, the African Auto Pact Task Team take no responsibility whatsoever for decisions derived from its content.

Executive Summary

- Despite ECOWAS having an aggregate population of around 388 million, the region only sold about 57,000 new vehicles in 2018. Production was even lower, at approximately 4,000 vehicles. Pre-owned vehicle imports and a plethora of small, disconnected domestic markets ensure that there is limited scope, within present conditions, for the creation of a sustainable, large scale automotive industry in the region.

- The African Auto Pact demand model developed by B&M Analysts for the AAAM shows a relatively non-dynamic new vehicle market in the region to 2035. If pre-owned vehicles continue to be imported in volume by the growing adult population that earns more than $10,000 per annum, ECOWAS is projected to only sell a total of 125,563 new vehicles in 2035. This would represent regional growth of around 68,244 units on 2019 levels.

- The reduction of pre-owned vehicle imports will have a significant impact on ECOWAS' new vehicle demand. B&M Analysts' Production Equivalency Model (PEM) suggests that new vehicle demand could reach 792,834 units in 2035 provided pre-owned vehicle imports are fully terminated by then and that there is an 80% replacement value of pre-owned vehicles to new vehicles.

- The two most attractive vehicle markets (and potential production hubs) in ECOWAS based on the PEM are:

    - Nigeria, with modelled new vehicle demand of 200,185 units in 2020, increasing to 350,405 units in 2035. If CKD production were established and Nigeria were to become a new vehicle production hub for ECOWAS (with Ghana) then it has the potential to produce up to 450,000 vehicles in 2035.

    - Ghana, which had modelled new vehicle demand of 60,273 units in 2020 and increasing to 148,022 units in 2035. Again, if CKD production were established and Ghana were a production hub for ECOWAS (with Nigeria) then it has the potential to manufacture up to 300,000 vehicles in 2035.

- Based on its present Social Accounting Matrix (SAM), the economic benefits that would accrue to Nigeria if advanced CKD production were established for ECOWAS supply, would amount to $8.8 billion in GVA (or 1.97% of its GDP in 2019) and create 580,671 jobs.

- Based on its present SAM, the economic benefits that would accrue to Ghana if advanced CKD production were established for ECOWAS supply, would amount to $4.8 billion in GVA (or 7.12% of its GDP in 2019) and create 115,747 jobs.

- The benefits of vehicle assembly in Nigeria and Ghana would not only accrue to the two assembly or hub economies. If a common policy framework – the Auto Pact model – is adopted in the Region, then significant benefits could flow to other ECOWAS economies (spoke economies). The

benefits arise from the increase in new vehicle demand in the Region and the significant production in the assembly economies. The main benefits are as follows:

  - If an ECOWAS automotive pact were successfully implemented, and the region were to meet the PEM estimate of around 750,000 units of production annually by 2035, we estimate that the automotive industry will contribute a potential $1.1 billion of GVA in the spoke economies by 2035.

  - Based on this GVA, all of which would represent foreign exchange savings and a positive contribution to the region's trade balance, the spoke economies could employ 24,750 people in component manufacturing operations (for the vehicle assemblers), with a further 4,950 employed in aftermarket related component activities.

  - Benefits to the spoke economies could be further augmented if they were to secure complementary automotive assembly activities for the broader ECOWAS region. Examples include motorcycle assembly, medium and heavy commercial vehicle assembly, and finally, the assembly of off highway transport equipment.

- Trade data suggests that there are currently very limited existing component capabilities in the ECOWAS spoke economies. Most automotive components are imported. However, the analysis suggests that there are pockets of component production of P&A parts and medium and heavy commercial vehicle (M&HCV) tyres in Senegal, and production of light motor vehicle tyres in Burkina Faso. This is based on analysis of trade data from the past decade.

- As a region, ECOWAS has maintained a large trade deficit on motorcycles. Exports of motorcycles in 2019 amounted to only 9,718 units versus imports of 2.5 million units in the same year. The trade deficit has also grown over the past decade. The largest motorcycle trade deficits are for Nigeria, Togo, and Ghana. These three economies collectively imported 75% of all motorcycles in the region, or about 1.8 million units in 2019. Togo is the only country with some level of motorcycle exports in 2019. It exported 6,964 motorcycles in 2019. However, these volumes suggest re-exports as opposed to local manufacture.

- The key policy and implementation considerations for establishing a regional Automotive Pact within ECOWAS includes:

  - Individual countries accepting the economic logic of working as a regional economic community, in the form of the ECOWAS, rather than trying to optimise their own limited market (and associated production) potential.

  - Ensuring that effective implementation of aligned automotive policies in identified hub and spoke economies.

  - Attracting assembly, component and complementary manufacturing investments into hub and spoke economies, to ensure the establishment of a regional production dynamic of benefit to all participating economies.

1. Introduction

The Economic Community of West African States (ECOWAS) is a political and economic union that consists of 15 countries in West Africa[1]. ECOWAS was formed in 1975 with the aim of promoting cooperation and integration in West Africa, ultimately leading to the establishment of an economic union. The objective of ECOWAS is to create a common market for goods and services, harmonise policies for the protection of the environment, and ultimately create an economic and monetary union. Currently, ECOWAS comprises a Free Trade Area and Customs Union, but it has not yet achieved a single market nor an economic or monetary union.

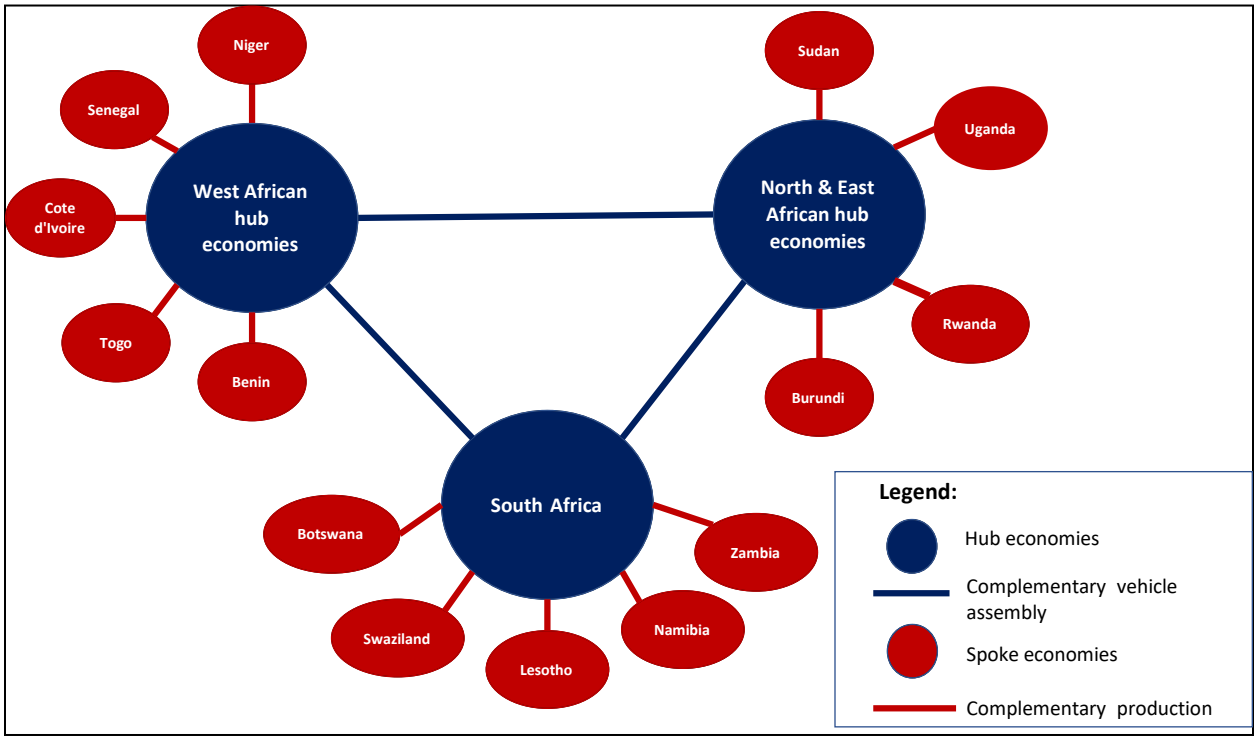
The 15 member states of ECOWAS have an aggregate population of around 388 million, and yet the region only sold approximately 57,000 new vehicles in 2018 and producing even fewer, at around 4,000 vehicles. Pre-owned vehicle imports and a plethora of small, disconnected domestic markets ensure that there is presently limited market scope for the establishment of a sustainable, large scale automotive industry in the region. This significantly limits the potential for large scale automotive assembly and component manufacturing, and consequently industrialisation.

Looking forward 15 years to 2035, the region will have an additional 190 million inhabitants and is expected to have some of the most densely populated cities in Africa. This means that there is significant potential to develop a regional automotive industry. This potential will, however, only be realised if a regional automotive market and associated production dynamic is created.

The Sub-Saharan African Automotive Pact ('SSA Auto Pact') project completed for the African Association of Automotive Manufacturers (AAAM) in July 2019, presented the evidence for a sub-continental automotive production structure in SSA, built around three to four hub economies (South Africa, Nigeria-Ghana, and Kenya) and an associated spread of value adding activities to neighbouring economies that could participate in the automotive value chain based on their comparative locational advantages. The intention of the Pact is to catalyse the development of large scale regional automotive industries in East, West and Southern Africa, and then ultimately connecting these regional hubs into a sub-continental framework supporting large scale, complementary vehicle and associated component production. The model's conceptual framework is presented in Figure 1. As revealed, the emergence of the hub economies within a regional market and production dynamic is central to the SSA Auto Pact concept. For example, Nigeria and/or Ghana have the potential to be major assemblers of vehicles, with components for vehicles assembled by other ECOWAS economies.

[1] Benin; Burkina Faso; Cape Verde; Côte d'Ivoire; Gambia; Ghana; Guinea; Guinea Bissau; Liberia; Mali; Niger, Nigeria; Senegal; Sierra Leone; and Togo.

Figure 1: Hub and spoke model for SSA Automotive Pact development



Key to the realisation of the Pact concept in ECOWAS, is unlocking automotive value addition and substantially growing CBU and associated automotive component production in the region. Initially, activity would be concentrated in the hub economies based on the establishment of CKD-based vehicle assembly capacity. After this development, spoke economies would be incorporated as automotive value chains are established, and Tier 1 and Tier 2 automotive component manufacturing activity is established in alignment with identified sources of comparative advantage. International evidence demonstrates that major economic value is generated within these automotive component supply chains.

This report focuses on the potential (and associated complexities) of establishing a CKD-based automotive manufacturing system based on the hub and spoke concept presented in Figure 1 in ECOWAS. The report comprises six sections. Following this introduction, Section 2 provides a context of the automotive industry and outlines the development trajectory for ECOWAS. Section 3 provides an outline of the methodology undertaken to calculate the impact of establishing an Auto Pact in ECOWAS. Section 4 provides the results of projecting new vehicle growth opportunities based on a set of realisable scenarios and explores the development of an associated production equivalency. Section 5 presents the country-specific opportunities available to the Pact's potential hub and spoke economies. In Section 6, the report shifts to an analysis of the Auto Pact within the ECOWAS' complex regional trade agreements. Section 7 concludes with a summary of findings and recommendations.

2. Context

There are considerable challenges in modelling the development of an automotive manufacturing sector in ECOWAS. These challenges arise from the current position in ECOWAS and the specific complexities of the sector itself.

The contemporary auto manufacturing sector is an advanced form of manufacturing, driven by economies of scale that are best achieved within an intricate global production and trade system. The manufacturing assembly process is located in a limited number of industrial economies, served by a more extensive global supply chain. Currently, auto manufacturing is, to all intents and purposes, non- existent in the Region. Therefore, the challenge facing ECOWAS is to attempt the development of auto manufacturing in the context of low levels of existing industrialisation. We are inserting an advanced manufacturing sector into economies with low levels of industrialisation. Attempting to precisely predict the effects of such a structural change is not feasible. The object of the exercise is to define a scenario of what the outcome of such a structural insertion might be. To do this we have developed specific modelling approaches.

Market forces or attempts at import substitution policies cannot be effective in such a globally integrated manufacturing sector. However, ECOWAS is a major economic region that could sustain an auto sector within the global sector. However, to achieve this will require a specific and comprehensive policy and institutional structure to be put in place. This is built around a comprehensive set of policies that encourage economies of scale in production. This is achieved by not attempting to produce all models required by the domestic market. Rather the production of certain models is encouraged, and that production is precisely linked to tariff preferences and rebates for other models produced by the investing OEM. This is a carefully structured model that links an investment dynamic from SKD to CKD to tariff preferences for imports specifically related to this investment dynamic. It is a form of Trade Related Investment Measure (TRIMS). It is trade related in respect to systems of tariff preference and duty rebates and in that it is trade promoting in industrial products through imports and exports. In a mature TRIMS based systems the auto sector gravitates toward balance of payments neutrality. This is a major structural change given the current salience of auto imports in the ECOWAS economies. However, the development must be consistent, and it evolves over time.

This poses some modelling challenges since each step of the process brings about structural changes that cannot easily be modelled. This is made more difficult by the problems of accurate data availability and current input-output models based on relatively disparate levels of industrialisation. Only Nigeria and Ghana have any form of official Social Accounting Matrix (SAM).

The evolution of both production and the market structure is complex and dynamic. As assembly commences within the framework of a TRIMS based programme the source of vehicles leads to complex, but potentially positive balance of payments effects. New vehicles are now sourced from four groups of supply source:

1. Domestic production– starting with SKD and moving to CKD. Such production is usually linked to global OEM. This would be a limited number of models.

2. Duty rebated new vehicles linked in a precise way to the level of domestic production and the invested OEM. This would be a wider range of models to meet consumer preferences and would be imported at zero duties.

3. Full duty Imported vehicles from the invested OEM (not duty rebated due to lack of credits).

4. Full duty imported vehicles from non-invested OEM.

The totality of this supply structure can be referred to as the Programme Fleet since it will be compliant not only with the investment and tariff rebate conditions, but also with the common vehicle identification system, standards and homologation of the Auto Programme.

The extent of the demand for the Programme Fleet vehicles will be strongly affected by the availability of second-hand vehicle imports and the age profile of such imports. Second-hand vehicle imports can trade at sub-economic values and will disrupt new vehicle demand. The logic of the Auto Programmes is to replace the predominance of second-hand vehicles imports with the Programme Fleet and, over time, with second-hand vehicles emanating from the Programme Fleet. The pre-owned market does not disappear, but the source of the vehicles is now domestic and not imported and is therefore increasingly compliant with the standards etc of the Programme. Only new vehicles are imported.

These complex changes in the structure of supply of the vehicle fleet depend on macro demand factors – economic growth and a postulated market entrant income level of $10,000. But other factors will have a major impact. These are: the approach taken to second-hand vehicles; standards and homologation and demand inducing support measures such as procurement and asset-based financing products. It is essential that these aspects are implemented as a coherent package and we are working on this assumption. In essence the exercise is attempting to assess the economic potential of the auto sector if a comprehensive programme is introduced.

In the absence of detailed information it is inherently difficult to model consumer behaviour in such structural change situations. The extent that new vehicles – locally assembled and imported – will displace imported pre-owned depends on the factors outlined above. It is also not possible to do meaningful studies in buyer behaviour, as they decide between new vehicles and pre-owned – both imported pre-owned and those already in the economy. Buyer behaviour in mature markets such as South Africa offer little help in the cases of major structural change we are contemplating here.

We have therefore chosen a working assumption, which is that the combination of the various elements of a Programme should be capable of replacing up to 80% of what would have been imported pre-owned vehicles in the absence of a Programme. It is possible that this will overestimate the new vehicle demand in the early stages. However, it seems a reasonable aspiration as a target for the introduction of the sector. It will be possible to construct different possible outcomes using a lower coefficient. As indicated a similar working assumption was used in East Africa so that comparable scenarios are possible.

Accordingly, for ECOWAS, we have opted to do a base case type exercise. In essence this is a scenario building exercise. It starts with the present position and then projects demand based on economic growth and a commonly used income level of $10,000 dollars. These projections give us an expected level of demand in 2035. Then, rather than attempt a complex projection of the economic impact through SAM we have undertaken another exercise.

This takes the South African situation where we have accurate information on the sector and the economy and where a TRIMS based policy has been in existence from 1995. This is defined as the Production Equivalent Model. So effectively we are taking the level of supply chain development and the SAM coefficients existing in the South African programme and applying them to a future state in ECOWAS. It is also assuming that the structure of new vehicle supply will be similar to that prevailing in South Africa. Total production approximates total domestic demand, but the actual supply conditions are that half of domestic demand is met by domestic production and the other half by the other elements of the programme fleet as outlined above. The balance of the domestic production is exported – hence the balance of payments neutrality effect. Achieving this in ECOWAS will require the consistent implementation of the programmes. It would also be strongly facilitated by an African Auto Pact.

A similar approach was used in the Ethiopia/EAC study so that we have a basis for regional comparisons. In addition, we have done a more complex modelling process for Ghana, as there is detailed and reliable information available on imports and there is an official SAM.

It follows from these complexities just outlined that if the policy package is not comprehensive and is not implemented consistently for the entire period then the PEM and demand estimates will be optimistic. The objective of the exercise is to make a base case to policy makers that illustrates and highlights the following fundamental issues:

- The present position in the sector is sub-optimal and will remain so despite economic growth – in fact, the sector is a major contributor to the obstacles to higher growth based on industrialisation.

- That the nature of the auto sector, as a global advanced manufacturing sector requires a comprehensive, TRIMS based, policy package and a supportive institutional and infrastructural development process to be in place if it is to have any prospect of developing.

- That such a programme could result in an auto manufacturing sector that will be a major contributor to the economy and its industrialisation.

- In order to achieve the levels of production that would result in the above outcome it is essential for such a policy package to effectively be a Pact within ECOWAS and the impact will be even greater if it aligns with a Pan African Auto Pact.

3. Methodology

The project began by obtaining and then analysing relevant market and economic information required to determine the new vehicle market growth (and associated vehicle production) potential of each of the member states of ECOWAS through to 2035. This encompassed an analysis of GDP per capita growth rates, projected demographic shifts (to identify adult population growth rates), and most importantly the projected growth rate of adults earning more than $10,000 per annum[2].

- **Assumptions regarding the $10 000 per annum threshhold:**
  A review of the literature and several assumptions led to the $10,000 threshold. The literature that explores the required levels of income to afford a new vehicle purchase shows that the position is complex[3]. The threshold for vehicle affordability across 64 countries varied from $8,000 (mean) to $5,600 (median) in 2000 US$ terms. Adjusting for $ inflation through to 2020, the present level would therefore be $12,000 (mean), or $8,400 (median).

  There was however a large standard deviation for these figures (US$7,100) suggesting major differentials between countries (partly explained by taxation differences).

  We opted to pin the demand analysis on the change, after economic growth, in adults earning above US$10,000. Clearly, actual conditions related to market structure; income distribution patterns; taxation levels and asset financing mechanisms will all impact on future effective demand. For the purposes of building future macro scenarios for the automotive sector, the assumption is that the $10000 threshold is reasonable. However, this needs to consider a market structure similar to that in South Africa where effective and affordable asset-based financing products exist in both the new and pre-owned markets.

[2] An adult earning more than $10,000 per annum is deemed to be a potential new vehicle consumer in the model, and hence is the anchor on which we project the growth in demand for new vehicles.

[3] An article by Francois Lescaroux in the Journal of Transport Economics and Policy (May, 2010) was the most useful.

The growth parameters above were used to determine shifts in vehicle sales, vehicle production, automotive imports, and automotive exports for ECOWAS countries. This work was completed via desktop research using credible sources.

This data was then compiled into a macroeconomic forecasting model that calculates (a) Vehicle Demand Growth – based on the existing profile of vehicle consumption in an economy; (b) Adjusted New Vehicle Demand – based on the termination of pre-owned vehicle imports;[4] (c) a Production Equivalency Model (PEM) – based on a country or region manufacturing the equivalent number of vehicles sold, and (d) inputting the PEM results into Nigeria and Ghana Social Accounting Matrixes (SAM), respectively, to generate economic impacts.

The methodology followed is depicted in Table 1. Critically, the vehicle demand model has been developed to estimate the potential for a regional automotive industry in Africa.

Table 1: ECOWAS vehicle demand model methodology

Indicator	Methodology
Base vehicle demand data	• Base vehicle demand data was calculated using new vehicle sales data and pre-owned vehicle import data for the 10-year period (2009-2018). This data is depicted in Table 2 and Table 3.
Vehicle demand growth	• CAGR growth rates of the economy's population earning more than $10,000 per annum was calculated. Each economy's base vehicle demand profile was linked to this base population. Absolute new and pre-owned imported vehicle demand growth was then projected based on the change in this vehicle consuming population group to 2035.
Adjusted new vehicle demand data	• Adjusted new vehicle demand is the demand we estimate for ECOWAS if pre-owned vehicle imports are banned, thereby forcing the consumption of new vehicles and internally generated pre-owned vehicle sales only. We estimate a 20% absolute loss in vehicle demand as some consumers, who would have been able to afford a pre-owned vehicle import are no longer able to purchase a new vehicle. The balance will purchase new vehicles.
Production Equivalency Model (PEM)	• The adjusted new vehicle demand data for 2019 through to 2035 was then calculated and a PEM imputed. This estimates the impact of new vehicles being manufactured regionally, rather than being imported. The PEM considers aggregate production values, Gross Value Addition (GVA), employment (vehicle and component manufacturing) and investment opportunities associated with the production of new models. • The model is based on the production of a vehicle unit worth $10,000. Production values are calculated by multiplying the adjusted new vehicle demand by this unit price. GVA is calculated at 40% of production value, as per the South African standard. However, GVA is split amongst the countries, with this based on the distribution on total vehicle sales in 2019. Based on the distribution of 2019 vehicle sales, 2 hub economies were identified: Nigeria and Ghana. These make up 66% of vehicle sales in ECOWAS in 2019. 66% of GVA is thus allocated to the 2 hub economies and the rest allocated to spoke economies. • Employment is calculated by dividing GVA by GVA per employee. The actual South African standard for GVA per employee was applied. Employment was then split between vehicle and component manufacturing at a ratio of 1:3 (again the South African standard). • Lastly, the African investment opportunity was calculated by multiplying annual new vehicle sales by $10,000. This is the investment level we have calculated for an average eight-year production run. • This model was then applied to each ECOWAS country.

The assumptions of the PEM model are provided in Annexure 1.The PEM allows us to robustly estimate both new vehicle demand and potential manufacturing supply in ECOWAS. The results from the PEM were then used as inputs into the SAM based models for Ghana and Nigeria, as the two identified ECOWAS hub

[4] Here we are working on the assumption that the Regional Pact could include the significant reduction and eventual elimination of pre-owned imports. More detail on this is provided in the Ghana-South Africa study.

production countries. The assumptions of the SAM based models are provided in Annexure 2. After quantifying assembly and component production opportunities in the hub economies, we obtained and then analysed information on the potential for component and complementary production (motorcycle, yellow metal equipment etc.) in ECOWAS' spoke economies. This was to determine further industry value chain opportunities across the hub and spoke economies.

Finally, we considered regulatory and policy issues. This information was obtained from Ubu and AAAM engagements with the sector and governments in Nigeria and Ghana, respectively. This allowed us to develop what we believe are sound recommendations on market development and production related opportunities in ECOWAS.

4. Mapping ECOWAS' potential vehicle market

4.1. ECOWAS vehicle market consumption to 2035 per a "business as usual" model

The African Automotive Pact model shows a relatively non-dynamic automotive market in the region to 2035. If pre-owned vehicles continue to be imported in volume by the growing adult population that earns more than $10,000 per annum, ECOWAS is projected to only sell approximately 125,563 new vehicles in 2035. This would represent regional growth of around 68,244 units on 2019 levels, when only 57,319 new vehicles were sold. Moreover, the entire regional market would still only be a quarter the size of the South African market.

Interestingly, Cote d'Ivoire and Guinea are expected to experience the strongest new vehicle demand growth in the region in 2035 under the "business as usual" model, although the figures would still be small at only 28,718 and 19,565 units, respectively. As presented in Table 2 below, the two largest economies in the region, Nigeria, and Ghana, will continue to have exceptionally low levels of new vehicles sales through to 2035, with Ghana reaching 14,863 units and Nigeria 17,806 units.

Table 2: Estimated new vehicle sales to 2035, based on the existing market consumption profile

	2019	2020	2023	2026	2029	2032	2035
Benin	2 250	2 349	2 670	3 035	3 450	3 921	4 458
Burkina Faso	1 074	1 129	1 313	1 527	1 775	2 064	2 400
Cabo Verde	869	889	952	1 019	1 091	1 169	1 251
Cote d'Ivoire	11 165	11 844	14 139	16 880	20 151	24 056	28 718
Gambia, The	1 991	2 045	2 218	2 406	2 609	2 830	3 069
Ghana	5 700	6 052	7 243	8 669	10 376	12 418	14 863
Guinea	8 475	8 930	10 447	12 221	14 297	16 725	19 565
Guinea-Bissau	459	476	531	591	659	734	818
Liberia	288	296	322	350	381	414	450
Mali	2 008	2 093	2 369	2 681	3 034	3 434	3 886
Niger	4 048	4 262	4 973	5 803	6 771	7 901	9 220
Nigeria	9 800	10 173	11 378	12 726	14 234	15 920	17 806
Senegal	5 500	5 749	6 566	7 498	8 564	9 780	11 169
Sierra Leone	2 145	2 243	2 563	2 929	3 346	3 824	4 370
Togo	1 546	1 628	1 899	2 216	2 586	3 017	3 521
ECOWAS	**57 319**	**60 157**	**69 582**	**80 550**	**93 323**	**108 207**	**125 563**

The continued importing of pre-owned vehicles in large quantities is the major reason for the limited new vehicle sales projected in Table 2. Pre-owned vehicle imports are projected to substantially increase by 2035, as highlighted in Table 3. Nigeria is, for example, estimated to import around 415,748 pre-owned vehicles by 2035, while Ghana is projected to import 166,449 units. Other substantial projected importers are Senegal (61,778 units) and Guinea (58,207 units). In aggregate, the region is projected to import nearly 834,088 pre-owned vehicles by 2035, up from 411,989 units in 2018.

Table 3: Estimated pre-owned vehicle imports to 2035, based on the existing consumption profile

	2019	2020	2023	2026	2029	2032	2035
Benin	6 695	6 987	7 942	9 028	10 263	11 667	13 262
Burkina Faso	4 690	4 932	5 734	6 667	7 752	9 014	10 480
Cabo Verde	2 584	2 644	2 831	3 032	3 247	3 477	3 723
Cote d'Ivoire	9 311	9 878	11 792	14 077	16 805	20 062	23 950
Gambia, The	5 923	6 085	6 599	7 157	7 762	8 419	9 130
Ghana	63 836	67 776	81 118	97 086	116 198	139 072	166 449
Guinea	25 215	26 568	31 080	36 359	42 534	49 757	58 207
Guinea-Bissau	1 367	1 417	1 579	1 759	1 961	2 185	2 435
Liberia	4 134	4 251	4 622	5 026	5 465	5 943	6 462
Mali	5 975	6 226	7 047	7 975	9 026	10 215	11 561
Niger	12 044	12 679	14 795	17 264	20 145	23 506	27 429
Nigeria	228 814	237 516	265 656	297 131	332 334	371 709	415 748
Senegal	30 420	31 798	36 315	41 473	47 365	54 094	61 778
Sierra Leone	6 382	6 672	7 625	8 713	9 956	11 377	13 000
Togo	4 600	4 843	5 651	6 593	7 693	8 976	10 474
ECOWAS	**411 989**	**430 271**	**490 386**	**559 342**	**638 506**	**729 471**	**834 088**

The findings presented in Table 2 and Table 3 are clear. ECOWAS does not represent a viable automotive market if pre-owned vehicle imports continue to dominate regional consumption through to 2035.

4.2. Adjusted ECOWAS vehicle market consumption to 2035 (based on the substitution of pre-owned vehicle imports)

The banning of pre-owned vehicle imports will have a significant impact on new vehicle demand in ECOWAS, with new vehicle demand reaching around 792,834 units in 2035 compared to the 125,563 units estimated in Table 3 above. We assume that consumers earning more than $10,000 per annum will purchase new vehicles to meet their mobility requirements. However, as indicated in Table 1, the elimination of pre-owned vehicle imports does not directly substitute into new vehicle sales, as at least 20% of consumption demand may be eliminated based on increased vehicle prices. This projected new vehicle demand is presented in

Table 4. As highlighted, ECOWAS' new vehicle market now looks significantly more attractive for both production and broader value chain investments, with the most attractive markets in ECOWAS being:

- Nigeria, with demand of 200,185 units in 2020, increasing to 350,405 units in 2035; and
- Ghana, where demand increases from 60,273 units in 2020 to 148,022 units in 2035.

Nigeria and Ghana consequently represent the best candidates for vehicle assembly in the region. Nigeria represents the greatest potential, followed by Ghana. These two economies offer significantly more potential than the other economies in the region.

Table 4: Estimated ECOWAS new vehicle demand to 2035 if pre-owned vehicle imports are terminated

	2020	2023	2026	2029	2032	2035
Benin	7 938	9 024	10 258	11 660	13 255	15 067
Burkina Faso	5 075	5 900	6 861	7 977	9 275	10 784
Cabo Verde	3 004	3 217	3 445	3 689	3 950	4 230
Cote d'Ivoire	19 746	23 573	28 141	33 595	40 105	47 878
Gambia, The	6 913	7 498	8 132	8 819	9 565	10 373
Ghana	60 273	72 138	86 338	103 334	123 676	148 022
Guinea	30 185	35 311	41 308	48 324	56 530	66 131
Guinea-Bissau	1 610	1 794	1 999	2 228	2 483	2 767
Liberia	3 697	4 020	4 371	4 753	5 168	5 620
Mali	7 074	8 006	9 061	10 254	11 606	13 135
Niger	14 405	16 809	19 614	22 887	26 706	31 162
Nigeria	200 185	223 903	250 430	280 101	313 287	350 405
Senegal	31 187	35 617	40 677	46 456	53 055	60 592
Sierra Leone	7 581	8 662	9 899	11 311	12 925	14 770
Togo	5 502	6 420	7 491	8 740	10 198	11 900
ECOWAS	**404 374**	**461 891**	**528 024**	**604 128**	**691 784**	**792 834**

Importantly, the scenario presented in

Table 4 does not consider the potential catalytic impact of an automotive pact on regional economic performance. It simply captures the conversion of pre-owned vehicle imports into new vehicle sales across the ECOWAS economies. It then extrapolates the growth of the new vehicle market based on the growth of each country's adult populations with incomes above $10,000 per annum. This presents a baseline indication of the likely new vehicle consumption if pre-owned vehicle imports are discontinued.

5. Nigeria as an ECOWAS hub opportunity

Nigeria has a history of vehicle production that dates to the 1970s. However, growth in automotive production in Nigeria has been stunted by supply side constraints and the liberalization of the economy's trade regime, which has permitted cheap imported pre-owned vehicles. As revealed in Table 5, Nigeria is a lower middle-income country with a large population. Nigeria is therefore the largest and wealthiest economy in West Africa. However, its vehicle market is very underdeveloped relative to its wealth and population size.

Table 5: Key Nigeria automotive indicators

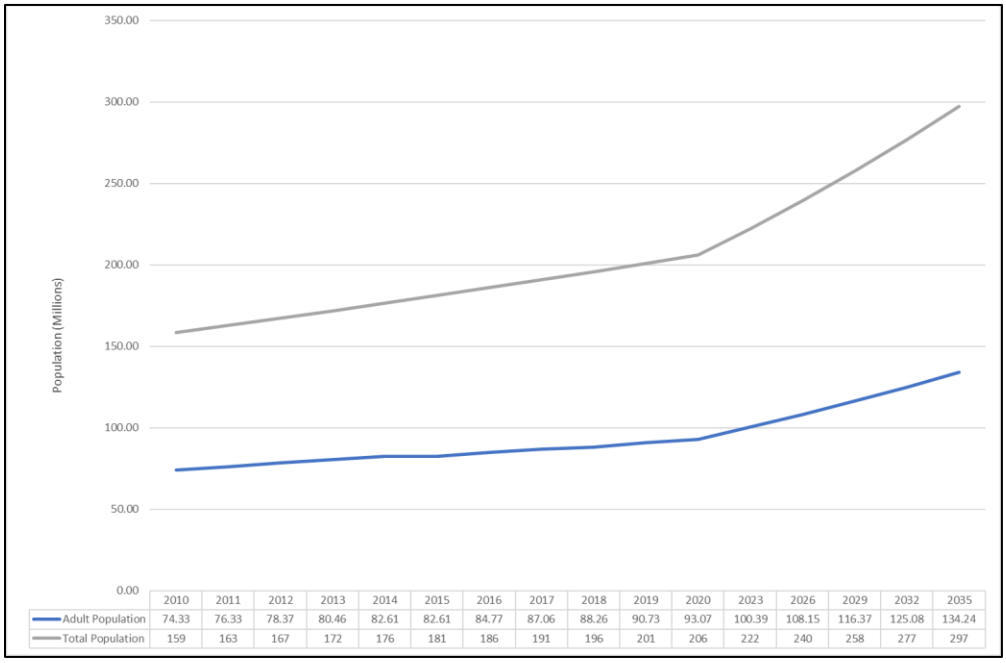
Indicator	Values
Population 2019*	201 million
GDP per capita PPP 2019 (nominal)*	2 230
Total number of vehicles in operation (2015) †	3.75 million
Estimated ratio of people to vehicles	21 per 1,000
Passenger vehicle production (2016[i])	4 000
Passenger vehicle sales (2019)	5 100
Commercial vehicle sales (2019)	4 700

Source: *World Bank http://data.worldbank.org/; †OICA http://www.oica.net/category/vehicles-in-use/; [i]OICA production and sales http://www.oica.net/category/production-statistics/; http://www.oica.net/category/sales-statistics

Nigeria's GDP growth rate averaged 3.7% over the period 2010 to 2019. This is below the SSA average of 4.03% and the ECOWAS average of 4.87%. Furthermore, Nigeria's GDP per capita declined by an average of 0.31% over the same period, with this well below the SSA and ECOWAS averages, which both experienced growth over this period of 1.64% and 3.03%, respectively.

The United Nations (2020) estimates that the Nigerian population will grow by approximately 48% by 2035. The adult population will therefore grow to 297.3 million adults by 2035. The Nigerian vehicle market is therefore expected to grow significantly, although job creation will be critical for this growth potential to translate into vehicle sales. For example, by 2035 there will be approximately 44 million additional adults requiring employment in the country.

Figure 2: Nigeria's population growth rate, 2009 - 2035

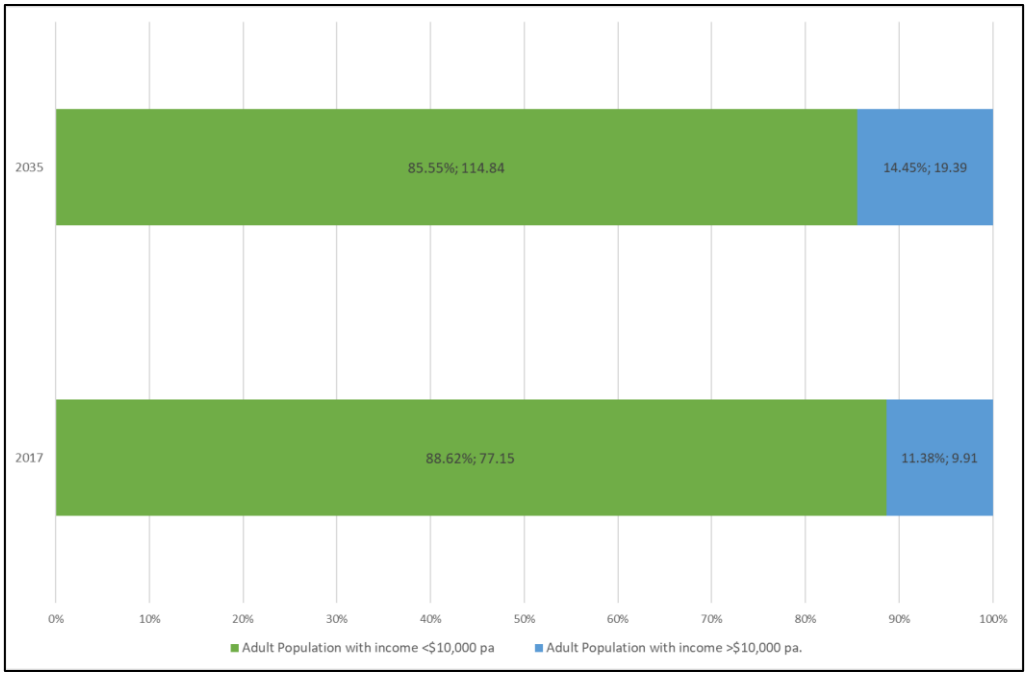


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2023	2026	2029	2032	2035
Adult Population	74.33	76.33	78.37	80.46	82.61	82.61	84.77	87.06	88.26	90.73	93.07	100.39	108.15	116.37	125.08	134.24
Total Population	159	163	167	172	176	181	186	191	196	201	206	222	240	258	277	297

Source: UN Database, 2020; Credit Suisse Databooks,2010-2019

Only 11.4% of Nigeria's adult population earned over $10,000 annually in 2017. This represented a total new vehicle consuming population of around 9.91 million adults. However, we expect large growth in the total number of adults earning above $10,000 by 2035. As revealed in Figure 3, given anticipated economic growth and the absolute growth in population, the number of adults able to purchase vehicles will increase to 19.4 million in 2035. This will spur large increases in the demand for new vehicles.

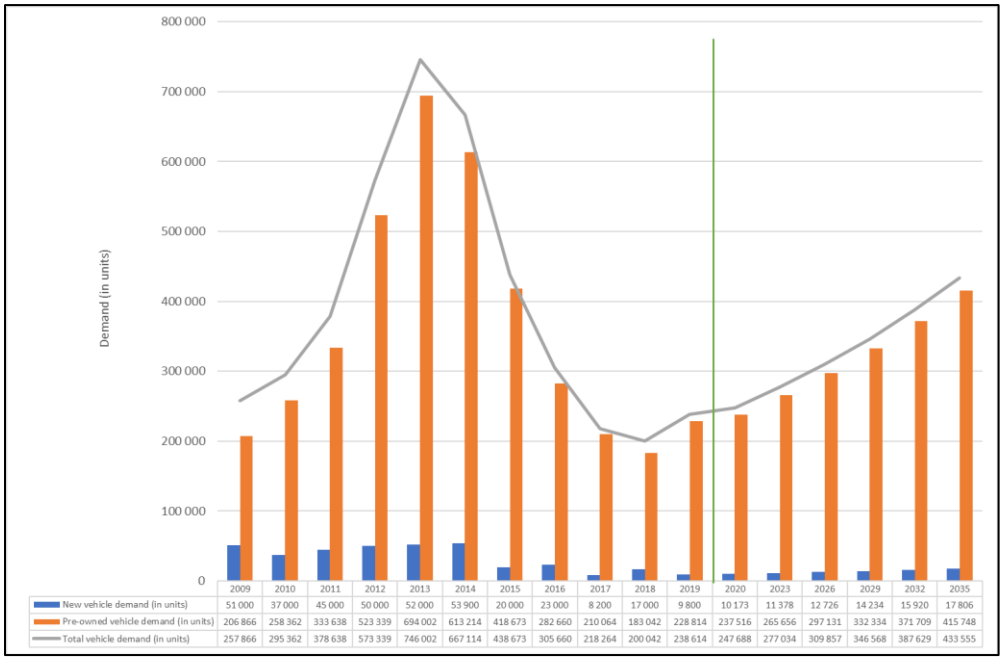
Figure 3: Nigeria adult population earning income above $10,000, 2017 and 2035



Source: UN Database, 2020; Credit Suisse Databooks,2010-2019

While Nigeria's strong GDP growth has contributed to substantial recent vehicle demand growth, 2016 to 2018 saw major declines in aggregate demand. This largely impacted pre-owned vehicle imports, which declined significantly on peak 2015 levels. As revealed in Figure 4, both new vehicle sales and pre-owned vehicle imports are however projected to recover strongly through to 2035, with new vehicle sales increasing from 9,800 units in 2019 to 17,806 units in 2035, and pre-owned vehicle imports from 228,814 to 415,748 units.

Figure 4: Nigerian vehicle demand projections to 2035, based on the existing consumption profile.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2023	2026	2029	2032	2035
New vehicle demand (in units)	51 000	37 000	45 000	50 000	52 000	53 900	20 000	23 000	8 200	17 000	9 800	10 173	11 378	12 726	14 234	15 920	17 806
Pre-owned vehicle demand (in units)	206 866	258 362	333 638	523 339	694 002	613 214	418 673	282 660	210 064	183 042	228 814	237 516	265 656	297 131	332 334	371 709	415 748
Total vehicle demand (in units)	257 866	295 362	378 638	573 339	746 002	667 114	438 673	305 660	218 264	200 042	238 614	247 688	277 034	309 857	346 568	387 629	433 555

A direct consequence of Nigeria's continued dependence on pre-owned vehicle imports is a large negative automotive trade balance. Based on our model, Nigeria's deficit will increase to $8.4 billion by 2035 (versus $4.6 billion in 2019). This deficit will place a severe strain on the country's foreign currency reserves and represents a major drain on Nigeria's economic growth potential. Unless oil prices increase multi-fold over the period there is limited chance of Nigeria being able to sustain this type of automotive import dependence.

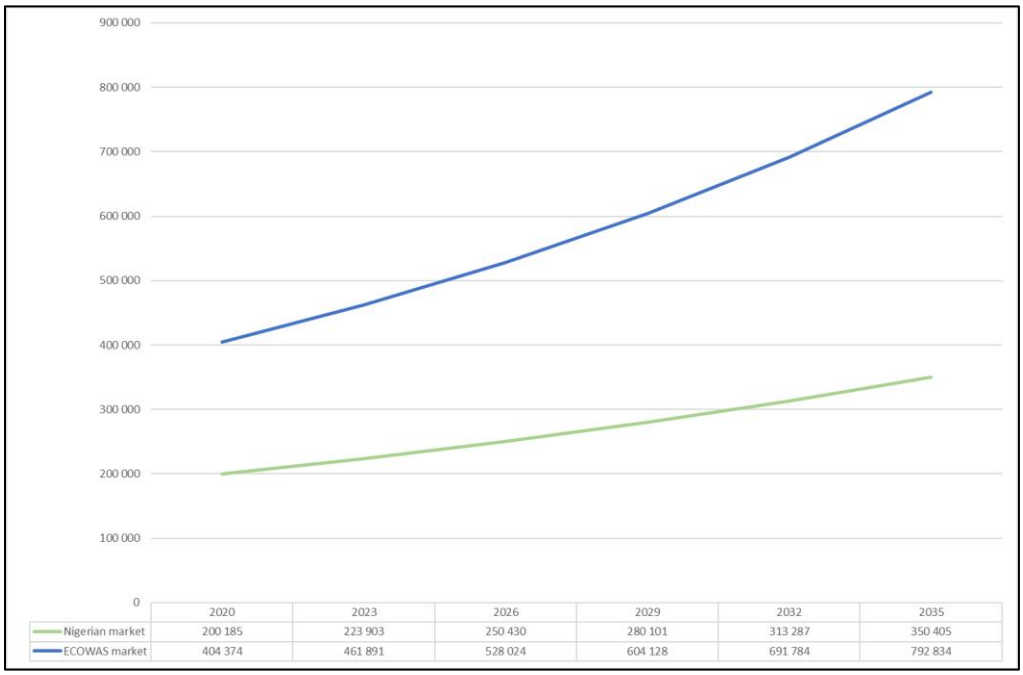
Figure 5: Nigeria's automotive trade balance to 2035

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2023	2026	2029	2032	2035
Vehicle Component Exports	17.48	10.55	45.38	10.10	10.49	7.87	3.01	6.71	7.81	5.64	5.85	6.07	6.79	7.60	8.50	9.50	10.63
Vehicle Component Imports	-2 131	-3 638	-3 211	-1 646	-1 996	-1 810	-754	-1 272	-1 887	-2 610	-2 709	-2 812	-3 145	-3 518	-3 934	-4 400	-4 922
Vehicle Exports	1.24	2.54	2.77	1.26	1.87	1.50	2.68	2.90	0.72	3.56	3.80	3.95	4.42	4.94	5.52	6.18	6.91
Vehicle Imports	-1 996	-2 225	-2 825	-3 206	-3 573	-3 310	-2 962	-2 455	-1 708	-1 653	-1 913	-1 986	-2 221	-2 484	-2 779	-3 108	-3 476
Trade Balance	-4 109	-5 850	-5 988	-4 841	-5 556	-5 110	-3 710	-3 718	-3 586	-4 253	-4 612	-4 788	-5 355	-5 989	-6 699	-7 493	-8 380

Source: UN Comtrade, 2020

If Nigeria prohibited the importing of pre-owned vehicles, and the balance of ECOWAS countries were to enact similar legislation, our African Auto Pact model projects new vehicle demand for Nigeria of 200,185 in 2020, increasing to 350,405 units by 2035. As further revealed in Figure 6, Nigeria is also well located regionally with demand within ECOWAS increasing from an imputed 404,374 units in 2020 to 792,834 units in 2035.

Figure 6: Nigeria's adjusted new vehicle demand to 2035 (with no pre-owned vehicle imports)



Notes: Based on the termination of pre-owned vehicle imports and substitution with new vehicles (and demand reduced by 20% for affordability reasons).

5.1. Nigeria assembly scenarios

With this size of market, Nigeria has the potential to become a key automotive assembly hub for ECOWAS. Based on its own market demand of 350,405 units, and aggregate ECOWAS demand of 445,176 units, we estimate that Nigerian vehicle production of 450,000 units per annum could be supported by 2035 based on the four scenarios outlined below. A large market of this size is expected to attract significant investment and generate substantial economic value and employment for Nigeria. However, the degree of economic benefit and associated employment will depend on the nature of automotive investments attracted into the country. To illustrate the potential outcomes of attracting different types of investment, this study used a multiplier impact model based on a recent (2017) SAM for Nigeria to quantify the direct and indirect impacts of different types of automotive investment.

Four automotive investment types were investigated:

1) SKD1: Semi-Knock Down production for the domestic market only, and with no localisation of components
2) SKD2: Semi-Knock Down production for the domestic market only, and with only limited localisation of trim parts
3) Basic Completely Knocked Down assembly for the ECOWAS market, with this based on an entry level vehicle (costing $10,000) and 40% GVA (per South Africa's standard).
4) Advanced Completely Knocked Down assembly for the ECOWAS market, with this based on the average value of vehicles manufactured in South Africa, and as per South African GVA levels.

The direct investment value of each assembly type is shown in Table 6 below.

Table 6: Summary of Nigerian SAM model inputs

Nigeria	Scenario 1: SKD 1	Scenario 2: SKD 2	Scenario 3: CKD basic	Scenario 4: CKD advanced
Units produced	350 405	350 405	450 000	450 000
Assembly GVA per unit (US$)	1 500	1 500	3 000	5 944
Component GVA per unit (US$)		500	2 000	3 969
Total assembly GVA (US$)	**525 607 415**	**525 607 415**	**1 350 000 000**	**2 674 773 674**
Total components GVA (US$)	**-**	**175 202 472**	**900 000 000**	**1 786 204 384**
TOTAL direct GVA (US$)	**525 607 415**	**700 809 887**	**2 250 000 000**	**4 460 978 058**

Note: GVA assumptions based on estimates of South African GVA calculated from the South African Automotive Masterplan.

5.1.1. Nigeria production impact

The four different assembly scenarios will have highly variable impacts on the Nigerian economy (including impacts on assembly operations and associated component production, if applicable). The estimated assembly and component production impacts are shown in **Table 7** below.

Table 7: Summary of Nigerian opportunities ($million)

	SKD1	SKD2	CKD basic	CKD advanced
Direct GDP impact ($million)	526	701	2 250	4 461
Indirect GDP impact ($million)	233	508	2 265	4 379
TOTAL GDP impact ($million)	**759**	**1 209**	**4 515**	**8 840**
% GDP (2019) contribution	**0.17%**	**0.27%**	**1.01%**	**1.97%**
Direct assembly employment created	4 233	4 233	10 872	21 541
Indirect employment created	27 270	62 055	281 731	559 130
TOTAL employment (direct and indirect)	**31 503**	**66 288**	**292 603**	**580 670**
Rural household income ($million)	94	185.6	789.1	1 565.80
Urban household income ($million)	613.2	914.8	3 249.40	6 444.60
Combined tax revenues ($million)	14.2	35.9	169.9	337.2

Source: Own Calculations
Note: Annually Recurring Impacts.

The findings presented in the table include both direct impacts on assembly activities as well as implications for upstream supplier industries. The total impact on Nigeria's GDP from operating an SKD1 assembly plant model is estimated at $759 million, equivalent to only 0.17% of Nigeria's GDP in 2019. In contrast, the impact of an advanced CKD assembly plant is estimated at $8.8 billion, which is equivalent to 1.97% of GDP in 2019. CKD production generates equivalent levels of indirect GDP benefit to direct benefits. Nigeria's relatively low indirect impact is based on the relatively low multipliers of manufacturing to the rest of the economy. This is due to the economy's high levels of import leakage, which the development of CKD production would play a critical role in addressing. The SAM in its present form estimates that 53% of value generated from automotive production would be supplied locally with the balance leaking from the demand system (being imported).

The cumulative employment impact of SKD1 assembly would amount to 31,503 compared to advanced CKD assembly which would amount to 580,670[5]. Even Basic CKD production would generate 292,603 jobs. CKD production generates higher multiples of indirect employment compared to SKD production due to its stimulation of the components and services industry. Note that there is no locally supplied componentry to the motor vehicle assembly unit in the SKD1 option since all components required for vehicle assembly are imported.

The impact on incomes would mostly be felt in urban households, with the Nigerian SAM indicating that advanced CKD assembly would generate $6.4 billion in annual income for urban households. However, even rural household income would rise - to as much as $1.6 billion. Government tax revenues would also be stimulated under each of the four models, although advanced CKD assembly would add $337 million to the Nigerian fiscus, relative to only $14.2 million from SKD1 assembly.

5.1.2. Detailed assembly and component impact

Increased automotive production in Nigeria would stimulate several industries. This is clearly demonstrated in **Table 8**, which imputes the growth that would occur in the top 15 support industries because of the four investment options.

Table 8: Automotive assembly and component impact on the top 15 industries in Nigerian ($million)

SKD1 impact		SKD2 impact		Basic CKD impact		Advanced CKD impact	
Vehicles & equipment	526	Vehicles & equipment	707	Vehicles & equipment	2 287	Vehicles & equipment	4 534
Business services	54	Wholesale & retail trade	126	Wholesale & retail trade	698	Wholesale & retail trade	1 387
Other services	49	Business services	79	Business services	274	Business services	544
Information & communication	29	Other services	68	Other services	226	Other services	448
Wholesale & retail trade	26	Information & communication	47	Information & communication	180	Information & communication	357
Real estate	25	Real estate	38	Real estate	139	Real estate	276
Finance & insurance	14	Finance & insurance	20	Finance & insurance	72	Finance & insurance	142
Electricity	11	Electricity	16	Metals & products	68	Metals & products	134
Transport & storage	6	Transport & storage	12	Non-metal minerals	55	Non-metal minerals	109
Crude oil	3	Metals & products	11	Electricity	53	Electricity	105
Textiles	1	Non-metal minerals	9	Transport & storage	50	Transport & storage	100
Food services	1	Crude oil	8	Textiles	41	Textiles	82
Other chemicals	1	Textiles	7	Other chemicals	39	Other chemicals	77
Sugar refining	1	Other chemicals	7	Crude oil	38	Crude oil	76
Education	1	Leather & footwear	6	Leather & footwear	36	Leather & footwear	72

Source: Own Calculations
Note: Annually Recurring Impacts

The values in **Table 8** refer to the sum of direct and indirect impacts on the Nigerian economy. The vehicles and equipment industry – which largely refers to component manufacturers supporting vehicle assembly – would be most stimulated by automotive sector investments. The impact on the assembly and

[5] The strong employment impact from the modelling is due to the very low levels of productivity in the Nigerian economy. Every unit of value created consequently has an extremely high employment multiplier.

component industry is highly dependent on the type of assembly introduced. SKD1 assembly would result in a $526 million industry. In contrast, advanced CKD assembly would result in a $4.5 billion automotive assembly and components industry.

Investment in the auto industry will also have a significant impact on trade, services, real estate, and the finance industries. The automotive industry relies on a complex administration system to support intercompany payments and retail distribution to the final consumer. The combined impact on services for the top 15 industries stimulated by the auto industry amounts to $205 million for SKD1 assembly and $3.3 billion for advanced CKD assembly. Advanced CKD assembly will also have an impact on basic and semi-finished goods such as metal products ($134 million), non-metal minerals like glass ($109 million), textiles ($82 million), chemical products (e.g. plastics, synthetic fibres and paints) ($77 million), crude oil refining ($76 million), and leather goods ($72 million). These intermediary inputs would support component supply for the automotive industry. The automotive industry would also have a stimulus effect on downstream industries, although the modelling's methodology does not allow us to quantify this in its current configuration. The substantial services and raw materials multipliers demonstrate how advanced manufacturing will have a significant stimulus on both upstream and downstream industries.

6. Ghana as an ECOWAS hub opportunity

As revealed in Table 9, Ghana is presently a lower income country with a reasonably large population. Ghana's vehicle market is quite underdeveloped relative to its population size, as the country has a relatively low motorisation rates, at only 32 cars per 1,000 inhabitants in 2015. However, the country's rapid recent economic growth could be a major catalyst for the sustainable development of an automotive industry. Ghana's GDP growth rate averaged 6.8% over the period 2010 to 2019. This is well above the SSA average of 4.03%. Furthermore, Ghana also experienced strong GDP per capita growth over the same period of 6.05%. This is one of the highest rates of GDP per capita growth in Africa over the last decade and is well above the SSA average.

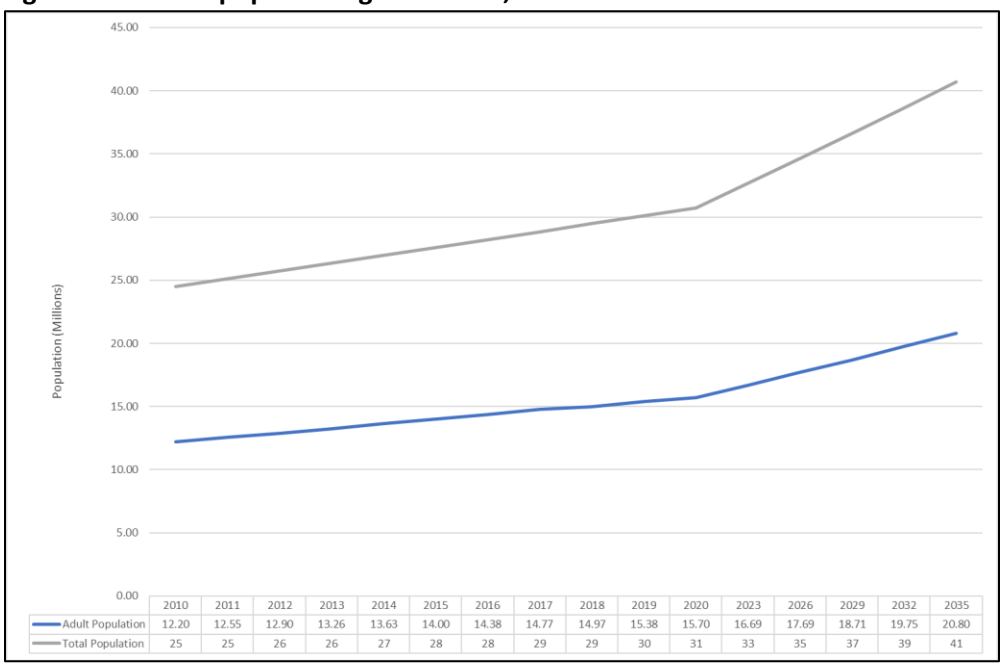
Table 9: Key Ghanaian automotive indicators

Indicator	Values
Population 2019*	30 million
GDP per capita PPP 2019 (nominal)*	2 202
Total number of vehicles in operation (2015)†	890 000
Estimated ratio of people to vehicles (per 1,000) (2015)†	32
Passenger vehicle sales (2019)	3 394
Commercial vehicle sales (2019)	2 306

Source: *World Bank http://data.worldbank.org/; †OICA http://www.oica.net/category/vehicles-in-use/

The United Nations (2020) estimates that Ghana's population will grow by approximately 35% through to 2035. The adult population will therefore grow to 20.8 million adults by 2035. Combined with its growing wealth, this adult population growth should result in substantial increases in Ghanaian vehicle demand over the period. As per Nigeria, job creation will be critical for Ghana to realise its potential. By 2035 there will be approximately 5.4 million additional adults requiring employment in the country.

Figure 7: Ghana's population growth rate, 2009 - 2035

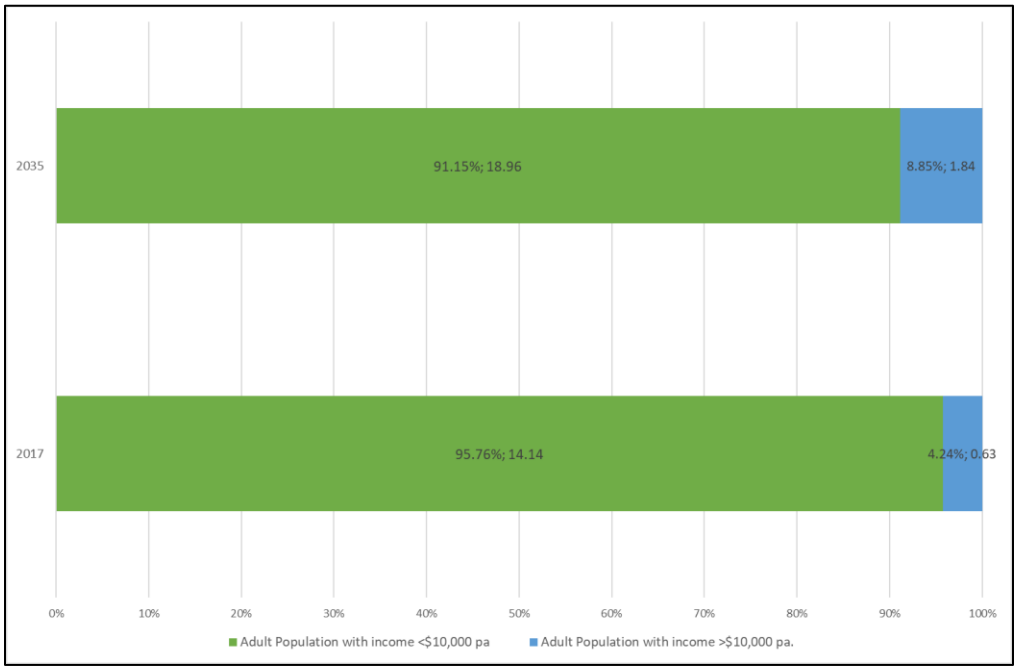


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2023	2026	2029	2032	2035
Adult Population	12.20	12.55	12.90	13.26	13.63	14.00	14.38	14.77	14.97	15.38	15.70	16.69	17.69	18.71	19.75	20.80
Total Population	25	25	26	26	27	28	28	29	29	30	31	33	35	37	39	41

Source: UN Database, 2020; Credit Suisse Databooks,2010-2019

Based on Ghana's present economic growth trajectory, we expect some growth in the proportion of adults earning above $10,000 by 2035. As revealed in Figure 8, given anticipated economic growth and the absolute growth in population, the number of adults able to purchase vehicles will increase from around only 630,000 adults in 2017 to 1.84 million in 2035. This will spur large increases in the demand for new vehicles.

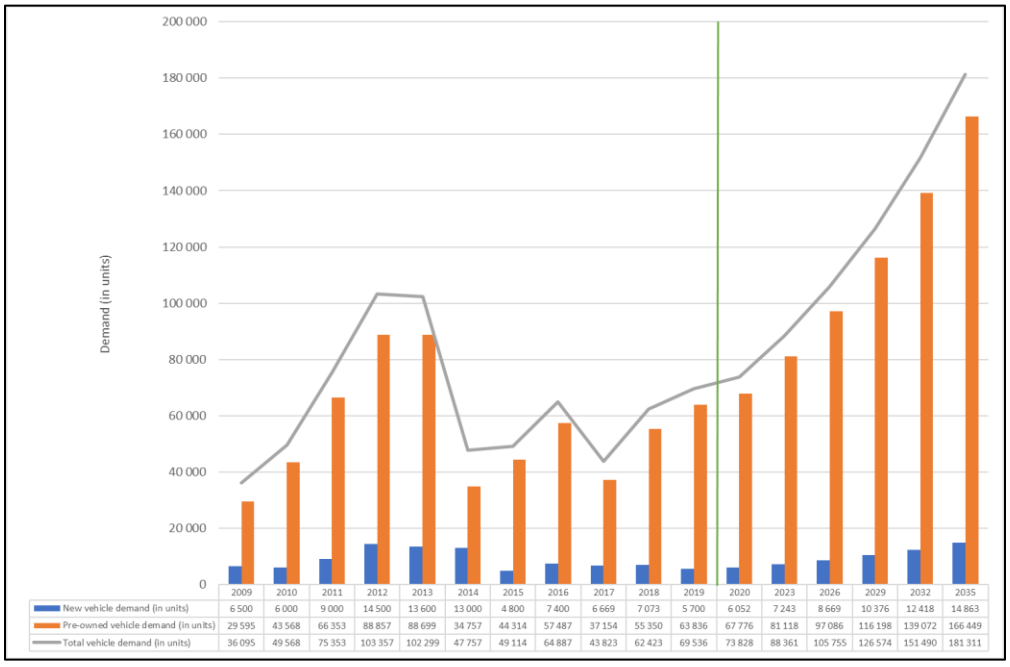
Figure 8: Ghana adult population earning income above $10,000, 2017 and 2035



Source: UN Database, 2020; Credit Suisse Databooks,2010-2019

Per the balance of ECOWAS, Ghana's automotive market is dominated by pre-owned imported vehicles. Ghana's new vehicle market accounts for 8.2% (8,900 vehicles) of the total vehicle market inclusive of pre-owned imports. However, this is higher than in Nigeria, where the new vehicle market accounts for only 4.1% of the vehicle market (inclusive of pre-owned imports). Based on its current trajectory. Ghana's total vehicle sales are estimated to reach 181,311 units in 2035. Most of these sales will be of pre-owned vehicle imports (166,449 units), with the new vehicle market reaching only 14,863 units. Per the Nigerian outlook, if Ghana continues this current trajectory its automotive consumption profile will increasingly become untenable. This is depicted in Figure 9, which shows major increases in import demand through to 2035.

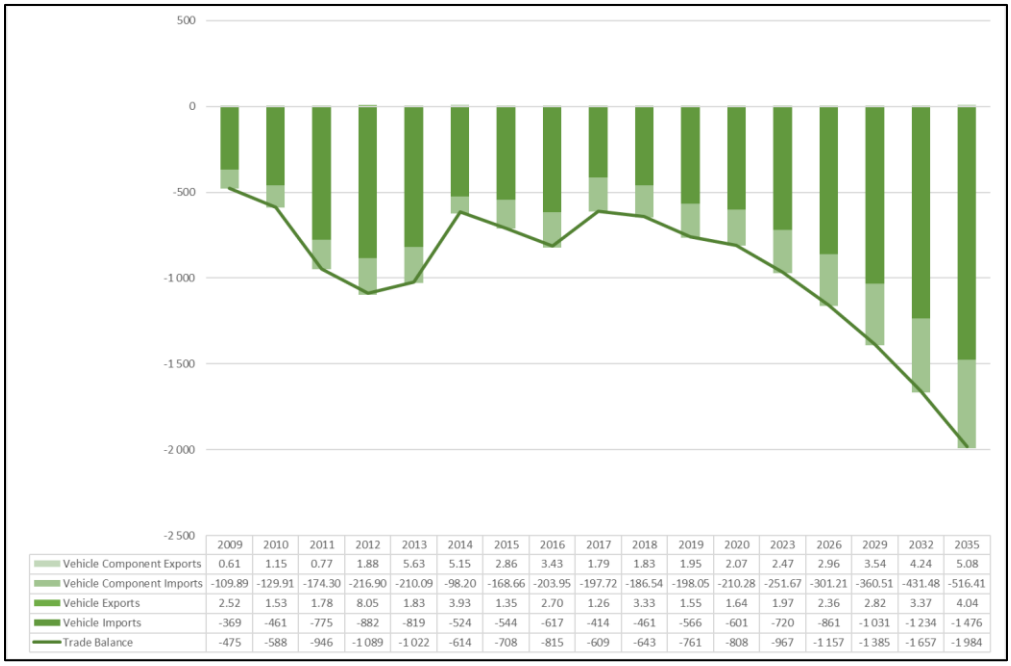
Figure 9: Ghanaian vehicle demand projections to 2035, based on the existing consumption profile



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2023	2026	2029	2032	2035
New vehicle demand (in units)	6 500	6 000	9 000	14 500	13 600	13 000	4 800	7 400	6 669	7 073	5 700	6 052	7 243	8 669	10 376	12 418	14 863
Pre-owned vehicle demand (in units)	29 595	43 568	66 353	88 857	88 699	34 757	44 314	57 487	37 154	55 350	63 836	67 776	81 118	97 086	116 198	139 072	166 449
Total vehicle demand (in units)	36 095	49 568	75 353	103 357	102 299	47 757	49 114	64 887	43 823	62 423	69 536	73 828	88 361	105 755	126 574	151 490	181 311

The direct consequence of Ghana's continued dependence on pre-owned vehicle imports is the same as for Nigeria. Its automotive trade balance will continue to deteriorate. This is clearly shown in Figure 10, which demonstrates that Ghana's automotive trade deficit will shift from $761 million in 2018 to over $1.9 billion by 2035.

Figure 10: Ghana's automotive trade balance

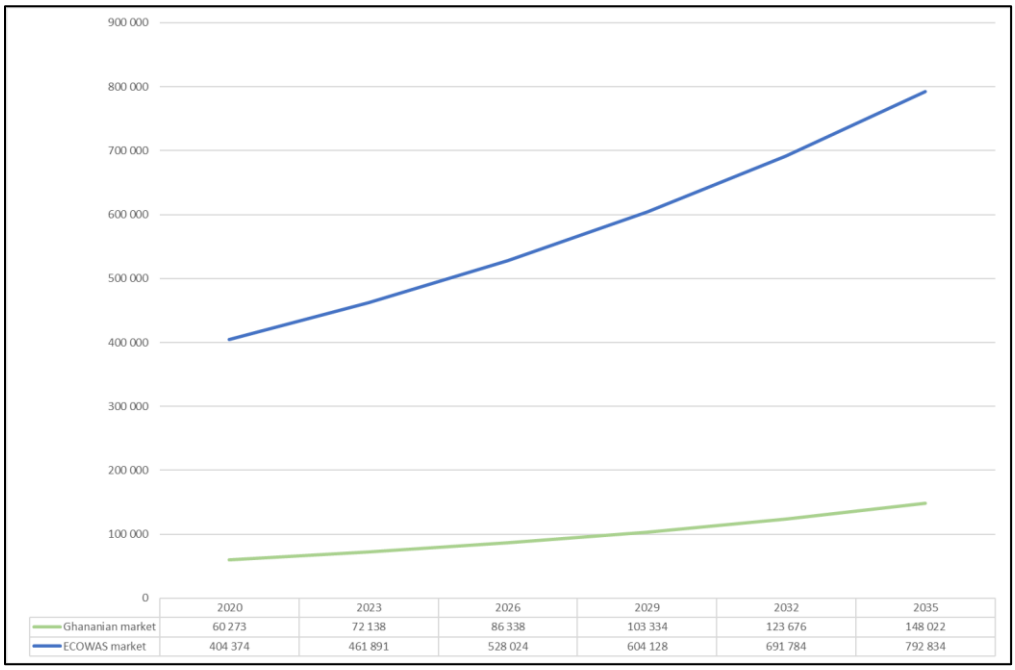


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2023	2026	2029	2032	2035
Vehicle Component Exports	0.61	1.15	0.77	1.88	5.63	5.15	2.86	3.43	1.79	1.83	1.95	2.07	2.47	2.96	3.54	4.24	5.08
Vehicle Component Imports	-109.89	-129.91	-174.30	-216.90	-210.09	-98.20	-168.66	-203.95	-197.72	-186.54	-198.05	-210.28	-251.67	-301.21	-360.51	-431.48	-516.41
Vehicle Exports	2.52	1.53	1.78	8.05	1.83	3.93	1.35	2.70	1.26	3.33	1.55	1.64	1.97	2.36	2.82	3.37	4.04
Vehicle Imports	-369	-461	-775	-882	-819	-524	-544	-617	-414	-461	-566	-601	-720	-861	-1 031	-1 234	-1 476
Trade Balance	-475	-588	-946	-1 089	-1 022	-614	-708	-815	-609	-643	-761	-808	-967	-1 157	-1 385	-1 657	-1 984

Source: UN Comtrade, 2020

If Ghana were to join Nigeria and other ECOWAS countries in prohibiting imports of pre-owned vehicles, our African Auto Pact model projects new vehicle demand for Ghana of 60,273 in 2020, with this increasing to a not insignificant 148,022 units by 2035. As further revealed in Figure 11, Ghana is also well located regionally with demand within ECOWAS increasing from an imputed 404,374 units in 2020 to 792,834 units in 2035.

Figure 11: Ghana's adjusted new vehicle demand to 2035 (with no pre-owned vehicle imports)



Notes: Based on the termination of pre-owned vehicle imports and substitution with new vehicles (and demand reduced by 20% for affordability reasons).

6.1. Ghana assembly scenarios

Based on its own market demand of 148,022 units, and broader ECOWAS demand of 792,834 units, we believe that Ghana could become a key automotive assembly hub for ECOWAS, producing 300,000 units per annum by 2035 (relative to 450,000 units in Nigeria). Potential of this size would attract significant automotive investment and generate substantial economic value and employment for the Ghanaian economy. However, the degree of economic value and employment will depend on the nature of the automotive investment that takes place.

To illustrate the potential outcomes of attracting different types of investment this study used a multiplier impact model based on the recent (2015) SAM for Ghana to quantify the direct and indirect impacts of the same types of automotive investment considered for Nigeria, as per the following:

1) SKD1: Semi-Knock Down production for the domestic market only, and with no localisation of components
2) SKD2: Semi-Knock Down production for the domestic market only, and with only limited localisation of trim parts
3) Basic Completely Knocked Down assembly for the ECOWAS market, with this based on an entry level vehicle (costing $10,000) and 40% GVA (per South Africa's standard).
4) Advanced Completely Knocked Down assembly for the ECOWAS market, with this based on the average value of vehicles manufactured in South Africa, and as per South African GVA levels.

The direct investment value of each assembly type is shown in Table 10 below.

Table 10: Summary of Ghana SAM model inputs

	Scenario 1: SKD 1	Scenario 2: SKD 2	Scenario 3: CKD basic	Scenario 4: CKD advanced
Units produced	148 022	148 022	300 000	300 000
Assembly GVA per unit (US$)	1 500	1500	3 000	5 944
Component production GVA per unit (US$)		500	2 000	3 969
Total assembly GVA (US$)	222 032 314	222 032 314	900 000 000	1 783 182 449
Total components production GVA (US$)	-	74 010 771	600 000 000	1 190 802 923
TOTAL direct GVA (US$)	**225 732 853**	**303 444 162**	**1 524 000 000**	**3 003 985 372**

Note: GVA assumptions based on estimates of South African GVA calculated from the South African Automotive Masterplan.

6.1.1. Ghana production impact

The four different assembly scenarios will have highly variable impacts on the Ghanaian economy (including impacts on assembly operations and associated component production, if applicable). The estimated assembly and component production impacts are shown in Table 11. These include both direct impacts on assembly activities and on upstream supplier industries. The total impact on Ghana's GDP from an SKD1 assembly plant is $296 million, equivalent to 0.44% of Ghana's GDP in 2019. In contrast, the impact of advanced CKD production is estimated at $4.8 billion, which is equivalent to 7.12% of GDP. The relatively low indirect impact on Ghana (compared to Nigeria) is based on the SAM model's weaker multipliers from automotive manufacturing to the rest of the economy (32% being supplied locally, and the balance imported, relative to 53% in Nigeria).

Table 11: Summary of Ghana opportunities ($million)

	SKD1	SKD2	CKD basic	CKD advanced
Direct GDP impact ($million)	222	296	1 500	2 974
Indirect GDP impact ($million)	74	139	905	1 796
TOTAL GDP impact ($million)	**296.3**	**434.9**	**2 405.4**	**4 770.4**
% GDP (2019)	**0.44%**	**0.65%**	**3.59%**	**7.12%**
Direct employment	1 788	1 788	7 248	14 361
Indirect employment	3 700	7 508	51 092	101 386
TOTAL employment (direct and indirect)	**5 488**	**9 296**	**58 340**	**115 747**
Rural household income ($million)	14.4	23.0	135.6	268.9
Urban household income ($million)	259.6	360.4	1 898.2	3 764.0
Combined tax revenues ($million)	10.7	33.7	269.9	535.9

Source: Own Calculations
Note: Annually Recurring Impacts.

The cumulative employment impact of SKD1 assembly would be 5,488, compared to advanced CKD assembly which is estimated to generate 115,747 jobs. Basic CKD production would also generate a very significant 51,092 jobs. CKD production generates higher levels of indirect employment compared to SKD production due to its stimulation of component production and associated services. This is not the case for SKD1, where all components are assembled. Urban household income would be bolstered by $3.8 billion from advanced CKD assembly, while rural household income would increase by $269 million.

Government tax revenues would also receive a substantial boost, with advanced CKD production generating a very significant $536 million in additional revenue for the Ghanaian fiscus.

6.1.1. Ghana component impact

The development of an automotive industry in Ghana would have a major stimulating impact on a range of economic sectors. Table 12 shows the impact on the top 15 industries in Ghana, and as highlighted the impact will be widespread, extending well beyond the machinery and equipment sector (which is the sector within which automotive assembly and component production is categorized). SKD1 assembly would result in a $222 million stimulation to the economy, whereas advanced CKD assembly would result in a very significant $3 billion stimulation.

Table 12: Automotive assembly and component impact on the top 15 industries in Ghana ($m)

SKD1 impact		SKD2 impact		Basic CKD impact		Advanced CKD impact	
Machinery & equipment	222	Machinery & equipment	296	Machinery & equipment	1 502	Machinery & equipment	2 978
Other services	22	Other services	29	Transport & storage	160	Transport & storage	317
Transport & storage	14	Transport & storage	25	Other services	148	Other services	293
Finance & insurance	9	Finance & insurance	13	Finance & insurance	70	Finance & insurance	139
Business services	5	Wholesale & retail trade	8	Wholesale & retail trade	63	Wholesale & retail trade	126
Real estate	4	Business services	6	Business services	33	Business services	66
Crude oil	4	Crude oil	6	Crude oil	33	Crude oil	66
Information & communication	3	Real estate	5	Metals & prod	29	Metals & prod	57
Wholesale & retail trade	2	Information & communication	4	Real estate	28	Real estate	56
Accommodation & food services	1	Metals & prod	3	Information & communication	21	Information & communication	42
Electricity	1	Petroleum	2	Petroleum	11	Petroleum	22
Petroleum	1	Electricity	1	Chemicals	11	Chemicals	22
Construction	1	Accommodation& food services	1	Forestry	10	Forestry	19
Education	0	Construction	1	Electricity	8	Electricity	16
Water supply & sewage	0	Chemicals	1	accommodation & food services	8	accommodation & food services	15

Source: Own Calculations
Note: Annually Recurring Impacts

The development of an automotive industry will also have a significant impact on the trade, services, real estate and finance industries, with each being stimulated by more than $100 million annually by the automotive industry. An advanced CKD-based assembly industry will also have an impact on the basic and semi-finished goods industries such as petroleum and crude oil refining ($66 million), metal products ($56 million), chemical products such as plastics, synthetic fibres and paints ($31 million), and wood products ($19 million). These elements highlight the potential value of the automotive industry to value chain developments.

7. Defining broader ECOWAS opportunities

Vehicle assembly and time sensitive component manufacturing will occur within the hub economies of ECOWAS. However, the broader members of ECOWAS have the potential to operate as spoke economies

(see **Figure 1**) and are therefore well placed to benefit from being part of the Pact through access to the pact fleet, the establishment of component production for vehicle assembly and aftermarket consumption, and through the potential trade of complementary automotive products such as motorcycles and off highway transport equipment.

7.1. Direct economic benefits

If an ECOWAS automotive pact is successfully implemented, and the region meets the PEM production estimates of around 750,000 units annually, we estimate that the automotive industry could contribute a further $1.1 billion in GVA for the ECOWAS spoke economies by 2035. Based on this GVA, all of which would represent foreign exchange savings and a positive contribution to the region's trade balance, the spoke economies could employ 24,750 people in component manufacturing operations (for the vehicle assemblers), with a further 4,950 employed in aftermarket related component activities.

Table 13: Direct benefit to spoke economies in 2035

	Adjusted annual units of demand	GVA ($millions)	GVA Percent of GDP in 2019*	Employment at component manufacturers	Aftermarket Component Employment spill over	Total Industry Employment estimate
Benin	15 067	46	0.32%	1 042	208	1 250
Burkina Faso	10 784	39	0.25%	882	176	1 058
Cabo Verde	4 230	25	1.28%	577	115	692
Cote d'Ivoire	47 878	348	0.59%	7 912	1 582	9 495
Gambia, The	10 373	63	3.54%	1 421	284	1 705
Guinea	66 131	126	0.92%	2 854	571	3 425
Guinea-Bissau	2 767	10	0.73%	222	44	267
Liberia	5 620	10	0.34%	236	47	284
Mali	13 135	61	0.35%	1 383	277	1 660
Niger	31 162	53	0.41%	1 204	241	1 445
Senegal	60 592	211	0.89%	4 786	957	5 743
Sierra Leone	14 770	58	1.47%	1 320	264	1 584
Togo	11 900	40	0.73%	911	182	1 094
Total	**294 407**	**1 089**	**n/a**	**24 750**	**4 950**	**29 701**

*The GVA estimates are understated as they only include the direct economic impact of automotive production and do not factor in the full supply chain – in other words, the GVA estimates exclude an Account of downstream activities.

7.2. Potential component benefits

Trade data suggests that there are currently very limited automotive component production capabilities in ECOWAS, with this particularly evident for the spoke economies. Most automotive components are imported. However, some economies reveal some potential based on the volume and growth of their

exports in specific automotive component merchandise categories. Table 14 reveals the results for Burkina Faso, Cote d'Ivoire, and Senegal. As evident:

- Burkina Faso had some exports of diesel or semi-diesel combustion engines ($304,782) and new pneumatic rubber tyres for motor vehicles ($119,792) in 2019. Exports of both products have grown over 30% per annum over the past decade. Burkina Faso is the only country out of the three countries exporting vehicle bodies, with exports amounting to $27,484 in 2019.

- Cote d'Ivoire's most significant component exports in 2019 included engines ($227,939), transmission shafts ($218,334), filtering parts ($168,121), and general parts and accessories (P&A, $147,264). However, export growth has only been evident for engines and transmission shafts, with these two categories experiencing a CAGR of 30% and 1.8% respectively.

- Senegal has relatively significant exports of diesel or semi-diesel engines ($1,489,084), general P&A ($933,312), new pneumatic rubber tyres used on buses or lorries ($91,722), and transmission shafts ($551,036) in 2019. Exports have grown across all the component categories over the past decade diesel or semi-diesel engines experiencing a 30.6% CAGR.

Table 14: Spoke economy component trade performance to 2019.

Component categories	Burkina Faso			Cote d'Ivoire			Senegal		
	Exports 2019 ($000)	10-year CAGR	TB 2019 ($000)	Exports 2019 ($000)	10-year CAGR	TB 2019 ($000)	Exports 2019 ($000)	10-year CAGR	TB 2019 ($000)
Motor vehicle bodies; (incl. cabs) (HS 8707)	$27	26%	-$43	-	-	-	-	-	-
Chassis; fitted with engines (HS 8706)	-	-	-	-	-	-	-	-	-
Internal combustion engines (diesel or semi-diesel engines)	$305	30%	-$19 643	$228	35%	-$8 652	$1 489	32%	-$10 727
Filtering/ purifying machinery, etc. (HS 842139)	$0.961	-33%	-$1 357	$168	-7%	-$6 4454	$47	8%	-$6 336
Glass (HS 700721)	-	-	-	$456	-21%	-$1 708	$10	-18%	-$1 480
Parts and accessories (HS 8708)	$25	-13%	-$23 290	$147	-2%	-$74 653	$933	15%	-$81 332
Vehicle radiators and parts thereof (HS 870891)	$1	-3%	-$143	$3	26%	-$1 171	$5	-5%	-$750
Truck and bus pneumatic rubber tyres (HS 401120)	$12	-	-$6 667	-	-	-	$92	2%	-$23 138
Motor car pneumatic rubber tyres (HS 401110)	$120	38%	-$593	$2	-	-$11 417	-	-	-
Transmission shafts (HS 8483)	$53	-24%	-$10 446	$218	2%	-$14 051	$551	26%	-$34 568
Electrical windscreen wipers, defrosters, and demisters (HS 851240)	$0.022	-	-$113	$2	-	-$110	$2	7%	-$425

Source: UN Comtrade, 2020
Note: No component data for Rwanda in 2017 and 2018.

The analysis suggests that any opportunities for component production will need to be established through Greenfield investments, as opposed to building off established manufacturing capabilities. There

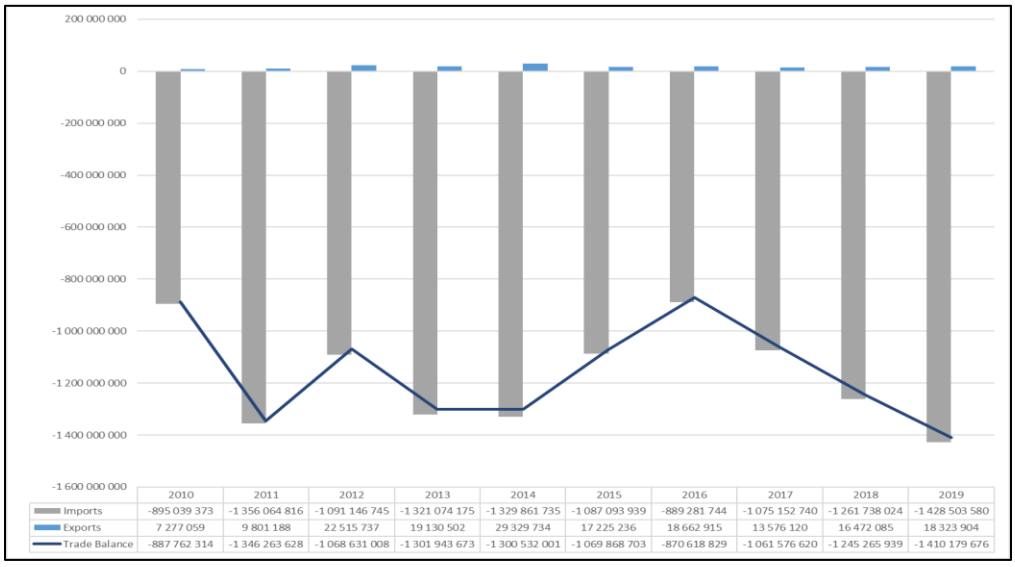
may be pockets of local automotive component manufacturing, but as revealed in Table 14, there is only very limited evidence of export capable production within the ECOWAS spoke economies.

We need to stress that the development of the automotive supply chain is a complex process and is not automatic. It too would require programmes of support. Accordingly, the above analysis is intended to be broadly indicative of potential on the basis of what available statistics we have.

7.3. Motorcycle capabilities

As a region, ECOWAS has maintained a large trade deficit on motorcycles. As shown in Figure 12 below, exports of motorcycles in 2019 amounted to only 9,718 units, whereas imports amounted to 2.5 million units. The trade deficit has moreover grown over the past decade, with exports increasing at a CAGR of 10.8% from 2010 to 2019. Imports have grown at a CAGR of 5.3%, but off an extremely low base. As revealed in Figure 13, the largest motorcycle trade deficits in ECOWAS are for Nigeria, Togo, and Ghana. These three countries imported 75% of the motorcycles entering the region – about 1.8 million units in 2019. Togo is the only country with significant exports of motorcycles in 2019, exporting 6,964 units.

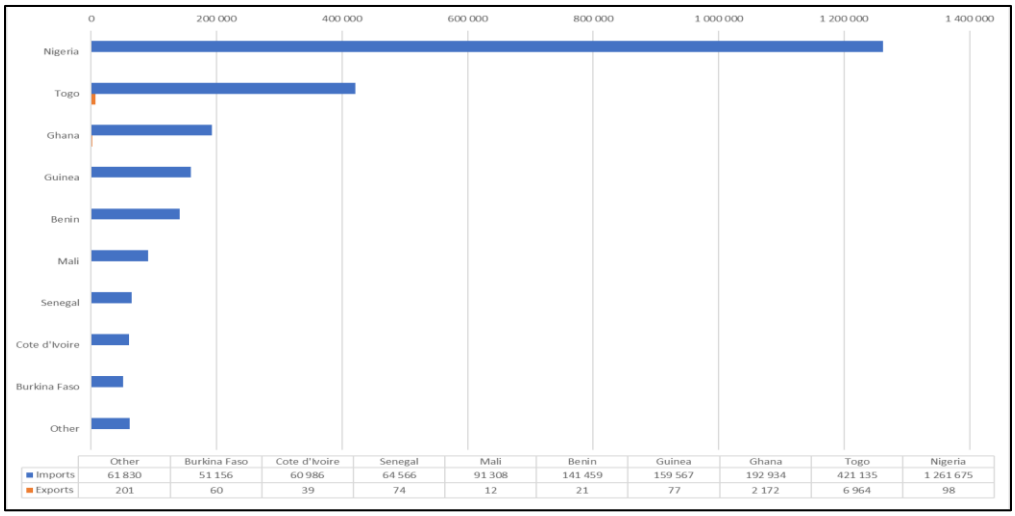
Figure 12: ECOWAS motorcycle trade balance, units (2010 – 2019)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Imports	-895 039 373	-1 356 064 816	-1 091 146 745	-1 321 074 175	-1 329 861 735	-1 087 093 939	-889 281 744	-1 075 152 740	-1 261 738 024	-1 428 503 580
Exports	7 277 059	9 801 188	22 515 737	19 130 502	29 329 734	17 225 236	18 662 915	13 576 120	16 472 085	18 323 904
Trade Balance	-887 762 314	-1 346 263 628	-1 068 631 008	-1 301 943 673	-1 300 532 001	-1 069 868 703	-870 618 829	-1 061 576 620	-1 245 265 939	-1 410 179 676

Source: UN Comtrade, 2020

Figure 13: ECOWAS trade balance of motorcycles by country, units (2019)



	Other	Burkina Faso	Cote d'Ivoire	Senegal	Mali	Benin	Guinea	Ghana	Togo	Nigeria
Imports	61 830	51 156	60 986	64 566	91 308	141 459	159 567	192 934	421 135	1 261 675
Exports	201	60	39	74	12	21	77	2 172	6 964	98

Source: UN Comtrade, 2020

7.4. Agriculture, mining, and construction equipment capabilities

Off-highway agricultural, mining and construction vehicle manufacturing has potential linkages to vehicle manufacturing and can be a complementary source of industrialisation. The product range of agriculture, mining, and construction equipment includes various types of machinery operated as a vehicle. These are depicted in Table 15.

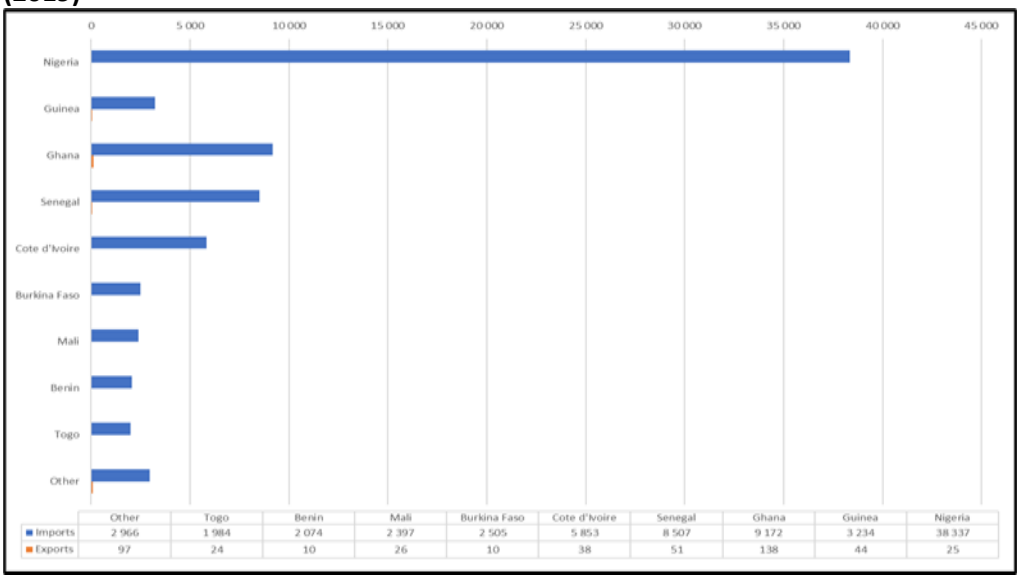
Table 15: Range of agriculture, mining, and construction equipment products

Segment	Product range
Agriculture	Articulated Tractor, Cane Loader, Agricultural Forklifts, Haulage Tractors
Forestry	Feller Buncher, Forwarder, Harvester, Logger, Long Range Forwarder, Skidder, Timber Trucks
Mining and Construction	Articulated Dump Truck (ADT), Crawler Dozer, Excavator, Motor Grader, Tipper Trucks, Tractor Loader Backhoe (TLB), Wheeled Loader
Construction	Asphalt Construction, Cold Milling / Stabilizer and Recycler, Crushing and Screening, Concrete Mixer, Fire Truck, Hooklift Truck, Cranes, Container Handler, Custom Load Bodies, Rock scaler, TLB Variations, Water Tankers

Note: For specific HS code definition, refer to Annexure 2

Currently, South Africa is the only country in Sub Saharan African with domestic OEMs manufacturing agriculture, mining, and construction equipment. The balance of the sub-continent hosts distributors of imported products such as AB Volvo, Caterpillar, Deere and Company, Doosan Infracore, Hitachi, JC Bamford Excavators, Kobelco Construction Machinery, Komatsu, SANY Group, and Xuzhou Construction Machinery Group (XCMG). Continued mineral discoveries and increasing rates of urbanisation in ECOWAS suggests that the region has the potential to support the assembly of off highway transport equipment as part of an automotive industrial complex. Figure 14 shows the trade position of agriculture, mining, and construction equipment by ECOWAS country in 2019.

Figure 14: ECOWAS trade of agriculture, mining, and construction equipment by country and units (2019)



	Other	Togo	Benin	Mali	Burkina Faso	Cote d'Ivoire	Senegal	Ghana	Guinea	Nigeria
Imports	2 966	1 984	2 074	2 397	2 505	5 853	8 507	9 172	3 234	38 337
Exports	97	24	10	26	10	38	51	138	44	25

Source: UN Comtrade, 2020

As shown in Figure 14, there are no significant exporters of agriculture, mining, and construction equipment in ECOWAS, with the region only exporting 464 units of machinery in 2019. Exports in the region spiked in 2017, with 820 units exported. The key agriculture, mining, and construction equipment export segments for ECOWAS are construction machinery (fork-lifts, bulldozers, excavators, graders, and loaders) and tractors.

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Annexure 1: African Automotive Pact Model Parameters

GDP Data: GDP data (GDP in Current US$), GDP growth rates, GDP (PPP), GDP (LCU), GDP per capita (US$) and GDP per capita growth rates) was collected from the World Bank for the period 2007-2019. The 10-year average GDP per capita growth rates were derived using the average GDP per capita growth rates over the past 10 years (2009-2018). This 10-year average was then used to forecast to 2035.

Population Data: Total population data was collected from the United Nations (UN). This data was for the period 2007-2035. Adult population data was collected from the Credit Suisse data books for 2007-2019. CAGR of the total population for the period 2009-2018 was used to forecast the growth in the adult population from 2020 to 2035.

Population with income above $10,000 per annum: Income distribution data by decile was collected from the World Inequality Database for 2017. This distribution was applied to Gross National Income (GNI) data to determine total income per decile. Per capita income data for each decile was calculated by dividing the total income in each decile by 10% of the adult population. Then each decile with per capita income above $10,000 was counted. Furthermore, a normal distribution was applied to the first decile without a per capita income greater than $10,000 per annum. This provided a percentage of that decile that had an income above the $10,000 per annum threshold. This percentage was then added to the deciles above $10,000 per annum.

These percentages were applied to the 2017 adult population data to determine the number of adults earning above $10,000 per annum. The CAGR of GDP per capita was then applied to forecast the percentage change to 2035. This was again applied to the adult population data to determine the new vehicle consuming population size. Approximately 44 million people in Sub-Saharan African earned an income above $10,000 per annum in 2017. Based on the above model, this is projected to grow to 91 million by 2035.

New vehicle sales unit data: For some African countries, new vehicle sales data (in units) was collected from OICA. However, most African country data was unavailable from OICA. Therefore, import unit data was used as a proxy. Where new and pre-owned vehicle imports could not be identified through individual country HS import codes, vehicle import data was split into new and pre-owned portions using the average new verse pre-owned vehicle import split. This average was calculated by taking those countries where new vehicle sales data was available and where there is no evidence of vehicle production taking place and calculating new vehicle imports as a percentage of total vehicle imports. The average of these figures over the past 10 years was the calculated. By applying this percentage to total imported units, we were able to estimate new vehicle imports for all other African countries.

Pre-owned vehicle data: Besides South Africa, there were no Sub-Saharan African countries that reported pre-owned vehicle sales. Therefore, pre-owned vehicle import data was used as a proxy.

The demand for vehicles in Sub-Saharan Africa (new and pre-owned), excluding South Africa, was approximately 1 million units in 2018. This is expected to grow to 2 million in 2035. Of the 1 million units

sold in 2018, only 160,000 were new vehicles and 830,000 pre-owned. If South Africa's new vehicle demand was included the demand in Sub-Saharan Africa was 1.54 million in 2018. This is projected to grow to 2.78 million in 2035. African vehicle unit growth projections to 2035, were calculated using the CAGR of the population above $10,000 per annum for the period 2017-2035.

Vehicle sales value data: The data in the African Auto Pact model is incomplete due to data availability constraints. Where available, we have incorporated the data in the African Auto Pact Excel model, but the date needs to be treated with some circumspection.

Trade Data: Vehicle and component trade (unit and value) data were collected from the UN Comtrade database and the projections to 2035, were calculated using the CAGR of the population above $10,000 per annum for the period 2017-2035.

The value data for the split of new and pre-owned vehicle imports was not possible to complete and as such only unit numbers were calculated.

Component Production and trade data: Trade data for components was collected from UN Comtrade database. There was no available data for component production, therefore African country component exports were used as a proxy.

Vehicle production data: Production data was collected from OICA where available. Estimates. The data for Nigeria was collected from a Deloitte study.

Annexure 2: Demand Driven SAM Multiplier Model and its Application to the Establishment of Motor Vehicle Assembly and Production Units in Ghana and Nigeria

The impact of the establishment and operation of a new motor vehicle assembly and production units on the Ghana and Nigeria economy can be examined with a multiplier model using Social Accounting Matrices (SAMs) for the respective countries as the underlying data bases. These models are derived from a standard multiplier model based on an Input-Output Table (IOT). The standard IOT model is driven by an exogenous increase in final demand for an industry's goods and services. The critical assumption is that all industries in the economy that are directly and indirectly supplying intermediate inputs to satisfy this exogenous increase in final demand can do so. Supply (or output) is perfectly elastic which implies that prices are fixed. A generic IOT model can be presented in the following way (see Miller and Blair, 2009, 21):

Equation 1 $$\mathbf{x} = \mathbf{Zi} + \mathbf{f}$$

Equation 2 $$\mathbf{x} = \mathbf{Ax} + \mathbf{f}$$

Equation 3 $$\mathbf{x} = \left(\mathbf{I} - \mathbf{A}\right)^{-1}\mathbf{f} = \mathbf{Lf}$$

Equation 4 $$\Delta\mathbf{x} = \left(\mathbf{I} - \mathbf{A}\right)^{-1}\Delta\mathbf{f} = \mathbf{L}\Delta\mathbf{f}$$

In which

x = a column vector of industry outputs in an economy (**Δx** denotes a change in outputs)

Z = a matrix of intermediate purchases by or sales to the industries identified in an economy

f = a column vector of final demand of goods and services supplied by industries in an economy (**Δf** denotes a change in final demands), consisting of the sum of household's demand, government expenditure, investment demand and exports

i = a column vector of unit values, so that **Zi** is a column vector of intermediate sales summed over all purchasing industries

A = a matrix of intermediate demands per unit of industry output for an economy. This is derived by dividing **Z** with the transpose of **x**, i.e., the column totals.

L = the Leontief matrix of direct and indirect impacts on gross value of production (output) of each of the activities labelled in the row headings because of a one unit increase in final demand for goods and services produced by the activity in the column heading. The column totals of **L** are referred to as the "output multipliers".

Comparison of output multipliers offers an indication which industry is more connected to the domestic economy and therefore acts more as a catalyst for an economy-wide increase in output. For purposes of the economy-wide impact on gross output (**Δx** in Equation 4) of establishing and operating a motor vehicle industry in Ghana and Nigeria, the direct input costs or outlays to the capital expenditure and operational expenditure phases are captured by **Δf** in Equation 4.

Thus, the exogenous change in demand **Δf** is assumed to represent various options of manufacturing motor vehicles in Ghana and Nigeria expressed in terms of demand for commodities. These options are described in the main body of this report in more detail and range from a relatively low volume semi knockdown (SKD1) assembly in which all components are imported to a relatively high-volume complete knockdown (CKD Advanced) production process. In the case of the latter a relatively high degree of components in produced locally. There are two additional in-between options identified with less than relatively high volume and local inputs (CKD Basic and SKD2 respectively).

Results of such a multiplier model not only include impacts on gross sectoral output. Using further linear relationships, the model can present impact for upstream industry level value added, household income, imports, tax revenues and employment, amongst others. Impacts on value added (GDP at factor costs) are based on economy-wide industry level value added to gross output ratios. These ratios are assumed to hold at the margin and are multiplied with the output impacts (**Δx** of Equation 4). The same applies to imports and taxes.

The typical assumption about the employment impacts is the same, in that the elasticity of employment with respect to output is equal to 1. In other words, if output goes up by 1%, employment will also go up by 1%. This may be considered as a rather more heroic assumption than the linearity of the base model itself (Bulmer-Thomas 1982, 61). Firms may hold on to labour in downturns to avoid costly search and training and when there is an upturn, the demand for labour may not increase due to rising labour productivity. Econometric analysis is required to estimate such elasticities. Broad industry level estimates have been made for Ghana and Nigeria by Kapsos (2005, 43-44) which suggests that the employment-output elasticity with respect to GDP are lower than a unit elasticity[6].

[6] Where they are higher than 1, they have been set back to unity.

While household income could well lead to household expenditure, this loop has been ignored for the analysis in this report since the focus is on the industries that are related directly and indirectly to the capital expenditure and operational phase of establishment of the motor vehicle industry. In this way the analysis of the results is not distracted by impacts on agricultural and processed food products and other consumer goods through the household income – expenditure loop.

Input data are presented in current price 2019 US$ while the SAM for Ghana is in 2015 current prices and the Nigeria SAM in 2017 prices. This does not matter if results are presented in US$ terms as is the case in this report. Where it does matter is when examining the impacts on employment since they are based on their ratio to industry output in Local Currency Units' (LCU) prices. Employment estimates for Ghana and Nigeria are available from the ILO (ongoing) for broad, 1-digit ISICver4 industries. Further breakdown to the level of the Ghana and Nigeria SAMs is based on the wage earnings shares of more detailed industries in the broad industries. Employment-output ratios are modelled in terms of US$ output by using the 2019 exchange rate based on World Development Indicator (WDI) GDP in US$ and LCU prices.

Direct employment for the newly established motor vehicle assembly / production units are derived using ratios between direct employment and expected units produced for 2019 from South African (reference to "SA Profile" required here) for the motor vehicle industry adjusted with an average exchange rate for 2020. This serves as a proxy for the "CKD Advanced" option in Ghana and Nigeria. Direct employment for the other options (SKD1, SKD2 and CKD Basic) is derived by taking their ratios of the assembly costs to the CKD Advanced option from the input data described in the main body of this report.

The 2015 SAM for Ghana is available from Ghana Statistical Services (2017) and identifies 55 activities and commodities while the 2017 Nigeria SAM has 86 activities and commodities and is described in IFPRI (2019). Both break labour remuneration for each activity (industry) down into four highest level of education attainment groups (uneducated, primary, secondary, and tertiary) in rural and urban areas. Households are broken down by income quintile, urban and farm/non-farm rural. Several taxes are identified in each SAM, including indirect taxes on products and production, corporate tax as well as household income tax.

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