# Electric Vehicles and the Changing Automotive GVC

## A Window of Opportunity for African Countries?

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# ELECTRIC VEHICLES AND THE CHANGING AUTOMOTIVE GVC: A WINDOW OF OPPORTUNITY FOR AFRICAN COUNTRIES?

Tobias Wuttke

*Only two African countries have successfully integrated with the automotive GVC to date: South Africa and Morocco. Their experiences, compared to other even more successful developing and emerging economies with automotive industries, highlight both the opportunities as well as the limitations of automotive GVC participation as an economic development engine. Scale in vehicle production, facilitated by government industrial policy, is the key prerequisite for successful participation with localisation benefits. These fundamentals do not change with the shift to electric vehicles. Governments in Africa and elsewhere need to attract FDI in electric vehicle production and from there can support the development of a local component and materials value chain. Once these basics are covered, governments and local firms can aim for making use of the technological window of opportunity by investing in EV-related technology, mainly battery technology, to potentially capture more value from automotive GVC participation than has traditionally been possible in the ICE vehicle value chain.*

## 1. Automotive GVC participation and economic development

The automotive industry has traditionally been an important driver of economic development in various countries. It creates a large number of direct and indirect jobs, has significant linkages to other manufacturing industries, and has higher R&D spending shares than most other industries. While the industry is changing rapidly, it remains an interesting industry for developing countries to engage in to derive industrialisation and development benefits. The industry that for over a century has been evolving around the key technology of the internal combustion engine (ICE) is characterised by the dominance of lead firms – which are the carmakers and their most important suppliers – from the US, Europe and Japan. Their dominance has only rarely been challenged over the last 50 years, the major exception being South Korea's Hyundai. Consequently, developing and emerging economies, even as their share in global vehicle production has increased significantly, have participated in the automotive GVC under the terms and conditions set by these lead firms.

The **African Industrial Policy in the 21st Century (AIP21)** network brings together scholars to share research results and outline a new research agenda in view of developing new thinking for a green and resilient industrial policy in Africa for the 21st century. The AIP21 Network organized a series of workshops in 2022 on green industrialization in Africa at Copenhagen Business School and the University of Johannesburg in South Africa, with co-funding from DANIDA's Knowledge in Action grant. These policy briefs are some of the outputs from the workshops.

The usual pattern of participation in the automotive GVC is the following: The foreign lead firms decide to produce a vehicle model in a country because domestic or regional demand is sufficiently large to justify the investment. They produce a vehicle model that was designed in their headquarter location (follow design), sometimes slightly adapted to local conditions but essentially it is the same car across the globe, and they demand that their established component suppliers co-locate with them in the country to meet just-in-time supply requirements (follow sourcing). These GVC dynamics of follow design and follow sourcing mean that foreign lead firms dominate the assembly and the tier-1 component supply stage of local automotive production in developing countries.

Attracting this kind of investment is already an achievement, as many countries do not manage to fulfil the local market demand requirements to justify that automotive lead firms invest in local production beyond the low value-add assembly of imported knocked-down kits. Difficult to implement policies like bans or restrictions on used vehicle imports are a prerequisite for attracting automotive FDI. Having local vehicle and component production in the country, albeit fully in foreign hands, leads to local manufacturing value added, employment and linkages to other sectors. Beyond this, however, learning and technology benefits for locally owned firms tend to remain limited. Locally owned component firms rarely manage to move beyond the second tier of component supply. Local firms supply based on design and manufacturing specifications from the multinational lead firms and do not develop design and innovation capabilities. In those cases, where governments fail to incentivise higher local content levels through the use of smart industrial policy, manufactured sub-components are mainly imported and assembled locally, which prevents the emergence of lower-tier local suppliers altogether.

**Table 1: Comparison of auto industries in different countries (2019)**

| | South Africa | Thailand | Turkey |
|---|---|---|---|
| Total vehicle production | 632,000 | 2,168,000 | 1,369,000 |
| Average production volume top 5 assemblers | 109,342 | 349,535 | 281,190 |
| Number of component suppliers (approx.) | 200 | 1,600 | 750 |
| Employment assembly | 30,000 | 100,000 | 50,000 |
| Employment component production | 80,000 | 425,000 | 300,000 |

Source: Author's own data collection for South Africa. Data for Thailand from Natsuda and Thoburn (2021). Data for Turkey from Automotive Manufacturers Association of Turkey (OSD) and Automotive Suppliers Association of Turkey (Taysad). Vehicle production includes passenger and light commercial vehicles.

Those countries that have seen the increase of local production volumes of both vehicles and components to above average levels, often based on the successful penetration of export markets in addition to production for their home markets, have experienced a stronger local multiplier effect from automotive assembly. This is illustrated by the comparison of South Africa, Thailand and Turkey in Table 1. All these countries have increased their participation in the automotive GVC over the past three decades, but Thailand and Turkey have experienced a larger local development multiplier. Higher production volumes and the achievement of economies of scale have justified more local production of components and sub-components, with positive effects on the number of automotive component firms and employment levels. Most vehicle models by global assemblers are produced in various locations globally and only if the local production volumes in a particular country exceed those in other production locations will the localisation of more component production and of R&D activities for this model become more likely. Thailand and Turkey have succeeded in this, while South Africa has not (Monaco and Wuttke, 2023).

In some cases where countries have managed to become the largest global production location for a particular vehicle model – like Thailand in the case of several pick-up truck models – the localisation of R&D centers has provided a further boost to local content and to the capabilities of local component supplier firms (Natsuda and Thoburn, 2021). In such cases, locally owned component suppliers sometimes get involved in the design of components for the locally produced vehicle models which offers them the opportunity to improve their technological capabilities. In addition, based on higher local production volumes, they are more likely to gather the resources to expand globally and to supply the other international assembly plants for that vehicle model. However, locally owned component suppliers rarely manage to challenge the incumbent mega suppliers from the core countries. Among the 100 largest automotive component suppliers globally, there are only two firms from developing/emerging economies other than China: Motherson (India) at rank 44 and Nemak (Mexico) at rank 65 (Berylls Strategy Advisors 2020).

## 2. Africa in the automotive GVC

There are only two countries in Africa that have successfully integrated with the automotive GVC: Morocco and South Africa. All the other African countries have either no automotive production at all or some local assembly based on imported knocked-down vehicle kits. According to the International Organisation of Motor Vehicle Manufacturers, Morocco produced a combined 465,000 passenger and light commercial vehicles in 2022, while South Africa's production was slightly higher at 556,000. Both Morocco and South Africa are exporting a large share of their total vehicle production: 59.7% in South Africa in 2021 (AIEC, 2022) and roughly 80% in Morocco (Vidican Auktor, 2022). The majority of both countries' exports go to Europe.

As illustrated above with the comparison of South Africa to Thailand and Turkey, these numbers are significant but not very high. There is no study on the local footprint of the Moroccan automotive industry in terms of the number and capabilities of local component suppliers to this date. Based on available studies for South Africa (see e.g. Wuttke, 2023; and Monaco and Wuttke, 2023), which have documented local content levels of roughly 40% and the presence of around 200 component suppliers, including both multinational and locally owned firms, similar figures can be expected for Morocco. Local content levels could be slightly higher in Morocco given that there are only two vehicle assemblers in the country, while in South Africa there are seven, and the individual production volumes of the assemblers are higher in Morocco than in South Africa. The big models produced in Morocco are the Peugeot 208 and Renault's Dacia Sandero (Tanchum, 2022), while the big models in South Africa are five in total: the VW Polo, the Ford Ranger, the Toyota Hilux, the Mercedes C-Class and the BMW X3. In addition, Morocco has seen the localisation of R&D activities by Stellantis and Renault (Vidican Auktor, 2022), while there is no automotive R&D at all in South Africa.

Both countries have taken different approaches to attracting automotive FDI. While South Africa has provided generous investment and component import incentives, Morocco has focused more on ease of doing business in FDI zones and investing a lot in quality infrastructure, such as the Tangier port. The attraction of Renault as an anchor investor was pursued with much dedication by the government, and the more recent investment by Stellantis in 2019 has helped to also nudge Renault into renewed investments (Vidican Auktor, 2022). In November 2022, Stellantis announced that it will invest into the doubling of its production capacity in Morocco up to 400,000 vehicles per year. Of course, Morocco is in a more favourable geographical position to attract lead firm FDI than South Africa because of its proximity to the large European market.

## 3. The change to EVs: A window of opportunity?

The automobile industry is currently going through a fundamental technological transition from vehicles based on internal combustion engines (ICE) to battery electric vehicles (EVs). This shift is already influencing the dynamics of competitiveness in the industry. In China, the government has successfully implemented industrial policies to leapfrog in battery technology and in electric buses. In electric vehicles, it has caught up to the global frontier and it now remains to be seen whether domestic Chinese assemblers will be able to challenge the global automotive lead firms based on Chinese dominance in battery technology (Altenburg et al., 2022). This is a very significant development: The core technology in the automobile will no longer be the internal combustion engine (ICE), but the vehicle battery and the associated power electronics. After a long period of dominance by the same incumbent automotive lead firms, based on constantly accumulated capabilities and intellectual property around the ICE, there now is a technological window of opportunity for latecomer firms, including from developing countries, to challenge these incumbents.

Whether the challengers or the incumbents will prevail in the battle for carmaker dominance is far from settled. The incumbents' dominance to this day has not only been built on mastering the ICE technology, but also on the capability to integrate different technologies in a highly complex product that needs to comply with ever-increasing safety and environmental regulations and meet customer expectations. Several recent studies have pointed out that incumbent carmakers might be able to use these capabilities to defend their lead firm status even as the industry switches to the dominance of battery electric vehicles and later on to autonomous driving (Alochet et al., 2023; Murmann and Schuler, 2023). Nevertheless, there are more and more attempts by firms from developing and emerging economies to become automotive lead firms. Noteworthy examples outside of China are Vietnam's Vinfast and Turkey's Togg. Both firms aim to build electric vehicles, including for Western markets, based on jumping to the head of the supply chain and outsourcing design and major components, while partnering with battery technology leaders for the development and manufacturing of the battery pack.

Successful catch-up with automotive lead firms will likely require the development of unique capabilities in the area of the battery. The battery pack represents roughly 30 to 40 per cent of the total value of an electric vehicle. The technology around batteries is currently dominated by Japan, South Korea, and China. It will be difficult for other developing countries to catch-up with these first movers (Alochet et al., 2023). On the other hand, battery technology is a "short-cycle technology" that is in constant flux (Lee, 2019). Lithium-based batteries are currently dominating, but other battery technologies, such as solid-state batteries and battery chemistries based on sodium and potassium are emerging. It is far from settled which types of batteries and battery chemistries will prove to dominate in EVs going forward which provides an opening for newcomers to invest.

Where does all this leave African countries? There is often talk that the availability of raw materials needed for battery production in African countries could be used by these countries to move into battery manufacturing and subsequently also into EV production. This, however, is an unrealistic

expectation. As long as there is no significant demand for electric vehicles in African markets or the exporting of electric vehicles to major markets from African countries becomes cost-competitive, investment in local vehicle production will not occur. Battery pack plants have similar economies of scale requirements as engine and transmission plants for ICE vehicles at around 200,000 units of production per year (Klier and Rubenstein, 2021). In the case of South Africa, the current vehicle production volumes have only convinced one of the seven assemblers operating in the country to localise a major engine production plant. Production volumes and economies of scale will remain key to achieving localisation, even with the shift to electric vehicles. High local vehicle production volumes will incentivise the localisation of battery pack assembly, and from there potentially battery cells and related materials production. This is what will be required for African countries and firms if they want to be involved with the electric vehicle industry. Once that is achieved, local firms might want to start experimenting with battery technologies, and states can help with the setting up of the relevant technology ecosystem, including research institutes, the availability of the relevant skills and sufficient capital, as well as technology partnerships with foreign companies.

The country in Africa that currently seems closest to making this step is Morocco. While there is currently no production of electric vehicles in South Africa, 50,000 vehicles produced in Morocco annually are EVs. The Ministry of Trade and Industry is taking active measures to attract FDI by carmakers into EV production in the country and has announced that the start of construction of a battery gigafactory is imminent. The country has lowered import duties on lithium-ion cells to promote the local assembly of battery packs (Tanchum, 2022). The current type of EVs made in Morocco are, however, quadricycle models like the Citroen Ami and Opel Rocks-e, and not full-scale EVs. Renault has a very successful EV model in its portfolio in the Dacia Spring. This model is, however, produced in China and not in Morocco (ibid.). It remains to be seen whether the country will succeed in attracting significant local EV and battery production.

## RECOMMENDATIONS

***Governments*** need to provide the right conditions for the attraction of investments by vehicle assemblers. This includes promotion of local demand, but also enabling smooth vehicle and component exports, importantly through the provision of adequate infrastructure.

***Governments*** should design policy incentives to maximise production volumes per vehicle model rather than attracting a large number of vehicle makers with low average production volumes.

***Important basics of automotive FDI*** remain the same, even with the shift to electric vehicles. Economies of scale in vehicle and component production continue to determine the possible extent of localisation of automotive manufacturing of sub-components and materials. ***Governments*** should keep this in mind when designing policy for the sector.

The shift to EVs is under way and will not be reversed. ***Governments*** should strategically focus on attracting FDI in EV production, and local companies should partner with foreign firms in EV-related technologies, especially in battery technology.

Where significant local capabilities exist, ***governments and local capital*** should aim for the indigenisation of EV-related technology. This requires that governments invest in research institutes and in the training of engineers and skilled workers, incentivise private automotive R&D activities, and support local automotive companies in their capability building efforts. On the side of private capital, it requires technological efforts, i.e. investments in learning and in R&D where commercial opportunities exist or can be reasonably expected for the future.

In the specific case of Africa, ***countries*** should partner and coordinate their policies in order to maximise economies of scale through specialisation rather than building up redundant production structures in each individual country.

## ABOUT THE AUTHOR

**Tobias Wuttke** is a postdoctoral researcher at Bard College Berlin. He is currently working on a research project funded by the German Research Fund, assessing the geographical restructuring of global production networks in the electronics industry. He holds a PhD in International Studies from Roskilde University, Denmark. His doctoral research focused on industrialisation in times of global value chains, with a case study of South Africa's participation in the automotive GVC. He previously worked for the German development organisation GIZ in Botswana and Nigeria.

## REFERENCES

Alochet, M., MacDuffie, J. P., and Midler, C. (2023). Mirroring in production? Early evidence from the scale-up of Battery Electric Vehicles (BEVs), Industrial and Corporate Change, 32 (1), 61–111.

Altenburg, T., Corrocher, N., and Malerba, F. (2022). China's leapfrogging in electromobility. A story of green transformation driving catch-up and competitive advantage, Technological Forecasting and Social Change, Volume 183, 121914.

AIEC. (2022). Automotive Export Manual 2022. Automotive Industry Export Council South Africa, Johannesburg.

Berylls Strategy Advisors. (2020). The world's 100 biggest automotive suppliers in 2019 – Berylls's study on the global automotive supplier industry.

Klier, T., & Rubenstein, J. M. (2021). From ICE to EV: conceptualizing changes to powertrain sourcing. Gerpisa Colloquium 2021.

Lee, K. (2019). The Art of Economic Catch-Up: Barriers, Detours and Leapfrogging in Innovation Systems. Cambridge University Press.

Monaco, L, and Wuttke, T. (2023). The South African Auto Industry in a World of GVCs: Lead Firm Sourcing Strategies and Local Supplier Development. International Journal of Automotive Technology and Management, 23 (2), 1–17.

Murmann, J. P., Schuler, B. A. (2023). Exploring the structure of internal combustion engine and battery electric vehicles: implications for the architecture of the automotive industry, Industrial and Corporate Change, 32 (1), 129–54.

Natsuda, K., and Thoburn, J. (2021). Automotive Industrialisation: Industrial Policy and Development in Southeast Asia. Routledge.

Tanchum, M. (2022). Morocco's green mobility revolution: The geo-economic factors driving its rise as an electric vehicle manufacturing hub. Middle East Institute.

Vidican Auktor, G. (2022). The Opportunities and Challenges of Industry 4.0 for Industrial Development: A Case Study of Morocco's Automotive and Garment Sectors. Discussion Paper No. 2/2022, German Development Institute (DIE).

Wuttke, T. (2023). Global Value Chains and Local Inter-Industry Linkages: South Africa's Participation in the Automotive GVC. The Journal of Development Studies, 59 (2), 153–69.