Restart of Automobile industry in East African countries: Conditions to invite foreign OEM, case studies in Kenya, Tanzania, and Uganda

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1. Introduction

The research question this paper addresses is how the automobile industry behaves and grows in developing countries. This is considered based on research in Kenya, Tanzania, and Uganda in the East African community (EAC). Although automobile industries in these countries had started in the 1960s, automobile production declined in the 1990s due to liberalization. Recently, the economies and populations in these countries have grown and they are looking to restart their automobile industries. In this paper, the “automobile” is defined as a passenger or a commercial vehicle. A motorcycle is not considered.

In each country's development, the status of “having enough technology to produce the automobile” is a significant Merkmal. In many developing countries, governments want to evolve and foster their automobile industry, in particular, in Asia, South and Central America, and Africa. There are four reasons why many developing countries might want to grow their automobile industries. First, such growth represents proof of having advanced technology as well as a wide range of technologies. Second, having an automobile industry in the country engenders strong feelings of pride in the leaders of the country. Third, there is a strong linkage between the automobile industry and GDP and it may significantly contribute to an increase in GDP. The fourth and final
reason is that by promoting an automobile industry, huge job creation is expected.

In 2015, in the case of Japan, according to Japan Automobile Manufacturers Association (JAMA), there were 16 automobile assemblers\(^1\). The total number of companies in the automobile industry, which included first-, second-, and third- (or more) tier suppliers was roughly 25,000. Regarding job creation, there were 5.3 million employees in the automobile and related industries and this was 8.3% of all 63.8 million Japanese employees. Based on such statistics, it would be meaningful to promote the automobile industry in developing countries.

To accomplish the analysis, the author interviewed face to face or by e-mail from October 2016 to February 2017. According to interviews with automobile assemblers, market size and other related conditions are considered very important in the decision to invest in a new car factory. However, they also avoided definitively stating a specific number of indicators. These numbers influencing the decision to invest are very different in each country based on characteristics such as a population, average technical level of human resources, education, natural resources, safety, infrastructure, and degree of industrialization of other industries, among others. Although this is understood, to capture the potential development in a structural flow, the research begins with an analysis of the annual production and size of the domestic automobile market needed to start SKD (semi knock down) production, shift to CKD (complete knock down) production, then to full production, and finally to in-country research and development (R&D). The methods used are the “Takt time method” and the case studies.

2. History of Automobile Industries in Kenya, Tanzania, and Uganda

2.1 Kenya

As of 2017, the important automobile OEM manufacturers in Kenya included Kenya Vehicle Manufactures Ltd (KVM), Isuzu East Africa (IEA), Associated Vehicle Assemblers Ltd (AVA), and Volkswagen (VW).

The automobile industry in Kenya began in the 1960s. During that time, it is said that Volkswagen started to assemble the Beetle in Kenya following SKD style production;\(^ii\) however, it then closed those plants and stopped production in 1977.

After the mid-1970s, several significant automobile manufacturers started SKD production in Kenya. In 1974, Leyland Kenya Ltd was established as a joint venture between the Kenya government and Leyland UK. The plant was originally designed to produce light and heavy commercial vehicles. It started production in August 1976 and assembled 857 units.\(^iii\) In the 1970s, it assembled European automobiles such as Morris, Land Rover, VW, and Leyland. After the mid-1980s, it started to assemble Japanese
automobiles. In 1989, it changed its name to Kenya Vehicle Manufactures Ltd (KVM) after Leyland UK sold its share in the company. Cumulative production was approximately 65,000 automobiles. In 1990, it assembled 4,652 units at its peak. After the 2000s, the annual production came to hundreds of orders. The car model range today includes the Nissan Series, Mazda, Land Rover, Mercedes, and Iveco.

In 1975, General Motors Kenya (GMK) was established as a joint venture between General Motors and the Kenyan government for the assembly of GM vehicles for the Kenyan as well as other African markets.iv It started production after 1977. In 2003, it changed its company name to General Motors East Africa (GMEA). GMEA assembled and sold Isuzu buses, pick-ups, and trucks. It also sold GM Chevrolet cars, which were imported. After April 2017, GMEA was again renamed, becoming Isuzu East Africa (IEA), after Isuzu acquired the shares of GM and others.

In 1975, the Associated Vehicle Assemblers Ltd (AVA) was established, and in 1977, it started assembling Toyota cars in Mombasa, Kenya. In 1985, after the 1990s, production decreased, and recently, annual production was only about one third or one half of its peak level.vi

In the 1980s, the original Kenyan car, the Nyayo, was created, and as of 1986, it was the first automobile independently developed in Africa. "Nyayo" means "footsteps" in Swahili, and was also the nickname of Kenya’s President at the time, Daniel arap Moi. At the start of this project, Moi ordered the workers at the University of Nairobi to go ahead, “no matter how ugly or slow it may be.” The engineers went to work and the car finally rolled off the production lines a few years later. The quality of the Nyayo was labeled as “not bad.” It was said that “the cars were not ugly”; they were also “not very slow.” In fact, “during the test runs, the car could attain a speed of 120 km per hour.” The automobile parts were produced at military bases or at the Kenya Railways Central Workshops. In 1990, President Moi launched three new Nyayo cars, subsequently, the Nyayo Motor Corporation was established. Although this project was ambitious in producing an original African automobile, it was not successful. Due to a lack of funds, the car never entered into production. The Nyayo Motor Corporation was later renamed the Numerical Machining Complex Limited with the purpose of manufacturing metal parts for various local industries.

According to interviews to government people, one important reason for the failure of the Nyayo project was said to be the liberalization of the automobile industry in the 1990s. It was said that after liberalization, many used vehicles were imported and
the new car market shrank with decreased production of automobiles in Kenya. Although it is now said that more than half of the new vehicles sold in Kenya are assembled locally ix, 80–90% of annual sales are thought to be imported used vehicles.

Recently, the Kenyan government moved to change the situation with the aim to increase domestic automobile production. In 2016, it invited Volkswagen into the market. As a result, it started to assemble the Polo Vivo in Kenya in cooperation with DT Dobiexi, which assembled in KVM. The government also decided to establish new protection policies such as tariff control on imported used vehicles.

2.2 Tanzania

As of 2017, among the important automobile OEM manufacturers in Tanzania were Superdoll and the Tanzania Automotive Technology Centre (TATC). Although the commercial production of trailers has only been handled by Superdoll, its production volume has been quite small. Passenger cars are not assembled in Tanzania on a commercial basis.

According to study research and interviews, the automobile production in Tanzania started around 1980. The first automobile produced in Tanzania was the “Nyumbu MKI,” created by its army.xi In the early 1980s, Scania which is the Swedish commercial vehicle manufacturer, and the government of Tanzania agreed to establish a joint venture company called the Tanzania Automobile Manufacturing Company (TAMC). The company built an assembly plant in Kibaha, approximately 40 km outside of Dar es Salaam.xii Scania had already established a branch in the country in 1973, and used it as means to import its trucks and provide maintenance and repair service in the country. To minimize its operation costs and reduce expenditures in foreign currency due to import of completed assembly units, it decided to establish an assembly plant in Tanzania. In the mid-1990s, Scania ceased operations and handed over the assembly plant to the Tanzanian government due to the reduction in production volume.

The TATC was established in 1985xiii Although it made several trucks and special purpose vehicles, it did not do so on a commercial basis. In 1992, Superdoll was established and started to assemble trailers. xiv

2.3 Uganda

As of 2017, there is no significant volume of automobile assembly in Uganda; however, Kirra Motors Corporation (KMC) is ready to start assembling vehicles in the country.

According to a literature review, commercial vehicle assembly of SKD style
production in Uganda began in 1950 with seven local assemblers. Griffiths (1969) wrote that the assembly of Lorries and busses by SKD style began in Uganda in 1950. This implies that automobile assembly started during the country’s colonization by the UK, and continued after its independence in 1962.

After the 1970s until middle of 2000s, the political and economic situation of Uganda became unstable due to wars or insurgencies. Based on the current research, there appears to have been no assembly of automobiles of any significant volume in Uganda. According to Byansi et al., who is a designer from Kiira Motors, there are some emerging manufacturers in Uganda such as the Musa Body Group, Body modification workshops, Rubaga bus body builders, and Jussy Coaches and Pro-Ride.

Recently, KMC has been in the limelight in Uganda for its achievement in developing Uganda’s first successful solar-powered bus, the “Kayoola,” which is a 35-seater, with a power capacity of 150 KW peak and solar power of 1320W. This was done as part of a project called “The Vision 2040 Era,” which was started in 2009 by the Uganda president Yoweri Museveni. KMC was established in 2014 in the country as the brainchild of members of the Makerere University. This also coincided with a presidential initiative for promoting automotive manufacturing in the country. KMC in Uganda is co-owned by the Uganda Development Corporation (UDC), which is the public investment arm of the Ugandan government, and Makerere University in Uganda. Although it has yet to start mass production, it does have a plan to build a factory for mass production of not only its solar-powered bus but also of passenger cars with gasoline or diesel engines. After its mass production, the estimated cost of the Kayoola is said to be 58,000 USD. This production is also expected to create more than 7,000 jobs either directly or indirectly by the year 2018.

3. Present Situation in Kenya, Tanzania, and Uganda
3.1 Kenya

Kenya is a leading country in the EAC. In 2015, as shown in Fig. 1, the population was 46.1 million, the land area was 569,140 sq. km, the nominal GDP was 63.4 billion USD, and GNI per capita was 1,340 USD, which classified it as a lower-middle-income economy, according to the World Bank. In 2010, the population was 40.3 million, the nominal GDP was 40.0 billion USD, and GNI per capita was 1,000 USD, which classified it as a low-income economy. In 1990, the population was 23.4 million, the nominal GDP was 8.6 billion USD, and GNI per capita was 380 USD. Thus, Kenya’s economy and population have expanded steadily and smoothly in both the short and long term.

According to OICA, the automobiles in use in Kenya were 1,250 thousand units
in 2014, which was ninth among African nations, and its motorization rate was 28 (number of vehicles/1,000 inhabitants), as shown in Table 1 and Fig. 2. In 2014, the average motorization rate of Africa was 44, the entire world was 180, the USA was 808, Europe was 464, and Japan was 607. Thus, there is a big potential market in Kenya. Total registrations or sales of new automobiles were 14,100 in 2015 and 10,600 in 2016 (Table 2). According to interviews, the total production of the main assemblers in the country (KVM, IEA, AVA) was around 9,800 in 2015. This means that around 70% of sales of new automobiles was from domestic assembly.

One remarkable characteristic of the automobile market in Kenya is that many automobiles in use are second hand cars. The increase of automobiles in use from 2013 to 2014 was 60,000 units as calculated from Table 1. New registrations in 2013 were 13,000 units. Of new registrations of automobiles in 2013, 78% represented second hand cars and 22% new cars. Most cars observed in Nairobi appear to be Japanese cars, specifically Toyotas.

3.2 Tanzania

Among the EAC, Tanzania has a large land area. In 2015, as shown if Fig. 1, the population was 53.5 million, its land area was 885,800 sq. km, its nominal GDP was 45.6 billion USD, and GNI per capita was 920 USD, which classified it as a low-income
economy according to the World Bank. In 2010, the population was 45.6 million, the nominal GDP was 31.4 billion USD, and GNI per capita was 700 USD. In 1990, the population was 25.5 million, the nominal GDP was 4.3 billion USD, and GNI per capita was 200 USD. Thus, Tanzania’s economy and population have expanded steadily and smoothly in both the short and long term.

The automobiles in use in Tanzania were 370,000 units in 2014, which was 18th among African nations, and its motorization rate was only 7, as shown in Table 1 and Fig 2. This means there is a great potential for market expansion in Tanzania as well. Total registrations or sales of new automobiles were 5,200 in 2015 and 4,500 in 2016, as shown in Table 2.

According to interviews, most automobiles were imported and many were second hand cars. The increase in automobiles in use from 2013 to 2014 was 10,000 units as calculated from Table 1. New registrations in 2013 were 6,700 units. This means that 67% of the increase in cars represented new cars. However, this does not correspond with the interviews or observations in Tanzania. The increase of automobiles in use might be much larger than OICA’s estimation. Here, also, most cars seen in Dar es Salaam and Arusha were Japanese, specifically Toyotas.

Table 1. Automobiles in use in Africa (2005–2014)

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Author, using data from OICA

Note: Includes estimated figures
Table 2. Registration or Sales of New Vehicles in Africa (2005–2016)

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<tr>
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<td>1,233,974</td>
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Author, using data is as same as table 1

3.3 Uganda

In 2015, as shown in Fig. 1, the population in Uganda was 39.0 million, its land area was 200,520 sq. km, its nominal GDP was 27.5 billion USD, and GNI per capita was 700 USD, which classified it as a low-income economy, according to the World Bank. In 2010, the population was 33.1 million, the nominal GDP was 20.2 billion USD, and GNI per capita was 550 USD. In 1990, the population was 17.4 million, the nominal GDP was 4.3 billion USD, and GNI per capita was 320 USD. Thus, Uganda’s economy and population gradually expanded in both the short term and long term.

The automobiles in use in Uganda were 460,000 units in 2014, which was 16th among African nations, and its motorization rate was 12, as shown in Table 1 and Fig. 2. This means there is a strong potential market in Uganda as well. Total registrations or sales of new automobiles were 3,100 in 2015 and 4,000 in 2016, as shown in Table 2.

According to interviews, most of the automobiles in Uganda were imported and many of them were second hand cars. The increase in automobiles in use from 2013 to 2014 was 30,000 units as calculated from Table 1. New registrations in 2013 were 5000 units. This means that 83% of the increase in cars represented second hand cars and 17% new cars. Here, also, most cars seen in Kampala, Port Bell, and Jinja were Japanese cars, especially Toyotas.
4. Case Studies

4.1 Significant factors for automobile production: Multiple regression analysis

The interviews with the employees of automobile OEM manufacturers revealed that the most important factors in the decision to invest in a new factory were current buying power as well as the future potential of the automobile market. Although there seems little doubt of this, the study confirms this statistically through multiple regression analysis. In this analysis, as an indicator of market buying power, the GDP per capita is used, and as an indicator of market potential, the population is used. Population size is very important not only as representative of the potential market size for selling automobiles, but also for the potential labor pool to support the start of production and growing supply chains. The explained variable is the volume of automobile production. The formula for the regression is as follows:

\[ carpd = b_0 + b_1 \text{gdpcap} + b_2 \text{pop}. \]
where \( carpd \) is the volume of automobile production in each country in 2015; \( gdpcap \) is GDP per capita in each country in 2014; \( pop \) is the population in each country in 2014. Thus, automobile production is expected to be influenced by the GDP per capita and the population of the previous year.

The software used in this analysis is STATA 11. The data of GPD per capita and population of each country are extracted from the database of World Development Indicators of the World Bank. The data on automobile production in each country are extracted from the OICA. This analysis includes automobile production of 49 countries. Although automobile production was observed in Kenya, there is no Kenyan production data in the OICA data. In Kenya, automobile production is done via SKD or primary CKD style. Thus, the SKD or primary CKD production data might not be included.

As is shown in Table 3, \( t \) values of \( gdpcap \) and \( pop \) are 2.67 and 7.85, respectively. GDP per capita and population effects on automobile production are statistically significant at the 1% level. The signs of both are positive. Thus, GDP per capita and population are both positively correlated with automobile production, generally speaking, in the automobile industry.

### Table 3. Result of Multiple Regression Analysis

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>Number of obs = 49</th>
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</thead>
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<td>Model</td>
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<td>2</td>
<td>2.3006E+14</td>
<td>F(2, 46) = 31.55</td>
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<tr>
<td>Residual</td>
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<td>46</td>
<td>7.2907E+12</td>
<td>Prob &gt; F = 0.0000</td>
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<tr>
<td>Total</td>
<td>7.9549E+14</td>
<td>48</td>
<td>1.6573E+13</td>
<td>R-squared = 0.5784</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>Adj R-squared = 0.5601</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Root MSE = 2.7E+06</td>
</tr>
</tbody>
</table>

| Carpd          | Coef.    | Std. Err. | t       | P>|t| | 95% Conf. Interval |
|----------------|----------|-----------|---------|------|-------------------|
| Gdpcap         | 56.15932 | 21.04631  | 2.67    | 0.010| 13.7953 to 98.52335 |
| Pop            | 0.0118943| 0.0015143 | 7.85    | 0.000| 0.0088461 to 0.0149425 |
| Cons           | -645116.9| 623295.9  | -1.04   | 0.306| -1899747 to 609512.8 |

### 4.2 GDP per capita and automobile production

It is generally said that GDP (or GNI) per capita of 1,000 USD is a Merkmal to initiate a boom in the motorization of motorcycles, and GDP per capita of 3,000 USD is a Merkmal to initiate a boom in the motorization of automobiles. Economies in the world are divided among income groups, according to the 2015 GNI per capita by the World Bank,xxii as low income, 1,025 USD or less; lower middle income, 1,026–4,035 USD:
upper middle income, 4,036–12,475 USD; and high income, 12,476 USD or more. According to this classification, GDP per capita of 1,000 USD is basically the borderline between a low-income economy and a lower-middle economy. GDP 3,000 USD is basically near borderline between lower-middle economy and upper-middle economy.

Fig. 3 is a scatter plot of GDP per capita in 2014 and automobile production in 2015. Selected countries are those with GDP per capita below 10,000 USD. India and China are excluded from this to better understand the trends in other countries. As those countries have production volumes quite large, the other countries tend to coalesce in the figure when these two countries are included. Countries in the figure include Bangladesh, Pakistan, Vietnam, Philippines, Ukraine, Morocco, Egypt, Arab Republic, Indonesia, Tunisia, Iran, Algeria, Thailand, Serbia, Ecuador, South Africa, Azerbaijan, Colombia, and Belarus; with this list representing countries in ascending order from small to large in GDP per capita.

Fig. 3. GDP Per Capita vs. Production Volume

As shown in Fig. 3, there are several countries with automobile production with GDP per capita exceeding 1,000 USD such as Bangladesh, Pakistan, Vietnam, and the Philippines. The populations in these countries all exceed 90 million: Bangladesh (159 million), Pakistan (185 million), Vietnam (91 million), and the Philippines (99 million). It seems that automobile production can start even with GDP per capita around 1,000 USD when the market potential is significantly large enough. Once GDP per capita of
3,000 has been exceeded, generally speaking, there are many countries with automobile production.

4.3 Minimum market size required for OEM manufacturing: “Takt time method”

For automobile OEM manufacturers, how many units are required to start production? To answer this, two methods are used: the first is the “Takt time method,” and the other is the case study approach presented in the next section.

The Takt time is a very important indicator used by automobile manufacturers to measure factory efficiency. In visiting automobile production factories, a sign showing the Takt time above the production lines can normally be seen. A Takt time represents the average interval of time between the start of production of one automobile and the start of the next automobile. Ninety seconds of Takt time in the factory indicates that every 90 seconds a new automobile is produced in that factory. According to interviews with factory managers in various countries, 60 to 90 seconds of Takt time in a final assembly line of automobiles is the normal target. As the Takt time represents the interval times of production, we can calculate back from the Takt time the production volume for a certain period (daily, monthly, or annually). This calculation is called here the “Takt time method.”

Now, assume there is an automobile factory that has an operational time of an eight-hour a day (1 shift), 25 days a month, including Monday to Saturday, which is normally seen in developing countries. In this experiment, five cases are set for the calculation. In the cases, Takt times are set at 60 seconds, 90 seconds, 120 seconds, 180 seconds, and 300 seconds, respectively. Sixty to 90 seconds of Takt time are thought to be the target for automobile OEM manufacturers. Thus, this is the “ideal” case. In certain instances, 120 to 180 seconds of Takt time might be acceptable for automobile OEM manufacturers. This was observed as Takt times in factory visits, and this is called here the “acceptable” case. Although 300 seconds of Takt time may not be acceptable for automobile OEM manufacturers, this and much longer Takt times were observed. Even though those cases might be irregular for automobile OEM manufacturers, the 300-second case of Takt time is called the “patient” case here.

Based on the calculated annual production in this experiment, total automobile market size in the factory’s imagined country is calculated. In this calculation, imagined market share by the imagined factory is divided into four categories (10%, 25%, 50%, and 75%). Although a 75% market share might be thought unrealistic, if the imagined company is the first and only investor in the imagined country this could be possible. The cases are labeled as follows: 10 to 25% of market share as the “normal” case, 25 to
50% as the “ideal” case, and 50 to 75% as the “optimistic” case.

The results of this experiment are shown in Tables 4 and 5. Table 4 shows the detail results of each calculation. In Table 5, the results for each case are summarized. Some numbers are modified for better understanding (roughly rounded up or down).

Table 4. Detail Results of Takt Time Method (Production and Desired Annual Market Size)

<table>
<thead>
<tr>
<th>Takt time (sec)</th>
<th>Daily production (units)</th>
<th>Monthly production (units)</th>
<th>Annual production (units)</th>
<th>Market size (share 10%)</th>
<th>Market size (share 25%)</th>
<th>Market size (share 50%)</th>
<th>Market size (share 75%)</th>
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</thead>
<tbody>
<tr>
<td>60</td>
<td>480</td>
<td>12K</td>
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<td>288K</td>
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<td>90</td>
<td>320</td>
<td>8K</td>
<td>100K</td>
<td>960K</td>
<td>384K</td>
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<td>192K</td>
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<td>300</td>
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<td>115.2K</td>
<td>57.6K</td>
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Author

Table 5. Rough Image of Production and Desired Market in Each Case

<table>
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<tr>
<th>Takt time range (sec)</th>
<th>Monthly production (units)</th>
<th>Annual production (units)</th>
<th>Market (Normal share, 10-25%)</th>
<th>Market (Ideal share, 25-50%)</th>
<th>Market (Optimistic Share, 50-75%)</th>
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<tr>
<td>Ideal</td>
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<td>8K~12K</td>
<td>100K~150K</td>
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<td>Acceptable</td>
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<td>50K~70K</td>
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<tr>
<td>Patient</td>
<td>300</td>
<td>2.4K</td>
<td>30K</td>
<td>120K~300K</td>
<td>40K~60K</td>
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</tbody>
</table>

Author

As shown in Table 5, in the case of the “ideal” Takt time, which ranges from 60 to 90 seconds, the annual production ranges from 100K to 150K (K=thousand) units, the desired market size of the “normal” share of 10 to 25% is calculated to range from 380K to 1,500K, the desired market size of the “optimistic” share of 50 to 75% is calculated to range from 130K to 300K. In the case of the “acceptable” Takt time, which ranges from 120 to 180 seconds, the annual production ranges from 50K to 70K units, desired market size of the “normal” share of 10 to 25% is calculated to range from 200K to 700K units,
desired market size of the “optimistic” share of 50 to 75% is calculated to range from 60K to 150K units. In the case of the “patient” Takt time, which is 300 seconds, the annual production is 30K units, the desired market size of the “normal” share of 10 to 25% is calculated to range from 120K to 300K units, desired market of “optimistic” share of 50 to 75% is calculated to range from 40K to 60K units.

The range of the annual production of this imagined company and the desired domestic market size of the country are calculated as follows. The minimum size of production and minimum size of the desired domestic market are 30K units and 40K units, respectively, in the case of the “patient” Takt time and an “optimistic” market share. This might be the borderline for automobile OEM manufacturers to decide to invest in the developing country under the assumptions in this experiment. The maximum sizes in the experiment are 150K units in annual production and 1,500K units in domestic market size, in the case of the “ideal” Takt time and “normal” market share. If these numbers are obtained in a developing country, decision makers at many automobile OEM manufacturers should already be considering investment in this country. Generally thinking, the borderline for new investment in a developing country might be 50K units of annual production at a factory and 100K units of domestic automobile market size with an “acceptable” Takt time of 180 seconds and an “ideal” share of the market.

4.4 Minimum market size of new car sales: Case of Company A

In order to consider how large the minimum domestic market needs to be and how large the minimum annual production needs to be, an actual production case at company A in 2008 was reviewed. Company A is a Japanese automobile OEM manufacturer. Fig. 4 shows the annual production units of Company A in each country, and the total domestic new car market size in each country in 2008. The data on market size are extracted from the OICA. As can be seen in Fig 4, 50K units of annual production is a borderline for Company A. However, there are higher and lower numbers of annual production as well in Fig. 4.

For a better understanding, mini-sized production and mini-sized markets are considered in Fig. 5, magnified at the left of Fig. 4. In the case of the actual automobile production of Company A in 2008, the minimum size of annual production was 13K units, and the minimum size of the domestic new car market was 125K units. This means that for this minimum production of 13K units, calculated back based on the assumption of the previous section, the Takt time was just over 10 minutes; the 125K units as a new automobile market was almost the same as the 120K units of “patient” Takt time and...
“normal” market share, as stated in the previous section.

These factors show that 50K units of annual production obtained by the “Takt time method” may certainly be one borderline, although there are exception cases. However, 100K units of an annual total domestic market using the “Take time method” is also certainly another borderline for production.

Fig. 4. Production Size of Company A and Total Domestic Market of Each Country

![Graph showing production size and total market](image1)

Author, data from Company A

Fig. 5. The Minimum Production and Market Size in the Case of Company A

The analysis of Production and Total Market size of Small and Medium Case

![Graph showing minimum production and market](image2)

Author, data is same as Fig. 4
4.5 Case study of Company B in Kenya

Company B is an automobile OEM manufacturer assembling in Kenya. It assembles two types of pickup trucks using CKD style production. The Takt time of each model is around 30 minutes and 45 minutes, respectively. The number of required auto parts is about 1,700. Among the required auto parts, 250 are procured domestically such as leaf springs, batteries, wiring harnesses, exhaust pipes, tires, metal brackets, and sheets. The number of domestic suppliers is between 20 and 25. Local content represents roughly 20% of the number of auto parts. Calculated based on value, local content is roughly 35%, which includes body assembly. The company has an assembly line of chasses, a paint shop, an assembly line of cabins, and a final assembly line. There are no stamping machines for skin panels and no molding machines for bumpers or console panels, for example. Those are imported as CKD parts. Painting and welding are manually processed. Thus, the ratio of automation of welding and painting is 0%.

The production was around 4,200 units in 2014 and 5,400 units in 2015. Its market share in Kenya was around 30% in 2014, and around 35% in 2015.

4.6 Case study of Company C in Tanzania

Company C is a dealer and an assembler of trailers. It imports trailers (CBU) and associated parts; it also assembles trailers in-house using CKD style production. It assembled 260 trailers in 2015. Automobile parts are imported as CKD parts. It does painting, welding, and assembly in-house. It also draws, cuts, bends, and punches metal sheets to create the necessary parts for assembly. Local content based on value is 30%. This value added is all done through in-house manufacturing. This means that all parts are imported from countries such as Germany, South Africa, France, and China. No suppliers exist in Tanzania that meets its quality requirements. The Takt time appears not to be used in the control assembly.

4.7 Case study of Company D in Uganda

Company D is an automobile assembler. It successfully developed an original electric vehicle. It started R&D in 2011. Its first trial assembly began in 2013 and was completed in February 2016. Today, it is planning to begin assembly of electric vehicles for commercial production. It is also planning to assemble automobiles with gasoline and diesel engines in the near future. It plans to build a factory near the port of Lake Victoria for preferential logistics in terms of both importing and exporting. All employees will be hired in Uganda. There is no plan to hire foreign engineers. In the beginning, it plans to
import 99% of its automobile parts for the automobile assembly since currently there are no factories in Uganda that can supply these parts to meet its quality requirements. Its target for local content of its electric vehicle is 60%, which includes chasses, body flames, and sheets. The remaining 40% is comprised of imports such as motors, high quality batteries, and solar panels; these are expected to be imported from India, China, the USA, and Germany.

5. Discussion and Conclusion
5.1 Risks of starting automobile production too early

Based on the literature review of the automobile industries in Kenya, Tanzania, Uganda, starting domestic automobile production at too early a stage in which means low GDP per capita or a small size of market, might endanger its success. A small volume of automobile production tends to come at a high price. It is sometimes said that the liberalization of second hand cars has destroyed the automobile industry; meaning that the price of new cars might be significantly higher than those of imported second hand cars when the consumer considers price and quality between a new domestic car and an imported second hand one.

In general, it is believed that products made in developing countries should be cheaper than those made in developed countries. In the case of labor-intensive products, this is true. In the case of automobile and automobile parts, this is not always true. In many cases, the automobiles and the automobile parts produced in developed countries are cheaper than those produced in developing countries. In the case of South East Asian countries in the 1990s, the research from the field surveys indicated that it was not unusual for prices to be one and a half to two times higher for domestic procurement compared to imports from Japan or other countries. In the research from the field study in Kenya in 2016, the author finds that some motorcycle parts on order domestically were three to five times higher compared to the same imports. Moreover, the domestic quality did not achieve the same level as the imports. Thus, the difference was not only the higher price but also the inferior quality. In order to meet the quality standard of automobile assemblers for automobile parts, local suppliers need to import capital goods such as machinery and other facilities as well as the necessary raw materials to better meet quality requirements. Moreover, they need to train their employees. In certain cases, they should buy the new technologies needed as well. In the case of a small volume of production of automobiles and automobile parts in the developing country, the costs are extremely high compared to any advantage provided by the low labor cost. Thus, in general, the prices of automobiles and automobile parts made in developing countries
are higher than those made in developed countries.

5.2 What GDP level is needed to begin automobile production

In general, it is said that the motorization of the automobile market starts when GDP (or GNI) per capita of the country exceeds 3,000 USD. It is also said that the population of the country is a big factor for global automobile manufacturers in deciding whether or not to invest in new factories. As discussed in section 4.1, the correlation of GDP per capita and population with automobile production is statistically significant at the 1% level. Thus, what level of income and volume is needed to start automobile production in a country?

As shown in 4.2, it appears that automobile production is often started in some countries with a GDP per capita as low as 1,000 USD with a population near to 100 million. However, where GDP per capita exceeds the 3,000 level, many countries have automobile production.

In 2015, GNI per capita in Kenya was 1,340 USD, in Tanzania 920 USD, and in Uganda 700 USD. Thus, in Kenya, it already exceeded the 1,000 USD level. Moreover, the 1,000 level may be reached in the near future in Tanzania and Uganda. The total population of these three countries is around 140 million. It is calculated to be around 265 million for the entire EAC. Considering the free import tariff in the place of origin in the EAC, these three countries might in a good starting position for automobile production in terms of both GDP per capita and population, with Kenya a step ahead the other two countries.

5.3 What volume is needed to begin automobile production?

According to the “Takt time method” shown in 4.3, the minimum required annual production is about 30K units, and the minimum desired domestic annual new car market is about 100K units in the case of “patient” Takt time and an “ideal” market share. In the case of the “optimistic” market share and “patient” Takt time, a desired domestic annual new car market is about 40K units. This might be the borderline for global automobile OEM manufacturers to invest in the developing country. It might also be the same Merkmal for domestic manufacturers to consider starting automobile assembly. According to the actual case of Company A, the minimum size of annual production was 13K units, and the minimum size of the domestic new car market was 125K units. Considering these facts, it might be that the potential domestic new car market is more important than actual production volume. When the potential domestic market is expected to reach 100K units in the near future, automobile manufacturers
may be highly interested in the market. In Kenya’s case, although the new car market was only 14K units in 2015, the increase in automobiles in 2014 was 60K, which exceeded the case of the 40K “patient” Takt time and “optimistic” share. With the recent rapid economic growth, and considering the 264 million population in the EAC, it might be a significant number in considering the possibility of starting automobile production in Kenya; and, VW actually decided to invest in Kenya in 2016. The increase in automobiles in 2013 in Tanzania was 10K units, and was 30K units in Uganda. Considering each country by itself, these numbers indicate severe conditions. However, considering the EAC market as a whole, although Kenya is a step ahead here, Tanzania and Uganda might still have possibilities for this industry in the future.

5.4 Investment areas in automobile OEM factories

Fig. 6 shows the flow of automobile production and orders. In automobile production, each process is basically done in the following order: first, the stamping of skin panes, next, the welding and assembly of bodies, then painting, and finally, the assembly and inspection processes. Before the final assembly process, power train production or a plastic molding process occurs in parallel. Depending on the situation, sub-assembly lines are directly connected to the each assembly line. According to interviews with automobile OEM manufacturers, they roughly divide investment in automobile in-house production into four areas by considering necessity, urgency, and costs. The first investment area includes machines and facilities for final assembly and final inspection. The second and third investment areas include machines and facilities for welding and painting. Initially, welding and painting processes are done manually. This means initial automation ratios for these processes are 0%. With the increase in production volume, machines that automate these processes are gradually invested in and the automation ratio increases. The fourth area includes big stamping machines for skin panels or big molding machines for console panels or bumpers. Subsequent to the first investment, or almost at the same as, automobile parts suppliers gradually consider and conduct their investments based on potential production volume in the present and the near future. Sometimes, special request from automobile OEM manufactures urged them investment.
In the case of Company B in Kenya, its first investment area was already in place. However, in terms of welding and painting, automation ratios were 0% for both. Stamping machines and molding machines had not received investment. In the case of Company C in Tanzania, automation ratios for welding and painting were here again, both 0%. In terms of the stamping machines, although there were some simple stamping machines, these were not as large or complicated as the transfer stamping machines for skin panels. The molding machines had not received investment by Company C. These facts imply that the competed investments were categorized in the first investment area only. Second and subsequent investment areas had not yet occurred.

5.5 Each phase in the path of automobile production

Fig. 7 shows each phase in the path of automobile production; this was created by summarizing the results of this research. Phase I shows the situation where automobiles are only imported and there is no automobile production of significant volume in the country. In Phase II, automobile production of significant volume begins. This initially starts in the SKD style of production. In this second phase, the first area of investment may be taking place as well. The borderline between Phase I and II is a mix of the following indicators: GDP per capita of 1,000 USD, annual automobile market size of 10-50K units, and significant population volume above 90 million. Tanzania and Uganda fall between Phase I and II.
Phase III is the transition phase from SKD to CKD style production. Gradually, manufacturers invest in in-house welding and painting facilities and thereby automation ratios gradually increase. The borderline between Phase II and III includes the following indicators: GDP per capita of 2,000 USD and an annual automobile market of 100-300K units. Kenya falls between Phase II and III.

Phase IV is the phase when, generally speaking, motorization is started with levels beyond 3,000 USD of GDP per capita. The annual automobile market size is beyond 300K units in this phase. Automobile OEM manufacturers may increase local procurement and may consider introducing big transfer stamping machines for skin panels or big molding machines.

In Phase V, GDP per capita is expected to exceed 5,000 USD and the annual automobile market to exceed 500K units. In this phase, automobile OEM manufacturers might proceed in domestic production such as introducing engine assembly, transition assembly, and local procurement.

In Phase VI, the annual automobile market exceeds one million units. In this phase, global automobile OEM manufacturers consider a shift to R&D processes in that country.
5.6 Automobile promotional policies best suited to each phase

In Kenya and Tanzania, the research discovered that liberalization of imports, such as second hand cars, destroyed the domestic automobile industry. If true, forced automotive promotional plans at too early a stage may not lead to strong results, historically speaking. The price of domestic automobiles could become too high. This would then mean that many consumers would be unable to buy an automobile. The automobile market would then shrink. In a protected and small market, the domestic automobile OEM manufacturer does not have an incentive to advance its technologies and develop new effective models. The automobile market may then fall into a stagnant situation with obsolete automobiles in terms of appearance and quality far behind international standards. Similar cases were observed, for example, in India and Brazil in the 1980s. If the government moves to promote the automobile industry too early, this may force a heavy burden on its citizens.

Then, how should it do this? The research suggests that a government should introduce automotive promotional policies suited to each phase, as stated in section 5.5 and shown in Fig. 8. When GDP per capita reaches 1,000 to 2,000 USD and the size of the population is strong with a good perspective for continuous economic growth, this is the time to consider introducing the automobile industry. In this Phase, it might be suitable to introduce preferential treatment for investors in SKD and CKD assembly and for automobile parts manufacturers: preferential treatment could include a tax holiday in a certain period, and exemption of import duty for machinery, dies and molds, parts, raw materials, and other facilities. The government could invest in efforts to develop better infrastructure in parallel or in advance of industry development. Fostering commodity manufacturing, such as plastic molding, metal processing, metal stamping, rubber forming, and glass molding, is an effective way to learn and accumulate the technology necessary for automobile parts manufacturing.

As a country nears GDP per capita of 2,000 to 3,000 USD, with a solid perspective for continuous economic growth, and a suitably sized automobile market, this might be the time to consider developing the automobile industry further. This might mean announcing an increase in the tariff on second hand cars, and SKD parts, for a certain period such as five years, in order to incent manufacturers to advance domestic production and shift from SKD to CKD style production. However, too sudden change in policies may not bring about the desired results. It normally takes more than one to two years to decide and then build automobile assembly lines. In this Phase, it would be better to establish a system of training and education for automobile production in parallel. It might be effective to consider introducing an inspection system not only for
maintaining automobile safety quality and avoiding environmental pollution, but also to foster growth in technicians and in the automobile parts market.

Fig. 8. Image of Suitable Policies to Promote Automobile Industry in Each Phase

Author

In cases where GDP per capita exceeds 3,000 USD and an annual market of 300K units, with strong economic conditions, it may be time to consider developing full-scale production systems and systems to maintain safety and the environment. It might be effective to announce raising tariffs on CKD parts for a certain period, such as five years, in order to incent manufacturers to shift from CKD to full-production style. In this Phase, it may be effective to push manufacturers to introduce or transfer technologies of easy to medium difficulty. At the same time, local content policies need to be avoided as these have been prohibited by the World Trade Organization as of the late 1990s. However, it may be effective to introduce safety and environmental policies.

In countries with a GDP per capita of 5,000 USD or an annual market of 500K units, the latter half stage of a full-scale production system can be developed. In this Phase, it may be effective to push manufacturers to introduce or transfer more complex and difficult technologies.

Once the annual automobile market reaches around one million units, it is a good time to begin developing R&D processes in country. In this advanced state of domestic R&D, the automobile industry can then achieve world-class recognition in the global industry.
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References

Internet information as of May 15, 2017

i http://www.jama-english.jp/.


viii Same as vii

ix Same as v


xi Interview Oct 31, 2016

xii http://www.transportworldafrica.co.za/2013/09/19/scania-40-years-win-east-africa/

xiii Same as x


xvi Shown in (xiv


