

# Impact of the Transition to Electrical Vehicles on Workers in Automotive Parts Manufacturing in Thailand

Kiriya Kulkolkarn



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# Foreword

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Climate change is one of the biggest challenges of our times. Since the COP 21 summit in Paris in 2015, 189 countries have ratified the Paris Agreement, followed by decisions to invest in a sustainable low-carbon future and undertake ambitious efforts to combat climate change. One of the most important collective aims is to keep the global temperature rise this century to well below 2° Celsius, mainly by reducing greenhouse gas (GHG) emissions and fostering a climate-resilient pathway.

As a country highly vulnerable to the impacts of climate change, Thailand has declared its nationally determined contribution to the Paris Agreement: It intends to reduce its GHG emissions by 20 per cent by 2030. Effective adaptation to climate change and a transformation towards a decarbonized, resilient development model within the parameters of the Paris Agreement is an enormous challenge for all countries.

In Thailand, the energy sector releases 74 per cent of the country's total GHG emissions; within that volume, 42 per cent derives from public electricity and heat production, 26 per cent from transport, 20 per cent from manufacturing industries and construction, and the rest from other sources. Consequently, some national strategies and action plans that have been developed focus on the reduced consumption of fossil fuel energy. A successful transition of the mobility sector is considered pivotal towards reducing emissions. The government has developed a master plan to increase the share of electric vehicles to 30 per cent of the total annual car production by 2030. Yet, the plan also aims to help Thailand's automotive industry stay competitive in global markets.

Over the past decades, the automotive industry has developed into an important sector of the economy. Before the COVID-19 crisis, around 800,000–900,000 workers were employed in 2,500 companies in the sector. To transition towards electric vehicles, the government and business sector have focused on technological development, with little attention to the social impact of restructuring the automotive industry, especially the consequences for workers and employment opportunities. The automotive parts industry alone employs roughly

590,000 workers, and working conditions are considered worse than in car assembly factories.

Friedrich-Ebert-Stiftung (FES) in Asia is committed in its work to socio-ecological transformations, in which social and ecological factors are treated equally. FES supports the concept of a “just transition” as developed by the international labour movement and integrated into the Paris Agreement. It works to foster a transition towards a low carbon and climate resilient economy that maximizes the benefits of climate action while minimizing hardships for workers and their communities. In this sphere, any change a sector pursues must be socially just.

FES Thailand and partners have organized various activities to support the socio-ecological transformation of the economy. In cooperation with Thai trade unions, the restructuring in the automotive industry and the challenges for the future of work, like digitalization, automation and the transition to electric vehicles, have been analysed. Because data on these issues have been scarce for years, a recent joint research study highlighted the huge impact of the transition towards electric vehicles on workers in the automobile sector. The results and recommendations, it was hoped, would be embraced by social dialogue partners and other stakeholders to develop strategies on how to secure better and new employment opportunities for affected workers, especially in low-skill jobs.

After publication in 2019, the Thai version of the study was indeed used as a reference for policy debates in many unions and with employers and the Ministry of Labour. With the automotive industry an important employer in many countries, the study is now offered in English in an updated and revised version. FES would like to thank the researcher, Kiriya Kulkolkarn, and union leaders from the Automobile Labour Congress of Thailand for their support with fieldwork and data collection.

**Preeda Sirisawat**

Senior Academic Advisor, FES Thailand

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# 1. Background

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Global warming and climate change are challenges confronting our world. The international community has agreed to tackle the rising temperatures as part of the United Nations Sustainable Development Goals and the Paris Agreement. In support of the goals of both instruments, Thailand adapted and integrated targets associated with developing a green economy into its Eleventh (2012–2016) and Twelfth (2017–2021) National Economic and Social Development Plans.

The development towards a green economy globally is expected to have both positive and negative impacts on labour markets. Low-carbon and environment-friendly technologies will create new jobs and employment opportunities. But the traditional carbon-intensive industries, where most unskilled workers are found, will be vulnerable. Concerned about the extent to which green technologies are threatening employment, some international labour organizations developed a conceptual framework for a “just transition” that is now included in the Paris Agreement.

According to the International Energy Agency database, 24 per cent of greenhouse gases derive from road transportation (after the electricity and heating sector, at 41 per cent) in 2017.<sup>1</sup> The automotive industry emits a large volume of greenhouse gases due to the use of fossil fuels. Hence, as a countermeasure, the use of electricity in transportation is rising.<sup>2</sup>

In Thailand, according to the Federation of Thai Industries, the automotive industry accounts for 5.8 per cent of the country's gross domestic product and employs 890,000 workers in 2019.<sup>3</sup> The trend towards the use of electric vehicles as a replacement to internal combustion-engine vehicles will likely have considerable impact

on the industry. The government has embraced the trend and is seeking foreign manufacturers to invest in electric vehicle production in Thailand. Without doubt, any impact to the automotive industry will have a domino effect on the automotive supply chain.

An electric car has fewer parts than an internal-combustion car. For example, a gearbox, a radiator, a fuel tank, an injector nozzle, the fuel system, the ignition system and an exhaust pipe are not found in an electric vehicle. Electric car battery production requires 80 per cent fewer workers. And electric vehicle manufacturing consumes only 30 per cent of the time the internal-combustion engine needs for production (UBS, 2017). In addition, the electric car, once in use, needs less maintenance because it can travel far longer in mileage before a tune-up is required. Therefore, there are fewer parts to malfunction or cause a breakdown. As a result, the future vehicles will likely contain fewer parts and thus require fewer workers.

## How might the electric vehicle trend affect workers?

This research project set out to explore the electric vehicle trend and its impact on the automotive and automotive parts industries in Thailand, primarily to gauge the human impact in terms of affected employment. We wanted to assess the impacts on the labour markets in the automotive parts industry and provide suggestions for a just transition from the production of internal-combustion engines to the cleaner technology.

We expect that in this changing trend towards the electric vehicle, workers will not be left behind and that the transition in the automotive industry could become a model for other sectors as they move and adjust to impending changes in production processes in the future world of work.

1 <https://www.iea.org/data-and-statistics/charts/global-co2-emissions-by-sector-2017>

2 Shifting to electric vehicles would potentially raise more carbon dioxide in the electricity sector, which already emits a large amount because consumption is large. But each electric car emits less carbon dioxide than a traditional fossil fuel car, so overall it will decrease (in units and not the sector percentage).

3 From a presentation at the ASEAN Leading Industrial Machinery and Subcontracting Exhibition, BITEC, Bangkok, 9 May 2019.

## 2. Methodology

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This research sought qualitative data through interviews, group discussions, seminars, site visits and written documents. It is presented in this report through descriptive analysis and discussion and concludes with suggestions for the tripartite constituents.

The following steps were involved when conducting the research:

- Step 1 Study statistics and research work from both Thai and international sources relating to the electric vehicle trend, the production of such cars and the differences between the electric car and the internal combustion-engine automobile. Attend academic seminars relating to these issues. Assess the expected impact of the trend on workers.
- Step 2 Interview experts in the automotive and automotive parts industries for their perspectives on the electric vehicle trend and its impact on workers and for their advice to prepare for the impacts.
- Step 3 Set up and manage discussion groups for data acquisition and recommendations with public and private sector parties.
- Step 4 Interview entrepreneurs in the automotive parts industry.
- Step 5 Set up and manage three group discussions with workers in the automotive parts industry.
- Step 6 Visit the Thai-German institute, the Sumipol Institute of Manufacturing Technology and the Vidyasirimedhi Institute of Science and Technology to learn about upskilling methods for labour skill development with government support.
- Step 7 Analyse all data gathered to make a summary and provide suggestions for all involved parties.

The participants in this study are directly involved in the automotive and automotive parts industries: the Thailand Automotive Institute and Office of Industrial Economics (Ministry of Industry), the National Science and Technology Development Agency (Ministry of Higher Education, Science, Research and Innovation), the Board of Investment of Thailand, the Fiscal Policy Office (Ministry of Finance), the Ministry of Labour, academic researchers, the Federation of Thai Industries, Thai Auto-Parts Manufacturers Association, electric vehicle and internal-combustion engine entrepreneurs in the automotive parts industry and workers.

## 3. Theoretical concepts

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### Electric vehicles and market failure

In terms of economics, the use of electric cars causes a positive externality to society. Compared with the internal-combustion engine of a similar-sized car, the electric vehicles produces less to no exhaust. Consequently, there is less air pollution and less fine particulate matter (PM2.5) due to lower carbon dioxide emissions. PM 2.5 threatens the human respiratory system and can cause cancer. Accordingly, while drivers of electric vehicles benefit from owning them, society in general also benefits from improved air quality.

Like many other countries, the number of electric cars in Thailand remains small. However, the positive externality usually leads to less consumption and inefficient resource allocation. A market failure has occurred because the market has failed to value the electric vehicle correctly. Hence, such cars are under-consumed, and the quantity needed to maximize social welfare has not yet been achieved. As a result, government intervention is needed to increase the use of the electric vehicle, through a subsidy, reduced taxes and/or benefit packages. Government support would help boost the production and consumption of electric vehicles to ultimately make them more affordable. Yet, the government has a limited budget, and supportive interventions would not be sustainable in the long run.

### Compensation principle

In welfare economics, the compensation principle is the decision rule when two states are under selection. Given an initial state, an alternative state will be selected when the gainer can compensate the loser to the point that both situations improve and no one loses, at least compared with their initial state. For instance, the construction of an expressway would benefit car users but present a loss to landowners whose land would be expropriated. But if landowners receive fair compensation and the drivers using the expressway pay a toll for that use, then there more likely is a sense that no one lost (excluding the impact on the environment). With electric vehicles, the producers of the technology, such as the battery and electric motor, will benefit as the demand trend expands, whereas internal-combustion engine producers, especially producers of engine parts and exhaust pipes, will lose as demand diminishes. With the compensation principle, internal combustion engine producers would receive government compensation in exchange for a cleaner environment that benefits the overall society.

### Just transition

A just transition is an important proposal by worldwide labour movements, which the Paris Agreement has adopted. Workers support environment-friendly business activities because they see that the healthy sustainability of our world means a healthy sustaining of employment. A transition towards a low-carbon society should concurrently move with workers' support. To ensure that the transition to a green economy takes into account social challenges and impacts on jobs, the International Labour Organization designed guidelines for a just transition towards environmentally sustainable economies and societies.

## 4. Automotive and automotive parts industries in Thailand and associated policies

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### Automotive industry

The automotive industry is a significant sector in the Thai economy, accounting for 5.8 per cent of gross domestic product. The automotive industry links with several other industries, including the automotive parts industry and the steel industry, and with gas stations and the agriculture sector. Thailand is currently a global manufacturing hub for three major types of vehicles: one-ton pick-up trucks, eco-cars and high-quality small motorcycles.

### Automotive parts industry

According to Krungsri Research (2019), around 80 per cent of Thai domestic car production relies on auto parts produced in country, while the eco-car and motorcycle production combined use more than 90 per cent of parts produced locally (Krungsri Research). And 60–80 per cent of the parts for passenger cars and pick-up trucks are domestically produced. The automotive parts manufacturers have two main markets:

1. Original equipment market, which represents 30–40 per cent of the total domestic market value. Original equipment manufacturers normally produce and feed auto parts for car production firms selling vehicles in Thailand and also exporting to global markets.
2. Replacement equipment market, which represents 60–70 per cent of the total domestic market value. Its manufacturers supply replacement parts for car manufacturers.

There are also associated activities, which include the upstream (raw material production and supply), support (machinery production and services), service (distribution, sales and after-sale service) and policy-related (technical and marketing service groups) work.

A rising trend in battery electric vehicle demand in Thailand will significantly affect this auto parts industry due to the major difference in components required: For instance, the electric powertrain system uses only 20 parts, while there are more than 2,000 parts in the internal-combustion engine. There would be a trade-off, however, with electrical system and electronic parts becoming required components.

### Electric vehicle industry in Thailand

Thailand's electric vehicle industry is in the beginning stage. The ratio of electric vehicles to internal-combustion engine cars is relatively small. According to the Department of Land Transport (n.d.), there were 1,933 electric vehicles and 143,356 hybrid cars among the more than 40 million cars registered in Thailand as of September 2019 (Department of Land Transport). The proportion of electric vehicles and hybrid cars combined is only 0.005 per cent of all vehicles. But that share is increasing.

There are 1,200 charging stations for the 1,933 electric vehicles. This is adequate, but there would be an insufficient supply of stations if a larger number of hybrid cars came into the market. And most of the charging stations are densely packed in Bangkok, and sparingly provided in non-Bangkok areas.

From the world market, Thailand imports battery electric cars available in country from five firms: Japan's Nissan, the Republic of Korea's Kia and Hyundai and China's BYD and MG. All these vehicles use lithium-ion batteries. The car importers are obliged to pay a custom duty, excise tax, local government tax and value-added tax.



For domestic production, the BMW Group Thailand and Mercedes-Benz Manufacturing (Thailand) have been producing plug-in hybrid electric vehicles, and FOMM Asia produces small-sized electric vehicles. These firms, however, target export markets. Isuzu Thailand, Toyota Motor Thailand and Honda Automobile currently invest in hybrid electric vehicle production. Mitsubishi Motors Thailand is starting to produce plug-in hybrid electric and battery electric vehicles, while Nissan Thailand is studying the potential of such production. The remainder of firms in Thailand's electric vehicle industry produce electric vehicle parts and components. Electric vehicle charging station development in Thailand relies on large investors and joint ventures.

There are some limitations in the production process. Electric vehicle batteries are expensive and have a short battery life (approximately eight years globally). It is an even shorter life in Thailand due to the average high temperature, at around 28°Celsius. The availability of charging stations and insufficient supply of electricity are additional limitations.

### **Policies on automotive and automotive parts industries in Thailand**

There have been four stages of automotive industry policy development in Thailand. The first covered the import-substitution production of the local content and parts required in car manufacturing. In the second stage, the government supported the investment, production and export of automobiles. In the third stage, Thailand became a global hub of car production, especially in three major products: pick-up trucks, eco-cars and high-quality motorcycles. Now the government has shifted into a fourth stage involving production of "future vehicles", with the electric vehicle particularly promoted. Several government agencies are drafting policies that will support development of the electric vehicle industry.

The **Ministry of Energy** projected the world is shifting away from fossil fuel to renewable energy and thus created the 2015 Thailand Integrated Energy Blueprint. This policy aims for the country to become one of the world's leading car production hubs for electric vehicles, targeting 1.2 million plug-in hybrid electric and battery electric vehicles combined, or 1 per cent of the 22 million cars expected to be produced in Thailand over the next 20 years. It is also targeting 690 charging stations operating by 2036.

The **Ministry of Higher Education, Science, Research and Innovation** has proposed a research and development plan that focuses on the electric vehicle industry and supports the domestic use of auto parts. Research on electric vehicle parts production is prioritized, considering that Thailand still imports batteries, energy management systems, electric vehicle motors, the propulsion systems and lightweight car structures.

The **Ministry of Industry** supports electric vehicle car production in six areas: supply side, demand side, infrastructure preparation, electric vehicle standards, used-battery management and other minor policies, such as human resources management.

The **Thai Industrial Standards Institute**, within the Ministry of Industry, sets standards for electric vehicles. The Cabinet has approved a policy that enables government agencies and state-owned enterprises to purchase electric vehicles for government use. The Cabinet is also exploring how to increase the share of plug-in hybrid electric and battery electric vehicles used in certain areas, such as airports and national parks.

The **Board of Investment of Thailand** promotes investment into electric vehicle production with benefit packages for six types of electric vehicle businesses: (i) equipment used in hybrid and plug-in hybrid electric vehicles; (ii) hybrid electric vehicles and parts; (iii) plug-in hybrid electric vehicles and parts; (iv) battery electric vehicles and parts; (v) electric buses; and (vi) electric vehicle charging stations.

The **Ministry of Finance** encourages electric vehicle production by reducing excise taxes in four types of electric vehicle:

1. Hybrid electric pick-up passenger vehicle with an air cylinder volume that does not exceed 3,250 cm<sup>3</sup> and emits fewer than 175 grams per kilometre of carbon dioxide.
2. Hybrid electric double cap car with an air cylinder volume that does not exceed 3,250 cm<sup>3</sup>.
3. Hybrid electric car with an air cylinder volume that does not exceed 3,000 cm<sup>3</sup>.
4. Battery electric passenger car.

Although electric vehicle importers and investors would benefit from tax incentives, there has yet to be any policy to remove support for fossil fuel vehicles or to encourage more electric vehicle buyers.

## 5. The electric vehicle trend and its impact on the automotive and automotive parts industries in Thailand

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### Future vehicle technology

Modern automobile technology provides more convenient, safe, efficient and environment-friendly transportation. There are four current trends of modern technology development:

1. **Connected vehicles**, which have an internet connection that supports content transfer.
2. **Autonomous vehicles**, which refers to self-driving and has become helpful for older persons, people with disabilities and other people who are unable to drive.
3. **Shared vehicles** refers to the ride-sharing services that use online platforms to connect drivers and passengers.
4. **Electric vehicles**, which use electric motors as a main power source.

Future vehicles require newly created parts, such as the electric propulsion system and battery. Smart Sensors, maps, navigation systems, control systems, electronic devices, software and entertainment content are needed in the autonomous vehicle system. Robotic and 3D printing technologies are employed in manufacturing all car parts and equipment. Hence, the modern technologies are creating various new jobs for producing parts and equipment. In addition, they are also creating new services, such as car rental operations, ride-hailing platforms and electric vehicle charging stations attached to retail shops, restaurants and other conveniences.

Because the autonomous vehicle system does not need a human to operate it, some driving services might be vulnerable. Taxi drivers are one of the potential groups at risk of losing their job (livelihood). According to the Department of Land Transport (n.d.), in 2018 there were 122,356 taxi drivers in Thailand. The taxi market power that used to be controlled by taxi drivers is shifting to or being shared, at the least, with ride-hailing platforms,

such as Grab and Uber. Ride-sharing services are expected to change ownership behaviours; for instance, demand for personal-use cars is projected to reduce while demand for business-purpose cars is expected to increase. Additionally, future vehicles with fewer parts than the current internal-combustion engine ones implies there will be reduced car maintenance, which will reduce the number of jobs related to maintenance services and internal-combustion engine parts production.

Robotic and autonomous production systems will become important in the manufacturing process. Accordingly, car manufacturers, material suppliers and workers will be affected by newcomers in the industry who specialize in advanced technology. The more advanced the technology is, the less the unskilled and semi-skilled workers will be needed. To some extent, developing countries with cheap workers will lose their advantage, especially when foreign investors move their production to countries that are more capable of producing newly needed parts, have abundant resources, are closer to the car markets and/or have local government support.

Because Thailand is a major hub of car production owned by foreign firms, policies from their headquarters will be significant in directing the automotive industry. To remain competitive as well as the global production hub, Thailand needs to increase the number of technical workers, electrical researchers, IT and software researchers and data analysts who can support electric vehicle production.

### Four types of electric vehicle and the future market trend of electric vehicles

According to the International Energy Agency (2018), an electric vehicle uses an electric motor for propulsion (International Energy Agency). The energy source derives either from a battery or fuel cells. (i) The battery vehicle solely relies on a battery. Vehicles that still use an internal-combustion engine combined with a battery,

due to the limitations of technology, are classified into two types, depending on the source of electric power: (ii) The hybrid electric vehicle, which needs petroleum oil for propulsion, converts mechanical energy from the braking system to generate electric power. (iii) The plug-in hybrid electric vehicle, which developed from the hybrid electric vehicle, imports electric power from an outside source – the charging station.

(iv) The fuel-cell electric vehicle exploits hydrogen as a source of energy—one could say it is a true green vehicle. Yet, the hydrogen-generated technology and infrastructure of the fuel cell electric engine production is currently limited.

The Electric Vehicle Association of Thailand and the Thai Auto Parts Manufacturers Association (TAPMA) predict that more than half of the country's car market in 2037 will be electric vehicles. And of them, battery engines and plug-in hybrid engines will account for 20 per cent and 30 per cent, respectively. The remainder will be internal-combustion and hybrid electric engine vehicles (Kasikorn Research Center, 2017).

### **Differences between the internal-combustion engine and the electric vehicle**

UBS, a Swiss multinational investment bank, studied the differences between the internal-combustion engine in the Volkswagen Golf and the battery electric Chevrolet Bolt (UBS, 2017). Their assessment also found the internal-combustion engine to be more complicated with more parts, especially in the powertrain system. The battery engine has a complicated electric system that requires six to ten times more semiconductors than an internal-combustion engine. As for the number of auto parts used, the battery engine requires 60 per cent fewer parts and has no internal-combustion equipment. Consequently, as the UBS report found, the battery engine requires less maintenance work with longer mileage before the first car check-up.

According to an interview with TAPMA officers,<sup>4</sup> an internal-combustion engine requires 30,000 parts, while a battery electric vehicle needs between 1,500 and 3,000 parts per car. Research by Sikor Company Ltd (2018) and Kasikorn Research Center (2017) summarized the

similarity and differences of parts used in both engines in three categories:

1. Both have similar parts in
  - suspension system
  - body parts, such as the car body, air conditioner, mirrors
  - lighting system
  - other minor elements, such as car accessories.
2. Similar and different parts in
  - braking system
  - steering system
  - cooling system.
3. Different parts in
  - transmission system
  - engine system
  - exhaust system
  - fuel system.

Auto parts production for any internal-combustion vehicle will largely be affected by the transition to cleaner transport. The powertrain system alone (transmission, engine, exhaust and fuel system) of the internal-combustion engine requires around 2,000 parts, with a total value of more than one third of the production cost. In contrast, the battery vehicle uses an electric motor consisting of the traction motor inverter and energy storage system. The battery, together with the battery management system, on-board charger, AC/DC converter and other minor electrical equipment, account for around 30 per cent of the total electric vehicle production cost.<sup>5</sup>

### **Impacts on auto part makers in Thailand**

According to the data provided by TAPMA in 2019, the transition to electric vehicles will affect 49 out of 160 total auto parts. Manufacturers of these parts account for 816 firms (in a total of 2,500 auto parts manufacturing firms). In addition, 183 supporting firms will be affected. Hence, an estimated 999 firms are likely to be impacted by the transition.

Sikor Company Ltd (2018) found that small and medium-sized auto parts manufacturing enterprises (SMEs) at risk are those in tiers 2 and 3, which produce only a group of parts. But they number more than 600 firms, or approximately 60 per cent of the total number

4 Interview 8 January 2019.

5 Interview with TAPMA officers, 8 January 2019.

of Thai auto parts manufacturers. Most of the SME auto parts manufacturers, at 75 per cent of total manufacturers, are not in the business of making the engine parts that will be affected; rather, they produce car accessories and body parts. As a result, the remaining 25 per cent, or about 150 SMEs that produce parts in powertrain, engine, exhaust, fuel and fuel tank system will be highly at risk.

TAPMA research, however, led to estimates that auto parts SME manufacturers accounted for 70 per cent of total manufacturers, or 1,750 firms, in 2019. Because the TAPMA research covered more auto parts firms than the Sikor study, the additional estimate of 25 per cent affected firms amounts to 438 firms. If, as noted, 70 per cent SME firms (of the total 816 affected firms) will amount to 571 SME firms affected, it seems that the number of SMEs at risk will be around 438–571 firms.<sup>6</sup>

During this current beginning stage of the transition, these manufacturers are expected to face low risk because the electric vehicle market is in a steadily growing period. Once developed economies, such as the United States, Japan, the United Kingdom, Western Europe and China, have great demand for electric vehicle exports, the electric vehicle market will skyrocket. Then the SME manufacturers will be affected the most. Manufacturers in car replacement parts, auto service and repair shops will experience an indirect effect. The remaining manufacturers who produce parts, such as those in the suspension system, the car body and the lighting system, likely will easily tolerate the transition.

Fortunately, according to our estimates, the battery electric vehicle production needs a decade or more in development to gain a significant share of Thailand's automobile market. Consequently, the at-risk manufacturers still have plenty of time to revamp their business. We also estimate that electric vehicles will account for only around 20 per cent of the Thai automobile market in 2037. As a result, manufacturers of internal-combustion engine parts will remain in demand and insignificantly affected by the hybrid electric and plug-in hybrid electric vehicle production for approximately 10–15 years.

In summary, we suggest auto parts manufacturers should convert their manufacturing process to produce the electronic parts that will be in demand in the future and reduce the soon-to-be obsolete parts manufacturing. They should also study the size and lightweight materials that will be used in future vehicles.

The TAPMA officials explained that auto parts orders during 2018–2020 have been internal-combustion engine parts. If one engine model is used to produce cars for 10–15 years, there should not be any significant impact in the automotive parts industry during this period. Yet, car manufacturers should find ways to reduce their cost of production while increasing its efficiency by adopting the autonomous system into their production processes. In the long term, TAPMA expects that Thai auto parts manufacturers could expand into the replacement equipment markets, domestically and internationally, to capture older internal-combustion vehicles.

The Internet of things and the robotic and autonomous systems are expected to have a crucial role in the production process in the automotive industry. Product quality, production cost, car delivery and services should be emphasized in battery electric vehicle production. Automotive makers should seek out customer feedback to better innovate or even to consider shifting to other thriving industries, such as medical devices, aviation and industrial robots.

<sup>6</sup> Interview with TAPMA officers, 8 January 2019.

## 6. Impact on workers in the automotive parts industry

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### Quantitative impact on labour

According to data from Federation of Thai Industries, the automotive industry employed approximately 890,000 workers in 2019. The majority of them worked in the automotive parts industry (at 590,000 workers) followed by car dealers (at 200,000 workers) and workers in car manufacturing and assembly (at 100,000), excluding workers in other supporting industries.

If the TAPMA prediction that 49 parts (31 per cent) of 160 total parts used will become obsolete, affecting 816 of 2,500 manufacturers (33 per cent) when battery electric vehicles come to the market. These manufacturers currently employ 326,400 workers, or 37 per cent, in the supply chain, or almost half (47 per cent) when car dealer staff are included. And there are 183 firms in the supporting industries, which employ more than 300,000 workers who will be affected.<sup>7</sup>

According to the latest data (2018) from National Statistical Office website,<sup>8</sup> during the third quarter of 2018, there were 525,958 workers in the automotive industry. Compared with the 890,000 workers reported by TAPMA, there is a difference of 400,000 workers. This might be attributed to the fact that some manufacturers produce parts for more than one industry—the automotive industry and for electronic parts, for instance. While the NSO surveys may account for only one industry per worker, TAPMA may count all manufacturers related to the industry.

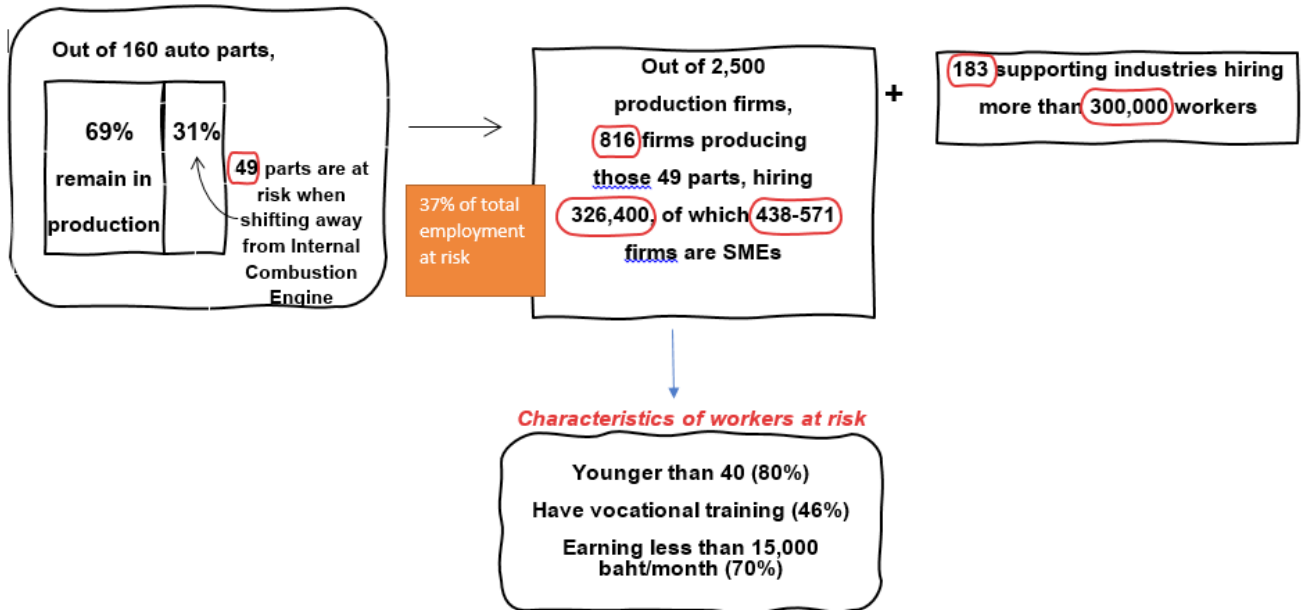
The NSO data suggest that workers who will experience the negative effects from the transition to electric vehicles are the 14,917 workers producing gears, bearings and other propulsion equipment, the 2,194 workers producing motor engines and the 208,812 workers producing other minor parts and accessories.

The majority of workers in gear, bearing, propulsion equipment and motor engine production are younger than 39 years. Workers in the age range of 30–39 years and younger than 29 years share equal representation, at 40 per cent. Nearly half of the workers (at 46 per cent) have a vocational certificate as their highest level of education, followed by high school graduates, at 42 per cent. Approximately 70 per cent of them earn no more than 15,000 Thai baht a month.

<sup>7</sup> Interview with TAPMA officers, 8 January 2019.

<sup>8</sup> See [www.nso.go.th](http://www.nso.go.th).

### Workers at risk in the auto-part production



Source: Authors' calculation based on data from the interview with TAPMA officials, 8 January 2019.

### Qualitative impact on labour

Electric vehicle production requires workers with electrical and electronic skills. Workers who specialize in motor engine and metalworking skills will be at risk of losing their job when electric vehicle takes a significant share of the automobile industry. Because electric vehicle production requires advanced technologies, unskilled and low-skilled workers will be more at risk than workers who are highly skilled and semi-skilled and able to work with these technologies. The only two activities that require low-skilled workers are car maintenance and sales. However, UBS (2017) estimated that maintenance jobs for electric vehicles will reduce by 60 per cent, compared to internal-combustion engines, so some low-skilled workers also will be greatly at risk.

Drawing on the interviews and group discussions for this research, the following highlights the various perspectives of the impact to workers in the automotive and automotive parts industries.

#### • Employers

We interviewed three employers and had a group discussion with three other employers. All of them represent large auto parts manufacturing firms.

They know that as Thailand becomes an ageing society, labour shortages are likely. The autonomous production system and other advanced technologies will replace some jobs. As a result, the proportions of labour demands will soon change. For example, demand for engineers will rise from 10 per cent to 15–20 per cent to work with the advanced technologies, while demand for technicians will increase from 30 per cent to 50 or 60 per cent. The demand for low-skilled workers will reduce from 60 per cent to a mere 20 per cent. The employers predicted that the automotive and automotive parts industry will transform products, processes and people over the next five years, particularly as the government increasingly supports the electric vehicle industry. However, the internal-combustion engine is not going to disappear from the market and will

retain approximately 30 per cent of the market share, or about equal size to the electric vehicle types.

Due to the development of electric vehicle technology, which is nascent, there are chances that other types of electric vehicles, such as the fuel cell electric vehicle, could capture the largest share of the car market rather than the battery electric vehicle. Consequently, the employers urged the government to carefully choose its policy support by taking this into account. The transition is important because its impact on the structure of the production is not only on workers and manufacturers in the industry but also on workers in other industries, such as the agriculture sector producing sugarcane, cassava, maize and palm as raw material for gasoline production.

Nevertheless, some of the employers forecasted that Thailand should not panic over the electric vehicle transition during the next 20–25 years, citing Germany as the rationale. Although the global leader of electric vehicle production, Germany is still experiencing limitations with the infrastructure for electric vehicle market, including charging stations, electric capacity and the main material for battery production—lithium. The world's lithium resources are in South America (at 60 per cent) and China (at 20–30 per cent). With Germany aiming to export electric vehicles in 2030, auto parts orders will be affected in 2027 at the earliest, agree the employers. Electric vehicle production in developing countries will follow suit 10–15 years afterward.

To summarize, the employers see that there is enough time for products, processes and people to adjust, which should start with hybrid electric and plug-in hybrid electric vehicles and, then, battery electric vehicle production. Additionally, large vehicles, such as trucks, are not able to propel using electric motors, thus some internal-combustion engines will remain in demand.

Large enterprises are more capable of adjustment than SMEs because they invest more in research and development, have longer supply chains and produce diverse product groups, so they can manage the changes in production processes more efficiently than the small and medium-sized ones. SME manufacturers might need to shift to developing markets in which the internal-combustion engine is still in heavy use. Because the

automotive and automotive parts industries are highly competitive, new car models, which are created every seven years, tend to be more energy-saving, have fewer parts, be more autonomous in the production process and require around 30 per cent fewer workers. Hence, the labour and parts required in future vehicles will reduce.

- **Government agencies**

The Board of Investment representative reported that there is an increase of investors in various types of electric vehicle production and, interestingly, investors from non-automotive industry have expressed interest in electric vehicle production. The Board of Investment expects there will be more electric vehicle manufacturers in the electric vehicle market. But the automotive industry will hire fewer workers as they integrate an autonomous system into their production process. Yet, highly skilled workers, such as engineers and technicians, will still thrive, as opposed to those low-skilled workers with secondary or lower education. Highly or semi-skilled workers who can work with, supervise or maintain an autonomous system or other advanced technologies will be in demand. The Board of Investment representative expressed concern for high training costs, which preclude employers from investing in workers' skill development. As well, training materials are limited in number and relevance; some are obsolete or no longer practical.

The Fiscal Policy Office supports electric vehicle production in Thailand by reducing the excise tax for such vehicles. Compared with the 20–25 per cent of excise tax imposed on internal-combustion engines, the excise tax on electric vehicles is at about 8 per cent and will be exempted during 2020–2022. Although the automotive and energy industries will be affected by the transition, the electronic industry will benefit and thus compensate for the losses in the other industries.

The representative from the National Science and Technology Development Agency pointed out five main components of the electric vehicle research and development: vehicle structure, energy storage, eDrive, connected technology and integrated knowledge on mobility. The transition of the automotive and auto-parts industries towards electric vehicle production will attract many new domestic and foreign manufacturers. Suppliers should collaborate with the government to develop



electric vehicle parts as the demand for internal-combustion engine car parts becomes smaller. Experts who specialize, for example, in the integration system, software application, battery design or services sharing will be in greater demand.

The Ministry of Labour operates several training centres for skills development. Working with the Federation of Thai Industries and TAPMA, the Department of Skill Development jointly established the Automotive Human Resource Development Academy especially for workers in the automotive and auto parts industries. The objective of the academy is to provide standard skill training for workers in the industry, offering more than 40 courses using modern machines and equipment supplied by the Department of Skill Development and have internship programmes with academic institutions. The Academy is thus a collaborative project between the public, private and academic sectors.

The Department of Skill Development also has training courses for entrepreneurs, such as its Professional Learning Community and Automotive Consumer Action Program to promote the autonomous system and robotics used in production processes. Vocational students can benefit from attending autonomous and robotic coding and welding courses. The Department provides the standardized test to certify some skills and information on job market and matching, labour rights, work safety, social security and work permit verification for skilled and unskilled workers.

The Ministry of Education established the Technical and Vocational Education and Training Career Center in 2017, in collaboration with the Ministry of Labour, the Board of Investment and other related agencies. The objective of the centre is to analyse, plan and develop technical and vocational education to meet the labour market demands and provide both upskilling and reskilling training in various disciplines. Across Thailand, there are 428 public and 483 private institutions providing technical and vocational education. In 2018, most of the technical and vocational students were in the modern automotive industry.

- **Academic researchers**

The price of electric cars in Thailand is currently high because there is little subsidy from the government. It will take some time for manufacturers to adjust their production. Because the export value of the automotive industry is large, if importing countries stop using the internal-combustion engine, the total export value will drop by 30–40 per cent. In turn, a significant number of workers in the automotive industry will lose their jobs.

In the automotive industry, Japan owns the core technologies used in car production, and directly purchases raw material from mines and thus can lower its cost of production. But owners of both electric vehicle core technologies and the raw material used to produce electric vehicles are China and Europe. Lithium used to produce the battery for electric vehicle is rare and found only in a few areas of the world, such as China, South America and South Africa. As a result, Japanese car manufacturers and the original equipment market will likely prolong the car life cycle before entering the electric vehicle production, starting from hybrid cars. Still, Japanese car firms continuously research and develop electric vehicle production to be ready to launch into the market when the time comes. Thailand, as a production hub of Japanese firms, should be prepared for this transition.

Changing to electric vehicle production will significantly impact engine parts, while other auto parts will not be much affected. Some work skills need to be adjusted, such as auto repair technicians must learn to work with electric motors and electricity compartments. With the cost of research and development in the automotive industry quite high, Japanese car manufacturers do not tend to transfer know-how or provide high-skill training to Thai workers. Technological development will also reduce labour-intensive work, which could encourage firms to move back home. Or there is likely potential for Japanese firms to move to other countries, such as Vietnam and India, for an even lower wage than what Thailand now offers. As a result, Thai manufacturers should research and develop battery production so that the country does not depend on Japan and to provide workers with higher wages.

If Thailand can develop workers' skills to keep up with the industry's changes, the country could be a global hub of software development for the electric vehicle industry, which would then increase employment. In the autonomous vehicle market that is still developing, Thailand should study the impact of such vehicles on the labour market, especially on taxi drivers. And there should be job training in skill sets for different business activities, for upskilling and for reskilling. In terms of academic institutions, schools should provide courses in digital technology to prepare students before entering the labour market.

- **Workers**

There are two main groups of labour unions in the automotive and auto parts industries: the Automobile Labour Congress of Thailand, which consists of 94 labour unions and 73,200 workers, and the Federation of Thailand Automobile Workers Union, with 54 unions and 40,000 workers.

The Automobile Labour Congress representative emphasized the transition towards electric vehicle in terms of the many workers who will lose their jobs, especially when the labour market has an excess supply of labour (as it does currently) and advocates retaining these workers in the industry. The Congress is coordinating with labour unions in Japan and other international labour agencies to exchange useful information and knowledge.

The most vulnerable workers are subcontract or short-term contract workers. They represent up to 60 per cent of the total labour force in a firm, including foreign workers. Some firms aim to stop employing these types of workers in five years. Also vulnerable are recent graduates about to start a job. At the moment, firms do not need more low-level jobs where new graduates will enter. Even though permanent workers have some job security, many firms have created programmes for termination. For workers aged 45 and older, there are early retirement and voluntary resignation programmes in which they can be compensated for at least 50 months, depending on the time worked for the firm in a big organization, and 20 months to none in a small organization. For workers younger than 45, there are leave days for sickness and alternative career options. Some firms have reduced their number of working days per month by six

days or have closed down the business. The reason behind the closing is unclear, whether it is the economic downturn or the emerging autonomous production systems.

The majority of firms in the automotive parts industry have no hiring plan for new workers. Instead, they are trying to reduce the number of workers. New graduates will have trouble finding a job. Some manufacturers have shifted their factory to a neighbouring country, such as moving radiator production to Cambodia. Thai workers will be relocated to work in other factories with fewer working hours. The age limit at which temporary contracts are typically offered will reduce from 35 years to 28 years. There is only a 2 per cent chance that temporary workers will be offered permanent contracts.

Some ageing workers employed in a firm for a long time would be open to early retirement if they could receive good compensation to allow them to move back to their hometown in the countryside to work in the fields and support their community, even taking part in the local government administration. They would do as planned if the compensation is high enough or higher than stated by the law. Younger workers desire to continue working with a firm or find another job at another firm due to the need to pay debt incurred when buying a house near their factory. As a result, younger workers need skills training courses to sustain the job. In a large enterprise, skills training courses are provided, as oppose to a small firm that offers nothing. In addition, government support for modern technology and machine investment means the government promotes fewer labour-intensive jobs. In this case, the government should establish a fund for helping workers who will be affected and use this fund to provide skills development training.

In addition, workers need to know their firm's business plan so that they can better plan for their personal life. Government agencies or independent institutions should inspect and verify a firm's hiring and layoff plan. On the academic side, institutions need to adjust their curriculum to better suit market needs. The Ministry of Labour should provide modern equipment and training courses in technology, job information and second-job training, such as tour guides or service jobs. Likewise, labour unions should provide useful training, such as a financial literacy course so that workers can learn how to better build up savings.

## 7. Discussions and suggestions

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A transition from the internal-combustion engine to electric vehicles is inevitable as the international community's concern over global warming intensifies. The Thai automotive industry needs to adjust to the coming change to maintain its global competitiveness in the industry. This changing transition is a product change that will affect people. As products and people are affected, the production process will also be hit due to the adoption of the robotic and autonomous system in electric vehicle production. Consequently, there will be less demand for labour in the automotive industry when robots replace unskilled and low-skilled workers.

There are four groups of workers predicted to be affected by the transition to electric vehicle use:

1. Contract or subcontract workers is the most vulnerable group because they will be laid off before permanent workers. These workers must prepare for a new job and develop their skills.
2. Non-adaptable workers are mostly aged 45 and older and poorly educated, so they will have limitations in finding a new job and developing new skills. Some large manufacturers may compensate these workers under the early retirement programme or relocate them to another production line. In the payroll system, wages cannot be reduced as workers age, so incentive compensation should be made available to workers willing to retire early to start their own small business or move back to the countryside. Savings plans and social security programmes are necessary for workers looking to work independently, especially in the informal sector. The government should provide support to this group through the provision of information centres and skills training. The government should also connect various groups in the informal sector so that they can access the job market and social safety nets, including health care. Additionally, the government should protect workers from lay-offs; court hearings and mediation processes must be accessible and equitable; and tax exemptions or reduced taxation on compensation paid from early retirement programmes should be offered.
3. Adaptable workers younger than 45 will need to be reskilled or upskilled and provided access to job information. They will need to learn about risk

assessment to better plan for their personal and professional lives.

4. Graduates of a vocational school or university who are looking for a job in the industry will have difficulty. Government and academic institutions must offer modern technology courses to increase their hiring chance because firms already tend to hire fewer high school or lower graduates and are more interested in technicians and engineers.

The transition will also lead to positive impacts on employment. Parts used in the electric vehicle production, such as battery and lightweight materials, will be manufactured in place of the obsolete internal-combustion engine parts. Future vehicles will use smart sensors, maps and navigation systems, electronic devices, software and media content. This in turn will increase the labour demand (though overall there may be fewer workers). And new businesses will be created, such as ride-sharing services and charging services or charging stations.

The net effect is still unclear in terms of whether the transition towards electric vehicle will have more positive or more negative impact on the labour market. If workers are forced to move to another industry, they will not be able to instantly compete because they will need time to adjust. Some employers contend that workers aged 45 and older likely will find it harder to adapt to new skills in the new industry. Newly created jobs might not be decent jobs. They may be dangerous, low-wage and lower-status jobs with fewer employment benefits.

Social protection, job protection and plans to support workers who are at risk of losing jobs so they can adapt to new skills and secure income is the core of the just transition principle. Policies targeting unemployed and vulnerable workers should be emphasized, such as the provision for financial assistance, skills training courses and information for demand and supply matching. The government could support small and medium-sized manufacturers to adjust their production processes to stay competitive or move to another similar industry. Government should also consider supporting communities where workers live. When workers are affected and forced to move out of an area, the communities will be affected.

With these concerns and predictions in mind, the following suggestions speak to employers in the automotive and automotive parts industries, labour unions and the government in Thailand.

### Employers

1. Create human resource and technology development plans together with labour unions.
2. Collaborate with labour unions to provide skill development programmes within a firm, for both upskilling and reskilling and support for the training budget.
3. Allow workers to participate in skills development programmes during work hours.
4. Small and medium-sized manufacturers should develop motors and parts for future vehicles by collaborating with government agencies, such as the Thailand Automotive Institute, the Ministry of Industry and the Ministry of Higher Education, Science, Research and Innovation.

Automotive workers unions and labour unions

1. Publish and circulate research work relating to the automotive and auto parts industry that will benefit workers and set up information centres.
2. Create a working plan, set up a working group and report to a committee of automotive works unions every month.
3. Work with employers in providing skill development programmes, both upskilling and reskilling, and develop a pilot project in a firm as a model for other firms.
4. Arrange meetings with related parties, such as academics, policy-makers, government agency personnel, employers and even workers to exchange information and opinions on what each should do to minimize the negative impacts of industry transition and so that each has a stake in policy-making.
5. Connect with labour unions in other countries to share lessons and experiences.

### Government

1. Set up a committee to assess the situation and impact on the structural change due to technology and global warming and provide policy recommendations that are just for all parties (employees, workers, government, academia and the general public). It could be called the Committee on Growth, Structural Change and Employment, but it should aim to support development that is sustainable and just.
2. Set up a special working group to contribute towards the management of human resources (covering skills development, job allocations and, if need be, reduction of a workforce). This working group should be an independent entity with its own structure and payroll system. A budget should be supported by the Skill Development Fund, which would collect fees from employers who do not provide skills training or partially do so. In addition, set up a fund to ensure a just transition by collecting environment-impact taxes from polluters, according to the polluter-pays principle.
3. The Ministry of Labour should develop a system to protect temporary workers and workers in the informal sector because their numbers tend to increase but they lack support from the government.
4. Support academic institutions to develop curriculums for skills needed in the labour market.
5. Consider further study of this research project by collecting more data from employees, such as asking about the enterprise size, type of parts produced and workers' profile (age, income, skills used, etc.). Interview firms about their business plans and human resources management towards future vehicles to study the risk assessment and seek direction when imposing policies.

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## About the author:



**Kiriya Kulkolkarn** is an Associate Professor at the Faculty of Economics at Thammasat University in Bangkok, Thailand where she is currently teaching Development Economics. On top of her BA and Mcom in Economics, she holds a Ph.D. in Agricultural and Applied Economics from the University of Wisconsin-Madison.

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Thanapoom Tower, 23rd Floor  
1550 New Petchburi Road, Makkasan, Ratchathewi,  
Bangkok 10400  
Thailand

Responsible:

**Vesna Rodic** | Resident Representative

Phone: +66 2652 7178-9

Fax: +66 2652 7180

Website: [www.fes-thailand.org](http://www.fes-thailand.org)

Facebook: Friedrich-Ebert-Stiftung Thailand

To order publication:

[info@fes-thailand.org](mailto:info@fes-thailand.org)

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