Impacts of producing electrically driven vehicles on Japan industrial output

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Abstract

The gradual adoption of electrically driven vehicles could contribute to reduced greenhouse gas emissions as targeted under the provisions of the agreement established at the 21st Session of the Conference of the Parties to the United Nations (UN) Framework Convention on Climate Change. However, the distinct body structures of internal combustion engine (ICE) vehicles and electrically driven vehicles indicate that producing the latter could create different impacts on industrial output, which potentially raises concerns considering the prominence of the automotive industry in the Japanese economy. To evaluate these impacts, we employed the Leontief production model to produce two sensitive simulations of producing electrically driven vehicles rather than ICE vehicles. We first estimated the sectoral classification of electrically driven vehicles, including hybrid vehicles (HV), plug-in hybrid vehicles (PHV), and battery electric vehicles (BEV) on the input–output tables published by the Japanese government, applied the inputs of electrical component parts to corresponding structures in each sector, and rendered ICEs irrelevant in the BEV sector. In the resulting simulations, the assumption of case 1 was that the production rates of electrically driven vehicles increased from 20% to 70%, and all relevant electrical machineries were produced in Japan. In case 2, the assumed production rate was the same; however, the electrical machineries for electrically driven vehicles were all imported. The results of case 1 showed a total output increase of 1.1 trillion yen and a total electricity demand increase of 130 million kWh, whereas in case 2, the total output decreased by 4.9 trillion yen and total electricity demand decreased by 57.6 billion kWh. These results indicate that the positive and negative impacts of producing electrically driven rather than ICE vehicles on Japanese industrial output mainly depend on whether the suppliers of electrical machineries with electric vehicles are sourced in Japan or overseas.

Keywords: electrically driven vehicles, Leontief production model, sensitive simulations

1 Introduction

Electrically driven vehicles could be gradually adopted to reduce greenhouse gas emissions as targeted under the provisions of the agreement adopted in the 21st Session of the Conference of the Parties to the United Nations (UN) Framework Convention on Climate Change (COP21). The Japanese government advocates the long-term goal of producing only electric vehicles by 2050. However, due to the distinct body structures of internal combustion engine (ICE) vehicles and electrically driven vehicles, replacing the former with the latter could create different impacts on industrial output, which potentially raises a national concern considering the critical importance of the automotive industry to the Japanese economy.

Accordingly, this study evaluated the impacts of producing electrically driven rather than ICE vehicles by employing the Leontief production model. Sectors related to electrically driven vehicles are included in the "Transportation Machinery Sector" in the input–output table published by the Japanese government. As such, before evaluating impacts, we estimated the sectoral classification of electrically driven vehicles, including hybrid vehicles (HV), plug-in hybrid vehicles (PHV), and battery electric vehicles (BEV) on the input–output table. Then, we conducted two sensitivity simulations by employing the Leontief production model.

A review by Winebrake et al. (2017) focused on the economic and employment impacts of adopting plug-in hybrid vehicles. Most of the studies included in that review evaluated the economic impacts of converting energy sources from gasoline to electricity with the use of plug-in hybrids rather than ICE vehicles, and the authors concluded that the transition from gasoline to electricity brings positive effects to economic and job growth. Kimura's (2019) evaluation of the impacts of producing future cars on Chubu area in Japan by the year 2030 employed an input–output model based on the interregional Chubu area input–output table for 2010. The results showed that the positive impacts of producing parts for electric cars would be greater than the negative consequences of decreasing the production and use of internal combustion engines.

Similar to Kimura (2019), we evaluated the impacts of producing electrically driven vehicles on Japanese industrial output; however, this study was conducted using updated information. Moreover, we used sensitivity simulations to evaluate impacts on Japanese industrial output according to whether the suppliers of electrical machineries with electric vehicles produced the components in Japan or overseas.

2 Estimating the sectoral classification of electrically driven vehicles

This section introduces the estimation method we applied to individual vehicle sectors, including ICE, HV, PHV, and BEV, based on the System of National Accounts input–output (SNA-IO) table for 2016 published by the corresponding Japanese cabinet offices[2]. Individual vehicle sectors were estimated based on the input and demand structures of the passenger motor car sector, which is not published on SNA-IO. Therefore, we employed RAS method to estimate the sectoral classification of this sector based on the industrial structure of the input–output table for 2014 published by the Ministry of Economy, Trade, and Industry of Japan. The transportation sector on SNA-IO was then classified into three sectors, namely, the passenger motor cars sector, miscellaneous cars sector, and motor vehicle parts and accessories sector.

We estimated the sectoral classification of electrically driven vehicles according to Kimura (2019). First, we estimated the input structure per vehicle by increasing and decreasing the value of parts relative to the passenger motor car sector. Then, the total input structure of each electrically driven vehicle sector was calculated by multiplying each vehicle's input structure by each production volume. The number of individual parts estimated for each vehicle type was based on the body constructions of the Toyota Prius (HV), Toyota Prius PHV, and Nissan Leaf (BEV), and the unit values were derived from Fuji Keizai (2017a, 2017b).

Table 1 shows the main component parts for each electrically driven vehicle. All of the

Table1. Main component parts equipped with each electrically driven vehicle

Sector	Parts	HV		PHV		BEV	
		Volume	Value	Volume	Value	Volume	Value
Electrical machinery	Electric Motor	2	7.40	2	7.40	1	4.00
	Power Control Unit						
	Inverter	2	4.97	2	4.97	1	2.56
	Current Sensor of Inverter	4	0.32	4	0.32	2	0.16
	DC-DC Converter	1	0.80	1	0.90	1	0.90
	Reactor	1	0.50	1	0.62	-	-
	Smoothing Capacitor	1	0.45	1	0.45	1	0.45
	Rechargeable Battery						
	Nickel-Metal Hydride battery	(1.3)	9.70	-	-	-	-
	Lithium-Ion Battery	-	-	(4.4)	23.20	(24.0)	76.81
	On-Board Charger	-	-	1	6.00	1	6.00
	Charging Cable	-	-	1	5.00	1	5.00
	Subtotal	-	24.14	-	48.86	-	95.88
Motor vehicle parts and accessories	Engine Parts etc	-	-	-	-	-	-25.44
Total		-	24.14	-	48.86	-	70.44

Note (1) ICE = internal combustion engine vehicle, HV = hybrid vehicle, PHV = plug-in hybrid vehicle, and BEV = battery electric vehicle. Unit prices are in tens of thousands of yen. Numbers in parentheses indicate battery capacity.
Note (2) The number of individual parts is based on figures for the Toyota Prius (HV), the Toyota Prius PHV, and the Nissan Leaf (BEV).

[2] Sectoral classification of all sectors refers to Appendix A.

electrically driven vehicles are equipped with a power control unit and a rechargeable battery; however, the types and number of component parts vary according to the vehicle. Specifically, HV and PHV use two different power sources, namely, an ICE and an electric motor, whereas the BEV only uses an electric motor. Both the PHV and BEV have an onboard charger and a charging cable to charge from outside, components that the HV lacks.

We reflected the component parts of each vehicle type to distinct input structures. The electrical components of each electrically driven vehicle belong to the electrical machinery sector of the SNA-IO, whereas the ICE was classified into the motor vehicle parts and accessories sector. We particularly focused on the input structure of the BEV sector due to that vehicle's exclusion of the ICE, which results in 37% fewer parts than for vehicles equipped with that component (Commission of Fabricated Material Industry, 2010). In this study, we converted quantity-based into yen-based values in conjunction with data from automobile part shipments. As a result, the input from the "motor vehicle parts and accessories sector" in producing BEV is reduced by 32%.

Table 2 presents the input structure per vehicle for each vehicle type along with the resulting output values. In addition to the vehicles listed above, we added data for the Toyota Allion (ICE) passenger motor car because the Prius HV and Prius PHV may be manufactured with similar parts. We used the commercial and transportation margin rates (18.8%) to convert the values from purchase price-based to producer price-based, and the value-added per vehicle was estimated by subtracting the total inputs from the output values.

The total input structure of each electrically driven vehicle sector was finally estimated by

Table 2. Input structure per vehicle

per vehicle (Ten thousand yen)		Passenger motors cars	HV	PHV	BEV
Total input		121.0	145.2	169.9	191.5
Electrical machinery		5.7	29.9	54.6	101.6
Motor vehicle parts and accessories		79.8	79.8	79.8	54.3
Value added		42.0	56.2	69.4	36.4
Value added rate	(%)	25.8	27.9	29.0	16.0
Output		163.0	201.4	239.3	227.8

Note (1) HV = hybrid vehicle, PHV = plug-in hybrid vehicle, and BEV = battery electric vehicle. Unit price is in tens of thousands of yen. Values in parentheses indicate battery capacities.
Note (2) Outputs per vehicle were calculated for the Toyota Allion (passenger motor car) Toyota Prius (HV), Toyota Prius PHV, and Nissan Leaf (BEV).

multiplying the input structure per vehicle by its production volume[3]. In order to match the total amount of each vehicle sector to that of the passenger motor car sector, the ICE sector was treated as an adjusted term.

Moreover the intermediate demands of vehicles are zero because producers do not input vehicles to produce final goods. And the final demand items are divided proportionally by the rate of the total. Table 3 presents the final demand items for each vehicle.

Table 3. Production and final demand items (2016)

	Total	ICE	HV	PHV	BEV
Production	787.4	626.8	155.4	2.9	2.1
	(100.0)	(79.6)	(19.7)	(0.4)	(0.3)
Domestic demand	414.6	287.2	124.9	0.9	1.6
	(100.0)	(69.3)	(30.1)	(0.2)	(0.4)
Export	411.8	376.8	32.0	2.4	0.6
	(100.0)	(91.5)	(7.8)	(0.6)	(0.1)
Import	32.8	32.2	0.1	0.4	0.0
	(100.0)	(98.2)	(0.5)	(1.2)	(0.1)

Note: ICE = internal combustion engine vehicle, HV = hybrid vehicle, PHV = plug-in hybrid vehicle, and BEV = battery electric vehicle. Unit prices are in tens of thousands, and items in parentheses indicate the rate of the total.

3 Evaluating the impacts of producing electrically driven vehicles

3.1 Applying the Leontief production model

In this section, we introduce the Leontief production model, which was employed due to its ability to measure the impacts of vehicle production on Japanese industrial output. The model is expressed as follows:

$$\sum_{i}^{n} Y_i = [I-(I-M)A]^{-1} \sum_{i}^{n} F_i \qquad (1)$$

$$i = ICE, HV, PHV, BEV$$

where i represents the type of vehicle, namely, ICE, HV, PHV, and BEV; Y_i denotes the output vector upon demands by vehicle i; F_i is the final demand vector of vehicle i; I represents the identity matrix; M denotes the matrix of import coefficients; and A is the matrix of input coefficients.

3 For details of production volume, see Table 3.

3.2 Assumptions

This study created two sensitive simulations for evaluating the impacts of producing electrically driven vehicles instead of ICE on Japanese industrial output. In these simulations, the production and import rates of electrically driven vehicle components were assumed based on their actual values in 2016[5]. Therefore, we did not adjust input coefficients due to process and product innovation.

Tables 4 and 5 list the assumptions. In case 1, similar to the long-term goal for 2030 advocated by the Japanese government, the production rates of electrically driven vehicles increase from 20% to 70%, such that HV production increases from 20% to 40% and BEV production increases from 0.3% to 30%. All electrical machineries for the electrically driven vehicles are produced in Japan. Conversely, in case 2, although the production rates are the same as for case 1, all electrical components are imported.

Table 4. Assumptions of sensitive simulations (1)

	Base (2016)	Case1	Case2
Production Rate of electricallydriven vehicle	20%	70%	70%
Import rate of electrical machineries with electricallydriven vehicle	0%	0%	100%

Note: Electrical machinery with electrically driven vehicles includes an electric motor, PCU, and rechargeable battery, among others.

Table 5 Assumptions of sensitive simulations (2)

	Base (2016)	Simulation Case (Case1&Case2)	Difference
Total	787.4	787.4	0.0
	(100.0)	(100.0)	(0.0)
ICE	626.8	233.1	-393.7
	(79.6)	(29.6)	(-50.0)
HV	155.4	315.0	159.5
	(19.7)	(40.0)	(20.3)
PHV	2.9	2.9	0.0
	(0.4)	(0.4)	(0.0)
BEV	2.1	236.2	234.2
	(0.3)	(30.0)	(29.7)

Note: HV = hybrid vehicle, PHV = plug-in hybrid vehicle, and BEV = battery electric vehicle. Vehicle volumes are listed in tens of thousands, and items in parentheses indicate the production rate.

[5] Electrical machineries of electrically driven vehicles include an electric motor, PCU, rechargeable battery, onboard charger, and charging cable.

4 Results and Discussion

Figure 1 illustrates the different impacts on Japanese industrial output based on the base case and simulation cases of increased production of electrically driven vehicles rather than ICE. Note that these sensitive simulations also evaluate the impacts of downsizing vehicles due to differences between the output per vehicle for basic electrically driven vehicles and those according to the SNA-IO table[6].

In case 1, impacts on Japanese industrial output are slightly increased by 1.1 trillion yen (rate of difference: 2.8%) compared with the base case. The decreasing factor is the motor vehicle parts and accessories sector due to substituting BEV for ICE, which eliminates the need for components related to the latter, whereas the increasing factor is the electrical machinery sector, which produces the main parts for electrically driven vehicles.

Conversely, in case 2, overall impacts are decreased by 4.9 trillion yen (rate of difference: 11.7%). As in case 1, the motor vehicle parts and accessories sector is a decreasing factor; however, in addition, the impacts of producing electrical machineries with electrically driven vehicles occur abroad because they are imported. For details on the impacts on individual industries, refer to Appendix2.

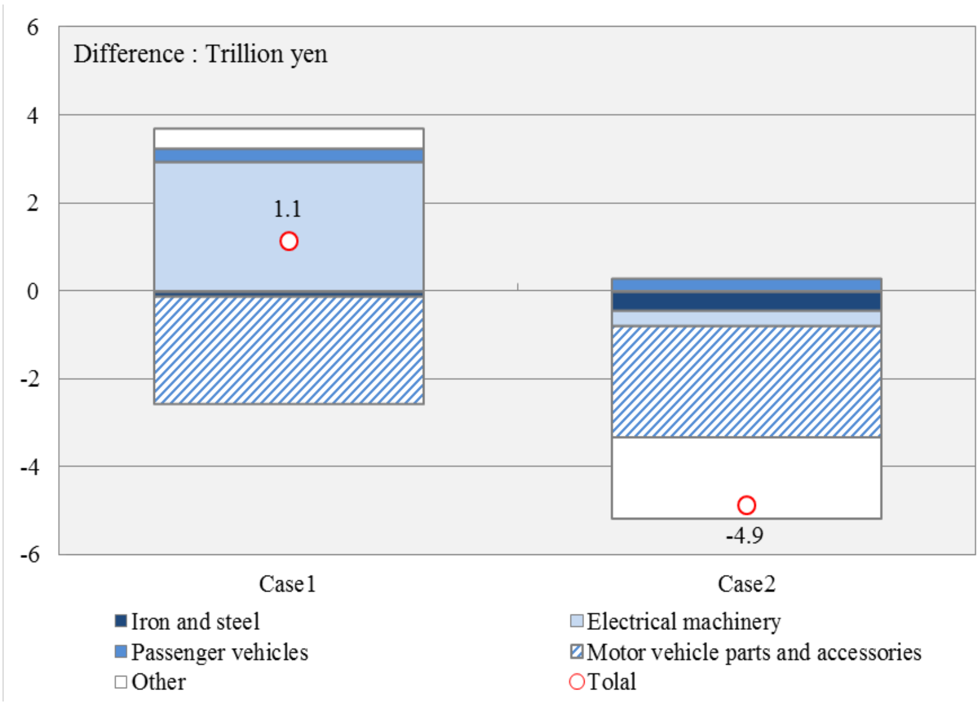

Figure 1. Impacts on Japanese industrial output

Note: The “Other” category aggregates the ICE sector, HV sector, PHV sector, and BEV sector. “Other” includes sectors other than the iron and steel sector, electrical machinery sector, passenger vehicle sector, and motor vehicle parts and accessories sector.

[6] The output per vehicle of the ICE sector is 2.1 million yen, that of the HV sector is 2.0 million yen, that of the BEV sector is 2.3 million yen, and that of the basic electrically driven vehicle is 1.6 million yen.

Figure 2 shows the different impacts on electrical input from producing intermediate goods between the base case and the simulation cases based on increased production of electrically driven vehicles rather than ICE. Because the input–output table in this paper is yen-based, we converted the impacts on electricity input to be quantity-based by using the corporate electricity unit price (14.0 yen/kWh).

The electric impacts of all industries in the base case were 307.5 billion kWh. In case 1, the impacts on electrical input are slightly increased by 1.3 billion kWh (rate of difference: 0.4%) compared with the base case. Specifically, as before, the motor vehicle parts and accessories sector is still a decreasing factor, and the main increasing factor is the electrical machinery sector. Conversely, in Case 2, impacts are decreased by 57.9 billion kWh (rate of difference: 18.7%). As in case 1, motor vehicle parts and accessories sector is a decreasing factor; however, in addition, the producers do not use electricity to produce electrical machineries with electrically driven vehicles because the components are imported. For further details of the impacts on individual industries, refer to Appendix 3.

Therefore, increasing electrically driven vehicle production results in both positive and negative impacts on Japanese industrial output and electrical input; however the specific impacts mainly depend on whether the suppliers of the relevant electrical machinery produce them in Japan or overseas.

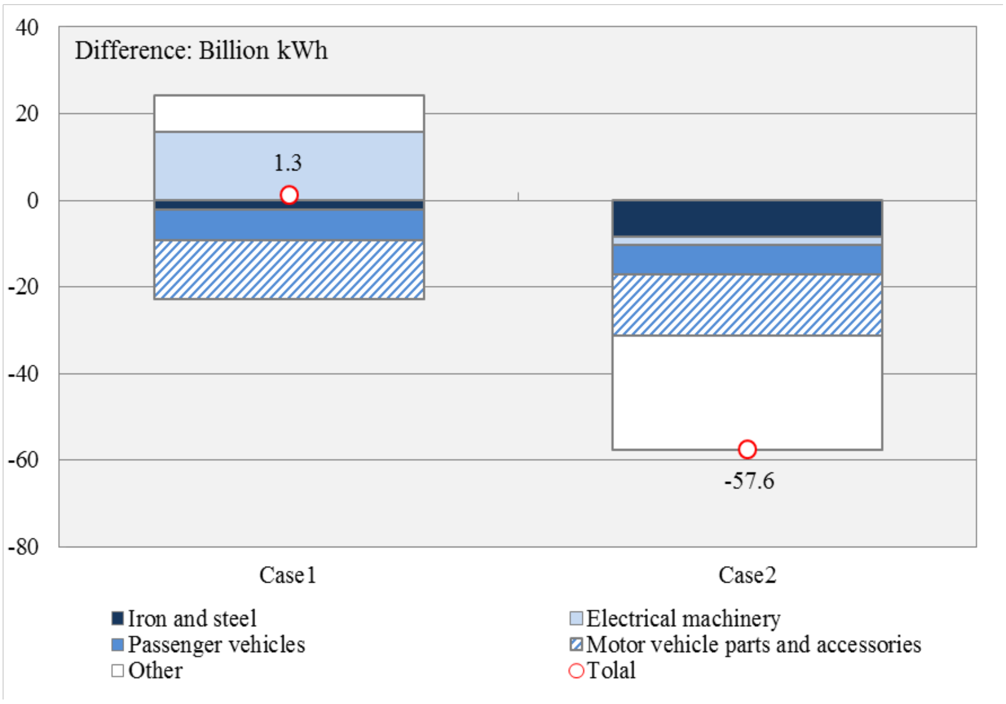

Figure 2. Different impacts on electrical input

Note: “Other” category aggregates the ICE sector, HV sector, PHV sector, and BEV sector. “Other” represents aggregated sectors other than the iron and steel sector, electrical machinery sector, passenger vehicle sector, and motor vehicle parts and accessories sector.

5 Conclusion

This study employed the Leontief production model which examined the impacts of increasing the production of electrically driven vehicles rather than internal combustion engine vehicles on Japanese industrial output. To do so, we first estimated the sectoral classification of electrically driven vehicles, including HV, PHV, and BEV on the input–output table published by the corresponding cabinet offices of the Japanese government. In sensitive simulations of increasing the production of electrically driven vehicles rather than ICE, the total impacts on Japanese industrial output increased by 1.1 trillion yen in case of producing the component electrical machineries in Japan, whereas the impacts decreased by 4.9 trillion yen when electrical component items were produced overseas. As a result, it can be concluded that the impacts of increasing the production of electrically driven vehicles mainly depend on whether the suppliers of the component electrical machineries produce them in Japan or overseas.

In future research, we will analyze the impact of changing demand structures on Japanese industrial output. Giesel and Nobis (2016) showed that station-based and free-floating carsharing leads to a reduction of private cars by nearly 10% based on online surveys. In order to evaluate the overall impacts of adopting electrically driven vehicles on Japanese industrial output, we will need to analyze the effects of changing demand structure due to carsharing services.

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Appendix 1. Sectoral classification

	Sector
1	Agriculture, forestry and fishery
2	Mining
3	Beverages and Foods
4	Textile products
5	Pulp, paper and wooden products
6	Chemical products
7	Petroleum and coal products
8	Ceramic, stone and clay products
9	Iron and steel
10	Non-ferrous metals
11	General-purpose, production and business oriented machinery machine
12	Electronic components
13	Electrical machinery
14	Information and communication electronics equipment
15	Internal combustion engine vehicle
16	Hybrid vehicle
17	Plug-in hybrid vehicle
18	Battery electric vehicle
19	Miscellaneous cars
20	Motor vehicle parts and accessories
21	Miscellaneous transportation equipment and repair of transportation equipment
22	Miscellaneous manufacturing products
23	Electricity
24	Gas and heat supply
25	Water supply
26	Construction
27	Commerce
28	Transport and postal services
29	Public administration
30	Information and communications
31	Finance and insurance
32	Real estate
33	Professional, science, technology and business support services industry
34	Public administration
35	Education
36	Medical, health care and welfare
37	Activities not elsewhere classified

Appendix 2. Impacts on electrical output

	2016			Difference		Rate of difference	
	BASE	CASE1	CASE2	CASE1	CASE2	CASE1	CASE2
	Trillion yen	Trillion yen	Trillion yen	Trillion yen	Trillion yen	%	%
1 Agriculture, forestry and fishery	0.06	0.06	0.05	0.00	-0.01	1.75	-18.01
2 Mining	0.02	0.02	0.02	0.00	0.00	1.59	-18.83
3 Beverages and Foods	0.10	0.10	0.08	0.00	-0.02	3.15	-17.97
4 Textile products	0.05	0.05	0.04	0.00	-0.01	0.84	-16.79
5 Pulp, paper and wooden products	0.15	0.17	0.12	0.02	-0.03	13.73	-19.70
6 Chemical products	0.46	0.47	0.38	0.01	-0.09	1.12	-18.75
7 Petroleum and coal products	0.20	0.20	0.16	0.00	-0.04	-1.11	-18.41
8 Ceramic, stone and clay products	0.26	0.26	0.22	0.01	-0.04	2.78	-16.24
9 Iron and steel	2.48	2.36	2.03	-0.12	-0.45	-4.85	-17.96
10 Non-ferrous metals	0.62	0.70	0.49	0.08	-0.13	12.16	-20.93
11 General-purpose, production and business oriented machinery machine	0.28	0.31	0.22	0.03	-0.06	9.04	-21.29
12 Electronic components	0.33	0.66	0.24	0.32	-0.09	97.43	-26.67
13 Electrical machinery	0.89	3.82	0.54	2.93	-0.35	329.51	-39.75
14 Information and communication electronics equipment	0.07	0.06	0.06	-0.01	-0.01	-11.87	-13.89
15 Internal combustion engine vehicle	13.13	4.88	4.88	-8.25	-8.25	-62.81	-62.81
16 Hybrid Vehicle	3.13	6.34	6.34	3.21	3.21	102.59	102.59
17 Plug-in hybrid vehicle	0.07	0.07	0.07	0.00	0.00	0.00	0.00
18 Battery electric vehicle	0.05	5.38	5.38	5.33	5.33	11,363.62	11,363.62
19 Miscellaneous cars	0.00	0.00	0.00	0.00	0.00	2.36	-18.62
20 Motor vehicle parts and accessories	11.86	9.42	9.36	-2.44	-2.50	-20.58	-21.09
21 Miscellaneous transportation equipment and repair of transportation equipment	0.04	0.04	0.04	0.00	-0.01	-4.24	-17.04
22 Miscellaneous manufacturing products	1.57	1.57	1.29	0.00	-0.28	-0.25	-17.88
23 Electricity	0.43	0.43	0.35	0.00	-0.08	0.42	-18.71
24 Gas and heat supply	0.08	0.08	0.07	0.00	-0.02	-4.07	-18.66
25 Water supply	0.07	0.07	0.06	0.00	-0.01	2.28	-18.20
26 Construction	0.18	0.19	0.14	0.01	-0.03	5.28	-18.88
27 Commerce	1.47	1.47	1.19	0.00	-0.28	0.12	-18.99
28 Transport and postal services	0.74	0.73	0.61	-0.01	-0.13	-1.34	-17.71
29 Public administration	0.23	0.24	0.19	0.01	-0.04	3.69	-17.90
30 Information and communications	0.46	0.48	0.38	0.02	-0.09	4.21	-18.46
31 Finance and insurance	0.25	0.25	0.21	0.00	-0.05	-0.06	-17.91
32 Real estate	0.18	0.18	0.15	0.00	-0.03	1.07	-17.79
33 Professional, science, technology and business support services industry	1.19	1.18	0.98	-0.01	-0.21	-1.13	-17.90
34 Public administration	0.01	0.01	0.01	0.00	0.00	2.72	-18.46
35 Education	0.02	0.02	0.01	0.00	0.00	19.32	-19.83
36 Medical, health care and welfare	0.02	0.02	0.02	0.00	0.00	2.96	-18.04
37 Activities not elsewhere classified	0.43	0.44	0.35	0.01	-0.08	2.35	-18.62
Total	41.58	42.73	36.71	1.14	-4.87	2.75	-11.72

Appendix 3. Impacts on electrical input

	2016 BASE	CASE1	CASE2	Difference CASE1	Difference CASE2	Rate of deviation CASE1	Rate of deviation CASE2
	Billion kWh	Billion kWh	Billion kWh	Billion kWh	Billion kWh	%	%
1 Agriculture, forestry and fishery	0.47	0.48	0.39	0.01	-0.08	1.75	-18.01
2 Mining	0.55	0.56	0.44	0.01	-0.10	1.59	-18.83
3 Beverages and Foods	0.74	0.77	0.61	0.02	-0.13	3.15	-17.97
4 Textile products	0.74	0.74	0.61	0.01	-0.12	0.84	-16.79
5 Pulp, paper and wooden products	5.48	6.23	4.40	0.75	-1.08	13.73	-19.70
6 Chemical products	8.53	8.62	6.93	0.10	-1.60	1.12	-18.75
7 Petroleum and coal products	1.34	1.33	1.10	-0.01	-0.25	-1.11	-18.41
8 Ceramic, stone and clay products	8.13	8.35	6.81	0.23	-1.32	2.78	-16.24
9 Iron and steel	46.77	44.50	38.37	-2.27	-8.40	-4.85	-17.96
10 Non-ferrous metals	13.85	15.54	10.95	1.68	-2.90	12.16	-20.93
11 General-purpose, production and business oriented machinery machine	1.43	1.55	1.12	0.13	-0.30	9.04	-21.29
12 Electronic components	5.22	10.30	3.83	5.08	-1.39	97.43	-26.67
13 Electrical machinery	4.80	20.60	2.89	15.81	-1.91	329.51	-39.75
14 Information and communication electronics equipment	0.27	0.24	0.23	-0.03	-0.04	-11.87	-13.89
15 Internal combustion engine vehicle	42.33	15.74	15.74	-26.59	-26.59	-62.81	-62.81
16 Hybrid Vehicle	7.79	15.79	15.79	7.99	7.99	102.59	102.59
17 Plug-in hybrid vehicle	0.14	0.14	0.14	0.00	0.00	0.00	0.00
18 Battery electric vehicle	0.10	11.84	11.84	11.74	11.74	11,363.62	11,363.62
19 Miscellaneous cars	0.00	0.00	0.00	0.00	0.00	2.36	-18.62
20 Motor vehicle parts and accessories	66.59	52.89	52.55	-13.71	-14.04	-20.58	-21.09
21 Miscellaneous transportation equipment and repair of transportation equipment	0.31	0.30	0.26	-0.01	-0.05	-4.24	-17.04
22 Miscellaneous manufacturing products	15.41	15.37	12.65	-0.04	-2.75	-0.25	-17.88
23 Electricity	39.35	39.51	31.99	0.16	-7.36	0.42	-18.71
24 Gas and heat supply	0.98	0.94	0.80	-0.04	-0.18	-4.07	-18.66
25 Water supply	2.18	2.23	1.78	0.05	-0.40	2.28	-18.20
26 Construction	0.44	0.46	0.36	0.02	-0.08	5.28	-18.88
27 Commerce	12.52	12.54	10.14	0.02	-2.38	0.12	-18.99
28 Transport and postal services	5.66	5.59	4.66	-0.08	-1.00	-1.34	-17.71
29 Public administration	2.50	2.60	2.06	0.09	-0.45	3.69	-17.90
30 Information and communications	1.62	1.69	1.32	0.07	-0.30	4.21	-18.46
31 Finance and insurance	0.53	0.53	0.44	0.00	-0.10	-0.06	-17.91
32 Real estate	0.57	0.57	0.47	0.01	-0.10	1.07	-17.79
33 Professional, science, technology and business support services industry	5.20	5.14	4.27	-0.06	-0.93	-1.13	-17.90
34 Public administration	0.06	0.06	0.05	0.00	-0.01	2.72	-18.46
35 Education	0.18	0.22	0.15	0.04	-0.04	19.32	-19.83
36 Medical, health care and welfare	0.12	0.12	0.09	0.00	-0.02	2.96	-18.04
37 Activities not elsewhere classified	4.65	4.76	3.78	0.11	-0.87	2.35	-18.62
Total	307.55	308.84	250.00	1.29	-57.55	0.42	-18.71