

Market analysis of heavy-duty vehicles in India for fiscal years 2019–20 and 2020–21

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Keywords: Bharat Stage (BS) VI, fuel efficiency, heavy-duty vehicles (HDV), tailpipe emissions, market trends, HDV sales

Introduction

The heavy-duty vehicle (HDV) sector in India recently saw some big technology changes as it adapted to meet Bharat Stage (BS) VI emission standards. Starting April 1, 2020, manufacturers are only allowed to sell new BS VI vehicles. This paper analyzes the first fiscal year (FY) 2020–21 of BS VI sales and the last year of BS IV sales, FY 2019–20, and compares these to our previous analysis of FY 2017–18, the first year of sale for BS IV vehicles in India.

Market analyses by vehicle segment, weight category, manufacturer, and engine size are all needed to optimize emission standards and testing requirements. In India, these are largely adopted from Euro standards to fit the Indian landscape, and that was the case with the BS VI regulations.

The sales data referenced in this paper was acquired from Segment Y Automotive Intelligence. In FY 2019–20, total domestic sales of commercial vehicles greater than 3.5 tonnes, which are “HDVs” in this paper, was nearly 306,000, and it was approximately 203,000 for FY 2020–21. Note that, starting in early 2020, most commercial activities were affected globally, including in India, due to the COVID-19 pandemic; this no doubt impacted FY 2020–21 sales. Between FY 2017–18 and FY 2019–20, sales decreased by 32%, and they decreased another 33% between FY 2019–20 and FY 2020–21. This marks a 65% cumulative decrease from FY 2017–18.

BREAKDOWNS BY MANUFACTURER MARKET SHARE AND GROSS VEHICLE WEIGHT

Figures 1 and 2 summarize manufacturers’ market shares for HDV sales in India for the two analyzed years. Tata Motors led with 46.5% of the market in FY 2019–20 and 49.42% in FY 2020–21. This continued the lead it had in previous years (Sharpe & Sathiamoorthy,

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This publication is part of NDC Transport Initiative for Asia (NDC-TIA). NDC-TIA is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports the initiative on the basis of a decision adopted by the German Bundestag. For more visit: <https://www.ndctransportinitiativeforasia.org/>.

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2019; Sharpe, 2015) and it still holds more than twice the market share of the second largest shareholder, Ashok Leyland. Ashok Leyland lost 1.8% market share between FY 2017-18 and FY 2019-20, but still held nearly a quarter of the market in FY 2019-20. It lost another 3.8% in FY 2020-21, and that year it had a 20.6% market share.

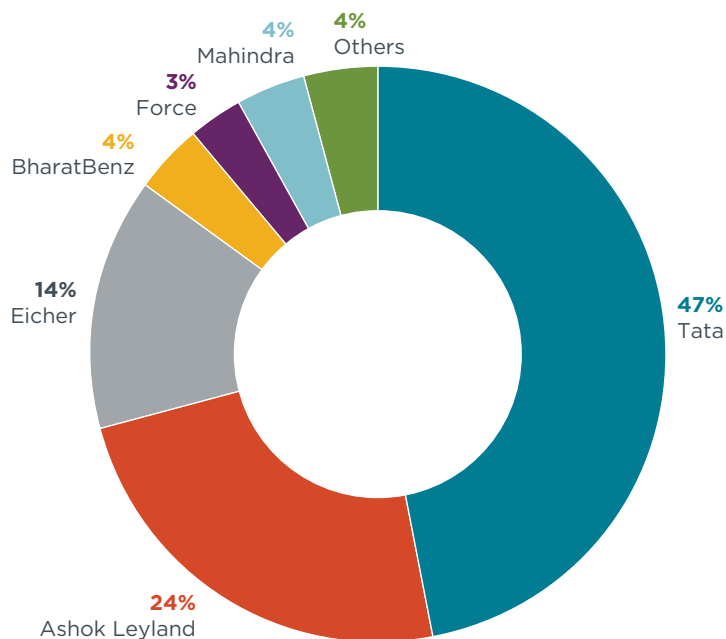


Figure 1. FY 2019-20 manufacturers' market shares for new HDV sales.

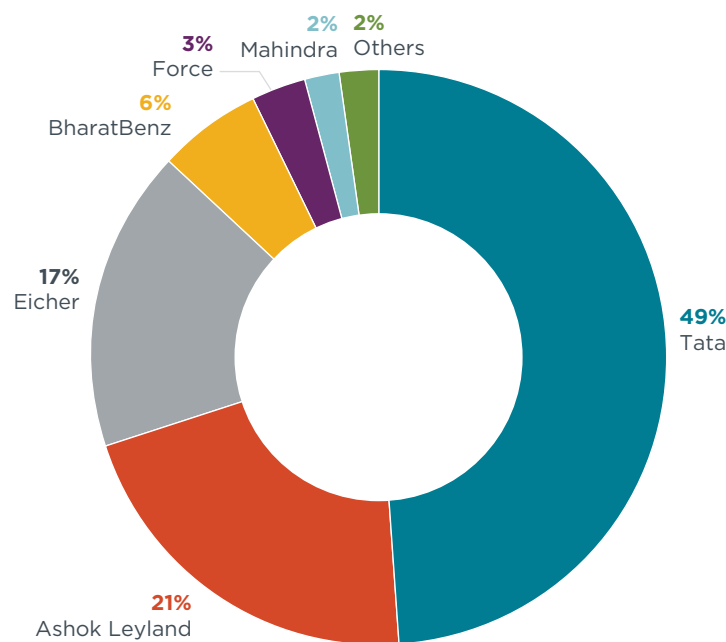


Figure 2. FY 2020-21 manufacturers' market shares for new HDV sales.

Eicher Motors (previously known as VECV) is the only other company with a double-digit market share, with 14% in FY 2019-20 and 17% in in FY 2019-21. Like Tata, it made 1% and 3% gains, respectively, in market share in FY 2019-20 and FY 2020-21. The next largest market shares are held by BharatBenz (Daimler India), Mahindra, and Force Motors, which each represent between 2% and 6% of sales. "Other" manufacturers include SML Isuzu, Volvo Trucks and Buses, JBM, Scania, and Mercedes.

In Figures 3 and 4, the inner rings represent the market share breakdowns for buses and the outer rings are for trucks. The top-selling manufacturers for trucks match the rankings for overall sales of trucks and buses combined, and Tata, Ashok Leyland, and

Eicher were the three top-selling manufacturers in both FY 2019–20 and FY 2020–21, as they were in FY 2017–18. In FY 2019–20, Force ranked ahead of Eicher in bus sales while Tata and Ashok Leyland remained the top two sellers. In FY 2020–21, however, Force Motors was the top-selling bus manufacturer, ahead of Tata Motors and Ashok Leyland. It had 31.5% of the market, more than double its share from the previous fiscal year.

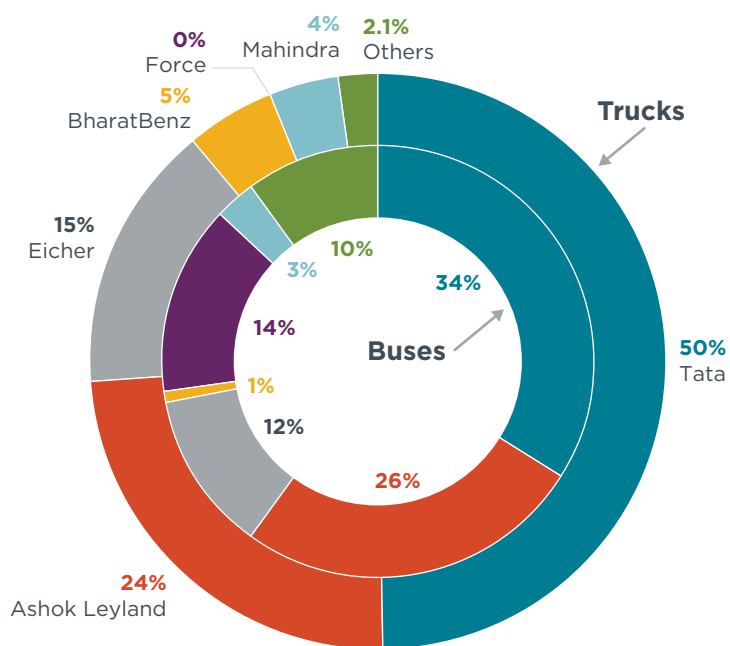


Figure 3. FY 2019–20 manufacturers' market shares for new truck and bus sales.

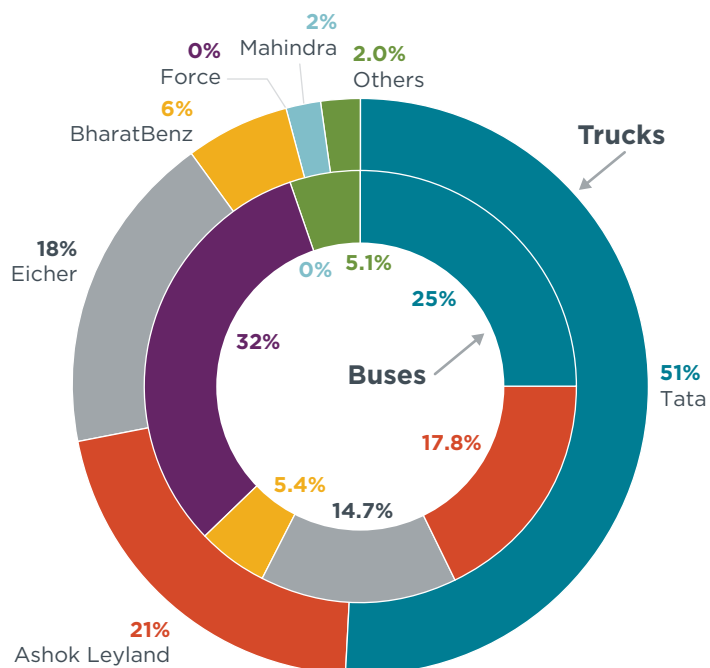


Figure 4. FY 2020–21 manufacturers' market shares for new truck and bus sales.

Figure 5 summarizes the market shares of new HDVs in terms of gross vehicle weight rating (GVWR), which is the maximum recommended operating mass of a vehicle, as specified by the manufacturer. This figure plots the cumulative market share as a function of vehicle GVWR for both trucks and buses. The vertical or near-vertical collections of data points in the chart reflect concentrations of vehicle sales at that particular GVWR value. Sales concentrations for FY 2019–20 in trucks were similar to

those from FY 2017-18, with 25, 31, 12, and 16 tonnes having the highest concentrations at each of these points of approximately 20%, 10%, 10%, and 5%. An increased concentration representing 5% sales at 40 tonnes was seen in FY 2019-20 as opposed to the 2% sales in FY 2017-18. India's Ministry of Road Transport and Highways (MoRTH) specifies a maximum GVWR of 28 tonnes and 18.5 tonnes (MoRTH, 2018) for three-axle and two-axle rigid trucks, respectively. These weight limits increased in July 2018, up from the previous 25 tonnes and 16 tonnes for three-axle and two-axle rigid trucks, respectively, and this could be contributing to the concentrations at these weights.

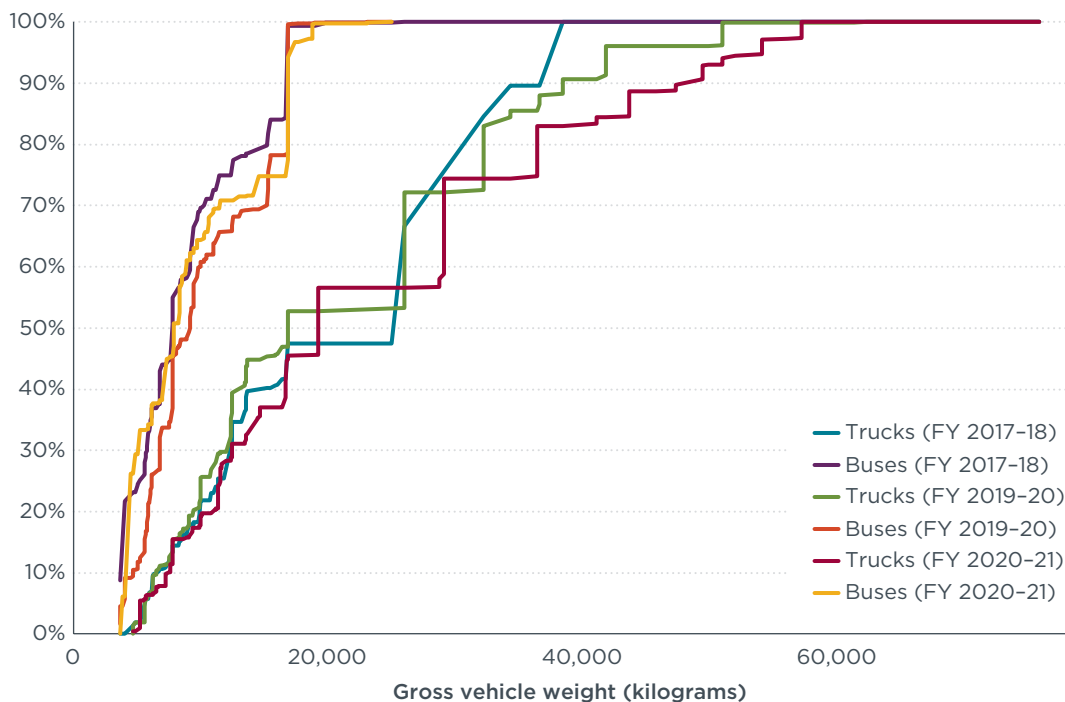


Figure 5. Cumulative market shares of trucks and buses as a function of GVWR.

In FY 2020-21, a shift toward heavier weight classes can be seen with sales concentrations of 18% at 28 tonnes instead of 25 tonnes; an 8% sales concentration at 35 tonnes instead of at 31 tonnes; and a 10% sales concentration at 18.5 tonnes instead of at 16 tonnes. There were no distinct spikes in market share at any given GVWR value for trucks less than 12 tonnes, as was the case in FY 2017-18. For buses, the highest concentration was in the 16 tonne category, which had approximately 20% of sales in FY 2020-21. The sales concentration at 7.5 tonnes was the second highest at 10% in both FY 2017-18 and FY 2019-20. In FY 2020-21, the highest sales concentration of buses was in a lower weight category, 4.3 tonnes, and that is similar to FY 2017-18. However, in the interim this seems to have shifted toward slightly higher weight class in FY 2019-20.

Figures 6 and 7 reflect each manufacturer's sales by vehicle type (truck or bus) and GVWR. As in FY 2017-18, Tata Motors and Ashok Leyland continued to be the most diverse manufacturers in terms of their sales mix in FY 2019-20, and each offered products in each of the eight vehicle class/weight categories that year. In FY 2017-18, Eicher only had five product offerings. By FY 2020-21, though, both Eicher Motors and Ashok Leyland offered a product in all eight categories. The top five highest-selling manufacturers all offer vehicles in at least five of the eight vehicle categories.

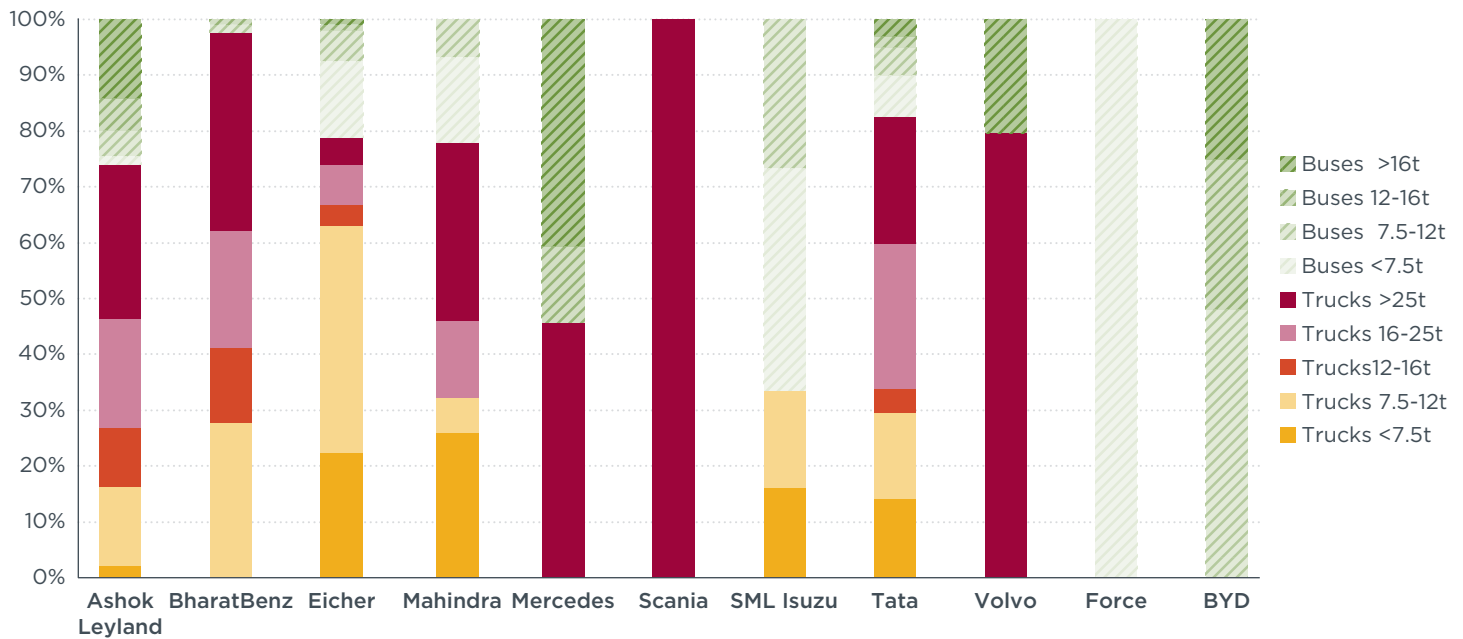


Figure 6. Manufacturer breakdown of sales by segment and gross vehicle weight for FY 2019-20.

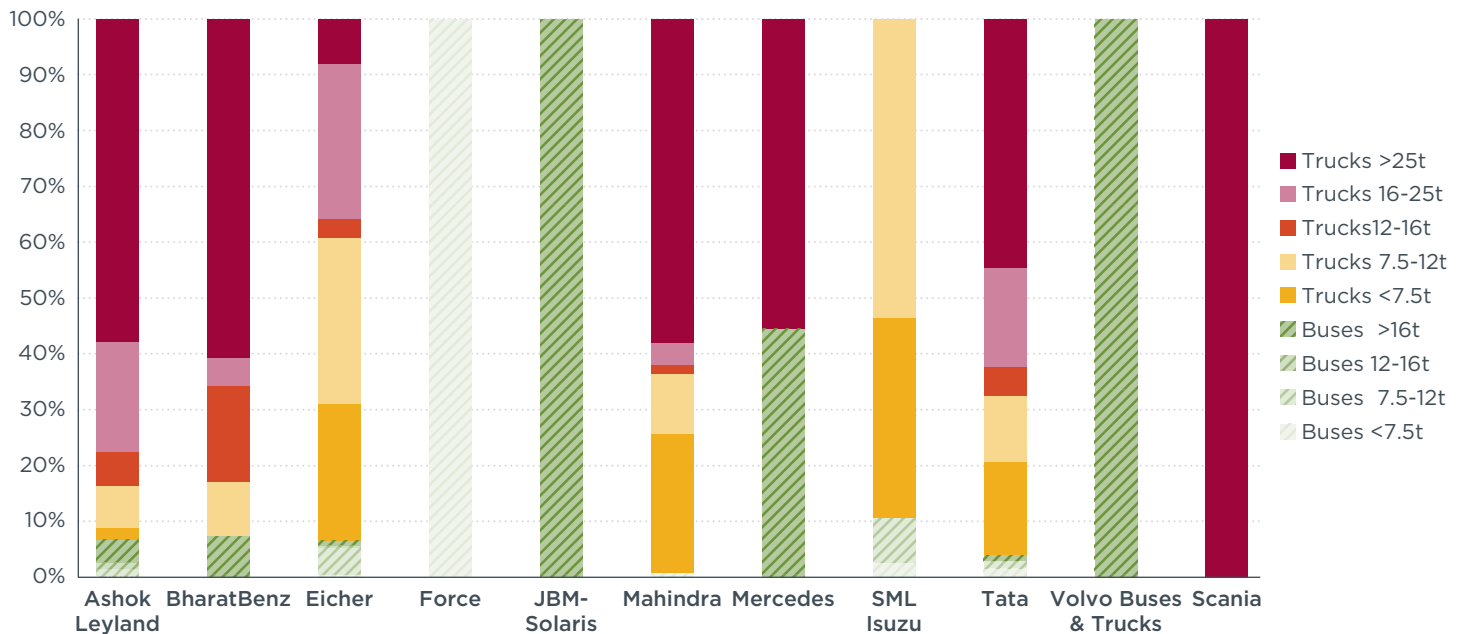


Figure 7. Manufacturer breakdown of sales by segment and gross vehicle weight for FY 2020-21.

Figure 8 shows the shift in market shares among manufacturers by total sales when compared to FY 2017-18. Tata Motors, Eicher Motors, and Daimler have all increased their market share since 2017, by 4.5%, 5%, and 3%, respectively. Meanwhile, Ashok Leyland and Force Motors lost 6% and 2.5% market share, respectively, in the same time frame.

Total sales in India in FY 2019-20 were 305,964, a 32% drop from what they were in FY 2017-18 (455,731) and sales dropped by another 33% to 203,456 in FY 2020-21. By sales volume, total bus sales only dropped 10% between FY 2017-18 and FY 2019-20, but total truck sales dropped by nearly 50% during that period. Between FY 2019-20 and FY 2020-21, truck sales dropped by another 19% and bus sales by nearly 79%.

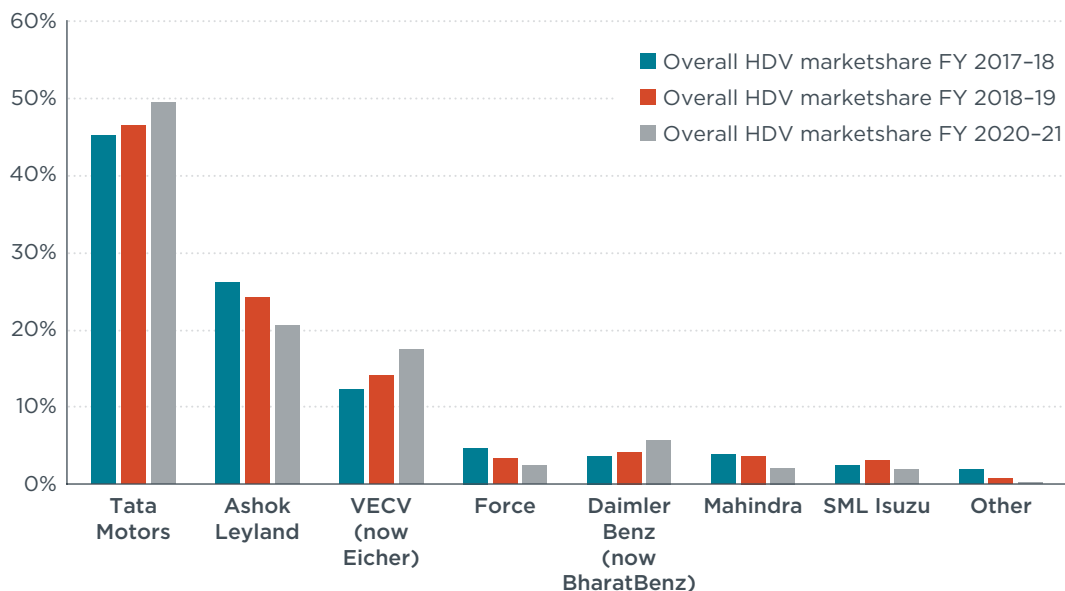


Figure 8. Manufacturer market shares.

Figure 9 shows more detail of market share by bus and truck segments. Tata continued to hold the largest market share in FY 2019-20, just like it did in FY 2017-18. Between 2018 and 2020, Ashok Leyland gained 9% market share and became the second highest in sales in the bus segment; Force, meanwhile, lost 11% market share in the same period. In the truck segment, except for Ashok Leyland, which lost 4% market share, all other manufacturers made marginal gains of between 1% and 3% between 2018 and 2020. While Tata Motors continued its dominance in the truck segment, Force Motors had the largest market share in the bus segment in FY 2020-21, and Tata Motors and Ashok Leyland each lost nearly 9% market share that year. It should be noted that total bus sales were just 15,849 in FY 2020-21. That was 8.2% of total commercial vehicle sales and down nearly 80% from FY 2017-18 sales.



Figure 9. Market shares of manufacturers for trucks (top) and buses (bottom).

TOP VEHICLE MODELS BY SEGMENT

Tables 1 and 2 present information about the top-selling truck and bus models from various GVWR segments. The columns on the right detail the percentage sales represented by the five and 10 best-selling models in each segment. This metric aids in ascertaining the heterogeneity in these segments. Overall, in FY 2019-20, all segments within the truck and bus categories are more diverse model-wise compared to FY 2017-18, except for the heaviest bus segment. In FY 2020-21, the total number of models across all bus and truck segments reduced by more than half from 364 in FY 2019-20 to just 180 in FY 2020-21. It is difficult to say if this is due to a consolidated approach from manufacturers in BS VI offerings or the impact of the pandemic. Except for in the lowest weight truck segment, <7.5-tonnes, the consolidation in FY 2020-21 resulted in much less model diversification compared to FY 2019-20.

Table 1. Top-selling vehicle models by gross vehicle weight segment for FY 2019-20

Segment	Rank/model	FY 2019-20 segment sales	Top model %: of segment sales	Top 5 models: % of sales	Top 10 models: % of sales
Trucks < 7.5 tonnes	Tata SFC 407 Tata SFC 410 Tata SFC 407 Tata SFC 407 Eicher 10.59	35,804	36.2%	60.4%	79.5%
Trucks 7.5 - 12 tonnes	Tata LPT 1109 Ashok Leyland Boss 1113 Eicher 11.10 Ashok Leyland eComet 1012 Tata Ultra 1012	55,815	11.8%	39.4%	62.0%
Trucks 12 - 16 tonnes	Tata LPT 1109 Ashok Leyland Boss 1213 Tata Ultra 1518 Ashok Leyland Guru BharatBenz 1217	17,357	21%	75.7%	100%
Trucks 16 - 25 tonnes	Tata LPT 2518 Tata Prima LX 2528.K Tata Prima LX 2523.K Tata LPT 1613 Ashok Leyland 2523	58,562	14.3%	42.2%	66.9%
Trucks > 25 tonnes	Tata Prima 3138.K Tata LPT 3118 Tata Signa 3118.T Tata Prima LX 4928.S Ashok Leyland 3718	64,664	9.2%	32.8%	51.3%
Buses < 7.5 tonnes	Force Traveller Eicher 10.75 Tata LP 410 Tata Starbus Tata LP 712	33,377	29.4%	63.4%	81.7%
Buses 7.5 - 12 tonnes	Ashok Leyland Lynx Tata LP 912 Tata LP 1112 Tata LP 909 Tata Starbus	16,713	20.2%	51.7%	77.6%
Buses > 12 tonnes	Ashok Leyland Viking Ashok Leyland Cheetah Ashok Leyland 12M Tata LPO 1512 Ashok Leyland JanBus	23,314	24.6%	69.0%	90.1%

Table 2. Top-selling vehicle models by gross vehicle weight segment for FY 2020–21

Segment	Rank/Model	FY 2020–21 segment sales	Top model % of segment sales	Top 5 models: % of sales	Top 10 models: % of sales
Trucks < 7.5 tonnes	Tata 407 Gold Eicher Pro 2055 Tata 710 Eicher Pro 2059 XP Tata 712	28,984	26.1%	57.6%	84.1%
Trucks 7.5 – 12 tonnes	Tata 1112 Eicher Pro2095 XP Tata 912 Eicher Pro 2080 XP Eicher Pro 2110	29,252	21.5%	55.9%	66.2%
Trucks 12 – 16 tonnes	Tata 1412 Ashok Leyland eComet 1415 HE Eicher Pro 2110 XP BharatBenz 1215RE Ashok Leyland eComet 1215	11,162	43.8%	84.3%	93%
Trucks 16 – 25 tonnes	Tata 1918 Ashok Leyland eComet 1615 HE Tata Signa 1923.K Tata 1512 Eicher Pro 3019	36,708	20%	70.5%	94.5%
Trucks > 25 tonnes	Tata Prima 2825.K Ashok Leyland 2825 Ashok Leyland 3520 Tata Signa 5530.S Ashok Leyland 4220	81,501	14.6%	37.3%	54.5
Buses < 7.5 tonnes	Force Traveller 3700 Force Traveller 4020 Force Traveller 3050 Eicher Starline 2050 Ashok Leyland MiTR	5,362	57.6%	97%	100%
Buses 7.5 - 12 tonnes	Eicher 2000 Series Eicher Starline 2070 E Ashok Leyland Oyster Ashok Leyland Sunshine SML Isuzu Prestige	2,593	25%	76.3%	95%
Buses > 12 tonnes	Ashok Leyland Cheetah Tata LPO 1618 Ashok Leyland Viking Ashok Leyland 12 M Ashok Leyland Oyster Wide	4,468	14.7%	63.4%	96%

Just as in FY 2017–18, Tata had the best-selling model in all the truck segments in FY 2019–20 and FY 2020–21. In the bus category, in FY 2019–20, Force Motors had the best-selling model in the lighter end of the spectrum while Ashok Leyland continued to hold best-selling models in remaining bus segments, as it did in FY 2017–18. In FY 2020–21, Eicher Motors had the best-selling model in the 7.5–12 tonne segment, and the remaining leaders stayed the same as in the prior year.

In FY 2019–20, the top-selling model had a greater than one-third share of total sales in only one truck category (<7.5 tonnes) and in the other four categories, the top model made up only between 9% and 21% of the segment's total sales. In FY 2020–21, the top-selling model was 44% of total sales in trucks 12–16 tonnes and 26% of sales of trucks <7.5 tonnes.

In the bus segment, Force Traveller, which was the top model representing nearly half of segment sales in FY 2017–18, dropped to represent only 29% of segment sales in FY 2019–20. In FY 2020–21, with substantially lower overall bus sales, Force Traveller was again the top model and nearly doubled its market share to 58% of segment sales of buses <7.5 tonnes. Increased consolidation was seen in the heavier bus segment

compared to FY 2017-18, with the top five models accounting for nearly 70% of segment sales of buses >7.5 tonnes and near 100% in the lower weight segment.

HDV engine characteristics

Engine-specific research on market conditions, test procedures and duty cycles, technology potential, and economic impacts is also critical in developing robust engine-based regulation. This section compares how the market has changed since FY 2017-18 with respect to engine size classifications. Figure 10 displays the volume of units sold for each size and power combination for HDV engines, and the size of the bubbles correspond to the volume of units sold.

No significant shift in sales between engine sizes were found between FY 2017-18 and FY 2019-20, and the smaller bubbles indicating lower sales correspond with lower overall sales in FY 2019-20 compared to FY 2017-18. No engines larger than 8 liters were sold in FY 2020-21, but this could also be due to the overall drop in sales due to COVID-19 and demand in certain segments may have been lower than in others.

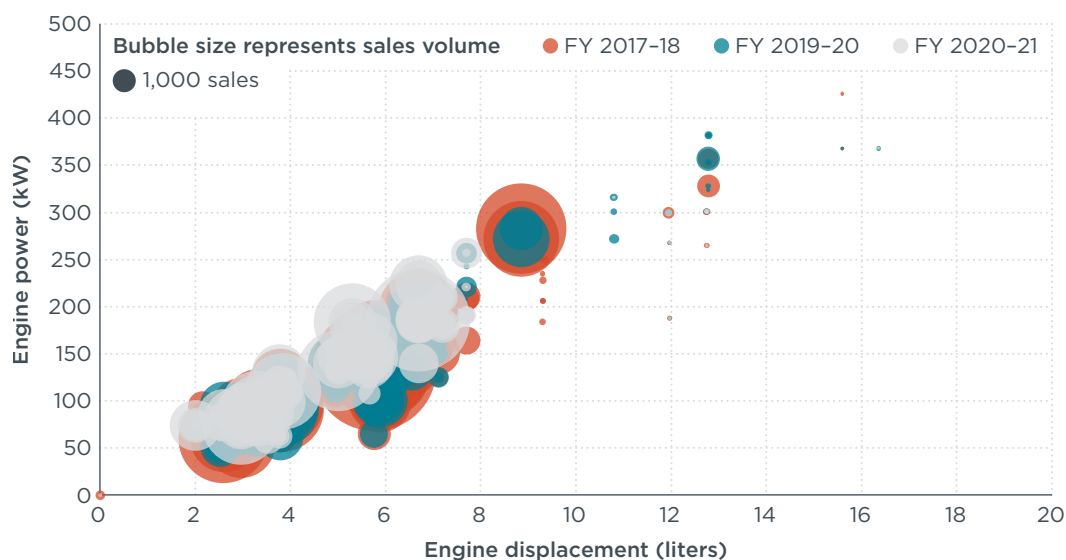


Figure 10. Sales-weight plot of engine size and power points.

Figures 11 and 12 show the engine size distributions for each of the GVWR bins for trucks and buses for the three fiscal years. It is evident from Figure 11 that the engine sizes are most tightly grouped for trucks less than 12 tonnes, with the large majority of engines between 3 and 4 liters; grouping in this range has not changed since FY 2013-14 (Sharpe, 2015). Trucks between 12 and 25 tonnes primarily have engines that range from 3 to 6 liters, and there was a significant shift from the smaller engines of 3.9 liters in FY 2017-18 to the larger engine sizes of 5.9 liters in FY 2019-20. However, this shift reversed to smaller engines again in FY 2020-21. This shift represented nearly 25% of total sales within the weight class. The heavier truck engines are predominantly between 5 and 7 liters and there was no noticeable change in this category.

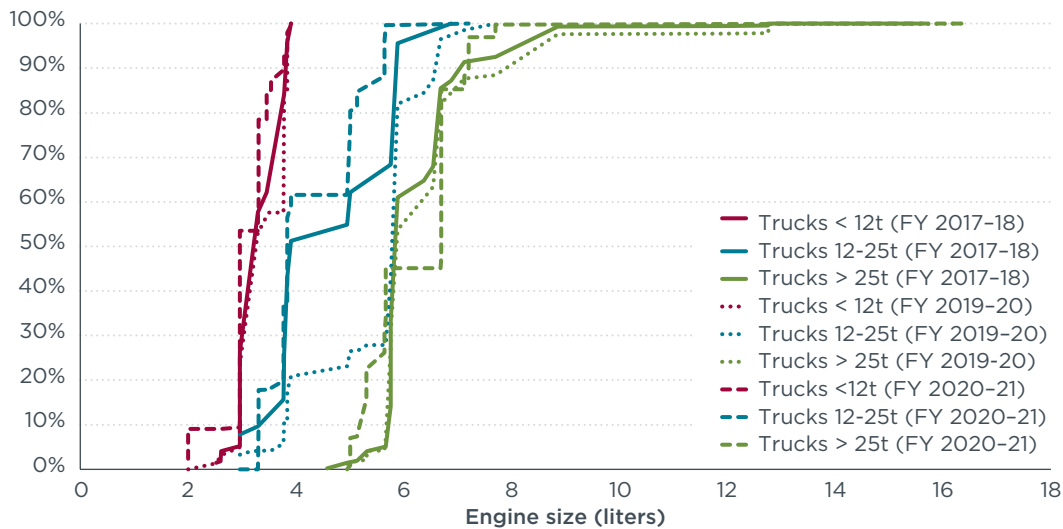


Figure 11. Engine size distributions for trucks in the three example vehicle weight categories

Figure 12 shows that in FY 2019-20, manufacturers introduced smaller engine sizes of less than 2 liters for buses less than 12 tonnes, but these were eliminated in FY 2020-21. Nearly 40% of FY 2019-20 sales for buses under 12 tonnes were from the newer, smaller engines. The remainder of engines in FY 2019-20, and all engines in FY 2017-18 and FY 2020-21 for buses less than 12 tonnes ranged from 2 to 4 liters. There is no noticeable difference between the fiscal years in the heaviest class of buses, where engine size distributions still range from 4 liters up to 13 liters. However, sales of engine sizes greater than 6 liters were only 1% of total bus sales in FY 2019-20 and FY 2020-21. So, if these are excluded, the engine size distribution is tightly concentrated at 6 liters.

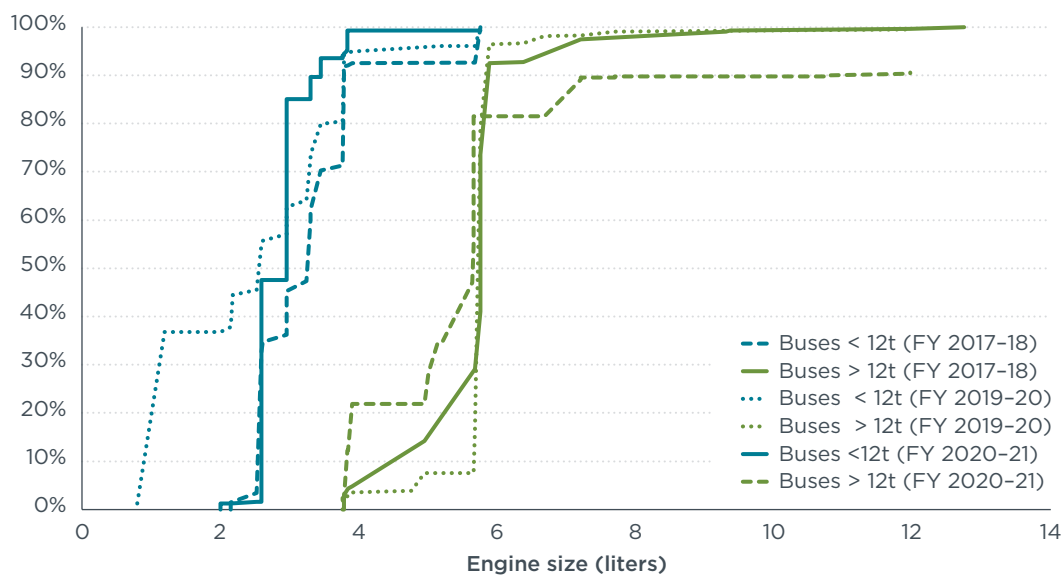


Figure 12. Engine size distributions for buses in the two example vehicle weight categories.

Figure 13 shows new commercial vehicle sales between 2019 and 2021 broken into the 19 categories. There are only 11 categories under fuel consumption regulations for M3 and N3 vehicles (Ministry of Power, 2020). The categories marked within the red circles had sales either in FY 2019-20 or in FY 2020-21, but these categories are currently not covered under the regulatory framework for fuel consumption standards. Sales were largest for the 4x2 7.5 to 12-tonne rigid trucks in FY 2019-20, same as it was in FY 2017-18. In FY 2020-21, the sales were largest for the 4x2 >12-tonne rigid trucks. Tractor-

trailers were mostly sold in two axle configurations, 4x2 and 6x4, and almost all buses sold were the 4x2 axle configuration.

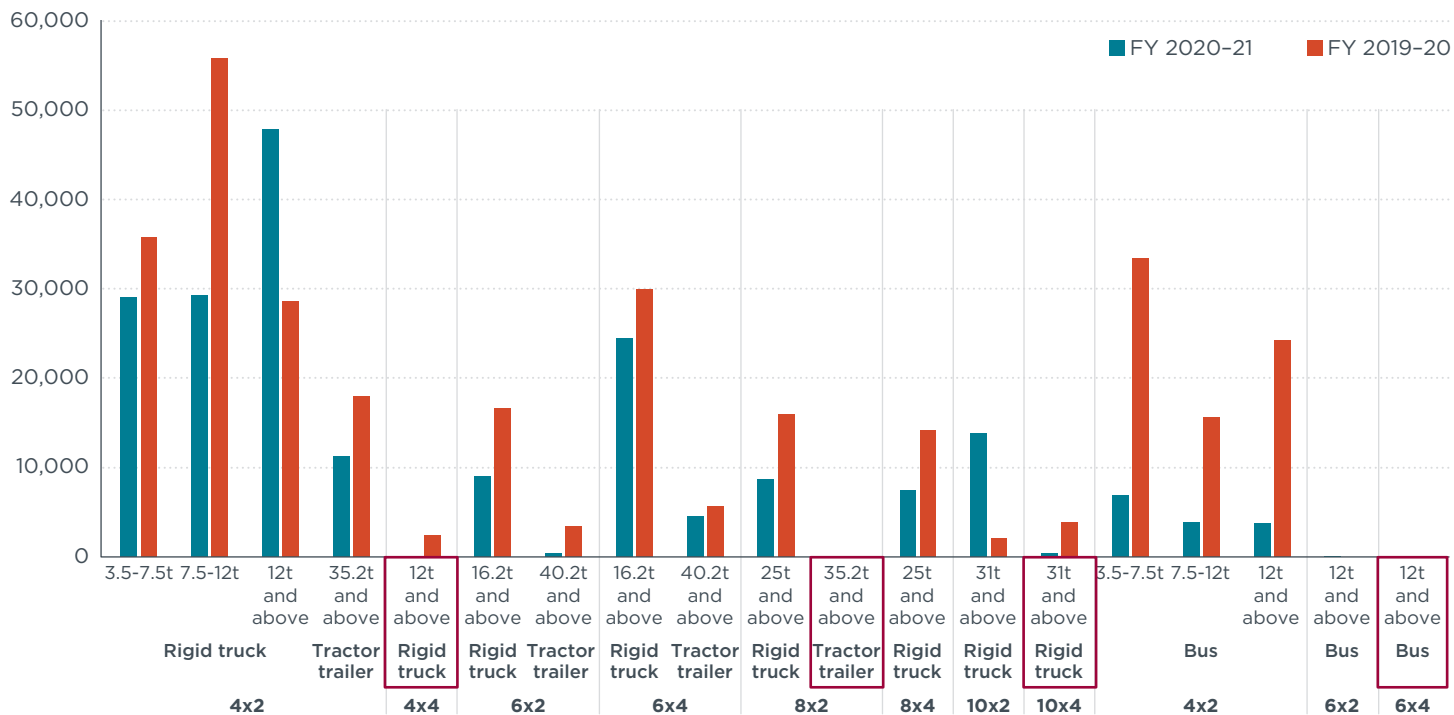


Figure 13. Commercial vehicle sales by regulatory subcategory in FY 2019-20 and FY 2020-21.

Figures 14 and 15 summarize engine power minimum (identified by circles), maximum (triangles), and sales-weighted average (diamonds) for each of the 19 vehicle groups. The distribution of engine power ratings is an important consideration for manufacturers in a design context. As fuel economy standards are based on vehicle weight ratings, it is important to appropriately pair engine power rating to GVWR. There are eight categories in FY 2019-20 and five in FY 2020-21 where the maximum engine power rating is more than 50% larger than the sales-weighted average power. In each of those categories, the maximum power rating ranges from roughly two to four times the minimum power rating. A wide range of engine power ratings like this makes it more difficult to create a single compliance equation to equitably evaluate all vehicles in the segment. This was the same in FY 2017-18, as well.

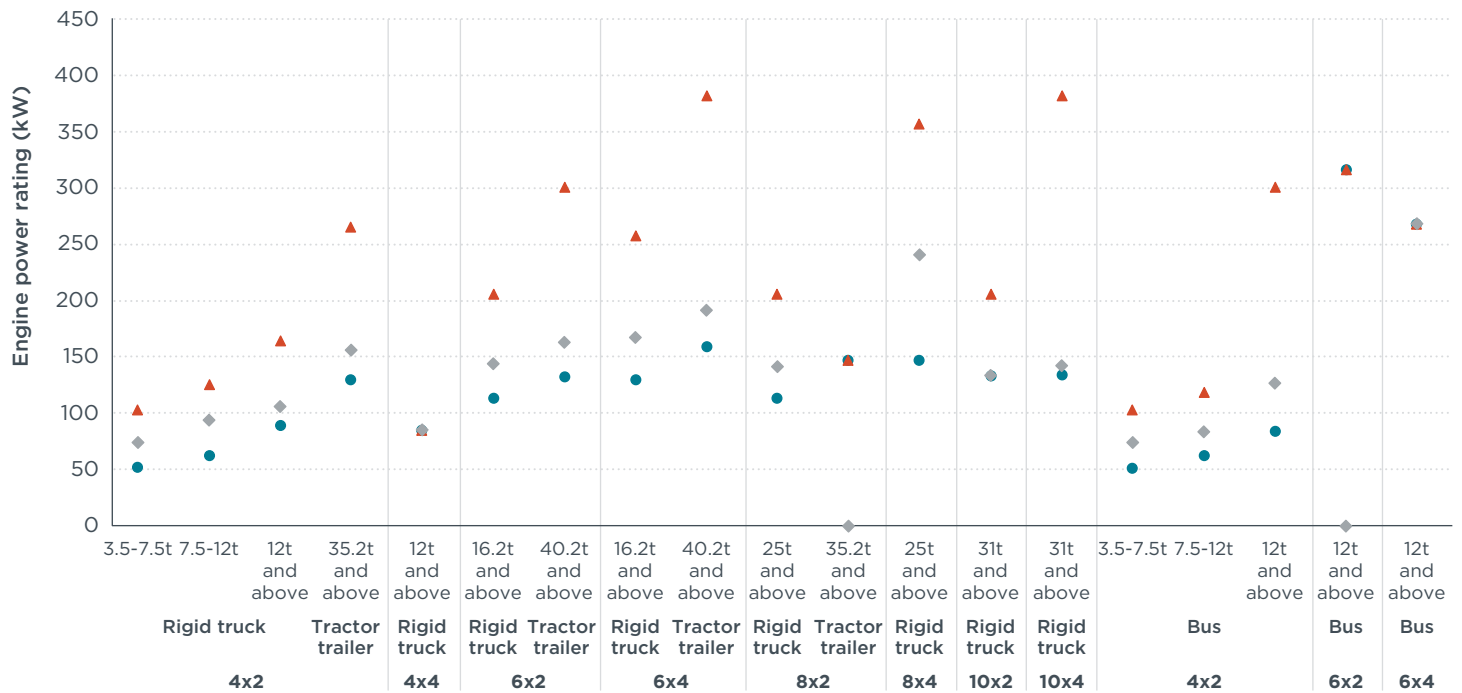


Figure 14. Minimum (circles), maximum (triangles), and sales-weighted average (diamonds) engine power in each subcategory for FY 2019-20.

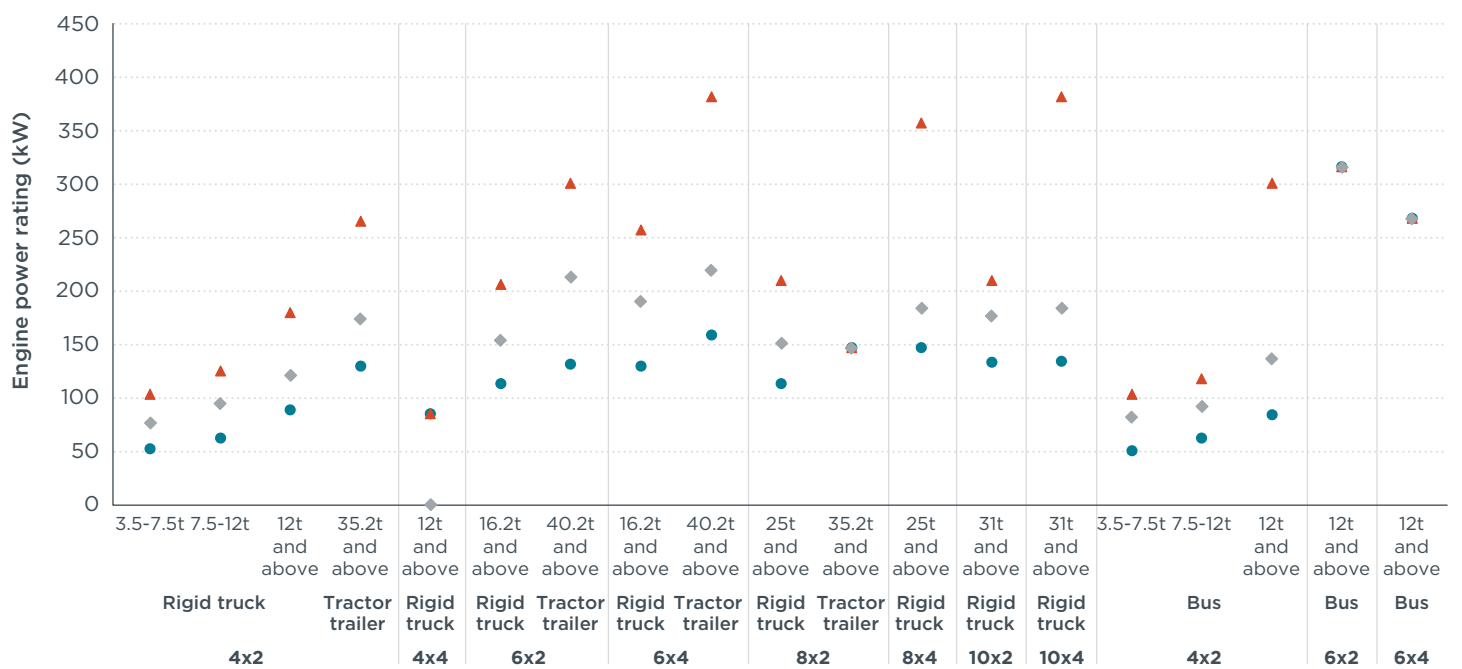


Figure 15. Minimum (circles), maximum (triangles), and sales-weighted average (diamonds) engine power in each subcategory for FY 2020-21.

Figures 16 and 17 show all the unique gross vehicle weight and engine power combinations and these are expanded views of Figures 14 and 15. As in FY 2017-18, engine power increases as vehicles increase in size, particularly for GVW values below 15 tonnes. There are several GVW values where there is a wide range of power ratings which form vertical lines. This shows a large difference between the smallest and largest engine power values.

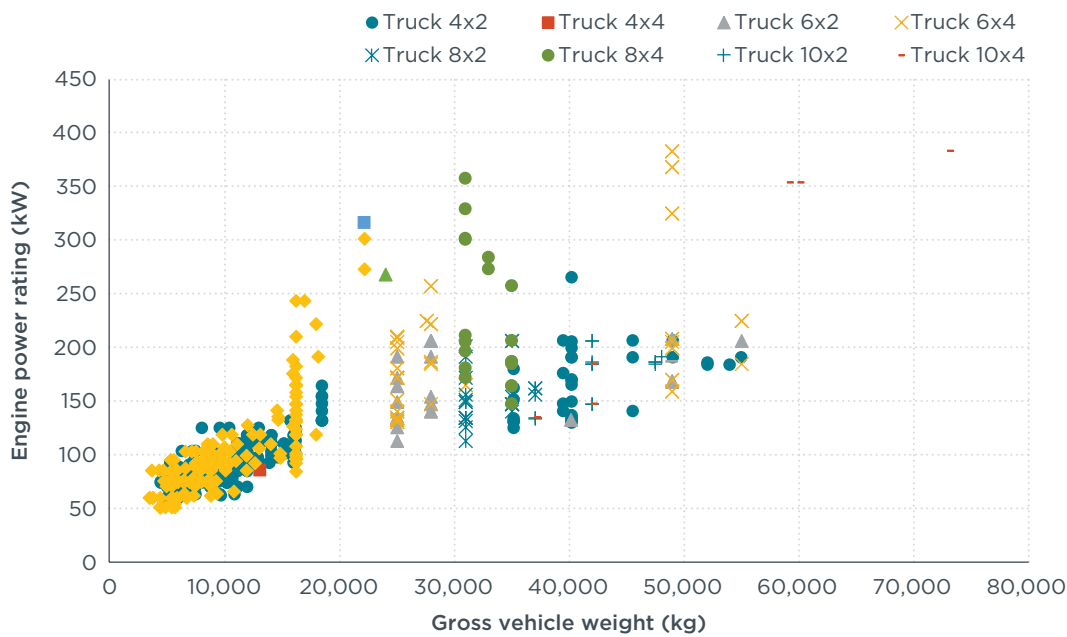


Figure 16. Combinations of gross vehicle weight and engine power rating FY 2019-20.

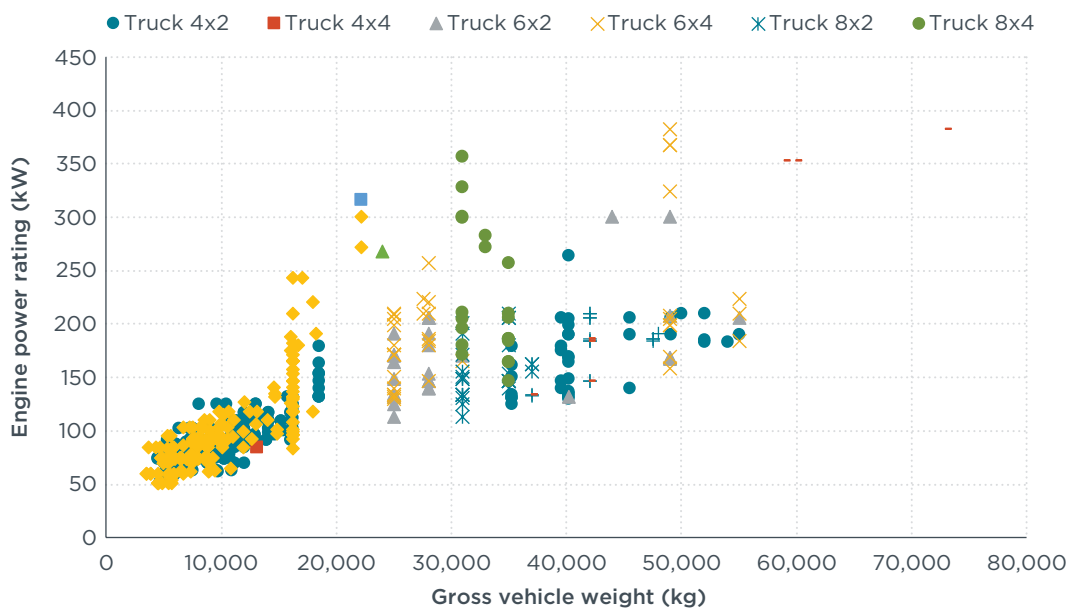


Figure 17. Combinations of gross vehicle weight and engine power rating FY 2020-21.

BS VI vehicle technology and market entry

As a result of the COVID-19 pandemic, vehicle sales dropped dramatically. The third and fourth quarter in calendar year 2020 started to see some increased sales activity, as factories began to re-open at limited capacity, but nearly half of all sales in FY 2020-21 came from the first quarter of 2021. A price increase of 10% was expected due to the technology upgrades in BS VI commercial vehicles (Mitra, 2020), and these upgrades were expected to mostly come from the emissions control system via the addition of things like selective catalytic reduction (SCR), diesel particulate filters (DPF), and ammonia slip catalysts (ASC).

We were able to procure data on aftertreatment systems of BS VI vehicles for to the top five manufacturers, and these together accounted for more than 90% of all commercial vehicle sales in FY 2020–21. The data show:

- » At least 95% of HDVs had DPFs and SCRs
- » At least 55% of HDVs had exhaust gas recirculation (EGR)
- » At least 65% of HDVs had ASCs
- » At least 18% of all SCRs were vanadium based. All vanadium-based SCRs were from one manufacturer, Eicher Motors.
- » Diesel exhaust fluid (DEF) tanks ranged from 18 to 60 liters and generally the size of the tank correlated with engine size and power.

Conclusions and future work

This paper updated ICCT's heavy-duty commercial vehicle market analysis from FY 2017-18 with more recent data from FY 2019-20 and FY 2020-21. Results show the market remains fairly concentrated. The top three manufacturers accounted for nearly 85% and 87% of sales in FY 2019-20 and FY 2020-21, respectively. Tata Motors by itself accounted for about 46% of the market in FY 2019-20 and approximately 49% in FY 2020-21, and that is similar to FY 2017-18. A substantial decline in overall sales—a roughly 65% cumulative decrease since FY 2017-18—is observed.

Engine manufacturers in India continue to make smaller engines than are present in the trucks and buses in other major markets such as the United States, Europe, and China. While we previously found that the distribution of engine size and power combinations in the HDV market in India stayed relatively constant between FY 2013-14 and FY 2017-18, this analysis showed a substantial shift to smaller engines in buses weighing less than 12 tonnes in FY 2019-20. Still, this shift reversed again in FY 2020-21.

To comply with BS VI regulations that went into effect April 1, 2020, manufacturers introduced a variety of new engine and emission control technologies. As almost all BS VI vehicles are equipped with a DPF and SCR, and more than 55% are equipped with EGR and ASCs, the importance of on-board diagnostics, vehicle maintenance, and regional inspections is amplified (Sathiamoorthy & Bandivadekar, 2019a; Sathiamoorthy & Bandivadekar, 2019b). Future ICCT research will study these new technologies and their effectiveness under varied operating conditions, and we will continue to aid policymaking by helping to define emissions testing requirements and fuel standards for the Indian HDV industry.

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