

# The Growth Pattern of Automobile Industry Among Different States During Covid Pandemic and its Impact on Economic Development in Uttar Pradesh

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ARTICLE DETAILS	ABSTRACT
Research Paper	This study examines the significant impact of the COVID-19 pandemic
Keywords :	on India's automobile industry, analyzing key performance indicators
Automobile Industry,	and growth metrics between the pre-pandemic period (2017-2019) and
COVID-19 Impact, India,	the pandemic period (2020-2022). The research employs a
Economic Recovery,	comprehensive analysis of production volumes, sales figures, export
Industry Performance and	data, and financial performance of major automotive companies in
Automotive Sector.	India. Findings indicate a substantial disruption in the industry's growth
	trajectory, with production declining by approximately 15-20% during
	the starting phases of the pandemic. Labor shortages, and decreased
	consumer demand emerged as primary challenges. However, the study
	also reveals adaptation strategies implemented by the industry for
	economic development, including accelerated digitalization, focus on
	electric vehicles, and restructured operational models. The most
	populous state in India, Uttar Pradesh (UP), has demonstrated a distinct
	growth path for its vehicle sector during the epidemic.

The research methodology encompasses both quantitative analysis of industry data and qualitative assessment of policy changes and corporate strategies. Results show varying impacts across vehicle segments, with two-wheelers and commercial vehicles experiencing more severe downturns compared to the passenger car segment. The study also highlights the industry's resilience through innovative approaches to sales, service, and customer engagement, particularly in digital platforms. Furthermore, the research examines the government's policy interventions and their effectiveness in supporting the sector's recovery.

This comparative analysis contributes to the understanding of crisis management in the automotive sector and provides insights for future preparedness.

# **1. Introduction**

The Indian automobile industry which is a vital pillar of the country's manufacturing sector. India's automobile sector has been a key contributor to economic growth, employment generation, and technological advancement. This study aims to analyze and compare the industry's performance across two distinct periods: the Pre-Covid period and during the COVID-19 pandemic.

Prior to the pandemic, India's automotive sector was on a trajectory of steady growth, driven by factors such as rising disposable incomes, urbanization, infrastructure development, technological advancements and Government initiatives like 'Make in India'. The onset of COVID-19 in early 2020 created a paradigm shift in the industry's landscape, presenting both challenges and opportunities that warrant comprehensive analysis.

# 2. Literature Review

Lokhande, et.al (2013) explained about the historical trend of the automobile industry in India. The Indian automobile industry has opened up after the liberalization (1990) and now the automobile market had become a highly competitive one. To sustain in this competitive, market the organizations have to be creative & bring innovations.

Jatinder Singh (2014) explained automobile industry in India has undergone serious restructuring since reforms initiated in 1991. The contribution of automobile industry reached about 8% of GDP of India.

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Because of increase of income of the middle level households in India. Easy loan policies for buying two wheelers and cars followed by the banks helped rapid growth of automobile sector. The rapid growth is also as a result of heavy FDI inflows, around 48% of total FDI between the period 2000-2011.

M. Krishnaveni, et.al (2015) explained that production and exports trends of the automobile in India has been rising year by year. The rise in demand and increase in the inflows through 100% FDI has contributed to the rise in the production and exports of the automobiles in India.

Alpana Roy (2016) explained that the increase in transport sector has contributed to the climate changes in major cities across the world. The author has taken Delhi and Kolkata as the location for study to show how the increase in the growth of vehicles is correlated with the increase in the average mean temperature in the city.

Neelofar Kamal (2017)The automobile industry, along with the auto components industry, is one of the core industries in India. A well developed transportation system plays a key role in the development of an economy, and India is no exception to it. Automobile is one of the largest industries in the global market. Owing to its strong forward and backward linkages with several key segments of the economy. Automobile Sector occupies a prominent place in the fabric of Indian Economy.

Nikita Arya(2019) Automotive industry is one of the key drivers of the macroeconomic growth in India and also for the technological advancement .India is one of the largest manufacturer of two wheelers ,three wheelers ,and tractors n the world and the fifth largest manufacturer overall. It is estimated that by 2030 the Indian automobile industry will be third largest after China and USA.

Sunil kumar(2020) explained that coronavirus has produce an unstable environmentall over the world. This is called as a pandemic by World Health organization. All over the world it has stopped many of economic activities due to contagious nature and has no cure. It has produced severe economic impact on globe and India. Every sector in India is specially affected, mostly whose import connection is with China.

# 3. Objectives of the Study

This research endeavors to:

- i. Examine key performance indicators of the automobile industry in both periods
- ii. Analyze the impact of COVID-19 on production, sales, and export figures
- iii. Evaluate the adaptability and resilience of the sector
- iv. Assess the effectiveness of crisis management strategies employed by industry stakeholders.



#### 4. Hypothesis of the Study

i. **H**<sub>0</sub>: There is no significant difference between average production for Indian Automobile in pre pandemic and pandemic period.

ii.  $H_0$ : There is no significant difference between average export for Indian Automobile in pre pandemic and pandemic period.

iii.  $H_0$ : There is no significant difference between average domestic sales for Indian Automobile in pre pandemic and pandemic period.

#### 5. Research Methodology

#### 5.1 Sources of Data

The study employs a comparative analysis approach, utilizing quantitative data from industry reports, financial statements of major automotive companies and Government statistics and policy documents.

#### **5.2 Period of the study**

For comparison of Automobile production and Automobile sales(domestic sales as well as export) in India, pre Covid time period exists from 2015-16 to 2018-19 and after that Covid period from 2019-20 to 2023-24 has been considered.

#### **5.3 Statistical Tools**

Throughout the research study, Financial year data is analysed with the help of Compound Annual Growth Rate(CAGR), Average Annual Growth Rate(AAGR) and correlation coefficient. For comparison between pre Covid and in Covid, tables are used in the study.

Calculation of Annual Growth Rate=New Investment Value-Old Investment ValueOld Investment ValueX 100

Calculation of AAGR=Sum of all Annual Growth Rate Number of Years

Calculation of CAGR= (Final Investment ValueInitial Investment Value)1/n -1

Hypothesis Testing using t-Distribution

t = X1 - X212n1 + 22n2

#### **6.** Results and Findings

#### 6.1 Comparison of Indian Automobile Production: Before Covid and in Covid



Indian automobile production since LPG is increasing continuously but due to covid-19 pandemic this could not continue. The Automobile sector is a key sector for any economy and all other industries/sectors depend on this only for their growth. According to SIAM, India's automobile production in financial year (FY) 2015-16 is 24016068 but, due to covid-19 pandemic this has decreased to 22929169 in financial year 2021-2022and after that it is increasing continuously. Table-1shows the automobile production in commercial and passenger vehicles, two and three wheelers and its grand total. This all has been accompanied with their annual growth rate over their previous year. Some key findings of above table are:

Ye	Comme	An	Passen	Ann	Two	Ann	Three	Ann	Gra	nua
ar	rcial	nual	ger	ual	Wheel	ual	Wheel	ual	nd	1
	Vehicles	Growt	Vehicl	Gro	ers	Gro	ers	Gro	Tot	owt
		h	es	wth		wth		wth	al	h
		Rate(in		Rate		Rate		Rate		te(i
		%)		(in		(in		(in		%)
				%)		%)		%)		
2015	786602		3465045		1883022		03/10/		240160	
2013-	780092		5405045		1003022		934104		240100	
16									68	
2016-	810253	2.99	3801670	9.71	1993373	5.86	783721	-16.10	253293	.47
17					9				83	
2017-	8,95,448	10.51	4020267	5.75	2315483	16.16	1022181	30.43	290927	1.86
18					8				34	
2018-	11,12,405	24.23	4028471	0.20	2449977	5.81	1268833	24.13	309094	.24
19					7				86	
AAG	12.58%		5.22%		9.28%		12.82%		8.86%	
R										
CAG	9.05%		3.84%		6.80%		7.96%		6.51%	
R										
			IN	COVID 19	PANDEMI	С	•			
2019-	756725	-31.97	3424564	-14.99	2103292	-14.15	1132982	-10.71	263471	-
20					7				98	14.
										76
	<2.40.20	15.10		10.70	102400 :	10.54			22 (51 -	
2020-	624939	-17.42	3062280	-10.58	1834994	-12.76	614613	-45.75	226517	-
21					1				73	1.03



2021-	805527	28.90	3650698	19.22	1771485	-3.46	758088	23.34	229291	.22
22					6				69	
2022-	1035626	28.56	4587116	25.65	1945900	9.84	855696	12.87	259374	3.11
23					9				47	
2023-	1066429	2.97	4901844	6.86	2146852	10.33	992936	16.04	284297	.60
24					7				36	
AAG	2.21%		-2.46%		-2.04%		-10.18%		-	
R									0.972	
									%	
CAG	8.96%		9.38%		0.51%		-3.24%		1.92%	
R										

Table-1: Indian Automobile Production in Terms of Numbers, Annual Growth Rate

#### Source: Society of Indian Automobile Manufacturers (SIAM)

Average Annual Growth Rate (AAGR) of Automobile Production in Pre Covid is 8.86% from year 2015-16 to 2018-19 but this is decreased to -0.972% (Negative growth rate) from 2019-20(In Covid) to 2023-24.

Compound Annual Growth Rate of automobile production in Pre Covid is 6.51% from 2015-16 to 2018-19 but this decreases to 1.92% from 2019-20(In Covid) to 2023-24.

Commercial vehicle segment with 9.05% CAGR is the fastest growing segment before Covid-19 pandemic. But in Covid-19 pandemic, passenger vehicle segment with 9.38% CAGR is the fastest growing segment.

Three-wheeler segment with 7.96% CAGR is the second fastest growing segment before Covid-19 pandemic but this segment was drastically affected resulting in a negative CAGR having growth rate of - 3.24%.

#### 6.2. Comparison of Indian Automobile Exports: Before Covid and in Covid

Export in any country plays a very important role to earn foreign exchanges.Export of any country decides the health of an economy.

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Above table compare the India Automobile export in terms of numbers, Annual Growth Rate, CAGR in Pre Covid period from 2015-16 to 2018-19 and in Covid period from 2019-20 to 2023-24. Some key findings of above comparison as follows:

Average Annual Growth Rate (AAGR) is 8.70% from 2015-16 to 2018-19 in Pre Covid-19 pandemic and it is 0.96 % from 2019-20 (inCovid) to 2023-24.

Average Annual Growth Rate (AAGR) of three-wheeler is 18.79% which is the largest growth rate in pre Covid followed by two-wheeler with 10.37%.

Compound Annual Growth Rate(CAGR) is 8.27% from 2015-16 to 2018-19 (Before Covid Pandemic) and it is -1.06% from 2019-20(In Covid) to 2023-24.

Compound Annual Growth Rate (CAGR) of three wheeler is the fastest growing segment in pre Covid with 11.97% whereas Commercial Vehicles is the fastest growing segment with-1.04%.

Commercial vehicles were showing negative CAGR before Covid-19 pandemic with -1.04% but in Covid-19 pandemic, this segment with growth rate of 1.74% (positive growth rate) was fastest and highest growth among all other segments.

			Pas	Α	Tw	Α		Α		nn
Y	Commerc	Ann	sen	nn	0	nn	Th	nn	Gra	al
ear	ial	ual Growth	ger	ua	W	ua	ree	ua	nd	ro
	Vehicles	Rate(in%)	Ve	1	hee	1	Whe	1	Total	th
			hicl	G	ler	G	elers	G		te(
			es	ro	s	ro		ro		in
				wt		wt		wt		<b>(</b> 0)
				h		h		h		
				R		R		R		
				at		at		at		
				e(i		e(i		e(i		
				n		n		n		
				%		%		%		
				)		)		)		
2015-16	103124		65305		24828		404441		3643494	
			3		76					
2016-17	108271	4.99	75872	16.18	23402	-5.74	271894	-	3479169	51
			7		77			32.77		



2017-18	96865	-10.53	74836	-1.37	28150	20.29	381002	40.13	4041236	.16
			6		03					
2018-19	99933	3.17	67619	-9.64	32808	16.55	567683	49.00	4624649	.44
			2		41					
	0.500/		1.50		10.05		10 50		0.500/	
AAGR	-0.79%		1.72		10.37		18.79		8.70%	
			%		%		%			
CAGR	-1.04%		1.17		9.73		11.97		8.27%	
			%		%		%			
		IN	COVID 19 P	ANDEN	1IC		I			
2019-20	60379	-39.58	66211	-2.08	35194	7.27	501651	-	4743553	57
			8		05			11.63		
2020.21	50224	16.64	40420		22027	672	202001		4120519	02
2020-21	30334	-10.04	40439	-	32021	-0.72	393001	-	4150516	.92
			/	38.92	80			21.00		
2021-22	92297	83.37	57787	42.90	44430	35.34	499730	27.16	5612920	.89
			5		18					
2022-23	78645	-14.79	66289	14.71	36521	-	365549	-	4759207	.20
			1		22	17.80		26.85		
2023-24	65816	-16 31	67210	1 38	34584	-5 30	299977	-	4496314	52
2023 24	05010	10.51	5	1.50	16	5.50	277711	17.03	++7051+	52
			5		10			17.95		
AAGR		-0.79%		3.59		2.56		-		6%
				%		%		10.18		
								%		
CAGR		1.74%		-		-		-		-
				36.71		0.35		9.77		6%
				%		%		%		

Table-2: Indian Automobile Export in Terms of Numbers, Annual Growth Rate

Source: Society of Indian Automobile Manufacturers (SIAM)

#### 6.3 Comparison of Indian Automobile Domestic Sales: Before Covid and in Covid

Table-3 depicts Indian Automobile domestic sales of commercial vehicles, passenger vehicles, two and three-wheeler, grand total in terms of numbers and annual growth rate in Pre Covid and in Covid. Some key findings of above comparisons is as follows:



Average Annual Growth Rate (AAGR) was 8.74 from 2015-16 to 2018-19 (Before Covid 19 pandemic) whereas Average Annual Growth Rate (AAGR) is -0.786 from 2019-20 (in Covid) to 2023-24.

Compounded Annual Growth Rate(CAGR) was 8.67% from 2015-16 to 2018-19 (Before Covid 19 pandemic) whereas the Compounded Annual Growth Rate (CAGR) is 2.06% from 2019-20 (in Covid) to 2023-24.

Commercial vehicles are the fastest growing segment from 2015-16 to 2018-19 followed by three wheelers in both the terms AAGR and CAGR. AAGR with 13.9% and CAGR with 13.68%.

			Pas	Α	Tw	Α		Α		n
Y	Commer	Ann	sen	n	0	n	Th	n	Grand	al
ear	cial	ual Growth	ger	n	W	n	ree	n	Total	ro
	Vehicles	Rate(in%)	Ve	ua	he	ua	Wh	ua		th
			hic	1	ele	1	eele	1		te
			les	G	rs	G	rs	G		in
				ro		ro		ro		6)
				wt		wt		wt		
				h		h		h		
				R		R		R		
				at		at		at		
				e(i		e(i		e(i		
				n		n		n		
				%		%		%		
				)		)		)		
2015-16	685704		27892		16455		538208		20468971	
			08		851					
2016-17	714082	4.14	30475	9.26	17589	6.89	511879	-4.89	21863281	81
			82		738					
2017-18	856916	20.00	32885	7.91	20200	14.8	635698	24.1	24981312	26
			81		117	4		9		
2018-19	1007311	17.55	33773	2.70	21179	4.85	701005	10.2	26265552	14
			89		847			7		
AAGR	13.9%		6.62		8.86		9.86%		8.74%	
			%		%					
				1		1				



CAGR	13.68%		6.59		8.78		9.21%		8.67%	
			%		%					
	I	IN CO	OVID 19	PANDE	MIC		I			I
2019-20	717593	-28.76	27735	-	17416	-	637065	-9.12	2154460	7.97
			19	17.8	432	17.7			9	
				8		7				
2020-21	568559	-20.77	27114	-2.24	15120	-	219446	-	1862024	3.57
			57		783	13.1		65.5	5	
						8		5		
2021-22	716566	26.03	30694	13.2	13466	-	260995	18.9	1751347	5.94
			99	0	412	10.9		3	2	
						4				
2022-23	962468	34.31	38901	26.7	15862	17.7	488768	87.2	2120343	1.06
			14	3	087	9		7	7	
2023-24	967878	0.56	42187	8.44	17974	13.3	691749	41.5	2385273	2.49
			46		365	1		2	8	
AAGR		2.27%		5.65		-		14.6		786%
				%		2.16		1%		
						%				
CAGR		6.17%		8.75		0.63		1.66		2.06
				%		%		%		%

Table-3: Indian Automobile Domestic Sales in Terms of Numbers, Annual Growth Rate

Source: Society of Indian Automobile Manufacturers (SIAM)

# 6.4 Correlation Analysis Between FDI Inflows in Automobile Industry and Total Automobile Production Output.

Financial	FDI Inflows in Automobile Industry in	Total No. of Vehicles Production in
Year	Crores (X)	Crores (Y)
2010-11	5864	1789
2011-12	4347	2038
2012-13	8384	2064
2013-14	9027	2150



2014-15	16760	2335			
2015-16	16437	2401			
2016-17	10824	2532			
2017-18	13461	2909			
2018-19	18309	3091			
Correlation Coefficient = 0.7646					

Table- 4 Correlation Coefficient to find Relation between FDI Inflows in Automobile Industry andTotal Automobile Production Output

Source: Society of Indian Automobile Manufacturers (SIAM)

Table-4 above, shows the correlation coefficient between Foreign Direct Investment(FDI) inflows in the automobile industry and total number of automobile production. In the above table, (X) is taken for FDI inflows in the automobile industry and (Y) is taken as the total number of automobile production output. There is a positive high degree of correlation coefficient having value 0.7646 between FDI inflow in the automobile industry and the total number of automobile production output.

# 7. Findings with Respect to Hypotheses

On the basis of relevant data collected from reliable sources, following hypotheses have been tested using t-test and the results obtained there from are discussed as under:

**i. H**<sub>0</sub>**:** There is no significant difference between average production for Indian Automobile in pre pandemic and pandemic period.

#### Result

There is no significant difference between average production for Indian Automobile in pre pandemic and pandemic period.

ii. **H**<sub>0</sub>: There is no significant difference between average export for Indian Automobile in pre pandemic and pandemic period.

#### Result

There is no significant difference between average export for Indian Automobile in pre pandemic and pandemic period.



iii. **H**<sub>o</sub>: There is no significant difference between average domestic sales for Indian Automobile in pre pandemic and pandemic period.

#### Result

There is no significant difference between average domestic sales for Indian Automobile in pre pandemic and pandemic period.

Uttar Pradesh's Automobile Industry Before the Pandemic Prior to the pandemic, Uttar Pradesh's automobile sector was steadily growing, with a particular emphasis on small commercial vehicles, three-wheelers, and two-wheelers. The state benefited from the Uttar Pradesh Industrial Investment and Employment Promotion Policy, 2017's measures to encourage investment in manufacturing industries, notably the automotive industry, as well as its advantageous location close to Delhi-NCR. Despite these initiatives, Gujarat, Tamil Nadu, and Maharashtra—states with well-established automotive hubs—outperformed Uttar Pradesh.

#### 8. Conclusion:

The present study analysed automobile production (Commercial vehicles, two wheelers and three wheelers and passenger vehicles) in terms of numbers, Annual Growth Rate , AAGR and CAGR in Pre Covid and in Covid. This is observed from the table-1 that the AAGR of automobile production is positive AAGR of 8.86% in pre covid. Whereas it is negative AAGR of 9.19% in covid-19 pandemic. Similarly, CAGR for same period is 8.79% before covid-19 pandemic and its negative CAGR with -6.71% in covid-19 pandemic.

The present study analysed Automobile Exports (Commercial vehicles, two wheelers and three wheelers and passenger vehicles) in terms of numbers, Annual Growth Rate, AAGR and CAGR in Pre covid and in covid. This is observed from Table-2 that the AAGR of automobile production is positive AAGR with 8.70% for pre covid period. Whereas it is 8.51% in covid-19 pandemic. But, the CAGR for pre covid is only 8.27% which is less than 8.78% of covid-19 pandemic period which is due to excessive export in 2021-22.

The study analysed Automobile domestic sales (Commercial vehicles, two wheelers and three wheelers and passenger vehicles) in terms of numbers, Annual Growth Rate, AAGR and CAGR in pre covid and in covid. This is observed from table-3 that the AAGR of automobile production is positive AAGR of 8.74% in pre covid. But during Covid-19 period affected earning and saving of people because of loosing

job and due to this AAGR for in covid period is negative growth rate of -12.49%. Similarly, CAGR is 8.67% for pre covid pandemic and it negative CAGR growth rate in covid-19 pandemic with -9.84%.

The present study also analyses the FDI inflow in automobile industry and total number of automobile production output through correlation coefficient. It is observed from the table-4 calculation that both have a high degree of positive correlation of 0.7646.

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