BOSTON CONSULTING GROUP

E-mobility as a job motor for Europe and Germany?

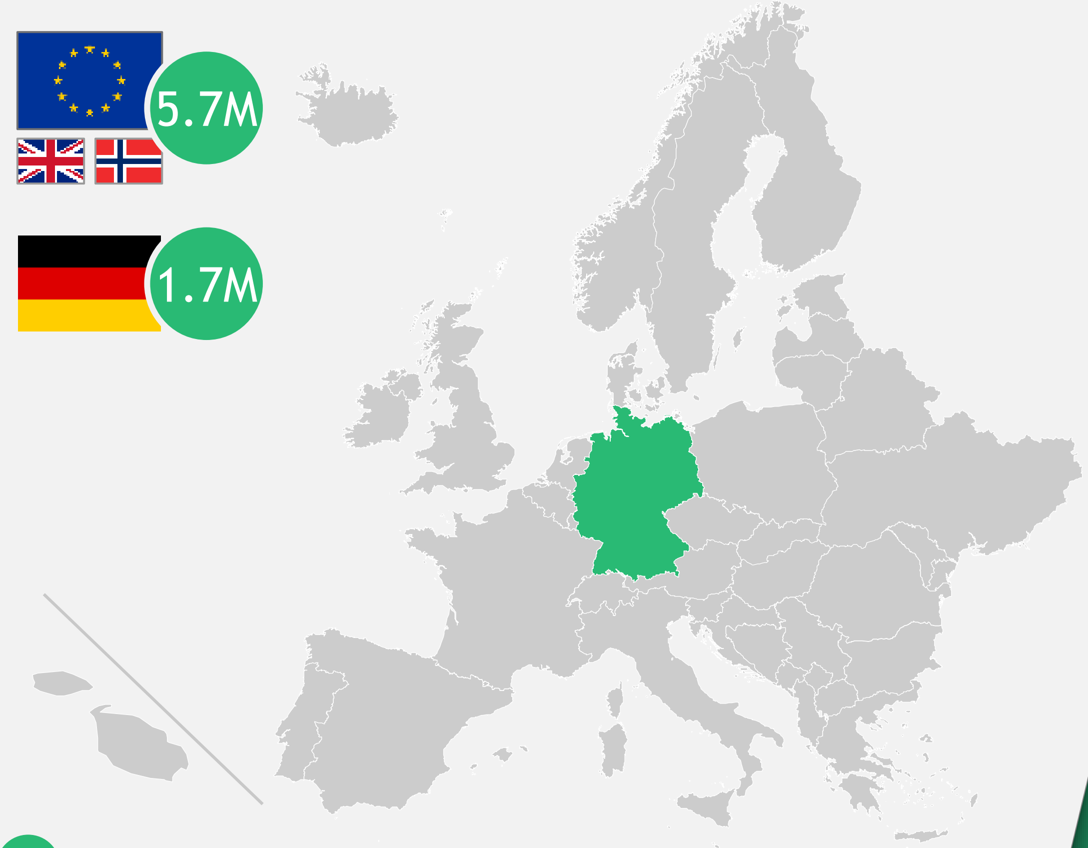
Study approach and initial results

MAY 26TH, 2021

European Climate Foundation

Agora Verkehrswende

Job development in Europe[1] from '20 – '30 …



X.XM Number of employee in scope (Basis 2020)

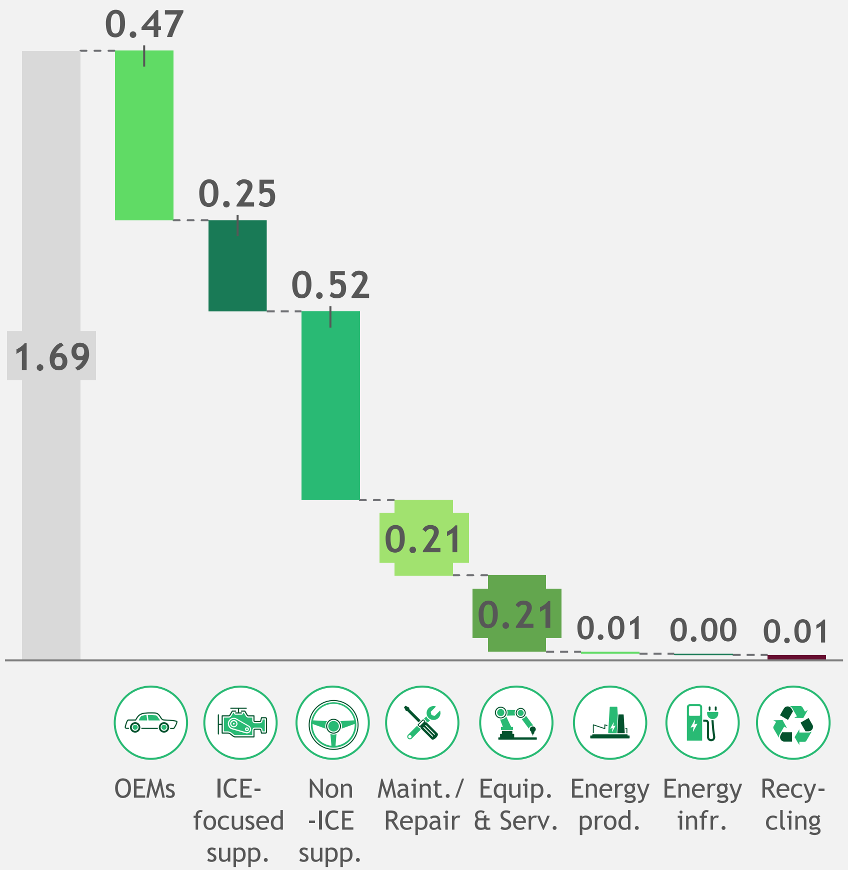
1. EU27 + UK + Norway
Source: BCG

… presented along five building blocks

1. **Industry sectors** and **job families** primarily affected
2. **Major trends** influencing job development in Auto industry
3. **Net impact** of job development until 2030
4. **Shifts & replacements** in industry sectors and job families
5. **Outlook** for results in **Germany**

8 industry clusters based on 26 affected sectors in scope

Total number of jobs with industry split in Germany [Numbers in M]



26 affected sectors grouped in 8 overarching industry clusters …

Core automotive

- … whereof, 0.47M (28%) jobs are associated with **OEMs**
- … whereof, 0.25M (15%) jobs are associated with **ICE-focused suppliers**
- … whereof, 0.52M (31%) jobs are associated with **Non-ICE suppliers**
- … whereof, 0.21M (12%) jobs are associated with **maintenance & repair**

Adjacent industries

- … whereof, 0.21M (13%) jobs are associated with **Equipment & Services**
- … whereof, 0.01M (0%) jobs are associated with **Energy production**
- … whereof, 0.00M (0%) jobs are associated with **Energy infrastructure**
- … whereof, 0.01M (1%) jobs are associated with **Material recovery**

Source: EuroStat; BCG

Scope of studies varies, results not directly comparable

ifo INSTITUT	VDA	European Climate Foundation; Agora Verkehrswende	IPE; ika RWTH Aachen University; fka; Roland Berger
May 2021	**2020 figures**	**June 2021**	**December 2019**
OEMS	OEMS	OEMS	OEMS
Supplier	Supplier	Supplier	Supplier
		Equip. & services	Equip. & services
		Aftermarket	Aftermarket
		Energy prod. & inf.	Trading & retail
Only jobs related to ICE included		*Broad inclusion of suppliers (Tier 1, 2, 3)*	Other

Narrower scope ↔ **Wider scope**

614k jobs	**809k jobs**	**1,689k jobs**	**2,236k jobs**

Source: IFO Institut; BMWI; VDA; BCG

Overview of 8 trends driving the Automotive industry

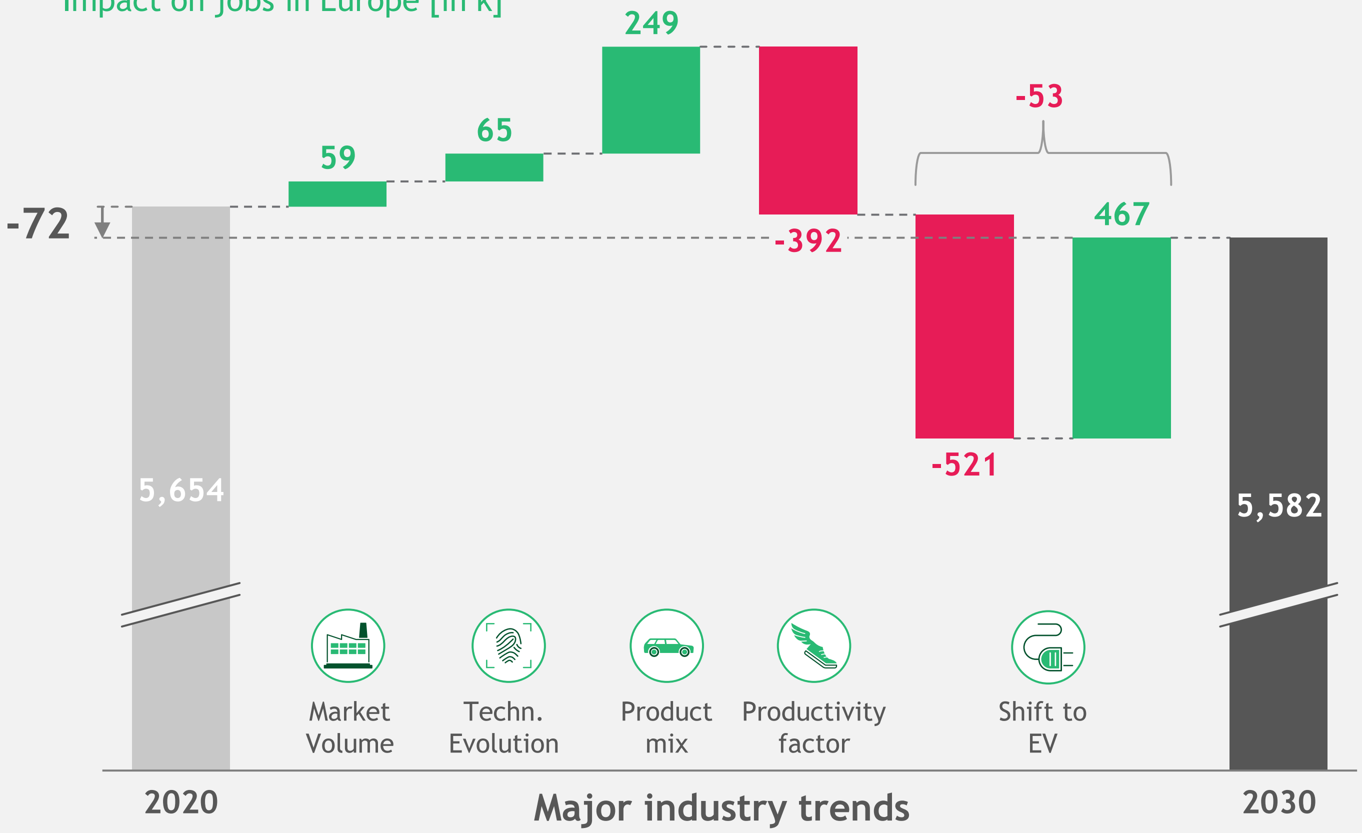
	Major trends	EU	DE		EU	DE	Quantification	EU	DE		Influence
Over-arching trends	**Retirement** (across industries and job families)	2.1% y-o-y	2.4% y-o-y	Retirement factor							Total baseline
	Fluctuation (across industries and job families)	1.9% y-o-y	1.9% y-o-y	Fluctuation factor							Total baseline
Industry specific trends	**Market volume** (production, sales, car parc)	0.0% y-o-y	1.6% y-o-y	Production volume increase	0.8% y-o-y	1.6% y-o-y	Sales volume decrease	0.7% y-o-y	0.5% y-o-y	Car parc increase	Industry specific market volumes
	Technology evolution (software & digitization)	11% y-o-y	11% y-o-y	Higher demand for software engineers							Software engineers job family
	Product mix (content per car & portfolio)	1.0% y-o-y	1.1% y-o-y	Increased content per car	0.0% y-o-y	0.0% y-o-y	Increase in car portfolio				Supplier industry OEMs
	Productivity (car production)	1.2% y-o-y	1.2% y-o-y	Productivity increase				*Detailing for Germany ongoing*			Total baseline
	Shift to EV (vehicle & battery production)	29% y-o-y	32% y-o-y	Increase in BEV vehicle production	100 %	100 %	High value-add in battery production				Industries with EV focus
	Job offshoring (job relocation outside the country)	N/A	0.8% y-o-y	Offshoring of automotive jobs							Jobs with high costs and easy relocation

Positive impact on job demand (green) · Negative impact on job demand (red) · No impact on job demand (grey)

1. Only affects OEMs
Source: IHS Markit; BCG

Flat development until '30, EV only with limited impact

Impact on jobs in Europe [in k]



59k new jobs created based on **market volume** change (driven by increased car parc) in Europe from '20 to '30

65k new jobs created based on **technology evolution** shift, driven by increased software in the car

249k new jobs created based on **product mix** driven by vehicle portfolio increase and linked complexity

-392k job reduction based on **overall increase in productivity and efficiency**

-53k jobs lost through **shift to EV**, -431k driven by reduced efforts for OEMs and ICE-focused suppliers, +223k through battery manufacturing and charging infrastructure

Source: EuroStat; BCG

Strong shifts until 2030, total number nearly constant

Total number of jobs in Europe 2030 [in K] and relative change to 2020

Job category[2]

	Industry cluster[1]	Engineering	Procurement	Production/ Service Ops.	Sales	Other	Total 2030	
Core automotive	OEMs	146 22%	29	555 -27%	51 -21%	108	889 -18%	-5%
Core automotive	ICE-focused suppliers	81 -34%	18 -36%	239 -44%	15 -47%	46	398 -40%	
Core automotive	Non-ICE suppliers	419 10%	86 8%	1,725 11%	79 -15%	176	2,484 9%	
Core automotive	Maintenance & Repair	10	53 5%	854 2%	73	52	1,043	
Adjacent industries	Equipment & Services	96	27	258	37	34	452	28%
Adjacent industries	Energy production	19 161%	2 85%	78 128%	1 -20%	11	112 128%	
Adjacent industries	Energy infrastructure	12 542%	8 882%	73 364%	9 550%	10	112 414%	
Adjacent industries	Material recycling	9	10	53	12 28%	9	92 2%	
		792 6%	233 4%	3,833	277 -12%	446	5,582	

Higher job demand compared to 2020 | Lower job demand compared to 2020 | Nearly constant job demand compared to 2020

1. Based on 26 industries
2. Based on 31 jobs families
Source: EuroStat; BCG

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Job category[2]

Higher engineering demand for the development of new BEV models

Decrease in production driven by lower labor content for BEVs

Massive decrease due to decreasing demand for ICE components

Increase due to upcoming battery cell production industry in Europe

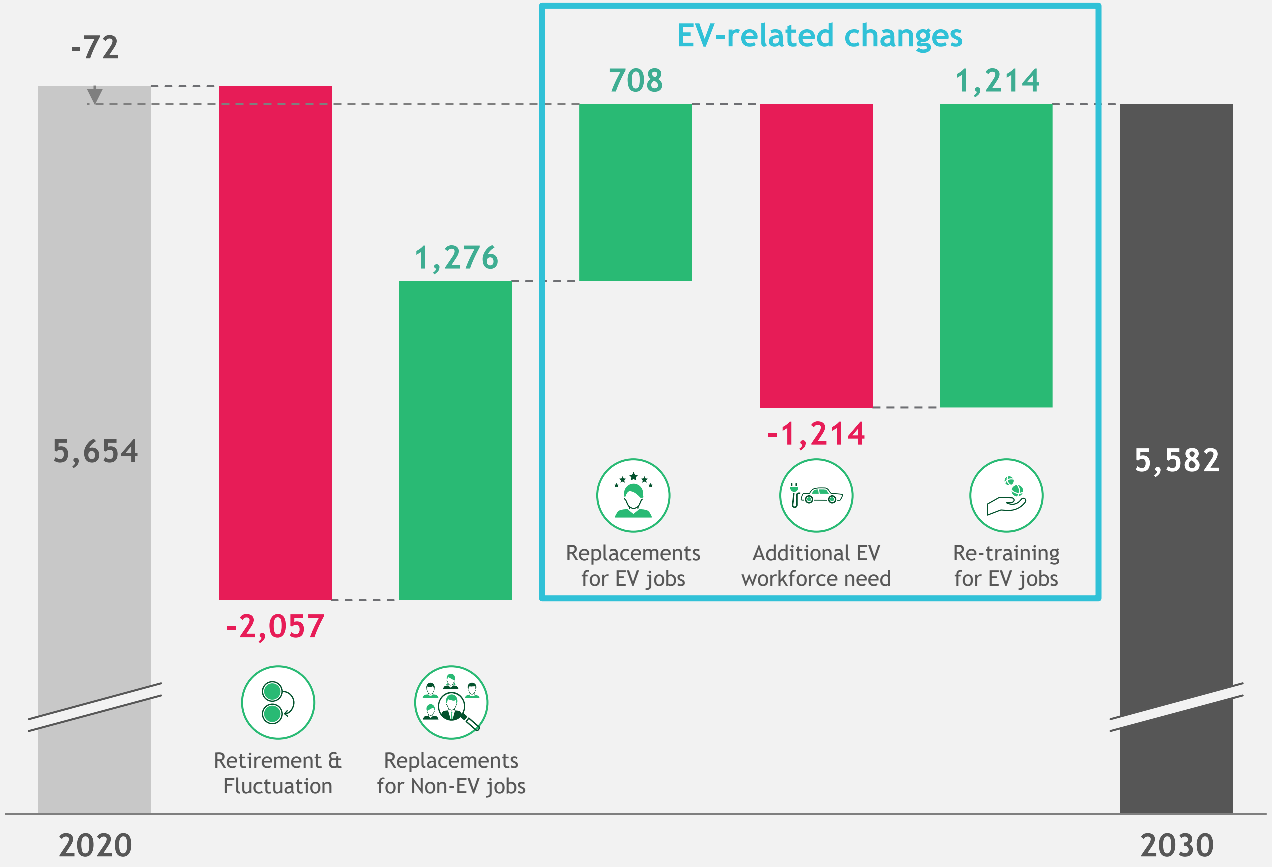
Lower maintenance effort for BEVs and less accidents with ADAS

Higher job demand compared to 2020 | Lower job demand compared to 2020 | Nearly constant job demand compared to 2020

1. Based on 26 industries
2. Based on 31 jobs families
Source: EuroStat; BCG

1.9M workers to be hired or trained for new job profiles

Impact on jobs in Europe [in k]



1.3M workers need to be hired for non-EV related jobs

Substantial effort but exiting job profiles and training needs ("business as usual")

0.7M workers need to be hired for EV related jobs

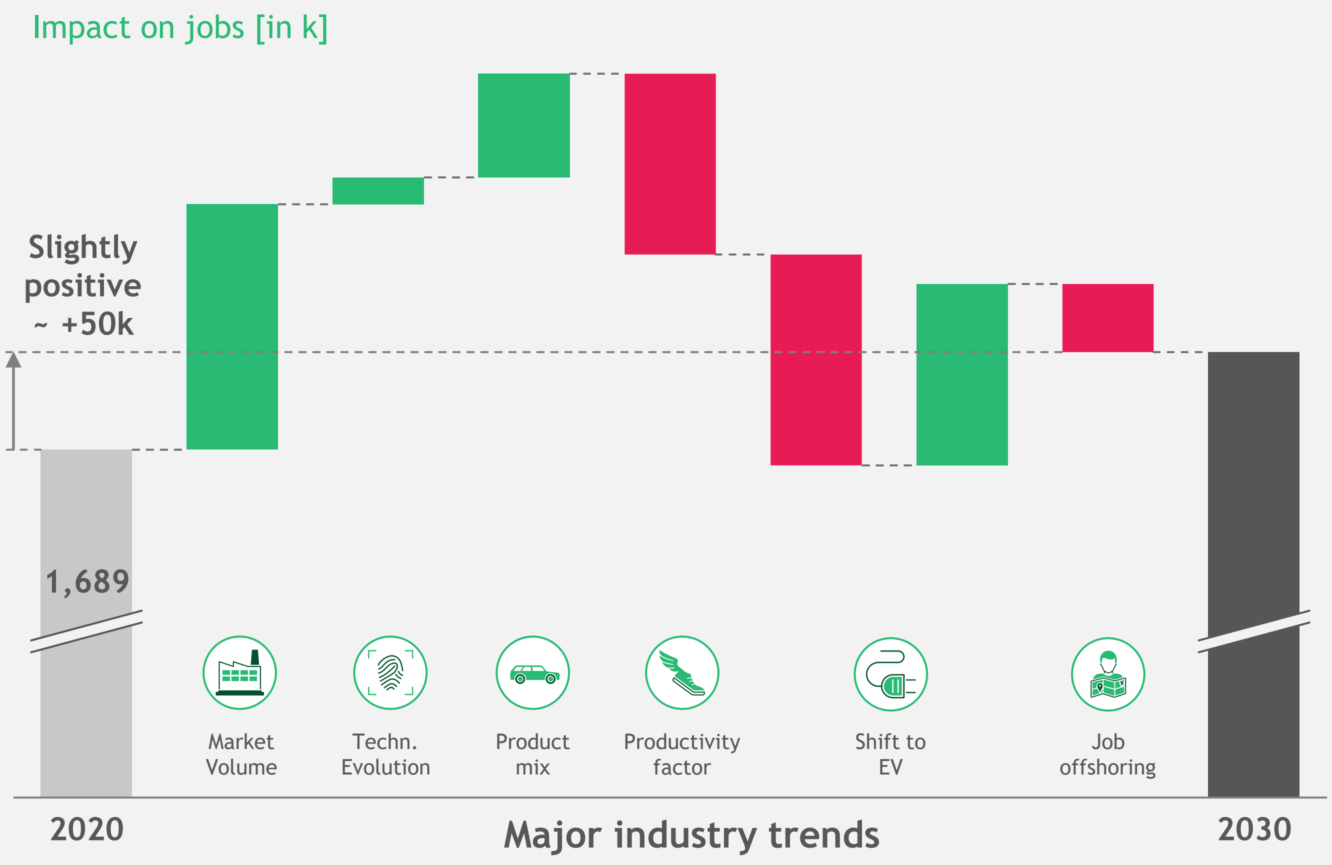
1.2M workers need to be re-trained for EV related jobs

1.9M hiring and training necessary for new EV related jobs

Massive effort with completely new job profiles and training needs

Source: BCG

Outlook for Germany: Overall balance more positive



Relative difference of Germany vs. EU

- **More** new jobs created based on **market volume**
- **Similar** jobs created based on **technology evolution**
- **More** new jobs created based on **product mix**
- **Similar** reduction based on **productivity**
- **Similar** jobs lost through **shift to EV**
- **More** jobs lost through **job offshoring**

Source: EuroStat; BCG

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