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The stakes for workers in how policymakers manage the coming shift to all-electric vehicles

Report • By Jim Barrett and Josh Bivens • September 22, 2021

Executive summary

Rapid technological change, new market dynamics, and global action to mitigate climate change is driving a historic shift toward electric vehicles (EVs) in the automotive sector. Although hybrid electric vehicles have been part of the U.S. vehicle fleet for more than two decades, and some mass-market EVs have been available for over a decade, battery electric vehicles (BEVs), which are powered exclusively by a battery and an electric motor, currently make up a small part of U.S. auto sales. And the batteries and other drivetrain components in BEVs are largely made by non-U.S. suppliers. The coming shift toward BEVs is a transformational change to the industry that is by now inevitable.

Given that this shift is coming, the most important question for policymakers is how the shift will be managed. Smart policy can transform this industry upheaval into a new beginning for U.S. producers and the rebuilding of a foundation for good jobs. If instead policy remains on autopilot through the upcoming transformation, the shift will instead reduce U.S. employment and further batter job quality in the auto sector. The policy actions needed to

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boost job quality and employment in the auto sector in coming years are not radical. Instead, they are commonsense measures like ensuring that any taxpayer subsidies or rebates to incentivize auto purchases come attached with specific requirements on labor standards in the industry, and with measures to boost investment in domestic auto capacity of U.S. producers and suppliers. If policymakers pass such commonsense measures, the U.S. can regain leadership in auto production in coming decades, and the benefits of this leadership will accrue to workers in the industry.

This report lays out the stakes involved. We report on the likely employment and job-quality implications of a large-scale shift to BEVs under various scenarios that are shaped by policy. By policy, we refer to measures to strengthen U.S. leadership in BEV production, including providing manufacturing incentives to onshore investments, enhancing the share of BEV drivetrain components that are produced domestically, securing and strengthening advanced manufacturing capacity, and crafting better trade agreements with more reliable enforcement measures.

We find that if this shift to BEVs is done without any policy efforts to shore up U.S. leadership in BEV production or to enhance job quality and equitable access to good jobs, then this sector will see employment decline and job quality continue a downward march. But if the shift to BEVs is accompanied by strategic investments in manufacturing and job quality in the U.S. auto sector, then the number and quality of jobs can rise together with BEV production. More specifically, the key findings are:

- Employment in the U.S. auto sector could rise by over 150,000 jobs in 2030 if:
  - Battery electric vehicles rise to 50% of domestic sales of autos in 2030 and
  - Due to smart policy measures, an increase in U.S. production of electric vehicle powertrain components brings U.S. manufacturers' share of the EV powertrain market up to their share of the market of internal combustion engine (ICE) powertrains for today's gas-powered cars, and the U.S.-assembled share of the overall vehicle market increases by 10 percentage points (to 60%).
- Interim production of plug-in hybrid electric vehicles (PHEVs) alongside BEVs could significantly ameliorate sources of downward pressure on jobs as BEV penetration expands.
- Due to manufacturing policy inaction, a rise in BEVs to 50% of domestic auto sales by 2030 could see losses of roughly 75,000 jobs by 2030. These losses would stem from policy failures that stunted investment in domestic capacity of U.S. producers to build the batteries and drivetrains of BEVs, and from a failure to regain market share in overall vehicle sales.
  - Should the U.S. fail to act on both EV deployment and manufacturing, fall further behind other nations as an EV market and location for EV production investment, and lose further market share, job losses could be even greater.
- For the auto sector to continue providing good jobs for U.S. workers, strong labor standards—including affirmative efforts to encourage unionization—will be needed.

Wages in the auto sector continue to be higher than in the rest of the economy, but this relative pay premium is driven by the unionized segment of the sector, and the unionization rate in autos has declined in recent decades. To ensure that U.S.-based producers maintain the technological leadership that will see auto assembly and parts production remain in the U.S., policy measures to encourage investment in all segments of the auto sector (including BEVs and PHEVs) will also be needed.

- Black workers, and workers with less than a bachelor's degree, are likely to have the most to gain from policy action to boost U.S. market share in electric vehicle production—and the most to lose from inaction. That is because Black workers and workers without a four-year college degree make up a disproportionate share of auto parts and assembly employment. Concretely, Black workers account for 12.5% of workers economywide, but 16.6% of workers in the auto sector, while workers without a four-year degree account for 62.2% of workers economywide but 74.6% in the auto sector.

The jobs embedded in the U.S. automobile supply chain once provided a key foundation for middle-class growth and prosperity. A cascade of poor policy decisions has eroded employment and job quality in this sector and this has helped to degrade labor standards across U.S. manufacturing and throughout the overall economy (Cutcher-Gershenfeld, Brooks, and Mulloy 2015). The industry transformation coming due to the widespread adoption of BEVs provides an opportunity to reverse these trends. The transformations necessary to ensure that this shift to BEVs supports U.S. employment and job quality—investment in advanced technology production and strengthening supply chains—will redound widely throughout manufacturing and aid growth in other sectors as well. The shift to BEVs is a key part of mitigating the dire consequences of global climate change, and the more this shift is supported by complementary policies and has clear benefits for workers' job quality and economic security, the more useful it will be as a model for transforming other key economic sectors in ways necessary to combat climate change and ensure prosperous, fair, and equitable outcomes for working people.

Potential employment impacts of a shift to EVs: Policy will matter greatly

This report summarizes the results of an analysis aimed at estimating the potential impacts of increased adoption of electric vehicle (EV) technology on employment in U.S. auto and component manufacturing sectors. Our analysis focuses on how three factors in the transition impact employment in the manufacturing sector: (1) the portion of the fleet that is made up of traditional gas-powered vehicles with internal combustion engines (ICEs) only, battery electric vehicles (BEVs) powered solely by a battery and an electric motor, and plug-in hybrid electric vehicles (PHEVs), which are powered by a battery and an electric motor but also include a backup ICE; (2) the domestic content of the EV powertrains that are installed in both PHEVs and BEVs relative to the domestic content of ICEs; and (3) the share of the domestic car market produced by auto manufacturers in the U.S.

In contrast with other studies (Hibbard and Darling 2021; Goldman School 2021) that look at the economywide impacts of increased BEV deployment, this study focuses more narrowly on the impacts on employment in the auto assembly and auto parts sectors. Given the importance of these sectors to the broader economy and the health of hundreds of U.S. communities, this “narrow” focus—which we label the “auto sector” in tables and figures—does not imply outcomes are of limited importance.

We find substantial potential challenges and opportunities related to increased EV deployment for workers in the auto manufacturing and related sectors. Critically, if the coming shift toward BEVs progresses with current rates of imported EV powertrain parts and domestic auto market share, significant numbers of well-paying manufacturing jobs in the auto sector will be at risk. Very roughly, the current share of BEV powertrain components produced in the U.S. is just under 45%, while for ICE powertrains it is closer to 75% (authors’ analysis from IMPLAN). Conversely, if the U.S. develops stronger domestic industries in key EV supply areas such as battery production, and adds to domestic manufacturers’ market share, there is the potential for significant growth in auto-sector employment and improvements in job quality.

Our analysis models the impacts of increased penetration of both BEVs and PHEVs on auto-sector employment. Modeling the employment implications of manufacturing BEVs and PHEVs at scale is difficult because neither technology has achieved a significant level of penetration in either the car or the light-duty truck and sport utility vehicle (LDT/SUV) market segment.

To overcome this challenge, we adapted a model of the existing auto industry to create models of domestic BEV and PHEV manufacturing at scale. To model BEVs, we removed purchases of ICE drivetrain components from the supply chain of the existing input-output model and replaced them with EV drivetrain parts. Based on public comments from auto industry leaders regarding the fewer hours needed to assemble EV drivetrains, we further modified the existing auto-sector model by reducing labor requirements in auto assembly by 30% per vehicle (Hackett 2017; Vellequette 2019). To model PHEVs, we started with the existing ICE manufacturing model and added EV powertrain purchases equivalent to 25% of the BEV labor requirement for the class of vehicle (car or LDT/SUV) to reflect PHEV powertrain labor requirements. Additionally, we increased the direct labor associated with PHEV assembly by 20% above their ICE equivalents to reflect the increased assembly costs associated with the more complex powertrain (Harbour Consulting 2007).

We conducted our analysis using the IMPLAN input-output model (IMPLAN 2019). Like other input-output models, IMPLAN contains detailed interindustry relationships that indicate how much of various inputs are required to create a certain amount of a given output. In this case, for example, the IMPLAN model shows how an increase in auto-sector output increases demand for intermediate goods and services such as glass, steel, rubber, advertising, etc. IMPLAN also maintains data that indicate how much labor is required to produce a given amount of auto-sector output (direct jobs) as well as the labor associated with the supply chain (indirect jobs) and the economywide employment that is created when auto-sector and supply-chain employees spend their income (induced jobs).

Like other input-output models, IMPLAN abstracts from dynamic impacts, such as how changes in the price of cars and trucks might change total demand for cars or the price of inputs. To hold these influences largely constant and to abstract from other exogenous factors such as changes in overall economic growth, potential changes in raw material costs, and future gasoline prices, we compared employment in the auto industry of 2019 with employment under various EV market penetration scenarios, assuming identical overall domestic market size and cost structure. That is, rather than providing a comparison of *today's* auto sector against *potential future* scenarios, our analysis essentially compares employment in today's auto sector against estimates of what employment would be if EVs represented various shares of today's auto market. As such, our analysis isolates the impact of the different manufacturing requirements of EVs from exogenous factors such as those identified above.[1] Additionally, we analyze a total domestic auto market based on the average combined light-duty fleet sales between 2015 and 2019.

Modeling different scenarios for the rise of EVs

Our analysis examines various scenarios of BEV and PHEV penetration in the new light-duty vehicle fleet (cars, SUVs, and light-duty trucks). Because we anticipate a long-term trend toward BEVs, we consider PHEVs in a limited context only, with a maximum market share of 25% in one of our scenarios to represent a near-term option in the shift away from ICEs.

In addition to various penetration scenarios, we also examine the impact of changes in the domestic content of EV powertrain parts and changes in the share of domestic auto demand met by domestic automakers.

Our first alternative scenario assesses the impacts if U.S. production of EV powertrain components (largely batteries and battery packs) could achieve the same domestic content that ICE powertrain components currently have. Today, the U.S. has much more limited domestic capacity to produce EV powertrain components than it does in engines and transmissions, which are largely domestically produced. Hence, modeling the effect of large-scale introduction of electric vehicles leads to fewer domestic jobs supported by these vehicles, because more of the powertrain parts are supplied by foreign producers. If smarter policy leads to an increase in U.S. capacity to produce EV powertrain components, then the negative employment impact of a large-scale introduction of BEVs is greatly mitigated.

Our next set of alternative scenarios simply examines the employment implications of a 10-percentage-point increase or decrease in overall domestic market share of automobiles. Obviously, an increase in domestic market share leads to more domestic employment and a reduction in this market share leads to lower domestic employment. It is worth noting that a 10-percentage-point increase in U.S. market share for these types of vehicle sales should not be seen as an unrealistic goal. Over the past decade, the share of U.S. vehicle sales produced in the U.S. has varied between 44% and 56%.[2] We model a 10-percentage-point gain from 50% in the base model—to a 60% market share.

These alternative scenarios regarding the extent of domestic EV powertrain production and the overall domestic market share are highly conditional on the acts of policymakers in supporting—or failing to support—the growth of the future U.S. auto sector.

As mentioned above, this analysis is narrowly focused on the impacts of increased EV technology deployment on employment in car and LDT/SUV auto and parts manufacturing. We do not consider the impact of electric vehicle technologies on heavy-duty vehicle manufacturing, the impact of BEV adoption on auto maintenance and repair industries, the potential impact on retail sales of consumer goods at fueling stations, or the impact on the broader economy due to changes in oil and electricity consumption associated with BEV penetration. We make no effort to predict the overall size of the domestic auto market, or the impact of specific subsidies for BEV purchasing or manufacturing. Finally, we did not model any of the infrastructure requirements likely necessary with an increasing BEV fleet, such as public charging stations and upgrades to electricity transmission and distribution systems. Our analysis does not assess the costs or benefits of any particular policy approach to achieve the various outcomes we analyze, opting instead to look only at the economic implications of the outcomes themselves.

Results: Employment impacts under different scenarios

The results of our analysis are represented in the charts below. We break our results into two categories, Assembly and Parts. Assembly represents employment at auto-manufacturing plants themselves, while Parts represents employment in the auto-sector supply chain. For this analysis, we include in the Parts category only those supply chain elements that become a physical part of the autos themselves, including things like tires, glass, and electronics, but excluding things like expenditures on real estate, advertising, and machinery.

The employment impact of growth in electric vehicle market share under different scenarios

Figure A shows the potential job changes for a range of scenarios regarding the growth of market share of electric vehicles—namely battery electric vehicles—by 2030. The first scenario assumes all-electric vehicles (BEVs) account for 30% of the auto market by 2030, with traditional gas-powered (internal combustion engine powered) vehicles retaining 70% of the market. The second scenario assumes a 50/50 split between BEVs and ICEs. The third scenario assumes that ICEs retain 50% of the market but the remaining 50% is split between BEVs and hybrids (PHEVs). The fourth scenario assumes that ICEs retain 50% of the market, BEVs account for 40%, and PHEVs account for the remaining 10%.

These scenarios assume no change in the share of electric vehicle powertrain components that are manufactured in the U.S. and no change in the U.S. share of the global auto market. Specifically, under our model, the domestic content of EV powertrain components are set to the IMPLAN default values for those commodities and also assume a 50% domestic manufacturer market share for both cars and light trucks/SUVs. In short, these estimates represent job changes under differing penetrations of EVs in a business-as-usual scenario where nothing is done to increase domestic production of EV powertrains or to improve domestic producers' overall share in the auto market.

In the first scenario, with 30% BEV penetration and 70% ICE market share, about 20,000 assembly jobs are lost and almost 25,000 parts jobs are lost. Assembly jobs are lost because BEV assembly is less complex and requires fewer person-hours than ICE assembly. The lost parts jobs are mostly due to the fact that the U.S. currently lags Europe and Asia in domestic battery and battery cell and materials production capacity, resulting in lost domestic employment in powertrains.

In the second scenario, with 50% BEV and 50% ICE market shares, the losses proportionately scale up relative to the first scenario. In the third scenario, with BEVs accounting for 25% of the market, PHEVs accounting for 25% of the market, and ICE retaining 50% of market share, the job losses for both assembly and parts are substantially reduced. PHEVs actually require more assembly jobs and slightly more parts than even ICE vehicles, hence the very substantial reduction in assembly jobs lost relative to the second scenario. PHEVs also require an ICE-type powertrain, so more of the powertrain is supplied by domestic producers and hence the job losses in parts is also blunted relative to other scenarios.

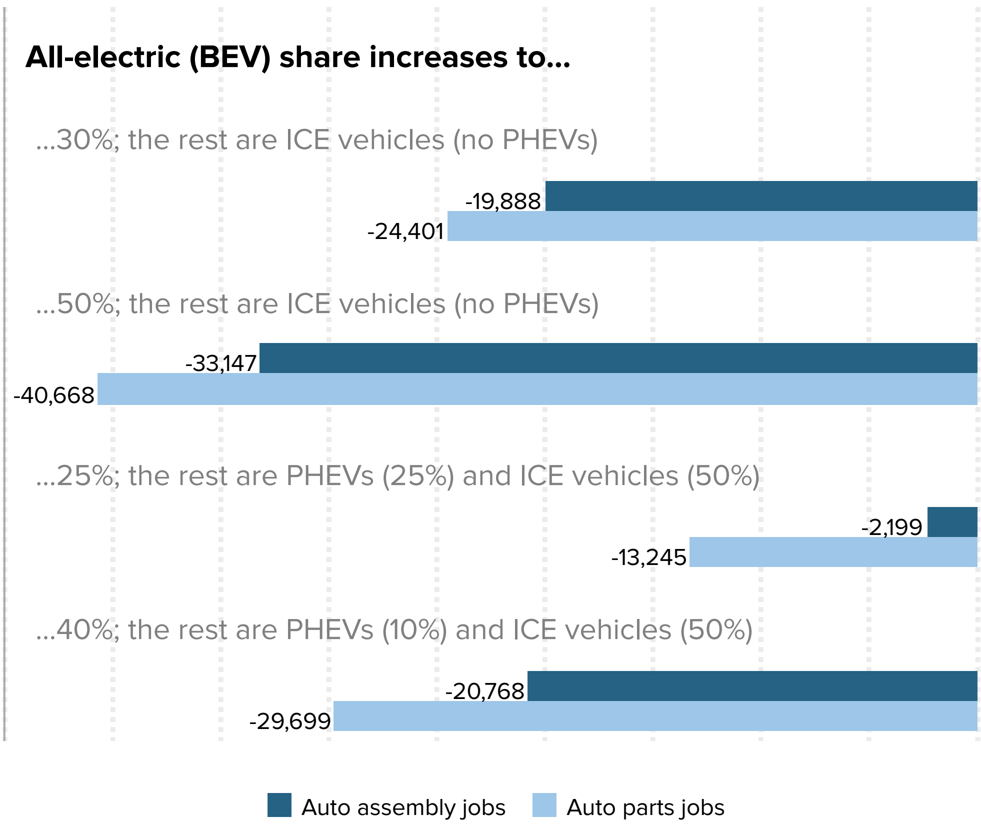
In the fourth scenario, with lower PHEV penetration than the third scenario (10% instead of 25%), the job losses from 40% penetration of BEVs is again blunted, but less so—over 50,000 jobs are lost, with nearly 30,000 of these in parts.

Figure B highlights how important one aspect of policy will be in shaping the job implications of a large-scale shift to electric vehicles. It shows the same scenarios as Figure A regarding market penetration by auto type, but changes the assumption regarding domestic content of EV powertrains. If policy supports increasing domestic production of EV powertrain components to levels comparable with domestic content of ICE powertrains, then a huge share of job losses embedded in the scenarios of Figure A can be avoided. All of these job-loss reductions are accomplished by reducing job losses in auto parts. In the first scenario, job losses that reached nearly 25,000 under the business-as-usual assumptions of Figure A would be reduced to roughly 1,500 if domestic content in EV powertrains could match current domestic content in ICE powertrains. Under the third scenario (the one that includes a 50% market share for ICEs but with BEVs and PHEVs each satisfying 25% of the market), there would be no job losses at all in parts production: Again, the parts requirements of PHEVs are actually slightly greater than even for ICEs, so the boost to parts employment stemming from greater parts use of PHEVs

Figure A

Without manufacturing policy action, growth in the electric vehicle share of the auto market leads to job losses; inclusion of plug-in hybrids mitigates some losses

Change in U.S. auto jobs in 2030 if the total number of cars made stays the same but the share that are battery electric vehicles rises



Notes: Today vehicles powered exclusively by a battery and an electric motor (battery electric vehicles, or BEVs) make up a very small share of the U.S. light-duty vehicle market (cars, vans, SUVs, and pickup trucks). Most vehicles are still conventional gas/diesel-powered (i.e., powered by internal combustion engines, or ICEs), and the rest are plug-in hybrid electric vehicles, or PHEVs, which are vehicles powered by a battery and an electric motor in addition to an ICE. The figure shows the job effects if the total number of cars produced in the U.S. stays the same but there is a rise in the shares that are BEVs and PHEVs. All other factors remain the same (e.g., the U.S. share of all autos produced remains the same, as does the share of a particular type of vehicle's drivetrain that is made up of domestic content).

Source: Authors' analysis of scenarios described in the text, from results estimated using the IMPLAN (2019) input-output model.

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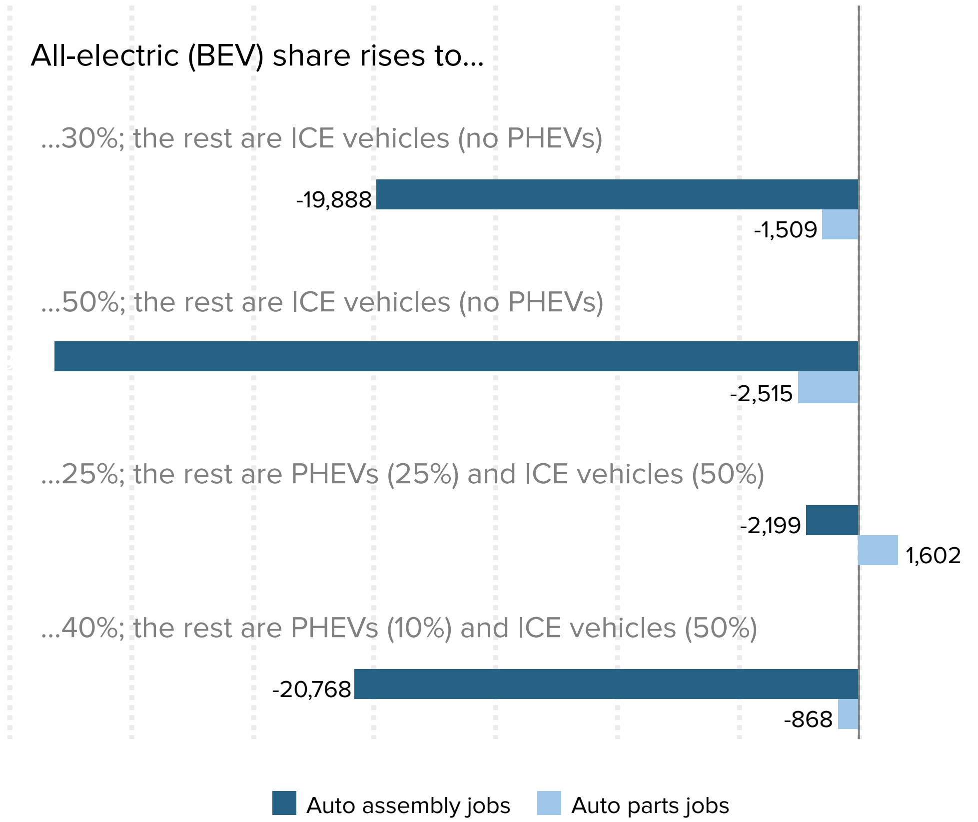
would very slightly outstrip the small parts losses due to the shift to BEVs.

Figure C shows that improving domestic capacity in powertrain components for BEVs and boosting the market share of U.S.-based producers will lead to job gains in the auto sector

Figure B

Onshoring and expanding electric vehicle powertrain components production in the U.S. would greatly stem auto parts job losses from growth in the electric vehicle share of the auto market

Change in U.S. auto jobs in 2030 if the EV market share rises and the U.S.-produced share of EV powertrain components rises to equal that of conventional vehicle powertrains



Notes: Today vehicles powered exclusively by a battery and an electric motor (battery electric vehicles, or BEVs) make up a very small share of the U.S. light-duty vehicle market (cars, vans, SUVs, and pickup trucks). Most vehicles are still conventional gas/diesel-powered (i.e., powered by internal combustion engines, or ICEs), and the rest are plug-in hybrid electric vehicles (PHEVs), which are vehicles powered by a battery and an electric motor in addition to an ICE. The figure shows the job effects if the total number of cars produced in the U.S. stays the same but there is a rise in the shares that are BEVs and PHEVs, and if an increase in U.S. production of electric vehicle (EV) powertrain components brings U.S. manufacturers' share of the EV powertrain market up to their share of the ICE powertrain market.

Source: Authors' analysis of scenarios described in the text, from results estimated using the IMPLAN (2019) input-output model.

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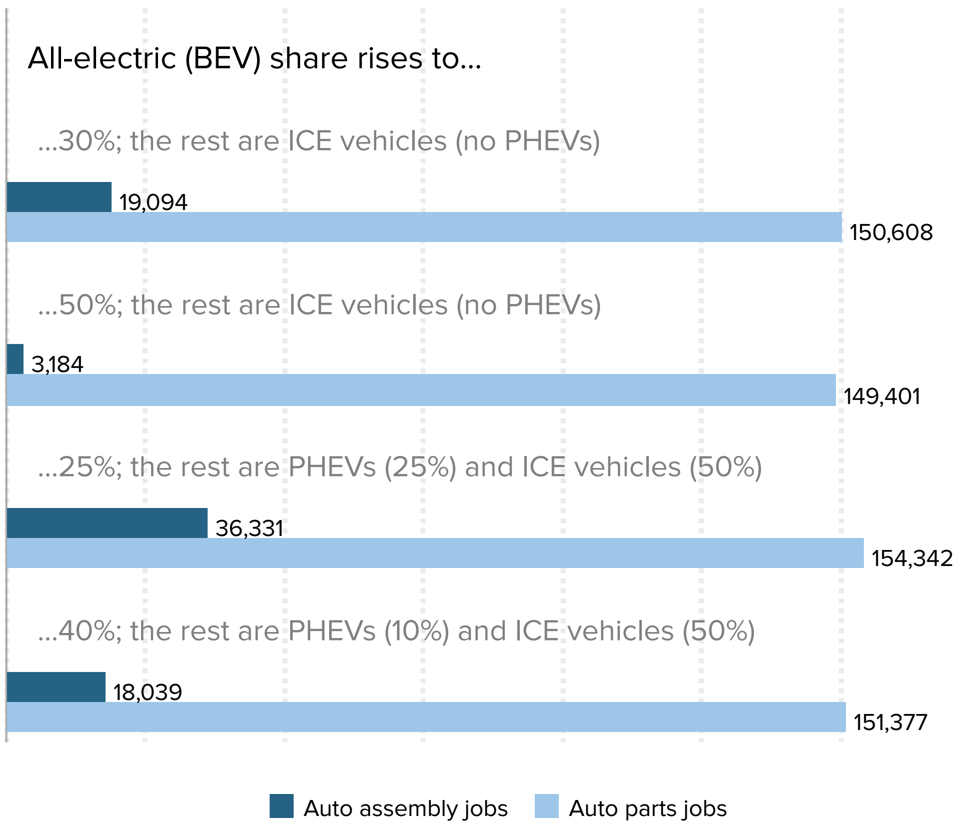
regardless of the extent of BEV penetration in 2030. In short, what will determine how much employment in the U.S. auto sector will grow is not the growth of BEVS—which is inevitable at this point. Instead, it is the policy response.

Figure C

Onshoring power train production and boosting domestic share of vehicles sold would lead to large job gains

Change in U.S. auto jobs under various BEV penetration scenarios, if U.S. EV powertrain component production matched ICE average and the share of domestically produced vehicles sold in the U.S. increased by 10 percentage points



Note: The figure shows the job effects if the total number of cars produced in the U.S. stays the same but there is a rise in the shares that are BEVs (battery electric vehicles) and PHEVs (plug-in hybrid electric vehicles), an increase in U.S. production of electric vehicle (EV) powertrain components brings U.S. manufacturers' share of the EV powertrain market up to their share of the ICE (internal combustion engine) powertrain market, and there is a 10-percentage-point increase in the share of all vehicles sold in the U.S. produced by U.S-based domestic manufacturers.

Source: Authors' analysis of scenarios described in the text, from results estimated using the IMPLAN (2019) input-output model.

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Figure D shows the importance of policies by presenting a range of outcomes depending on market share and policy assumptions. Each scenario in Figure D assumes a 50% penetration of ICEs. The base scenario assumes that the other 50% of the market is satisfied by BEVs and no policy changes affect the status quo in terms of market share of all vehicles and powertrain components. Under this scenario, which is the same as the second scenario in Figure A, there is a loss of nearly 75,000 jobs. From here, the influence of changing other assumptions is examined. The “hybrid” scenario starts from the base of 50% ICEs but then assumes that 25% of the market is satisfied by PHEVs (as is one of the scenarios examined in Figure A), with the remaining 25% satisfied by BEVs.

The “equivalent domestic content” scenario starts from the base but then assumes that the domestic market share of EV powertrains reaches the current domestic market share of ICE powertrains (as is one of the scenarios examined in Figure B). The “+10 ppt. market share” scenario starts from the base but then assumes that domestic auto producers boost their share of overall vehicle sales by 10 percentage points. The “–10 ppt. market share” scenario starts from the base and assumes a 10-percentage-point decline in domestic auto producers’ share of overall vehicle sales.

The final scenario starts from the base scenario and then assumes *both* that the domestic market share of EV powertrains matches current ICE powertrain production *and* that domestic auto producers boost their share of overall vehicle sales by 10 percentage points.

The results show how dramatically the future market share claimed by the U.S. auto sector—both in parts production and in overall sales—will shape the job-market implications of a shift toward BEVs in the future. For example, a 10-percentage-point across-the-board *increase* or *decline* in domestic auto producers’ share of vehicle sales is the difference between over 100,000 jobs gained or more than 250,000 jobs lost as BEVs are introduced. If a 10-percentage-point increase in overall vehicle sales market share could be matched with domestic competitive parity in producing EV and ICE powertrains, then the introduction of BEVs could lead to job gains exceeding 150,000.

Figure D highlights how powerful it would be for creating good jobs to regain U.S. leadership in auto production—both in powertrain components for BEVs and in regaining previous levels of overall market share.

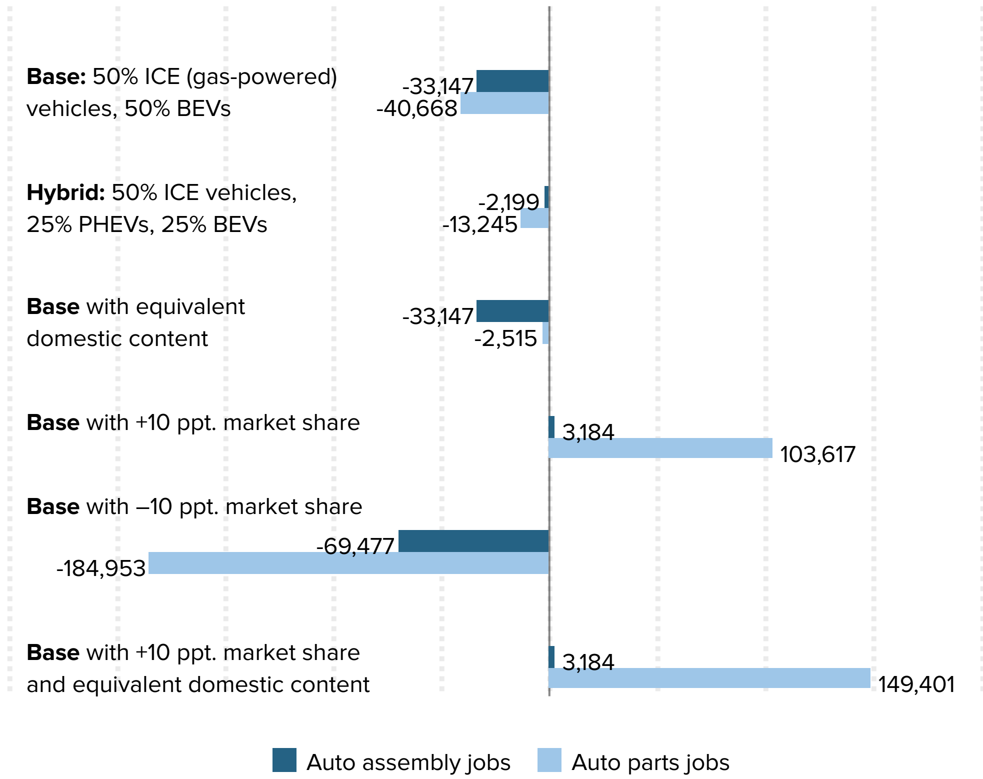
Reviewing the distribution of job gains or losses to understand their implications

Table 1 suggests how the job change estimates from the various scenarios above would affect workers by showing the current demographic makeup of the workforce in the automobile production sector (the workforces of auto assembly and parts), the share that are unionized (i.e., covered by a collective bargaining agreement), and, for those with less than a four-year college degree, their wages. The composition of workers affected by the job changes could of course be affected by policy. For example, at current rates of unionization the jobs created under the smarter policy scenarios implied by Figure D (policies that boost market share overall as well as market share of EV drivetrain production) would be less than 15% unionized. But policy can boost this share significantly if fundamental labor law reforms are enacted and if public funds used to guide the EV transition are contingent upon strong labor standards.

Figure D

Policies that help the U.S. regain leadership in the auto sector will affect job changes associated with growth in the electric vehicle share of the auto market

Change in U.S. auto jobs in 2030 if electric vehicles account for half of the auto market, under various scenarios



Notes: "Equivalent domestic content" means U.S. manufacturers' share of the EV (electric vehicle) powertrain market matches their share of the ICE (internal combustion engine, i.e., gas-powered) powertrain market. BEVs refers to battery electric (all-electric) vehicles. PHEVs refers to plug-in hybrid electric vehicles. A +10 ppt. market share means the domestic share of overall vehicle sales increases by 10 percentage points. A –10 ppt. market share means the domestic share of overall vehicle sales decreases by 10 percentage points.

Source: Authors' analysis of scenarios described in the text, from results estimated using the IMPLAN (2019) input-output model.

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For now, however, as Table 1 shows, the incumbent automobile production workforce skews quite heavily male. Black workers make up a disproportionate share of autoworkers, and autoworkers are less likely to have a four-year college degree than workers overall. Specifically, the overall workforce is 51.8% male and 12.5% Black, and 24.1% have a four-year college degree as their highest level of educational attainment. In the automobile production sector, 74.2% of workers are male, 16.6% are Black, and 17.2% have a four-year college degree but not an advanced degree.

Automobile workers are also heavily concentrated regionally. The seven states of the Upper Midwest[3] account for 54.8% of automobile jobs, the 11 states of the South[4] account for 30.1% of auto jobs, California accounts for 4.5% of auto jobs, and the remaining 32 states (which includes the District of Columbia) account for just 10.6% of these jobs.

Table 1 also highlights the auto sector's high unionization rate and higher wages—at the 10th, median, and 90th percentiles—relative to other sectors of the economy and the workforce overall. In the automobile sector, the share of workers covered by a collective bargaining agreement is 17.0%, compared with 11.8% in the overall workforce, 9.3% in all of manufacturing, and 7.1% in the private sector (not shown in table).[5] These facts are surely related: The higher wages paid by the automobile sector are particularly striking given the lower share of the auto workforce with a four-year college degree.

Table 2 compares the unionized and nonunionized automobile sectors along many of the same dimensions. The share of women is lower in the unionized sector, 23.6% compared with 26.2% in the nonunionized sector. Strikingly, the share of Black workers is significantly lower in the nonunionized sector, despite the fact that a much larger share of nonunion auto production occurs in the South, a region with a much higher share of Black workers economywide. **Table 3** shows the share of workers by race and ethnicity in each of the four "regions" constructed for this analysis.

It is worth highlighting as well that the job quality of the nonunionized auto sector might be even worse than Table 2 suggests, as there has been a shift in that sector toward hiring from temporary staffing agencies: By 2014, unpublished estimates from the U.S. Census Bureau indicated that roughly 14% of all workers engaged in automobile production were actually hired from temporary staffing agencies (Ruckelshaus and Leberstein 2014). The temp workers would be classified as in the automobile sector in the Current Population Survey (CPS) data used to construct Table 2, but other research has documented that pay for these temp workers is significantly lower than pay for permanent automobile sector workers (even nonunionized workers).

As the tables show, Black workers' share of the unionized automobile production workforce (25.5%) is substantially higher than Black workers' share of the overall workforce in the Upper Midwest (10.5%), while the share of nonunionized automobile production workers who are Black (14.8%) is substantially lower than Black workers' share of the overall workforce in the South (18.9%). This strongly suggests that, given the racial composition of the regional economy, the unionized segment of the auto-production sector has done a much better job of making job opportunities available to Black workers.

As shown in Table 2, wages at the 10th, 50th, and 90th percentiles are significantly higher for workers without a four-year college degree in the unionized automobile sector. The same holds true for the shares of workers covered by employer-provided health insurance and pension plans. In short, the association between higher job quality and unionization is, not surprisingly, strong. **Figure E** highlights this in more detail, with the dark blue line showing how much higher median wages are in the automobile sector than median wages economywide, and the light blue line showing the ratio of unionization rates in the

Table 1

Demographics, wages, and benefits of workers in auto sector, manufacturing, and all industries

	Auto sector	All of manufacturing	Economywide
Gender			
Male	74.2%	70.9%	51.8%
Female	25.8%	29.1%	48.2%
Race/ethnicity			
White, non-Hispanic	65.6%	64.3%	61.9%
Black, non-Hispanic	16.6%	10.3%	12.5%
Hispanic	10.4%	16.9%	17.5%
Asian American Pacific Islander (AAPI)	6.6%	7.5%	7.0%
Other	0.9%	1.0%	1.1%
Union status			
Union	17.0%	9.3%	11.8%
Nonunion	83.0%	90.7%	88.2%
Education			
Less than high school	6.6%	9.2%	8.1%
High school diploma/GED only	37.3%	34.0%	25.9%
Some college	30.7%	26.5%	28.2%
Bachelor's degree	17.2%	21.0%	24.1%
Advanced degree	8.2%	9.3%	13.7%
Wages for workers with less than a four-year college degree			
10th-percentile wage	$11.85	$11.14	$9.62
Median wage	$18.34	$18.22	$15.84
90th-percentile wage	$32.64	$33.44	$32.40
Employer-sponsored benefits			
Health insurance coverage	74.0%	66.8%	52.8%
Pension coverage	47.7%	43.2%	34.0%
Regions			
Upper Midwest	54.8%	28.2%	18.6%
South	30.1%	28.5%	31.2%
California	4.5%	10.6%	11.6%
Other	10.6%	32.7%	38.5%

Notes: Data are for workers ages 16 and older. Wage data are from 2016–2020 and are adjusted to 2020 dollars. Data on employer-sponsored pension and health insurance coverage are from 2015–2019. The xth-percentile wage is the wage at which x% of wage earners earn less and (100−x)% earn more. Self-employed and self-incorporated workers are excluded. The auto sector includes auto assembly and auto parts. Share of union workers is share covered by a collective bargaining agreement. Upper Midwest states are Illinois, Indiana, Michigan, Missouri, Ohio, West Virginia, and Wisconsin. Southern states are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. "Other" are all other states (those not in the Upper Midwest, South, or California region), including the District of Columbia.

Source: EPI analysis of BLS Current Population Survey (CPS) Outgoing Rotation Group (ORG) 2016–2020 pooled data and Current

Table 1 (cont.)

Population Survey (CPS) Annual Social and Economic Supplement (ASEC) 2015–2019 pooled data (EPI 2021).

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automobile sector to unionization rates economywide. The association between these lines is clear: As the auto sector's high union coverage relative to coverage overall erodes rapidly in the 1980s, 1990s, and 2000s, the relative pay advantage of working in the automobile sector declines as well. In the late 1980s, auto workers were nearly three times as likely to be unionized as workers overall and earned roughly 60% higher wages at the median; in 2020, they were only slightly more likely to be unionized and had median wages just 7% higher.

The decline of unionization in the automobile sector was driven by policy failures both within the auto supply chain and throughout the economy. Within the sector, policy failures to help U.S. producers invest and maintain their competitive position in the face of oil price shocks in the 1970s led to lost market share for the unionized automakers once known as the Big Three (General Motors, Ford, and Fiat Chrysler). Poorly structured trade agreements and lack of trade enforcement put further downward pressure on industry employment and job quality. In the broader economy, contractionary macroeconomics policy, failure to keep the U.S. dollar at a competitive level, and an assault on labor standards all spilled over to do great damage to workers in the U.S. auto supply chain (Scott and Glass 2016). These processes should not be allowed to repeat in coming decades as an even larger (albeit potentially better-planned) transformation in the auto sector looms with the introduction of EVs.

Conclusion

U.S. automotive workers have had their economic opportunities and job quality battered for decades by harmful policy decisions. The massive coming shifts in automotive sales toward EVs present new challenges and opportunities for these workers. If policymakers ignore the opportunity to build the sector back stronger, large job losses and further degradation of job quality is the most likely outcome. If instead policymakers help meet this coming transformation with strong investment targeted at boosting the U.S. position in the electric vehicle market and in advanced vehicle technology manufacturing, and if these investments are accompanied by measures aimed at strengthening bargaining power for workers, then employment will expand in the U.S. auto sector and the number of unionized jobs will grow. With a smart policy push, the long downward slide in job quality will reverse at the same time that the U.S. leads in building the vehicles of the future and combating climate change.

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Table 2

Demographics, wages, and benefits of workers in the unionized auto sector, nonunion auto sector, overall auto sector, and all industries

	Unionized auto sector	Nonunion auto sector	Overall auto sector	Economywide
Gender				
Male	76.4%	73.8%	74.2%	51.8%
Female	23.6%	26.2%	25.8%	48.2%
Race/ethnicity				
White, non-Hispanic	62.4%	66.3%	65.6%	61.9%
Black, non-Hispanic	25.5%	14.8%	16.6%	12.5%
Hispanic	7.7%	10.9%	10.4%	17.5%
Asian American Pacific Islander (AAPI)	3.1%	7.3%	6.6%	7.0%
Other	1.2%	0.8%	0.9%	1.1%
Education				
Less than high school	5.3%	6.8%	6.6%	8.1%
High school diploma/GED only	42.3%	36.3%	37.3%	25.9%
Some college	41.5%	28.4%	30.7%	28.2%
Bachelor's degree	8.1%	19.0%	17.2%	24.1%
Advanced degree	2.8%	9.3%	8.2%	13.7%
Wages for workers with less than a four-year college degree				
10th-percentile wage	$13.00	$11.62	$11.85	$9.62
Median wage	$20.95	$17.95	$18.34	$15.84
90th-percentile wage	$33.00	$32.36	$32.64	$32.40
Employer-sponsored benefits				
Health insurance coverage	82.4%	73.8%	74.0%	52.8%
Pension coverage	52.9%	47.5%	47.7%	34.0%
Regions				
Upper Midwest	74.9%	50.7%	54.8%	18.6%
South	16.4%	32.9%	30.1%	31.2%
California	2.1%	4.9%	4.5%	11.6%
Other	6.6%	11.4%	10.6%	38.5%

Notes: Data are for workers ages 16 and older. Wage data are from 2016–2020 and are adjusted to 2020 dollars. Data on employer-sponsored pension and health insurance coverage are from 2015–2019. The xth-percentile wage is the wage at which x% of wage earners earn less and (100−x)% earn more. Self-employed and self-incorporated workers are excluded. Unionized workers are those covered by a collective bargaining agreement. Upper Midwest states are Illinois, Indiana, Michigan, Missouri, Ohio, West Virginia, and Wisconsin. Southern states are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. "Other" are all other states (those not in the Upper Midwest, South, or California region), including the District of Columbia.

Source: EPI analysis of BLS Current Population Survey (CPS) Outgoing Rotation Group (ORG) 2016–2020 pooled data and Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) 2015–2019 pooled data (EPI 2021).

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Luke Tonachel of the Natural Resources Defense Council and Erin Falquier of Chicane

Table 3

Racial and ethnic demographics of workers in the four automaking 'regions'

	Upper Midwest	South	California	Other
White, non-Hispanic	76.9%	56.4%	37.6%	66.5%
Black, non-Hispanic	10.5%	18.9%	5.9%	10.4%
Hispanic	7.9%	19.5%	37.8%	14.4%
Asian American Pacific Islander (AAPI)	3.9%	4.5%	17.8%	7.1%
Other	0.8%	0.8%	0.8%	1.6%

Notes: Data are for workers ages 16 and older. Upper Midwest states are Illinois, Indiana, Michigan, Missouri, Ohio, West Virginia, and Wisconsin. Southern states are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. "Other" are all other states (those not in the Upper Midwest, South, or California region), including the District of Columbia.

Source: EPI analysis of BLS Current Population Survey (CPS) Outgoing Rotation Group (ORG) 2016–2020 pooled data (EPI 2021).

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Endnotes

1. This is an important, and we think valuable, aspect of this study. The automobile production sector has seen rapid productivity growth in recent decades and likely will continue to see this going forward—it has benefited from automation as much as any other industrial sector. This rapid automation and productivity growth by itself puts substantial downward pressure on employment levels in the sector. Even if nothing changed with regard to the composition of the auto fleet in coming decades, projections of employment in the sector would likely show nontrivial declines, largely driven by the intersection of rapid productivity growth and slowing consumer demand. Such projections highlight real challenges for autoworkers, but they are not challenges introduced by EVs, and disentangling these substantial effects from those stemming strictly from EVs is a useful exercise.

2. Analysis provided in correspondence by Kristin Dziczek of the Center for Automotive Research (CAR).

3. Upper Midwest states are Illinois, Indiana, Michigan, Missouri, Ohio, West Virginia, and Wisconsin.

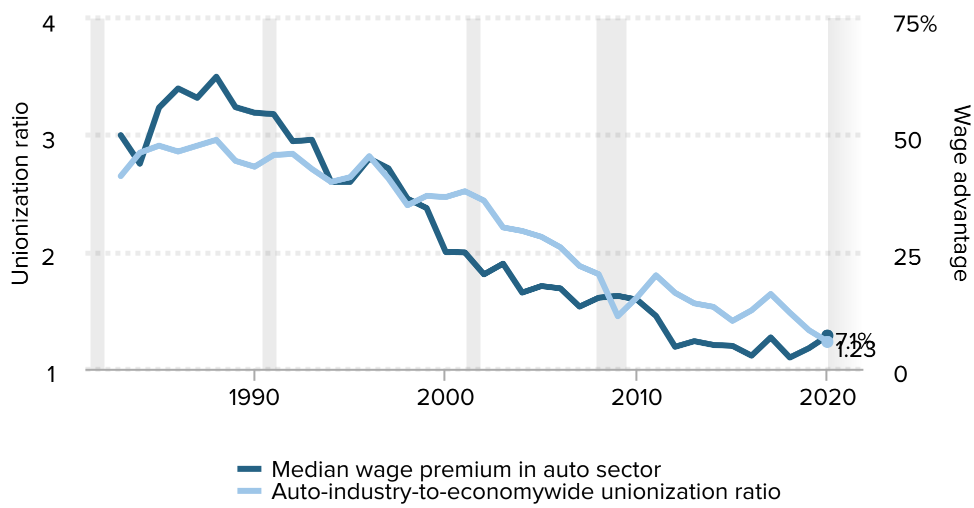
4. Southern states are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia.

5. EPI analysis of BLS Current Population Survey (CPS) Outgoing Rotation Group (ORG) 2016–2020 pooled data (EPI 2021).

Figure E

Pay advantage for autoworkers declines as unionization falls

Ratio of auto industry unionization rate to economywide unionization rate, and percent pay advantage for the median auto worker over the median worker economywide, 1983–2020



Notes: Wage data are adjusted to 2020 dollars. Data are for employed workers ages 16 and older. Self-employed, self-incorporated workers are excluded. The auto industry includes auto assembly and auto parts. The unionization rate is the share of workers covered by a collective bargaining agreement.

Source: EPI analysis of BLS Current Population Survey (CPS) Outgoing Rotation Group (ORG) 1983–2020 microdata (EPI 2021).

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