ROSA LUXEMBURG STIFTUNG
BRUSSELS OFFICE

THE NEED FOR TRANSFORMATION

CHALLENGES FOR THE INTERNATIONAL AUTOMOTIVE SECTOR

VOICES FROM UNIONS, WORKERS, CLIMATE MOVEMENT, INDUSTRY

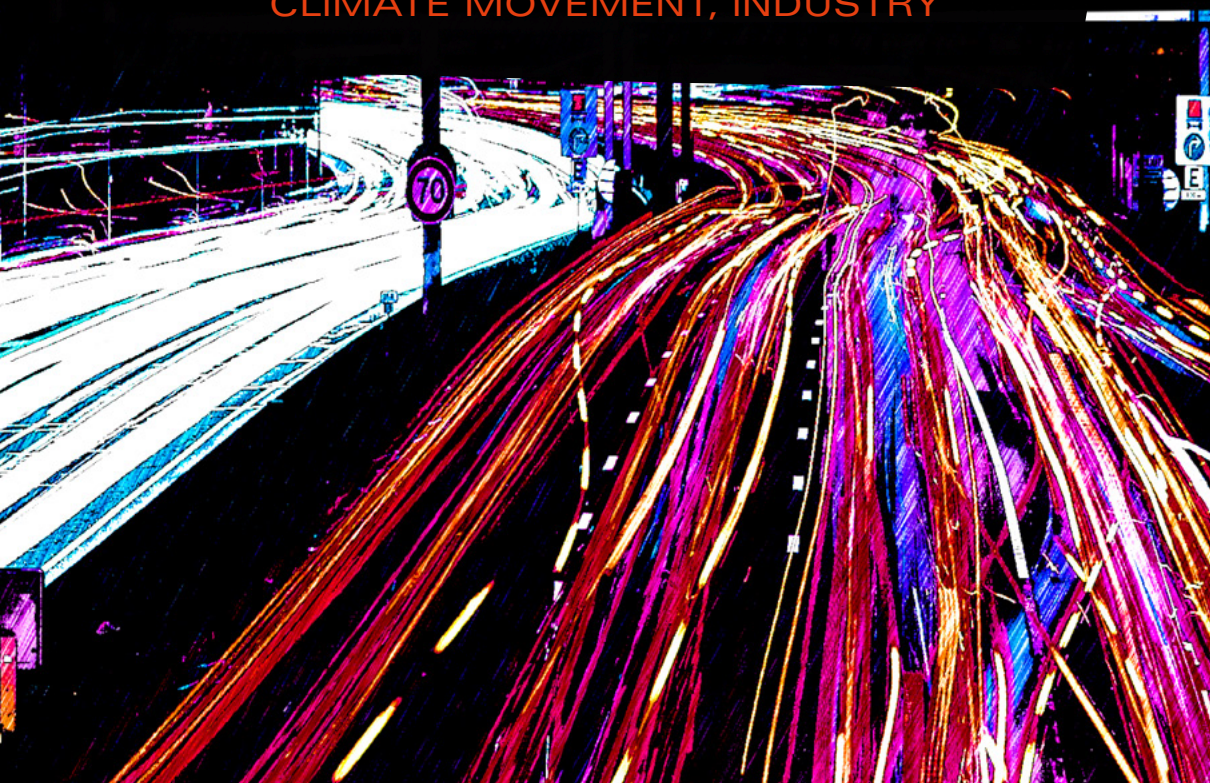

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TABLE OF CONTENTS

FOREWORD

Since the outbreak of the COVID19 pandemic, the global automotive industry has had to contend with a decline in employment, with 150,000 jobs lost in the European Union (EU) by February 2021. Nissan, Renault, Daimler, Continental, Bosch, ZF and many other manufacturers have had to lay off staff and cut jobs, and it is not only the carmakers themselves that have been affected: the vital supplier industry has been hit too. In Brazil, 50 percent of automotive production capacity has been idle during the pandemic, and Ford has ceased production in the country entirely. On the other hand, share owners benefited from dividends and asset growth.

Looking ahead, workers are set to face further upheavals as a result of the switch to electric car production. Experts believe that up to a quarter of jobs in the automotive industry could be eliminated, especially in the supplier industry. This poses exceptional challenges for the regions affected. For example, 12 million people work in the European automotive sector, whether directly in production or in the supplier industry. This sector generates 7 percent of the EU's gross domestic product and plays a key role in the manufacturing industry in many EU Member States, with 8.5 percent of jobs in EU manufacturing directly related to the automotive sector. In Slovakia and Romania, for example, the figure is 15 percent, in the Czechia 13 percent, Hungary 12 percent, Germany 11 percent and Spain 8 percent. Ten percent of Serbian exports are generated in the local automotive industry. However, we are not only talking about the approximately 12 million people who directly or indirectly live off this industry but the roughly 30 million people throughout Europe who are involved in this industry's economic output.

Global car production has been characterised by overcapacity and recurring sales crises for years, and only the increasing demand for vehicles on the Chinese market and various measures to create purchase incentives have been able to shore up demand in recent years. The billions in support from some governments during the COVID-19 pandemic were, of course, a welcome boon for the automotive industry.

Nevertheless, the fundamental question arises as to how, on the one hand, industrial production capacity can be secured in the long term and, on the other hand, the transport sector can take up the fight against climate change, given that transport is the only sector whose greenhouse gas emissions have been rising unchecked

for years. However, while the shift towards e-mobility – as reflected, for example, in the European Commission's European Green Deal and the European Battery Alliance – may lead to a reduction in greenhouse gas emissions, it will not be substantial enough to effectively combat climate change. And that is assuming the industry produces small, efficient electric cars that run on 100-percent renewable electricity. Neither of these is currently the case and that will not change any time soon, given that renewable-electricity expansion rates worldwide are far too low, and the trend towards large, heavy electric SUVs continues unabated. Moreover, manufacturing the necessary lithium-ion batteries is very energy- and resource-intensive, requiring the environmentally harmful, energy-intensive extraction of rare earth elements and raw materials such as lithium, nickel and cobalt. It also – through extractivism – increases the dependence of the Global South on production capacity in the Global North.

When it comes to a left Green New Deal, therefore, the focus must be more on developing alternatives: e-mobility needs to be discussed in a broader context, including above all the production of electrically-powered rail vehicles and public transport vehicles. Local and long-distance public transport must be comprehensive and affordable, guaranteeing the "right to mobility" all over the world. The mobility transition is a key conflict and a central "starter project" of a global left Green New Deal. The development of alternative production could create hundreds of thousands of jobs worldwide. Not only that but the massive expansion of rail and public transport has the potential to generate *local* jobs that would not be threatened by industrial relocation. The stark contrast between labour and capital was highlighted once again during the pandemic, as many companies in the automotive industry took advantage of the situation to put pressure on workers, downgrade working and employment conditions, cut wages, lay off staff and move production to cheaper locations.

A conversion of the automotive industry into an *ecologically-oriented mobility industry* can only succeed if it is underpinned by extensive social participation: public involvement would have to be combined with a greater say for workers, trade unions, environmental associations and the wider population, for example in the form of regional councils. It is also important to build on workers' knowledge and expertise, and the pride they have in themselves as producers and in their product and its usefulness. A "just transition" is needed for the automotive industry in order to be able to cope with the upcoming challenges of structural

change through e-mobility and the development of an *ecological mobility industry.* We need a green revolution in the industry while also protecting workers.

In this study, the obstacles and potential associated with a transformation of the automotive industry and the development of an ecological mobility industry are discussed in dozens of interviews with trade unionists, climate activists and representatives of the automotive industry from Brazil, Serbia, Slovakia, the Czechia, Spain, France and Italy. There is a particular focus on positioning in the international value chain, the impact of foreign direct investment, the structure of the local labour market and the bargaining power of local trade unions. The study also examines how local actors assess the potential for building an ecological mobility industry.

We hope you find it an interesting read!

We thank the Rosa-Luxemburg-Stiftung, Regional Office Brazil and Cono Sur, São Paulo which facilitated and financed the case study on Brazil in this publication.

Andreas Thomsen, Head of Office, Rosa-Luxemburg-Stiftung Brussels Office

Manuela Kropp, Project Manager, Rosa-Luxemburg-Stiftung Brussels Office

Brussels, June 2021

VORWORT

Seit Ausbruch der COVID-19-Pandemie hat die weltweite Autoindustrie Beschäftigungsverluste verkraften müssen: in der EU gingen bisher 150.000 Jobs verloren (Stand Februar 2021). Bei Nissan, Renault, Daimler, Continental, Bosch, ZF und vielen anderen mussten Entlassungen und Stellenkürzungen vorgenommen werden: sowohl die Autobauer als auch die wichtige Zulieferindustrie sind betroffen. In der brasilianischen Autoindustrie haben währen der Pandemie 50 Prozent der Produktionskapazitäten brachgelegen. Ford kündigte das Ende der Produktion in Brasilien an. Auf der anderen Seite profitierten die Aktienbesitzer von Dividenden und Vermögenszuwächsen.

Perspektivisch stehen weitere Umwälzungen für die Beschäftigten durch den Umstieg auf den Bau von Elektroautos an: Expert*innen gehen davon aus, dass bis zu einem Viertel der Stellen in der Autoindustrie wegfallen könnten, besonders in der Zulieferindustrie. Dies stellt die betroffenen Regionen vor besondere Herausforderungen. Bspw. arbeiten in der europäischen Autoindustrie 12 Millionen Menschen – direkt in der Produktion und in der Zulieferindustrie. Dieser Sektor erwirtschaftet 7 Prozent des EU-Bruttoinlandsprodukts und spielt in vielen EU-Mitgliedstaaten eine bedeutende Rolle im verarbeitenden Gewerbe: 8,5 Prozent der Jobs im verarbeitenden Gewerbe der EU sind direkte Jobs in der Autoindustrie, für die Slowakei sind dies bspw. 15 Prozent, für Rumänien ebenfalls 15 Prozent, für Tschechien 13 Prozent, für Ungarn 12 Prozent, für Deutschland 11 Prozent, für Spanien 8 Prozent. 10 Prozent des serbischen Exports wird in der lokalen Autoindustrie erwirtschaftet. Es geht jedoch nicht nur um 12 Millionen Menschen, die direkt und indirekt von dieser Industrie leben, sondern um rund 30 Millionen Menschen in Europa, die an der Wirtschaftsleistung dieser Industrie partizipieren.

Die weltweite Autoproduktion ist seit Jahren von Überkapazitäten und immer wieder auftretenden Absatzkrisen gekennzeichnet, und nur die steigende Nachfrage nach Fahrzeugen auf dem chinesischen Markt und diverse Maßnahmen, um Kaufanreize zu schaffen, konnten diesbezüglich in den letzten Jahren die Nachfrage sichern. Die milliardenschwere Unterstützung einiger Regierungen während der COVID-19-Pandemie kam der Autoindustrie natürlich sehr gelegen.

Dennoch stellt sich grundsätzlich die Frage, wie einerseits langfristig industrielle Produktionskapazitäten gesichert werden können, und andererseits der Kampf

gegen den fortschreitenden Klimawandel im Verkehrssektor aufgenommen werden kann. Denn der Verkehrssektor ist der einzige Sektor, in dem seit Jahren die Treibhausgasemissionen ungebremst steigen. Jedoch: die Wende hin zur Elektromobilität, die sich auch im European Green Deal der Europäischen Kommission und der europäischen Batterieallianz widerspiegelt, kann zwar Einsparungen bei der Treibhausgasproduktion bringen, aber nicht in ausreichendem Maße, um den Klimawandel wirksam zu bekämpfen. Und auch nur, wenn kleine, effiziente Elektroautos produziert werden, die mit 100 Prozent erneuerbaren Strom fahren. Beides ist derzeit nicht der Fall und wird auch in den nächsten Jahren nicht der Fall sein, denn die Ausbauraten für erneuerbaren Strom sind weltweit viel zu gering, und der Trend zu großen, schweren Elektro-SUVs ist ungebrochen. Die Herstellung der notwendigen Lithium-Ionen-Batterien ist sehr energie- und ressourcenintensiv, erfordert die umweltschädliche, energieintensive Förderung von seltenen Erden und Rohstoffen wie Lithium, Nickel und Kobalt und verstärkt durch den Extraktivismus die Abhängigkeit des Globalen Südens von den Produktionskapazitäten im Globalen Norden.

Jedoch muss es vielmehr, im Sinne eines linken Green New Deal, um den Aufbau von Alternativen gehen: Elektromobilität muss im weiteren Kontext diskutiert werden und v.a. Dingen die Produktion von elektrisch betriebenen Schienenfahrzeugen und Fahrzeugen des ÖPNV umfassen. Öffentlicher Nah- und Fernverkehr müssen flächendeckend und erschwinglich ausgestaltet sein – überall auf der Welt muss so das „Recht auf Mobilität" sichergesellt werden. Die Mobilitätswende ist ein Schlüsselkonflikt und ein zentrales „Einstiegsprojekt" eines globalen linken Green New Deal. Durch den Aufbau alternativer Produktion könnten hunderttausende Arbeitsplätze weltweit geschaffen werden. Gleichzeitig könnten durch den massiven Ausbau des Schienenverkehrs und des ÖPNV *lokale* Jobs entstehen, die nicht von Verlagerungsbestrebungen der Industrie bedroht sein werden. Wie scharf der Gegensatz von Arbeit und Kapital ist, hat sich auch während der Pandemie gezeigt: viele Unternehmen in der Autoindustrie nutzten die Lage, um Druck auf die Beschäftigten auszuüben, Arbeitsbedingungen zu verschlechtern, Löhne zu senken, Entlassungen vorzunehmen und Produktion an billigere Standorte zu verlagern.

Ein Umbau der Autoindustrie zu einer *ökologisch orientierten Mobilitätsindustrie* kann nur gelingen, wenn er von umfangreicher gesellschaftlicher Partizipation getragen wird: eine öffentliche Beteiligung wäre mit einer erweiterten Mitbestimmung von Beschäftigten, Gewerkschaften, Umweltverbänden und der Bevölkerung

zu verbinden, zum Beispiel in Form von regionalen Räten. Es wäre wichtig, an das Wissen der Beschäftigten in Form von Produzent*innen – und Gebrauchtwertstolz anzuknüpfen. Es braucht für die Autoindustrie einen „gerechten Übergang" (just transition), um die bevorstehenden Herausforderungen des Strukturwandels durch Elektromobilität und den Aufbau einer ökologischen Mobilitätsindustrie bewältigen zu können. Wir brauchen eine grüne Revolution der Industrie bei gleichzeitigem Schutz der Beschäftigten.

In der vorliegenden Studie werden die Hindernisse und Potenziale für eine Transformation der Autoindustrie und einen Aufbau einer ökologischen Mobilitätsindustrie mit Gewerkschafter*innen, Klimaaktivist*innen und Vertreter*innen der Autoindustrie aus Brasilien, Serbien, Slowakei, Tschechien, Spanien, Frankreich und Italien diskutiert. Dabei spielten insbesondere die Position in der internationalen Wertschöpfungskette, der Einfluss der ausländischen Direktinvestitionen, die Struktur des lokalen Arbeitsmarktes und die Verhandlungsmacht der lokalen Gewerkschaften eine Rolle. Außerdem wird diskutiert, wie die Potenziale für einen Aufbau einer ökologischen Mobilitätsindustrie von lokalen Akteur*innen eingeschätzt werden.

Wir wünschen eine spannende Lektüre!

Wir danken der Rosa-Luxemburg-Stiftung, Regionalbüro Brasilien und Cono Sur, São Paulo, die die Entstehung der Fallstudie für Brasilien ermöglicht hat.

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Manuela Kropp, Projektmanagerin, Rosa-Luxemburg-Stiftung Brüssel

Brüssel, Juni 2021

SUMMARY

This publication uses individual case studies to examine the conditions needed for the international automotive industry to transition to an ecological mobility industry in specific countries. The active expansion of an ecological mobility industry for the production of vehicles used in local and long-distance public transport (rail vehicles and buses) can protect jobs and cut the global transport sector's greenhouse gas emissions against the backdrop of advancing climate change and the fact that the transport sector is the only sector in which greenhouse gas emissions have been rising unchecked for years. By 2050, for example, the EU's transport sector must cut its greenhouse gas emissions by more than 90 percent compared with today's levels. This is the target set by the European Commission in its European Green Deal. At global level, the transport sector is responsible for about a quarter of all greenhouse gas emissions, and with the volume of passenger and freight transport continuing to rise, a change of direction is all the more urgent.

The automotive industry's supply and value chains span the globe, and individual case studies were prepared for countries within and outside Europe where the automotive industry plays an important role, namely Spain, the Czechia, Slovakia, Serbia, Italy, France and Brazil. An academic literature review was conducted for each case study, focusing on the local automotive industry, its importance for the labour market, its position in the supply chain, and the roles of foreign direct investment and of research and development. The structure of the local labour market, the evolution of labour costs and the role of trade unions is also highlighted. Last but not least, this publication touches on existing experiences in each country regarding the production of vehicles for an ecological mobility industry (rail vehicles such as trains and trams, buses) and the relevance of this sector.

Alongside the literature review, semi-structured interviews were conducted with stakeholders from different sectors: trade unionists, automotive industry workers, urban planners, representatives of automotive industry management, climate activists and journalists. The following questions were discussed: what are the obstacles and opportunities facing the transformation of the automotive industry into alternative products for an ecological mobility industry? What political initiatives would be needed to make such a transformation possible? Who are the potential allies in this political debate? What could be the possible thematic entry points to win over workers and civil society to a transformation of the automotive industry?

THE FOLLOWING RESULTS EMERGED:

For all countries studied, the interviews showed that the interviewees understood 'ecological mobility' to mean primarily the switch from cars with internal combustion engines to electric cars. It required some effort from the researchers during the interviews to clarify that 'ecological mobility industry' instead denotes a shift towards the production of rail vehicles and buses. This shows how strongly public discourse on a transformation of the transport sector is shaped by the image of the 'electric car' and how difficult it is to promote alternatives to private motorised transport. Understandably, climate activists and urban planners were much more familiar with this problem than trade unionists and management representatives from the automotive industry. However, since the switch to the production of electric cars has far-reaching consequences for workers in car production and in the supplier industry, these questions were also discussed during the interviews and included in the presentation of the results.

In all countries studied, the automotive industry was confirmed to have been repeatedly marked by sales crises and overproduction, with corresponding pressure on wage costs and employment/working conditions, threatened site closures and worker layoffs. In Brazil, for example, the authors state that the wage level has collapsed since 2012, which has also reduced local demand for cars, so it is clear that an expansion of the production of rail vehicles and buses could serve to maintain local employment.

In both Brazil and the European countries studied, it is evident that there is considerable need for local and long-distance public transport and that this urgently needs to be expanded, if only because of the traffic situation in urban areas and the fact that rural areas have no local and long-distance public transport links. By contrast, this need is not translating into actual demand because there is a lack of incentive systems, rail infrastructure and public transport services to make the switch from private motorised transport to public transport. The lack of long-term state planning in the transport sector was often flagged up during the interviews as a reason why a switch to the use of local and long-distance public transport was virtually impossible, let alone the development of a corresponding ecological mobility industry.

All the countries studied are already home to a production base of vehicles needed in an ecological mobility industry (i.e. rail vehicles and buses) but production volumes have declined everywhere in recent decades, with a strong trend towards further internationalisation of the division of labour. The exception here

is France, where we can see a slight increase in demand for rail vehicles in recent years, and this is also reflected in growing employment figures in rail vehicle production. The Czechia manufactures the most buses per capita in the world. During the COVID-19 pandemic, this sector proved to be much more resilient to declining demand than the country's car industry. As for Brazil, the size of the domestic market means that very specific industrial policies can be implemented, like local content rules and tax breaks for certain sectors, which can facilitate the expansion of an ecological mobility industry.

In all countries studied, the current incentive system (tax breaks, pressure on wages, limited workers' rights, subsidy policy) for the local automotive industry was found to be an obstacle to the expansion of the ecological mobility industry.

In Slovakia, the Czechia and Serbia, excessive dependence on foreign direct investment is evident, cementing the position of these countries as extended workbenches. Conversely, the Czechia is a good illustration of how ŠKODA's relative autonomy led to more investment in research and development locally than in other Visegrád states. Nevertheless, it must be noted that the Czechia is now driving its own marginalisation by ŠKODA outsourcing parts of its own production to India, Ukraine and Bosnia-Herzegovina. In France, for example, we are seeing the absurd situation in which there is still demand for small- and medium-sized cars on the local market but these are no longer produced in France, with manufacturing being relocated to other regions in recent years.

In all the countries studied, the automotive industry accounts for a considerable share of the manufacturing sector, both in terms of value added and the number of jobs. However, while employment in the Serbian, Slovakian and Czech automotive industries has increased, Western European countries have seen job numbers fall. A major reason for this is the level of unit labour costs, even though wages have risen in the Czechia in recent years.

It is clear that rail infrastructure in almost all countries studied has been scaled back in the past few decades, with the infrastructure that still exists urgently needing to be overhauled. The rolling stock is also completely obsolete and in urgent need of upgrading. We also found that recent investments in the rail sector in all countries studied were primarily dedicated to the construction of high-speed lines. From the point of view of the trade unions and climate activists, the expansion of regional train connections makes much more sense but is being neglected. Moreover, a representative of the Spanish platform to promote public transport

called for Spain's attractiveness as a production location for rail vehicles to be boosted by significantly increasing *local demand* for rail vehicles. An urban planner from France pointed out that establishing new rail interchanges could result in new service infrastructure, which would of course create jobs that could not be relocated to other countries.

The case study for France describes very vividly the conflict between urban and rural areas, which was reflected in the 'gilets jaunes' (yellow vests) movement. It is clear that the concepts for an ecological mobility transition must also take into account the needs of people in rural areas, where the range of small electric cars would not be sufficient, so-called micro-mobility such as cycling is not a real alternative and increased petrol costs due to a possible CO_2 surcharge would immediately affect low-income households. Many interviewees highlighted the issue of rural areas and pointed out that certain concepts that work for urban areas are not available in the countryside.

The problem of decision-making structures within companies became apparent for all countries studied, except France: decisions regarding the future direction of production are made at corporate headquarters in the USA, Germany, France or Japan, meaning that neither management nor trade unions at other production sites can really influence such decisions. Corporate headquarters also tend to leave out existing production sites when switching to building electric cars. This was the case in Spain: Renault decided to build the first wave of electric cars in France, and Volkswagen also decided to produce electric cars in Germany. From the point of view of the Spanish trade union CCOO, for example, this increases the pressure to also establish battery cell production in Spain in order to avoid losing out on the construction of electric cars. In this regard, the results of the Italian case study are particularly interesting: it clearly shows that due to the requirements of European competition law (awarding of public contracts) even an increase in local demand in Italy for rail vehicles and buses does not necessarily boost demand or create jobs in Italy. This is because orders are created along the international value chain and not necessarily locally. This raises the question of how local people can be won over by the restructuring of the automotive industry when the expansion of local and long-distance public transport creates jobs in other regions but not locally. The author therefore proposes amending the relevant EU directive and introducing a 'locality' criterion in the awarding of public contracts in order to be able to strengthen regional economies.

Trade unions of course have a difficult role, given the ongoing layoffs and restructuring in the automotive industry due to the COVID-19 pandemic and the shift to electric car production. In many interviews, it became clear that the trade unionists have to concentrate on their 'bread and butter' activities for the time being and do not see much room for discussions about restructuring the automotive industry. They complain about a lack of long-term state planning with regard to the expansion of rail and public transport. In France, for example, they called for more democratic participation in production decisions. Serbian trade unionists expressed concern that the state was completely unable to initiate changes in the transport sector. In Italy, trade unionists from the public transport sector warned that much more state planning was needed to link public transport and new forms of mobility such as platform services. In Slovakia, the Czechia and Serbia, trade unions face the problem of fragmentation of the trade union landscape, which was actively pursued by companies and politicians after the fall of the Iron Curtain. Many interviewees called for the active involvement of workers and a just transition for the auto industry. This must include the qualification and further training of workers, for the potential production of both battery cells and electric cars as well as rail vehicles and buses. Some trade unionists called for the promotion of international networking and cooperation between trade unions in the automotive industry to prevent production sites and workers from being played off against each other.

As regards thematic entry points for making the public more aware of the ecological mobility industry, climate activists and urban planners cited, first and foremost, the poor traffic situation in our cities as well as air and noise pollution. On the other hand, interviews in the Czechia and Slovakia in particular revealed that there is a 'distance from Brussels' in public discourse and that the EU's climate policy goals are met with scepticism or even rejection. In Serbia, however, interviews indicated that possible EU accession was considered a positive opportunity to curb the car cult and to promote local and long-distance public transport.

As part of a left-wing Green New Deal, the automotive industry could be transformed into an ecological mobility industry in order to secure future employment, achieve the right to mobility for all and ensure climate justice. In this context, workers' knowledge of the potential of production for industrial conversion must be utilised. Workers, trade unions, environmental associations and the regions affected must be involved in discussions and decisions on socio-ecological

conversion in the form of transformation councils. The transformation of the automotive industry must be designed as a just transition and must therefore not leave workers out in the cold: they must be democratically involved, given further training and retraining, and offered *decent work*, e.g. in an ecological mobility industry. This publication aims to contribute to this debate.

ZUSAMMENFASSUNG

Diese Publikation geht im Rahmen von einzelnen Fallstudien der Frage nach, wie die Bedingungen für einen Umbau der internationalen Autoindustrie hin zu einer ökologischen Mobilitätsindustrie in einzelnen Ländern aussehen. Der aktive Ausbau einer ökologischen Mobilitätsindustrie für die Produktion von Fahrzeugen des öffentlichen Nah- und Fernverkehrs (Schienenfahrzeuge und Busse) kann Beschäftigung sichern und Treibhausgase im Verkehrssektor weltweit einsparen. Hintergrund ist der fortschreitende Klimawandel und die Tatsache, dass der Verkehrssektor der einzige Sektor ist, in dem seit Jahren die Treibhausgasemissionen ungebremst steigen. Bis zum Jahr 2050 muss bspw. der Verkehrssektor in der EU über 90 Prozent seiner Treibhausgasemissionen reduzieren, verglichen mit dem heutigen Niveau. Dieses Ziel hat die Europäische Kommission im Rahmen ihres europäischen Green Deal ausgegeben. Auf globaler Ebene ist der Verkehrssektor für ca. ein Viertel aller Treibhausgasemissionen verantwortlich, und angesichts des weiter steigenden Volumens des Passagier- und Güterverkehrs ist ein Umsteuern umso dringender geboten.

Die Liefer- und Wertschöpfungsketten der Autoindustrie ziehen sich über den gesamten Erdball und so wurden für Länder innerhalb und außerhalb Europas, in denen die Autoindustrie eine gewichtige Rolle spielt, einzelne Fallstudien erstellt: für Spanien, Tschechien, Slowakei, Serbien, Italien, Frankreich und Brasilien. Für jede Fallstudie wurde eine wissenschaftliche Literaturrecherche durchgeführt, in der die lokale Autoindustrie, ihre Bedeutung für den Arbeitsmarkt, ihre Position in der Lieferkette, die Rolle von ausländischen Direktinvestitionen und von Forschung und Entwicklung diskutiert werden. Außerdem werden die Struktur des lokalen Arbeitsmarktes, die Lohnkostenentwicklung und die Rolle der Gewerkschaften beleuchtet. Zu guter Letzt wird diskutiert, welche Erfahrungen es in dem betreffenden Land bereits mit der Produktion von Fahrzeugen für eine ökologische Mobilitätsindustrie (Schienenfahrzeuge wie Züge und Trams, Busse) gibt und von welcher Relevanz dieser Sektor der Fahrzeugproduktion ist.

Zusätzlich zur Literaturrecherche wurden semi-strukturierte Interviews mit Stakeholdern aus den verschiedensten Bereichen durchgeführt: mit Gewerkschafter*innen, Beschäftigten aus der Autoindustrie, mit Stadtplaner*innen, Vertreter*innen der Unternehmensführung aus der Autoindustrie, Klimaaktivist*innen und Journalist*innen. Dabei wurden folgende Fragen diskutiert: welche Hindernisse und welche Chancen bestehen für einen Umbau der Autoindustrie hin

zu alternativen Produkten für eine ökologische Mobilitätsindustrie? Welche politischen Initiativen wären vonnöten, um solch eine Transformation zu ermöglichen? Wer sind potenzielle Bündnispartner*innen in dieser politischen Auseinandersetzung? Welches könnten mögliche thematische Anknüpfungspunkte sein, um Beschäftigte und die Zivilgesellschaft für einen Umbau der Autoindustrie zu gewinnen?

FOLGENDE ERGEBNISSE KRISTALLISIEREN SICH HERAUS:

Für alle untersuchten Länder zeigte sich im Rahmen der Interviewsituation, dass von den Interviewten unter „ökologischer Mobilität" zuallererst der Umstieg von Autos mit Verbrennungsmotor auf Elektroautos verstanden wurde. Es verlangte den Wissenschaftler*innen während der Interviews einiges an Anstrengung ab, um zu verdeutlichen, dass unter „ökologischer Mobilitätsindustrie" nicht die Transformation hin zu Elektroautos, sondern hin zur Produktion von Schienenfahrzeugen und Bussen gemeint ist. Dies zeigt, wie stark der öffentliche Diskurs über einen Umbau des Verkehrssektors vom Bild des „Elektroautos" geprägt ist und wie schwierig es ist, Alternativen zum motorisierten Individualverkehr stark zu machen. Verständlicherweise waren sich Klimaaktivist*innen und Stadtplaner*innen dieser Problematik viel stärker bewusst als Gewerkschafter*innen und Vertreter*innen der Unternehmensführung aus der Autoindustrie. Da aber der Umstieg auf die Produktion von Elektroautos weitreichende Konsequenzen für die Beschäftigten in der Autoproduktion und in der Zulieferindustrie hat, sind diese Fragen im Rahmen der Interviews ebenfalls diskutiert und in die Darstellung der Ergebnisse mit eingeflossen.

Für alle untersuchten Länder bestätigt sich: die Autoindustrie ist immer wieder von Absatzkrisen und Überproduktion gekennzeichnet, mit entsprechendem Druck auf die Lohnkosten, die Arbeitsbedingungen, drohenden Standortschließungen und Entlassungen von Beschäftigten. Für Brasilien bspw. konstatieren die Autoren, dass seit 2012 das brasilianische Gehaltsniveau eingebrochen ist und sich damit auch die *lokale Nachfrage* nach PKW verringert hat, so dass schon allein deshalb klar ist, dass ein Ausbau der Produktion von Schienenfahrzeugen und Bussen dem Erhalt von lokaler Beschäftigung dienen kann.

Sowohl für Brasilien als auch für die anderen untersuchten Länder in Europa zeigt sich, dass einerseits ein großer Bedarf an öffentlichem Nah- und Fernverkehr besteht und dieser dringend ausgebaut werden muss – schon allein

aufgrund der Verkehrssituation in den Städten und der Nichtanbindung von ländlichen Gegenden durch den öffentlichen Nah- und Fernverkehr. Aber andererseits zeigt sich, dass dieser Bedarf nicht in tatsächliche Nachfrage umschlägt, denn es fehlen Anreizsysteme, Schieneninfrastruktur und Angebote des ÖPNV, um vom motorisierten Individualverkehr auf den öffentlichen Verkehr umzusteigen. Oftmals wurde im Rahmen der Interviews das Fehlen von staatlicher, langfristiger Planung im Verkehrssektor angemahnt – dies wurde als Grund genannt, warum ein Umstieg auf die Nutzung von öffentlichem Nah- und Fernverkehr kaum möglich sei, geschweige denn der Ausbau einer entsprechenden ökologischen Mobilitätsindustrie.

In allen untersuchten Ländern gibt es bereits eine Produktionsbasis von Fahrzeugen für eine ökologische Mobilitätsindustrie, also von Schienenfahrzeugen und Bussen, allerdings haben in den letzten Jahrzehnten überall die Produktionsvolumina abgenommen, mit einem starken Trend zur weiteren Internationalisierung der Arbeitsteilung. Ausnahme ist hier Frankreich, wo wir in den letzten Jahren eine leichte Zunahme der Nachfrage nach Schienenfahrzeugen sehen können und dies sich auch in wachsenden Beschäftigtenzahlen in der Schienenfahrzeugproduktion niederschlägt. Tschechien verfügt über die größte Produktion von Bussen pro Kopf weltweit, die sich während der COVID-19-Pandemie als deutlich widerstandsfähiger gegen Nachfrageeinbrüche erwies, als die tschechische Autoindustrie. Für Brasilien erlaubt die Größe des Binnenmarktes die Anwendung ganz eigener industriepolitischer Maßnahmen, wie bspw. Regeln für den „local content" (lokaler Inhalt) und Steuererleichterungen für bestimmte Sektoren, die den Ausbau einer ökologischen Mobilitätsindustrie erleichtern können.

In allen untersuchten Ländern wurde festgestellt, dass das derzeitig vorherrschende Anreizsystem (Steuererleichterungen, Druck auf die Löhne, eingeschränkte Rechte der Beschäftigten, Subventionspolitik) für die lokale Autoindustrie einem Ausbau der ökologischen Mobilitätsindustrie entgegensteht.

Für die untersuchten Länder Slowakei, Tschechien und Serbien zeigt sich die starke Abhängigkeit von ausländischen Direktinvestitionen, die die Position dieser Länder als verlängerte Werkbänke zementiert. Andererseits ist am Beispiel von Tschechien gut nachzuvollziehen, wie die relative Autonomie von Skoda dazu führt, dass vor Ort mehr in Forschung und Entwicklung investiert wird als in anderen Visegrád-Staaten. Dennoch muss konstatiert werden, dass Tschechien nun seine eigene Marginalisierung vorantreibt, indem Skoda Teile der eigenen Produktion nach Indien, in die Ukraine und nach Bosnien-Herzegowina auslagert.

Für Frankreich zeigt sich bspw. die absurde Situation, dass auf dem lokalen Markt weiterhin kleine und mittlere PKW nachgefragt werden, diese aber aufgrund der Standortverlagerungen der letzten Jahre nicht mehr in Frankreich, sondern in anderen Regionen produziert werden.

In allen untersuchten Ländern macht die Autoindustrie einen entscheidenden Anteil des verarbeitenden Gewerbes aus, sowohl was die Wertschöpfung betrifft als auch die Anzahl der Jobs. Jedoch: parallel zum Aufbau von Beschäftigung in der serbischen, slowakischen und tschechischen Autoindustrie erfolgte der Abbau von Jobs in westeuropäischen Ländern. Ein entscheidender Grund liegt in der Höhe der Lohnstückkosten, auch wenn in Tschechien in den letzten Jahren ein Anstieg der Löhne zu verzeichnen ist.

Für fast alle untersuchten Länder zeigt sich, dass es in den letzten Jahrzehnten zu einem Abbau von Schieneninfrastruktur gekommen ist, und die noch bestehende Schieneninfrastruktur dringend überholt werden müsste. Auch ist das „rollende Material" völlig veraltet und bedarf dringend der Überholung. Für alle untersuchten Ländern konnte ebenfalls festgestellt werden, dass die Investitionen im Bereich Schiene neuerdings vor allen Dingen zum Bau von Hochgeschwindigkeitsstrecken erfolgt, dabei sei jedoch aus Sicht der Gewerkschaften und der Klimaaktivist*innen der Ausbau der regionalen Zugverbindungen viel sinnvoller, werde aber vernachlässigt. Zudem fordert ein Vertreter der spanischen „Plattform für die Förderung des ÖPNV", Spaniens Attraktivität als Produktionsstandort für Schienenfahrzeuge zu erhöhen, indem die *lokale Nachfrage* nach Schienenfahrzeugen deutlich gesteigert werde. Ein Stadtplaner aus Frankreich hob hervor, dass durch die Schaffung von neuen Umsteigepunkten bei der Eisenbahn eine neue Dienstleistungsinfrastruktur entstehen könne, die natürlich Arbeitsplätze schaffe, die nicht in andere Länder verlagert werden könnten.

In der Fallstudie für Frankreich wird sehr anschaulich der Konflikt zwischen Stadt und Land geschildert, der sich in der Gelbwesten-Bewegung niedergeschlagen hat. So ist klar, dass die Konzepte für eine ökologische Mobilitätswende auch die Bedürfnisse der Menschen im ländlichen Raum berücksichtigen müssen: dort wird die Reichweite von kleinen Elektroautos nicht ausreichend sein, sog. Mikromobilität wie Radfahren sind keine wirkliche Alternative und erhöhte Benzinkosten durch einen möglichen CO_2-Preis schlagen sofort durch aufs kleine Haushaltsbudget. Auf die Problematik des ländlichen Raums haben viele Interviewpartner hingewiesen und daran erinnert, dass bestimmte Konzepte, die für urbane Räume funktionieren, für ländliche Räume nicht zur Verfügung stehen.

Für alle untersuchten Länder, außer Frankreich, zeigte sich das Problem der Entscheidungsstrukturen innerhalb der Unternehmen: in den Konzernzentralen in den USA, Deutschland, Frankreich oder Japan fallen die Entscheidungen bezüglich der zukünftigen Ausrichtung der Produktion. Dies bedeutet, dass weder Unternehmensleitung noch Gewerkschaften an anderen Produktionsstandorten derartige Entscheidungen wirklich beeinflussen können. Außerdem stellt sich die Problematik, dass die Konzernzentralen dazu neigen, beim Umstieg auf den Bau von Elektroautos bisherige Produktionsstandorte außen vor zu lassen – so geschehen in Spanien: Renault entschied, die erste Welle der Elektroautos in Frankreich zu bauen, Volkswagen entschied sich ebenfalls, Elektroautos in Deutschland zu produzieren. Dies erhöht bspw. aus Sicht der spanischen Gewerkschaft CCOO den Druck, in Spanien auch eine Batteriezellfertigung anzusiedeln, um nicht den Anschluss beim Bau von Elektroautos zu verlieren. In diesem Zusammenhang sind die Ergebnisse der Fallstudie Italien besonders interessant: hier zeigt sich anschaulich, dass durch die Anforderungen des europäischen Wettbewerbsrechts (Vergabe öffentlicher Aufträge) selbst eine Steigerung der lokalen Nachfrage in Italien nach Schienenfahrzeugen und Bussen im Zweifelsfalle nicht zur Schaffung von Nachfrage und Jobs in Italien führt. Denn es entstehen Aufträge entlang der internationalen Wertschöpfungskette und nicht notwendigerweise vor Ort. Hier stellt sich die Frage, wie die Menschen vor Ort für einen Umbau der Autoindustrie gewonnen werden sollen, wenn doch andererseits der Ausbau des öffentlichen Nah- und Fernverkehrs Jobs in anderen Regionen, aber nicht vor Ort schafft. Der Autor schlägt daher die Änderung der entsprechenden EU-Richtlinie und die Einführung eines Kriteriums „Lokalität" bei der Vergabe von öffentlichen Aufträgen vor, um regionale Wirtschaftskreisläufe stärken zu können.

Die Rolle der Gewerkschaften ist natürlich angesichts der laufenden Entlassungen und Umstrukturierungen in der Autoindustrie durch die COVID-19-Pandemie und den Umstieg auf die Produktion von Elektroautos denkbar schwierig. In vielen Interviews zeigte sich, dass sich die Gewerkschafter*innen erst einmal auf ihr „Brot-und-Butter"-Geschäft konzentrieren müssen und nicht viel Raum für eine Diskussion über den Umbau der Autoindustrie sehen. Die Gewerkschafter*innen beklagen einen Mangel an langfristiger staatlicher Planung mit Blick auf den Ausbau von Schiene und ÖPNV. In Frankreich bspw. forderten sie eine stärkere demokratische Beteiligung bei den Entscheidungen über die Produktion. In Serbien äußerten sie die Sorge, dass der Staat überhaupt nicht in der Lage sei, Veränderungen im Verkehrssektor anzustoßen. In Italien mahnten Gewerkschafter aus dem Bereich des ÖPNV an, dass es viel mehr staatlicher Planung bedürfe, um ÖPNV und neue

Formen der Mobilität wie Plattformangebote miteinander zu verzahnen. In der Slowakei, Tschechien und Serbien stehen die Gewerkschaften vor dem Problem der Zersplitterung der Gewerkschaftslandschaft, die von Seiten der Unternehmen und der Politik aktiv nach dem Fall des Eisernen Vorhangs betrieben wurde. In vielen Interviews wird die Forderung nach einer aktiven Einbindung der Beschäftigten und eines „gerechten Übergangs" (just transition) für die Autoindustrie laut. Dies müsse unbedingt die Qualifizierung und Weiterbildung von Beschäftigten einschließen, sowohl für die potenzielle Fertigung von Batteriezellen und Elektroautos, als auch für die mögliche Produktion von Schienenfahrzeugen und Bussen. Einige Gewerkschafter*innen mahnen an, dass die internationale Vernetzung und Zusammenarbeit der Gewerkschaften in der Automobilindustrie gefördert werden müsse, um zu verhindern, dass die Produktionsstandorte und Beschäftigten weiterhin gegeneinander ausgespielt werden.

Als thematische Anknüpfungspunkte, um das Thema der ökologischen Mobilitätsindustrie in der Öffentlichkeit zu platzieren, nannten Klimaaktivist*innen und Stadtplaner*innen zuallererst die schlechte Verkehrssituation in unseren Städten und Luft- und Lärmverschmutzung. Andererseits stellte sich gerade bei den Interviews in Tschechien und der Slowakei heraus, dass im öffentlichen Diskurs eine „Distanz zu Brüssel" zu spüren ist und den klimapolitischen Vorgaben der EU mit Skepsis bis Ablehnung begegnet wird. Für Serbien allerdings wurde im Rahmen der Interviews ein möglicher EU-Beitritt als positive Chance gesehen, um den Auto-Kult eindämmen und den öffentlichen Nah- und Fernverkehr fördern zu können.

Im Rahmen eines linken Green New Deal kann es gelingen, die Autoindustrie zu einer ökologischen Mobilitätsindustrie umzubauen, um zukünftige Beschäftigung zu sichern, Recht auf Mobilität für Alle und Klimagerechtigkeit zu erreichen. Dabei muss das Wissen der Beschäftigten um die Potenziale der Produktion für eine industrielle Konversion genutzt werden. Die Beschäftigten, Gewerkschaften, Umweltverbände sowie die betroffenen Regionen müssen in Form von Transformationsräten an den Diskussionen und Entscheidungen zum sozial-ökologischen Umbau beteiligt werden. Der Umbau der Autoindustrie muss als „gerechter Übergang" (just transition) gestaltet werden und darf demzufolge nicht dazu führen, dass die Beschäftigten im Regen stehen gelassen werden: sie müssen demokratisch beteiligt werden, brauchen Angebote zur Fortbildung und Umschulung, und müssen *Gute Arbeit*, z.B. in einer ökologischen Mobilitätsindustrie, angeboten bekommen. Diese Publikation möchte zu dieser Debatte beitragen.

FRANCE

TRANSITION OF THE AUTOMOTIVE INDUSTRY TO AN ECOLOGICAL MOBILITY INDUSTRY

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TABLE OF CONTENTS

INTRODUCTION: COLLECTIVE MOBILITY: BETWEEN UTOPIA AND PRAGMATISM

Anti-car rhetoric has deep roots in the French intellectual left (Duverger 2014), but the question of alternatives remains open, with artists, social and ecological critics offering an array of views ranging from the utopian to the pragmatic. Answering this question is not a matter of desirability, but rather engaging with the specific political forces that already exist and that can potentially be mobilised. In this respect, as Castoriadis (Marker 1989) notes, since democracy can only be the outcome of a whole society, the chances of people rallying behind a stable common project remain low. Even if *commons* are a tangible reality that can/must mobilise a society at odds with itself (Coriat 2015), there are currently too few concrete political actions being undertaken, since these would require a whole new system of society, something which is beyond the scope of a report about mobility. The pragmatic solution *can* be a way towards utopia, by sowing the *seeds* of change. By pragmatic, we do not mean resignation to technical fetishism, but a concrete political strategy that considers what society needs to improve itself in a more sustainable way.

Mobility is not just about transport (Crozet 2018), i.e. it is not only a question of distance and time. For centuries, speed has been the rationale behind transport policy, the aim being to get between two points on the Earth's surface more quickly. Crozet demonstrates that the democratisation of speed came first with a reduction in the cost of transport and second with increasing income, resulting in a reduction in free time per income unit. That is to say, we are richer but with the same amount of free time, and as we prefer variety, we spend less time on a single activity. In this sense, increasing speed is a way to *maximise* our free time.

However, as Crozet also notes, the quest for speed has come up against two limits: (1) the technology itself and its contradiction with other policy goals such as safety, and (2) congestion. Now, ecological critics are advocating the need to reduce speed, as speed consumes resources. Individual mobility is thus a deeply collective (shared?) aspect of society. Notwithstanding this, mobility is not only about transport but also about how we organise our activities. Either we reduce our activities (in which case we would need to define democratically what activities should be reduced), or we see mobility as a way to *optimise* free time.

However, removing the limited scope that people think they have to organise their own activities could be seen as a threat to their freedom. Moreover, recent surveys show that car users in peripheral areas are not less ecologically aware

(Demoli / Sorin / Villaereal 2020). Therefore, it is not only about alerting people to climate change but also about offering alternatives to cars. Without that, we cannot expect people to abandon their private vehicles. Lastly, the Fordist promises associated with cars – high income, high consumption, high comfort – continue to occupy a central place in our society, not only from a corporate perspective but also in workers' minds. If we are to renounce this dream, either we propose a whole new alternative and rally everybody behind it, or we slowly reduce what remains from the Fordist era, while gradually shaping a new society.

The pragmatic solution we sketch in this report is not incompatible with a utopian project. Due to the constraints of the subject, we focus here on the conditions for conversion without banning cars. We consider conversion as the means of transitioning *from individual mobility represented by cars to individual mobility represented by public transport*, through inclusive mobility as defined in France's new national mobility law (*LOI n° 2019-1428 du 24 Décembre 2019 d'orientation des mobilités*).

We begin with a quantitative section to help us understand what exactly the conversion entails. We first need to see how the car industry is structured, and what transport needs exist in France. Second, we discuss, based on 12 semi-structured interviews, including workers from the automotive industry, managers, journalists, experts and urban planners, the opportunities and constraints involved in the trade-off between cars and public transport, while stressing the promise of electric vehicles. We conclude that our interviewed stakeholders are mostly in favour of intermodal transport, demonstrating that the use of (electric) cars is not incompatible with an expansion of public transport. This approach would ensure the same level of mobility and jobs while efficiently reducing carbon emissions.

THE STRUCTURE OF FRENCH AUTOMOTIVE AND MOBILITY INDUSTRY

THE AUTOMOTIVE INDUSTRY IN FRANCE

The French automotive industry has a long history. Since the 2008 crisis, France has dropped from the second to the third largest producer in Europe, behind Germany and Spain. The country manufactured 2.3 million vehicles in 2019 (12 percent of EU production), including 1.6 million passenger cars (ACEA 2020).

INCUMBENTS AND HIERARCHY

Both original equipment manufacturers (OEMs) and suppliers are well represented in France. Renault and Stellantis (PSA) currently own 11 production and assembly plants.[1] In addition, Toyota manufactures the bulk of its European output at an assembly plant in Onnaing, and Ineos has taken over the former Smart assembly plant in Hambach.

Heavy-duty production is also present, including the historic national brand Renault Trucks (Volvo Group) and Scania (Volkswagen). In the bus industry, CHN Industrial owns Iveco and Heuliez, two long-standing bus OEMs. The production of medium-sized and heavy-duty vehicles (including buses) totalled 65,000 units in 2019 (ACEA 2020).

The supply chain includes a large number of companies, among them four large domestic first-tier suppliers (FTSs): Valeo, Faurecia, Plastic Omnium and Michelin. Many foreign FTSs have production plants in France, including Bosch, Mahle, Continental and Siemens. Moreover, the foundry industry for the automotive sector remains sizeable, 20,000 employees (Observatoire de la Métallurgie n.d.), even if the shift from internal combustion engines to electric vehicles is adversely impacting the sector.

The FTSs are fairly autonomous in their strategic development. First, due to long-term collaborative relationships with OEMs, they develop or co-develop many products, and second, as FTSs are global companies, they are not dependent on local manufacturers to develop and sell their products. The dependency is higher for specialised foundries. Supply chain management is one of the core competencies of OEMs. Moreover, OEMs are solely responsible for creating (and then distributing) value added. In addition, suppliers are heavily reliant on quality, quantity and price.

EMPLOYMENT STRUCTURE

It is worth noting that labour productivity is quite high in France, with 10.6 vehicles produced per worker in 2018 (compared with an EU average of 7.4) (ACEA 2020). The automotive industry is one of the largest manufacturing employers in France. In 2020, there were 115,000 full-time employees (plus 11,000 temporary workers) in the car sector, and 70,000 in the supplier industry (plus 6,400 tempo-

1 Due to the coronavirus crisis and the shift to e-mobility, Renault has announced it will be shutting down (at least) one assembly plant (in Flins).

rary workers) (Observatoire de la Métallurgie n.d.). It represented seven percent of the French manufacturing workforce in 2018 (CCFA 2019). In addition, 2.2 million jobs (eight percent of total employment) are indirectly related to the automotive industry, including 420,000 employees in the repair and dealer sector (CNPA n.d.).

If we look at the manufacturing component alone, despite the substantial job cuts in recent decades (there were 265,000 jobs in 2008), blue-collar/manual workers still accounted for more than 50 percent of the workforce in 2019 (compared with 54 percent in 2008) (Observatoire de la Métallurgie n.d.). Engineers and managers now account for almost 22 percent, up from 18 percent in 2008. On average, women make up around 20 percent of the total workforce.

However, the age distribution of employees reveals that the automotive industry is faced with an aging workforce, except for engineers and managers, with 19 percent of blue-collar workers aged over 55, compared with 16 percent for engineers and managers.

The industry is also a high wage provider. In 2015, the average wage in the transport manufacturing sector was €3,000 gross, the fourth highest average sectoral wage in France (behind coking and refining, finance, and information and communication) (INSEE 2019c).[2] Between June 2017 and September 2020, the overall wage[3] rose by 6.2 percent in the transport vehicle industry as a whole and by 5.4 percent in the automotive industry. By comparison, the overall metal industry saw monthly wages increase by 5.9 percent, the construction industry by six percent and the service sector by 4.9 percent. Specifically, blue-collar workers' wages increased by 5.9 percent in the automotive industry (compared with 5.7 percent in the metal industry and 5.8 percent in construction).

For example, according to the 2019 social report of one French carmaker, the average monthly gross wage (full-time equivalent) was €2,606 for blue-collar/manual workers (*ouvriers*), €3,705 for white-collar workers *(employés*, including specialised technicians), and €6,689 for engineers and managers. This compares with an average monthly net income for blue-collar workers in France of €1,781 (INSEE 2020a).

2 Public information on wage structure and breakdown by sector in France is difficult/impossible to gather, due to a lack of official public statistics in this regard.

3 We refer here to the basic monthly wage indicator (DARES).

France's recently passed labour laws are rather ambiguous about the participation of employees in strategic decision-making. On the one hand, employees are now represented on the board of directors (three workers' representatives for large companies). On the other hand, at company level, the works council has only an advisory role in economic and strategic decisions.

Moreover, the existence of four main trade union confederations (CGT, CFDT, CFE-CGC, FO) and the nature of the decision-making rules (an agreement can be passed with 30 percent of the votes) means that it is quite difficult to rally workers behind one project. Moreover, there are no inter-company works councils in which supplier and OEM stakeholders could exchange views.

INVESTMENT, TRADE AND R&D

The automotive industry invested more than €3 billion in capital expenditures in 2018 (INSEE / Esane 2020) (16 percent of value added). The French automotive industry does not rely on foreign direct investment, as the domestic automotive industry is fairly autonomous, although Toyota is rapidly increasing its production capacity (just under 300,000 vehicles, equivalent to almost three quarters of Renault's total passenger car production in France in 2018 (CCFA 2019)). French multinationals employed two thirds of the workforce in France in 2016 (INSEE 2019b).

However, since the 2000s, carmakers and politicians have stopped viewing France as a location for manufacturing small vehicles. Consequently, with production decreasing and with the French market still mainly oriented toward the small and medium segments, imports are on the rise. In 2008, the trade balance in cars turned negative, standing at €10 billion (INSEE 2021). Until 2017, the trade balance in equipment was positive, due to the strong manufacturing bases. However, as suppliers follow OEMs, production is declining slightly and the trade balance has been negative since 2017.

This is the consequence of a strategic shift. As Renault and PSA became global firms in the 2000s and 2010s respectively, they reorganised their production to take advantage of increasing capacities in Spain, the enlargement of the EU to Central and Eastern European countries, and the trade agreements with Turkey and Morocco. Since suppliers follow OEMs, as (semi-)peripheral countries increased their skill levels and capacities, suppliers also reorganised their production by outsourcing many components.

Consequently, the situation is very controversial in terms of industrial policy. France is importing small and medium-sized vehicles without exporting large vehicles, on which domestic carmakers are in competition with the high-quality German brands. This is the main explanation for the decline in production and the loss of jobs in the automotive sector, and is a real issue for a shift to sustainable mobility as we will see later.

On the research and development (R&D) side, automotive is one of France's leading sectors when it comes to innovation. In 2016, the industry invested more than €4 billion in intra-sector R&D (CCFA 2019), equivalent to one third of the sector's value added. By way of comparison, the chemical industry (excluding pharmaceuticals) invested €1.8 billion. In 2019, PSA and Valeo were ranked first and second in terms of patent applicants (INPI 2020), with Renault fifth and Faurecia tenth.

THE PUBLIC TRANSPORT INDUSTRY[4]

France also has also experience with the manufacture of public transport vehicles, and especially rail vehicles. There are two large domestic bus brands, Iveco and Heuliez, both owned by CNH Industrial. According to the corporate website, Heuliez employs 450 people. The companies innovate in developing alternative-energy buses, including natural gas, electric/hybrids and hydrogen (e.g. the new Safra bus in the south of France).

France has a long history of train manufacturing. Alstom, the former national champion, is now the world's second largest trainmaker following its takeover of Bombardier. It develops a wide range of trains in France, from light rail/trams to high-speed trains and locomotives for freight. CAF is another rolling stock manufacturer with a history of manufacturing in France.

The French railway industry is fairly buoyant. Thanks especially to rising demand for trams and light rail for urban transport, activity is set to grow in the coming year. In terms of jobs, the sector employed more than 12,000 people in 2020 (Observatoire de la Métallurgie n.d.). According to its corporate website, the state-owned railway company SNCF (which is soon to lose its domestic monopoly) employs 19,000 workers in rolling stock maintenance, while SNCF Réseau, the company in charge of railway construction and maintenance, employs 59,000. In addition, railway track manufacturing directly employs 9,500 workers in France at specialised foundries.

In manufacturing alone, the sector generated turnover of €4.3 billion in 2015 and employed 13,400 workers (INSEE 2019a). On average, therefore, €1 billion of turnover can generate around 3,116 full-time jobs in the assembly/manufacturing sector. By comparison, €1 billion of turnover in the French automotive industry (including suppliers) can generate 1,806 full-time jobs.

Of course, this comparison does not consider either economies of scale or the structure of employment. Forty percent of jobs in the train construction industry are managers and engineers (compared with 22 percent in the automotive industry in 2018). However, there is a strong correlation between the domestic market turnover growth trend and employment growth (Observatoire de la Métal-

4 This report does not consider aviation, which is a vital industry in France, with the Airbus and Dassault assembly and R&D plants, and many important FTSs (Safran, Thales, etc.). This is also a major issue for a clean mobility conversion.

lurgie 2020): between 2007 and 2018, employment and turnover on the domestic market grew by 18 percent.

However, when we calculate the elasticity (percentage job growth linked to 1 percent domestic market turnover growth), a different picture emerges. If we take a closer look at the period 2007–11, whereas the domestic market turnover grew by 42 percent, employment rose by just 18 percent (own calculations based on op. cit.). This means that over a period of growth, growth of 1 percent can generate around 0.43 percent employment growth in the sector. However, in the second period (2014–18), when growth rose slightly after the 2011–12 Eurozone recession, the employment rate decreased slightly (domestic market turnover grew by 0.7 percent on average every year, while employment fell by an average of 1.46 percent each year). This fact shows that the employment cycle is driven by long-term sustained demand, and a negative shock could negatively impact job growth in the long run.

With regard to innovative solutions, Alstom is developing fuel-cell trains, mainly for freight, as a replacement for diesel engines, since they have the potential to run on non-electrified railways. Despite the long-term strategy of electrifying the network, only 56 percent of French railways are electrified (European Commission n.d.). However, the declining freight transport sector has a number of critical implications for the industry, with a loss of capacity in special truck manufacturing.

The railway industry is thus a strong sector in France, but we should keep in mind that it is a cyclical industry relying on long-term planning. The Alstom plant in Germany can produce around 200 locomotives per year, with 2,500 workers (including maintenance and bogie manufacturing) (Moragues 2016). To put this in context, the Bordeaux tram network, which is dense and expanding, uses fewer than 130 trams. As the lifespan of each train is relatively long (40 years), production follows cycles, and ensuring long-term and stable demand can pose quite a challenge. Nevertheless, there are many opportunities for investing in both light rail and regional trains to enhance multimodality.

GROWTH OF PUBLIC TRANSPORT

In 2018, there were 32,688,000 cars and 94,000 buses in France (CCFA 2019). The car fleet saw average annual growth of around 0.7 percent between 2005 and 2018, compared with 1.7 percent between 1990 and 2005. Since 2000, the number of new registrations for passenger cars has remained stable (around 2 million per year). This means that the increase in in-use cars is not

due to more purchases but rather to a trend to postpone scrappage. Indeed, the average age of passenger vehicles was around 9.1 years in 2018, up from 5.8 years in 1990.

In 2018, 757.1 billion passenger-kilometres (pkm) were travelled in private cars, while transport by bus accounted for 58.5 billion pkm (own calculations based on European Commission n.d.). Based on this fact, if we consider a stable volume of transport, one bus can cover 0.62 million pkm. Removing cars means that buses would need to cover 815.6 billion pkm, meaning that we would need more than 1,315,000 buses in operation each year. Since 2014, new bus registrations in France have averaged 6,000. There is a slight growth trend here, with new registrations totalling 5,382 in 2010 and 4,320 in 2000. The latest data from 2010 indicate that France was able to produce 3,475 buses each year.

It is safe to say, therefore, that the scale of conversion needed is a real challenge. Switching all road traffic to buses would be virtually impossible. Of course, this calculation is rather crude in that it considers neither the difference between urban and rural traffic nor the behavioural changes induced by a new public transport offer and the scale effects.

Nevertheless, demand for transport rose by 0.6 percent between 2014 and 2019 (SDES 2020). In 2019, passenger-kilometres travelled by car declined by 0.3 percent, while the overall growth rate between 2014 and 2019 was 0.4 percent. Public transport grew by around 1.5 percent between 2014 and 2019: 1.1 percent for road transport, 1.5 percent for rail and 2.8 percent for aviation. Between 2000 and 2018, transport by train (excluding trams) rose by 30 percent (although it has remained largely stable since 2010); transport by bus, long-distance bus and tram increased by almost 20 percent, and car transport by less than 10 percent (SDES 2019).

To sum up, growth in car mobility is slowing, while public transport growth is increasing, especially in trains, despite the declining share of intercity (non-TGV) trains. In Ile-de-France (the wider Paris region), the network is growing, with many tram lines being opened initially, followed (until the 2030s) by the opening of new metro and regional train lines (see figure below).

Of France's other large cities, only five have a metro system (Lille, Lyon, Marseille, Toulouse and Rennes), while 24 have a tram network. In 2007, the government budgeted €2.5 billion to develop green dedicated-line transport (trams, high-level service buses, etc.), which explains the steady growth in public transport in large cities.

CAPITAL EXPENDITURE ON PUBLIC TRANSPORT IN ILE-DE-FRANCE
(in Million Euro, Constant 2019 Values)

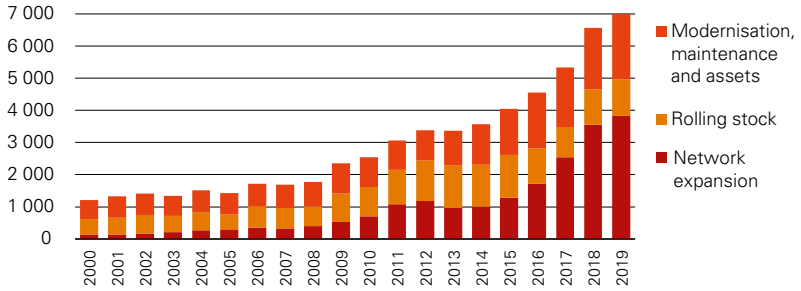

Figure 1. Source: omnil.fr 2021

Moreover, the opening up of regional rail services to competition has increased interest in developing dense urban-regional train networks (RER). However, the infrastructure constraints for regional rail remain significant, as the cost of upgrading old track is quite high, due to historic underinvestment. For decades, network upgrade investments have focused on high-capacity routes, at the expense of low-capacity routes (Ministry of Ecological Transition 2018). By way of comparison, France invested €2.75 billion in upgrade work in 2014, compared with €3.25 billion in Germany, whereas it spent €2.28 billion on maintenance, as against €1.4 billion in Germany.

A CONTROVERSIAL PUBLIC DEBATE

A major survey (Demoli / Sorin / Villaereal 2020) of ecological awareness and car ownership in peripheral/rural areas highlights many key factors that need to be considered when it comes to convincing car users to use public transport. First, car ownership (even among those with more than two cars) is not linked to lower environmental awareness (self-perception): car ownership is motivated more by economic constraints, location, schedule and habits. Second, diesel car owners seem to be less environmentally conscious. However, despite this lower self-perception, the qualitative interviews show that people are aware of the pollution they emit with a diesel car, but say that they have to carry on using the vehicle until it is ready to be scrapped, due to a lack of budget or choice/availability of new cars, thus exacerbating the problem of pollution. To sum up, the authors of the survey conclude that, while levels of environmental self-awareness are quite high,

car owners are forced to pollute because they do not have any other choice. The political implication is that anti-car rhetoric cannot lead to a change of ownership in many areas, but mobility policy to reduce car use should be embedded in wider, more inclusive social policy.

Indeed, anti-car policies are a subject of intense debate in France. In the wake of the Dieselgate scandal, the government introduced labels differentiating cars according to their level of pollution.[5] Local authorities can use this information to reduce polluting car traffic as they implement low-emission zones in almost all major cities. The rise of the green movement is largely correlated to urban voters, which has sparked a real debate in France as these voters occupy a specific section of the political spectrum.

From the 1990s onwards, the policies in place favoured diesel cars and home ownership in the suburbs. Consequently, the new mobility policies (tax on diesel, lower speed limits, pedestrian areas and bans on cars in some cities, etc.) are viewed negatively as punitive. The yellow vests movement started as a protest against a hike in the carbon tax on diesel and a reduction in the speed limit on rural roads, a reminder that workers living in peripheral areas need to use private vehicles, primarily because there is no real alternative: regional train services are in decline in rural areas,[6] making car ownership essential for freedom of movement.[7] Some 88 percent of country dwellers consider themselves dependent on cars, compared with 44 percent of those living in the Paris conurbation (IFOP 2018). Between 75 and 80 percent of far-right voters (*Rassemblement National*, *Debout la France*) and 72 percent of those with no political affiliation see themselves as reliant on cars, compared with (a still sizeable) two thirds of left-wing voters.

On the institutional side, there are more than 36,000 communes (local authorities) in France. Some are grouped together into urban/agglomeration communities, comprising one large commune (city or town) and many smaller ones surrounding it. Economic activities are generally concentrated in one large urban centre per department (*département*). However, the expansion of mobility needs goes beyond this very local scale. And as big cities have introduced traffic schemes for their own citizens (e.g. bans on cars in Paris), many people living in periph-

5 NO^x and particulate matter. Euro 6 diesel cars are thus considered more polluting than Euro 6 petrol vehicles, according to these labels.

6 An article providing a representative insight into the economic and social decline of medium-sized towns/cities due to the reduction of train frequencies and lines is Dumay (2018).

7 Among many other articles, see Le Bras (2019).

eral areas feel excluded from accessing the urban centre. This creates a clear tension in political debates, where urban voters are seen as wanting to exclude country dwellers from working in and accessing the city. This was highlighted by the Yellow Vests movement, in its targeting of anti-car policies.

It would be useful at this point to clarify the administrative levels governing traffic and transport regulations in France. The national government has power over national roads and major highways. The regions oversee regional rail services (TER), while the departments are responsible for departmental (i.e. secondary) roads. For decades, adjacent communes have been grouped together into urban/agglomeration councils (comprising elected municipal council members), with powers over public transport (except rail). In Paris, these powers have been transferred to the region. Finally, cities oversee local traffic regulations.

In view of the above, a rethink of local government policy is needed, for example, by merging adjacent cities in order to balance the power of inner-city voters with that of peripheral voters, by using the "urban sphere of influence" as a statistical unit,[8] or, alternatively, by introducing direct elections for urban/agglomeration council members and enlarging these councils. At the same time, economic activities in medium-sized towns/cities need to be developed in order to reduce the concentration of transport in one big city, and public transport should be enhanced without resorting to anti-car policies.

The figure below illustrates the spheres of influence around large urban centres, which extend well beyond the cities responsible for local traffic regulations. The biggest hubs are shown in red. They correspond more or less to the area of competence of the urban/agglomeration council. So, when one of the big cities bans cars, it affects part of the surrounding red area and the orange ring, which accounted for 43 percent of the population in 2017 (INSEE 2020b).

Tailles des aires = Spheres of influence; Pôle = Biggest hubs; Couronne = Surrounding area; 700 000 habitants ou plus = 700 000 inhabitants or more; 200 000 à moins de 700 000 habitants = between 200 000 and less than 700 000 inhabitants; Moins de 50 000 habitants = Less than 50 000 inhabitants; Hors attraction des villes = Outside the attraction of cities.

8 By way of comparison, the Paris area spans 150 km² with 2 million inhabitants, and has a sphere of influence of around 13 million inhabitants, while London covers more than 1,500 km² with 8 million inhabitants, but has almost the same urban sphere of influence. This means that when Paris implements a traffic policy, local voters' decisions potentially exclude 84 percent of those affected.

ZONING INTO SPHERES OF INFLUENCE OF CITIES 2020

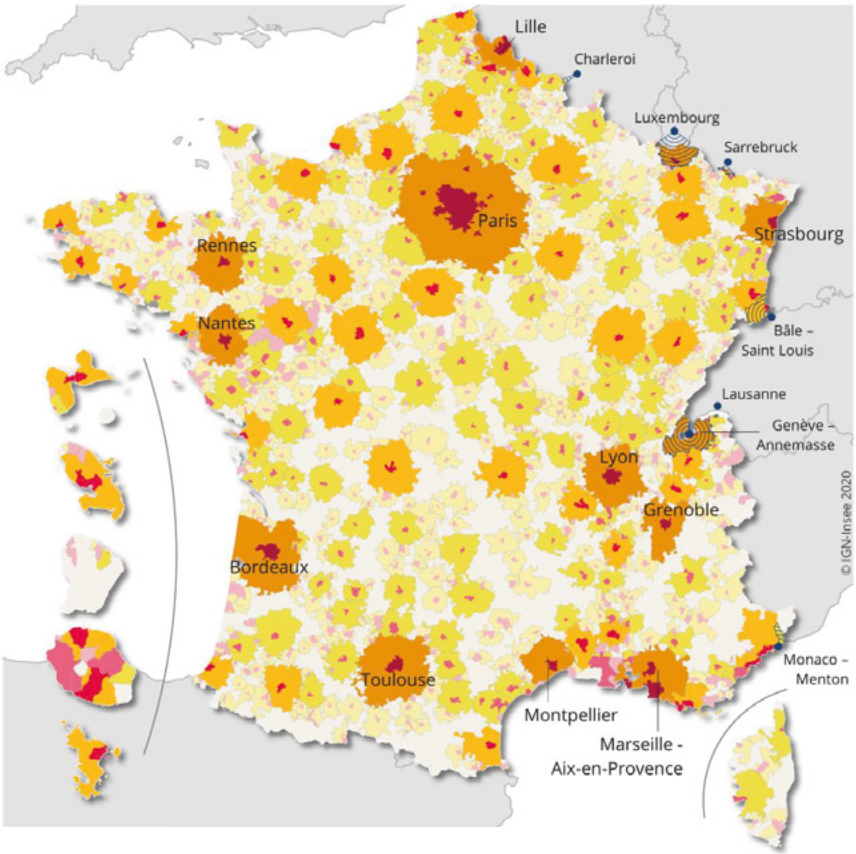

Figure 2. INSEE 2020b

To sum up, the growth of collective transport in France is driven primarily by increasing mobility needs, with a gradual shift from cars to public transport. However, its development is limited by the growing need for mobility, the expansion of urban areas into less densely populated areas, and the subsequent increase in cost. On the political side, anti-car policies are not popular with those living on the peripheries of urban centres, as these policies are implemented by the cities, which are actually very small compared with their spheres of influence.

TOWARD AN ECOLOGICAL MOBILITY INDUSTRY: CHALLENGES AND OPPORTUNITIES

A NARROW OPPORTUNITY FOR CLEAN E-MOBILITY

Scientific debates around the cleanliness of electric cars are confused due to many inconsistent (and sometimes bogus) studies. We can identify three dimensions to clean electric cars: energy supply for production and charging; raw materials; local production. These three dimensions could be controlled by a number of levers:

- Clean energy policy
- Multimodal policy
- Production in line with market needs
- Structured supply and value chain

CLEAN ENERGY POLICY

In terms of CO_2 emissions, the main factor determining the cleanliness of electric vehicles (EVs) is the source of electricity, both for manufacturing the batteries and for charging.

CO_2 emissions from electricity consumption are relatively low in France, due to its substantial use of nuclear energy. The new constitution and policies specify long-term targets for reducing the share of nuclear electricity capacity and increasing that of renewable energy.

According to one energy expert interviewed, the gain in energy consumption is in favour of electric cars:

An electric vehicle is more energy-efficient. A current internal combustion engine (ICE) uses around 10 kWh per litre of petrol. If we drive 100 km in a car that does 100 km to every nine litres, we consume as much energy as we need to heat

a house in winter! Even more with decarbonised electricity. If we were to save 24 Mtoe by reducing petrol consumption, the corresponding increase in electricity needs would amount to 6 Mtoe.

In terms of capacity, EV consumption should not be a problem if France maintains its nuclear power capacity, according to the expert. Of course, we must keep in mind that nuclear is not a clean energy (in terms of nuclear waste), but we should also be careful about disqualifying this energy in the fight against climate change. The problem with renewable energy remains its intermittence, so that coal and gas-fired supply is still needed to cover immediate electricity needs. Nonetheless, one of the main conditions for replacing carbonised electricity supply with renewable energy is storage capacity (RTE / IEA 2021), since neither nuclear nor renewable energy can cope with demand during peak hours, which is when coal and gas take over.

On this point, a debate is under way about the smart grid. According to the energy expert, a smart grid is essential, and could also create business opportunities for carmakers, who could make electric car batteries available for demand-side management:

Analysing the capacity of the early 2010s Tesla, we show that, after 300,000 km, the battery still has up to 90 percent of its capacity. A battery could conceivably last for 800 000 km, equivalent to 60 years of life. Of course, this would not be profitable for carmakers! The adverse consequence would likely be an artificial reduction of battery lifespan. However, with a bi-directional electric plug-in system, carmakers will lose this incentive. Indeed, if a battery is used 50 percent of the time for energy production and 50 percent for driving, its lifespan will be reduced to a reasonable time. We can intensify the use of the battery, while compensating the consumer. […] Moreover, the electricity in a battery is sold at the market price.

However, on this point, an R&D manager in the automotive industry takes a different view:

Concerning the business model of the two-way system of demand-side management, on the one hand it could be suitable for business consumers and fleets, on the other hand, it is probably not an attractive solution for household consumers. Just as with our phones, we like to have full batteries in the morning. […] As for the impact on electricity and power needs, electric vehicles could provide some flexibility, but they won't be the main power source! […] So a smart grid could create

more flexibility, but we'll need to think about the compensation: who will pay the VAT? Who will be willing to sell electricity at a cheaper rate than they buy it for?

Caution is also needed when it comes to fast-charging facilities. On the one hand, many of those interviewed consider them a useful service, especially in work-place car parks – rather than installing one charging point at every parking space, as suggested by an urban planner. However, the energy expert stresses that ultra-fast charging points (i.e. with a three-minute charge time) are a ridiculous goal, which would make electric supply unsustainable. According to one trade unionist:

In a new train station, they've installed 20 charging points. Nobody uses them. It isn't only a question of the availability of charging stations. The most important thing is the battery operating time per charge: we need individual charging points at home, but thanks to the long range, we don't really need public charging infra-structure everywhere.

In summary, there is an opportunity to make cars more sustainable. It will require a long lifespan battery, decarbonised energy to produce and charge the battery, and a system for using the car battery as an energy storage solution. Other projects, like using old batteries on the grid to harness their residual capacity, may be envisaged. In any case, we need a coherent, comprehensive and agile electricity system that compensates consumers while giving them the freedom to choose when they do and do not want to contribute to the system.

AN URBAN VEHICLE?[9]

There is a kind of paradox about electric cars. On the one hand, EVs are more sustainable when they are small, requiring fewer raw materials and less energy. This makes them particularly suitable for urban needs such as commuting. On the other hand, many cities wish to ban (or reduce) the use of cars in their areas, and the abundance of public transport in densely populated areas reduces the need for cars.

A trade unionist says: "Electric vehicles aren't the only solution, they are one part of the solution." According to both him and the R&D manager, EVs are quite an attractive option for households with two vehicles, but ICEs (hybrids) are likely to retain a sizeable market share in the future. On this point, almost 30 percent of French households own at least two cars. If EVs can replace one of these cars for commuting, we would electrify a third of the fleet.

9 The value of a multimodal policy and the conversion of automotive to collective and active transport is covered in detail in the next section.

"Technological neutrality is important. It won't be possible to have one single mode that fits everyone's needs," argues one trade unionist. "ICEs will disappear, but we have to tackle the transition […]. Hybrids can help to make the transition less abrupt. However, will there still be hybrids in 2050?" EV hybrids are viewed by unionists as a way of ensuring a smoother transition. On the mobility side, "EVs are also seen as a transparent way to decarbonise transport without changing everything. We can in this respect overcome the challenge of inclusion," explains one expert, demonstrating that EVs are the easiest way to decarbonise transport while allowing mobility for everyone.

However, EVs in multiple-vehicle households may remain problematic for rural or peripheral areas. "I live in a low-density rural area in the mountains. My wife and I both need our own cars," claims a trade unionist. There is therefore a clear opportunity to develop multimodality in order to reduce journeys by car. "One could also imagine large car parks just outside urban areas, where people could borrow a car for a day or more," says another trade unionist. Another, who also lives in a rural area, says that car parks alongside urban transport lines make it easier for him to access the city and all it has to offer, and these could also reduce the use of electric cars and in-city parking. The R&D manager adds: "The main reason to purchase a car remains individual mobility. There is a trend towards multimodality, but this will remain limited. As for shared vehicles, people like some comfort and are not willing to share a journey with just anybody." According to the R&D manager, "a simple calculation of traction force shows that the faster we travel, the more we consume. EVs are perfectly adapted for low speed in urban areas. For longer journeys, high speeds and intensive uses, many problems may arise, in particular with regard to overly long charge times, even with fast charging." On this point, a journalist notes: "Before, we used to run out of fuel. Now we'll run out of power. So what? We'll adapt!" Moreover, experience with using EVs in small towns has produced fairly optimistic results (so far).

These debates show that, one way or another, we can reduce the use of ICEs without eliminating individual mobility: EVs could be used for the last mile of a multimodal journey, and for long journeys if there are enough charging facilities; alternatively, EVs might be used only for day-to-day trips, and ICEs/hybrids for long journeys. In both scenarios, the use of individual thermal energy is reduced. We will discuss further the opportunities and constraints associated with a full conversion to public and active transport.

LOCAL PRODUCTION FOR LOCAL NEEDS

France's economic/industrial failure is that carmakers produce the cars sold in France elsewhere. There is therefore a clear need to relocate production to France, and EVs are one opportunity for doing that.

"Comparisons are often made between the materials needed to produce an ICE and those required for an electric engine. However, this does not take all the factors into account, and an electric engine takes longer to assemble and requires more workers, in wiring for example," points out one trade unionist. Another claims: "Thanks to the proactive national policy [of a leading FTS], a new electric engine, which could be used in a wide range of vehicles, will be produced in France." The R&D manager believes that the jobs lost in engine assembly can be offset by battery and electronics production.

As French demand favours small models, for which EVs are best suited, carmakers need to manufacture these cars in France. According to a journalist, "the domestic market is focused on the small vehicle segment, so we must produce these vehicles in France. Having factories without a market is an aberration. We should therefore re-examine the factors involved, including labour cost, to find a more acceptable balance." A trade unionist says: "[The Renault Zoe] is not a mass-market vehicle; the choice was to pursue a high-margin strategy. […] We claim that it is possible to make small EVs in France for less than €10,000, including subsidies." Such a venture is indeed possible in France, with the same labour cost, provided that OEMs abandon their high-margin policies: "Today, carmakers want all business units to be profitable. However, the overall optimality of a system is not the optimality of each part of the system," adds the unionist. The journalist adds: "Carmakers are still in control of assembly. They should reconsider this activity; there are a lot of opportunities in production management."

"OEMs benefit from public subsidies. There is political awareness about the dependency [*of suppliers' activities on OEMs' decisions*], but OEMs aren't playing the game," claims another trade unionist. Indeed, public policy could be more proactive in forcing carmakers to produce cars tailored to local market needs. There is thus an opportunity to manufacture small EVs in France, but this would mean reducing the incentive for carmakers to maximise their margins based on a policy guided by the needs of the financial market.

AN INTEGRATED VALUE CHAIN

Finally, the condition for supporting a clean and job-creating emobility industry is to integrate the whole supply chain based on decarbonised electricity. On this point, the R&D manager explains: "We can measure the annual number of batteries needed to assemble the new vehicles and then estimate that we will require around 300 GWh of batteries per year for European needs, including 50 GWh for France alone. This raises the question of sovereignty and economic balance in Europe. Batteries must generally be produced close to the assembly plants." In line with the new European Commission roadmap (European Commission Battery), a trade unionist insists: "The battery supply chain is a goal to aim for. We have not yet got to grips with the whole process. We need to develop a new generation of batteries, to be a leader in this. We can't just rely on assembly. How can we concentrate R&D efforts along the value chain?" Also reflecting the European strategy, another trade unionist considers the time frame as important: "It's all very well to talk the talk, but we need realistic targets."

Mastering battery production, especially in France where CO_2 emissions from electricity are quite low, is key to delivering sustainable e-mobility. The latest report from Transport & Environment shows that European battery production is the most important factor in reducing the use of raw materials throughout the vehicle lifecycle (Transport & Environment 2021) France also has strong R&D players in the energy field, as noted by the automotive R&D manager, which provides an opportunity to structure the value chain.

E-mobility is also a great opportunity to develop electronics production in France (or Europe). A trade unionist adds: "The lifespan of an electric vehicle is longer than that of an ICE car. Planned obsolescence is not a suitable solution. OEMs and suppliers have opportunities in services (software). However, we still need cars for that". Moreover, the COVID19 pandemic has led to a chip shortage. Both the automotive industry and trade unionists support the reintegration of electronics supply. Relocating production to France could foster new developments in many industries, especially transport, in terms of developing new skills and competencies, and then new products and uses. We cannot decide on the right policies without mastering the technologies required. However, according to a manager in the supply industry, the shift to new mobility will open up competition to newcomers. Even if suppliers change their core competencies, they will face new competitors who may be more competitive. Also, as traditional powertrain equipment will have less value, players who only manufacture this may lose

their core competency, namely developing technologies that fit exactly with what carmakers need (in terms of reliability, safety, etc.), thus creating long-term trust.

The recycling industry is also a key element in sustaining clean e-mobility. Indeed, almost every component – especially critical raw materials – can be recycled, and infinitely reused.[10] On this point, the automotive R&D manager warns: "We have 15 years to implement a recycling industry for batteries. In 2020, only 110,000 battery electric vehicles (BEVs) were sold. These could operate until 2030 at least. So, currently in Europe we have to recycle less than 1 GWh, which is not a lot, but by 2045 we'll have 300 GWh to take care of."

To sum up, there is a narrow opportunity to develop a clean and sustainable electro-mobility industry. Industry, trade unions and urban planners are all situated on this line. Due, first and foremost, to freedom of mobility – which is the main motivation for purchasing a car according to the automotive R&D manager, as demonstrated by many consumer surveys and statistics – and secondly to the technological opportunities that electronics offers, EVs provide opportunities to develop more sustainable mobility and to sustain economic and social change. The question is rather how to redefine the role of private vehicles within the mobility offer, rather than converting all mobility to public transport/micro-mobility.

SCOPE FOR DEVELOPING PUBLIC TRANSPORT AND MICRO-MOBILITY

CONSUMER CHOICES AND MULTIMODALITY

The first important question to address is our understanding of what determines people's mobility choices. On this question, there is no single answer, as a lot of factors come into play (both personal factors such as the wish for freedom and infrastructure factors such as density and concentration of spaces).

An urban planner argues: "We did a survey during the COVID19 crisis on mobility and work patterns. People who come [into the area] by car may live close by or far away. There is no common behaviour that we can infer from the distance and journey time, at least concerning cars. The choices don't depend only on the offer." However, the interviewee adds: "But we do at least need an offer [proximity to a stop; frequent services; infrastructure]. Of course, nobody likes cycling on a rural road with trucks thundering past! On [a bridge in a densely populated

10 Only plastic components, as in an ICE, are not recyclable.

city], bike traffic has increased tenfold since a cycle path was created. On this point, we should look to the Nordic countries: the reason there is such a high proportion of bicycle use there is because there are plenty of cycle paths."

In this connection, another urban planner points out that there could be conflict between bus lanes and cycle paths, reflecting conflicting competencies in different local authorities. However, the aim of this mobility planner is to offer a credible alternative to cars in terms of journey time, comfort and accessibility, wherever this is possible, but without prohibiting cars. Indeed, dependence on cars is linked not only to location – although a centralised network could disadvantage people living in peripheral areas – but also to the nature of people's jobs. The bulk of car traffic in the planner's region is due to "people who have no other choice, because they have atypical schedules, carry out deliveries, need to reach multiple locations in a day, and so on". On this point, the planner explains that they are working with companies to spread out the rush hour in order to better organise the mobility offer.

A journalist adds: "We also need to rethink transport holistically, with climate impact as the starting point. We have to develop mobility solutions for people who can't drive or don't want a car! This means creating a denser public transport network. We could also think about fleet pooling, with professional drivers, car sharing, and so on. Finally, retailers and dealers can play a role in the mobility offer, through leasing or shipping. Technologies lead to opportunities!"

"In my rural area [close to Switzerland], a century or so ago, there were a lot of train services and lines linking the countryside with the surrounding cities. Of course, that was before the arrival of cars. People have been encouraged to move towards mass consumption," points out a trade unionist. There are indeed many old railway lines that could be restored to boost public transport in rural areas. Underinvestment in regional trains is one important factor that leads to a shift from train to car, due to a lack of frequency, reliability, speed and comfort. So there is a huge opportunity to restore and reopen regional railway lines. "Multimodality works only if there is a public transport offer in the first place!," adds a representative of an association promoting active mobility.

However, an urban planner in a very densely populated area warns about the costs and challenges associated with building new infrastructure, while noting that new stations, and new hubs, can create a dynamic service economy for commuters (restaurants, shops, etc.). Another also details the constraints: "There

are technical constraints like the underground layers; real-estate constraints like buying space for infrastructure; and socio-economic profitability. We have to ask ourselves if it really makes sense to build such lines."

But there are also advantages: "Creating public transport infrastructure like tram lines also helps to improve the urban environment, and hence quality of life," argues one trade unionist. "We can also balance the hidden subsidies for cars [the lower cost of owning a car in the public space, something not reflected in the public budget] against the cost of public transport infrastructure," argues one expert on climate policy.

Quality of life, and specifically urban congestion and pollution, is one of the main arguments put forward by environmental NGOs to support the switch from individual motorised mobility to collective, public transport.[11] The five arguments of the Nicolas Hulot Foundation in favour of this conversion can be summarised as follows: cars emit more pollutants; car infrastructure is expensive for local authorities (9 percent of their budget); cars are slower than bicycles for short journeys; fewer cars mean more space to enjoy the city; opting for micro-mobility or public transport helps to combat climate change.

However, banning cars from city centres may have adverse effects: the car ban along Paris's riverbanks increased the probability of congestion on the ring road by 15 percent, and exacerbated air pollution exposure (three times more residents suffered from a deterioration in air quality compared with the number who benefited along the riverside), while a negligible amount of traffic switched to public transport (Bou Sleiman 2021).

"I'm done with all the talk on micro-mobility. It's good for Paris, not for rural areas," argues a representative of an association that promotes active mobility in rural areas. After describing the lack of safety on rural roads, which could be resolved by investing in infrastructure, and the long trips country dwellers have to make to get to a bakery, this representative also stressed that in rural areas "cycling is associated with the image of agricultural workers". Even in medium-sized towns and cities, "bikes are not something that appeal to young people. They do this job because it's their only way to earn money, but they don't use bikes otherwise". To encourage young people to cycle, this association first highlights the recreational aspect of cycling by organising activities (such as a weekend group bike ride), during which they then discuss the benefits for the environment.

11 See e.g. Nicolas Hulot Foundation for Nature and Mankind (2020).

Creating hubs in medium-sized towns/cities could therefore be a valuable way to decentralise densely populated areas while generating new economic and social activities in secondary areas. However, "decentralisation is not within the scope of the policies. We aim rather to find ways to reduce soil artificialisation [by combating urban sprawl]," notes one expert on climate policy. "And living in a 15m^2 flat is not what people want."

To sum up, the interviews suggest that there is plenty of potential to (re-)develop public transport. The important thing will be to develop collective transport without restricting cars through anti-car policies. This will allow society to move from private cars to more public transport and micro-mobility. The primary condition for this is offering strong public transport, not only in densely populated areas (where this is already happening) but in rural areas too. France has the railway capacity for this, but we need a coherent public policy in favour of trains (and not only high-speed trains (TGVs), which may be very efficient for long-distance travel in reducing the use of planes, but only connect large cities). Many city councils, such as Bordeaux, want to bring back regional trains and integrate them into their local public transport offer (RER Métropolitain n.d.). Mobility conversion is on its way!

INDUSTRY CONVERSION

France has a strong supply chain for rolling stock. In the automotive industry, FTSs generally specialise in private cars, which is a definite constraint for conversion to rail vehicles and public transport vehicles.

There are, however, opportunities in the foundry industry. A trade unionist says: "We need to work on activity diversification. But the challenge lies on the political side, when we say that production for cars is over, so we have to close. There has been a lack of planning. OEMs could do more to help suppliers invest in flexibility, but it's too late. […] Whether it be manufacturing for the car industry or for another sector, the important thing is that people have work!" A trade unionist specialised in the foundry sector adds: "Moving from one sector to another, the 'only' thing that changes is the foundry mould [a technology used for producing non-complex parts]. The question is whether there is a willingness to diversify. However, the mass-produced parts are made abroad.' Another trade unionist challenged this view: "Where we can diversify activity, there are already incumbents. It's a hard task to find new markets, new materials, etc."

Micro-mobility could be an interesting avenue for developing industry. But there is an issue of scale in jobs, in terms of both manufacturing and repair. "I don't see the bicycle industry creating economic growth, but e-bikes possibly could," says a representative of an association promoting active mobility.

"We should be careful about bogus good ideas. 800 kg of copper in an electric bus is not the solution: hydrogen is," comments one trade unionist. Indeed, the conversion to public transport needs new technological solutions, and hydrogen promises high efficiency, if the hydrogen is produced using low-carbon energy.

On this point, some trade unions[12] in France support upgrading the steel industry to use hydrogen in the production process while reducing CO_2 emissions by capturing and converting them to energy, thus creating a more sustainable ecosystem. Few projects related to the steelmaking industry have so far emerged in France.[13]

12 See e.g. the words of a CGT representative appearing in front of the French Senate (French Senate 2019).

13 For example, Jupiter 1000 in the south of France (see Jupiter 1000 n.d.) and a number of Arcelor Mittal projects (see Arcelor Mittal n.d.).

BETTER WORKING CONDITIONS, WORKERS' PARTICIPATION AND INCLUSIVE MOBILITY

For trade unionists, the most important issue is work, whatever the product. Concerning the transport sector (freight), one trade unionist mentioned the need for rail transport, as an opportunity both to reduce CO_2 emissions and to tackle low-income strategies: "One huge project is the rejuvenation of the truck fleet. In freight transport, due to outsourcing, some vehicles on the roads are complete wrecks. There is a huge amount of work to do on rail transport, if we are to eliminate polluting trucks."

However, at the industry level, there is no clear evidence that conversion would lead to better working conditions. More work is needed to democratise industrial strategies and policies. Most of the trade unionists interviewed claim that there is no meaningful dialogue at company level to drive strategic changes. Either trade unions go along with the firm's strategy ("Previously, the most reasonable trade unions tried to limit the damage by 'going along' with it. Now, they just consider themselves as stakeholders in the profit strategy," claims one trade unionist), or they oppose the strategy but without taking any effective collective action.

The situation is more critical along the supply chain: "One day, an OEM representative come to the foundry to discuss the possibility of producing new materials. We invested accordingly and borrowed. A few months later, the same representative came back to announce that they were reducing the order book," *claims another trade unionist*.

"There is somewhere that we can usefully participate. It seems that, in the strategic committees of some *filières*,[14] such as electronics and the steel industry, we can make our voice heard and are sometimes listened to. Sometimes, one trade union talks on behalf of the others. Basically, we can work collectively. This is also the forum where the public authorities explain their choices. By contrast, in the automotive sector, the [business federation] is less interested in the unions, and pursues its own agenda," explains a trade unionist. Another trade union representative confirms the value of participating in such committees, as they are listened to.

There are many voices, in both trade union and academic circles, in favour of making the *filière* committees into a more democratic space, for example by

14 Since the 2008 crisis, the French government has implemented a new *filière* (sector) policy, designed to foster a new industrial policy promoting innovation and a new industrial base. This policy is discussed and implemented through strategic filière committees, which include representatives of public authorities, business/industry and trade unions.

transforming the pluralist governance structure into a real system of joint management. For while the trade unions may have a voice on these committees, they lack decision-making and implementation powers. There are other forums, such as the Economic, Social and Environmental Council (ESEC),[15] in which trade unions have a voice, but their recommendations are only advisory. Conversely, one trade unionist highlighted the valuable initiative of the Citizens' Convention, in which citizens and other stakeholders can exchange views. However, the recent law on climate change did not clearly follow what the convention had proposed, creating a lot of frustration among the participants.

The other point in relation to worker participation is a proposal for a new law drafted by trade unionists from former automotive supplier GM&S.[16] This law aims to reduce the dependency of suppliers on OEMs, by means for example of inter-company works councils. However, "[this law] is not sufficiently understood and discussed by our trade unions. There needs to be more direct communication about it. In the works councils, the management refuse to engage in any political debates, believing that the works council is a place for company discussions only. And as many of our trade unions have their nose to the grindstone [due to the many industrial relations issues and other problems they have to address], they don't have time to develop a vision on the supply chain," explains a trade unionist.

On the mobility side, an urban planner explains that they take decisions after a public consultation, especially with companies, local elected members and users. "Local elected members help us to define the local needs." They also organise workshops and seminars, and strive to include the community in mobility planning. "User associations are on the administrative board […] they can provide us with a lot of expertise."

On the need for democratic debates and decision-making, a trade unionist says: "Our union works with [an environmental] NGO, we work with business representatives, we work with the public authorities. But never all of them at the same time. What we need are places where we can really debate all together, because

15 The ESEC is a consultative assembly, with members from trade unions, business federations, associations, etc., and draws up recommendations for the government on a wide range of topics, including industry.

16 After the 2008 crisis, this supplier was hit by a drop in orders from its two main clients. Despite protracted industrial action, the trade union was unable to save the factory. A 2019 film from Lech Kowalski charts this story (Kowalski 2019).

it is only by pitting different views against each other that we can change mind-sets."

This also raises the question of linking industry and mobility through a genuinely systemic policy. As the expert on climate policy stresses: "If we had a real and efficient retraining policy, for sure, the mobility conversion could be easier. There are many sticking points that can't be removed with an environmental policy alone." The question of political scale, of where industrial policy decisions are taken, is also an important point. A supplier representative says: "We send many requests to the government, but their answers are always conditioned by the European level." This representative argues that the European Union can be a powerful force in discussing and implementing technical standards, as long as it does not become a federal union (adding that this is a political and not solely an economic question). Industrial policy, economic policy and monetary policy should be decided at the national level.

To sum up, there are many spaces in France providing an opportunity to strengthen workers' voices in industrial decision-making, as well as in inclusive mobility policy, including of course industry conversion. However, the interviews do not suggest that conversion could lead to better working conditions (except for freight drivers). Instead, more work is needed on workers' participation to create better conditions for the *acceptance* and *enhancement of conversion*, within both industries and society, thus sowing the seeds for a whole new society.

CONCLUSION

The automotive industry in France faces two major challenges: the environment and mobility. These two challenges need to address both sides of the car issue, namely production and use. In a context of climate change and urban congestion, many voices and policies are promoting a reduction in the use of cars and an increase in public transport. However, such policies raise two issues. First, while there is a strong industrial base in France to manufacture public transport vehicles, it seems highly challenging to convert the automotive industry to public transport. Indeed, firms specialised in the manufacture of vehicles for individual motorised mobility could not easily transfer their production; the public transport industry already has a structured supply chain; and transport production is heavily dependent on public demand and may not be able to sustain long-term job growth. Second, the acceptability of such policies needs to be carefully studied. France is

Europe's largest country, and 43 percent of the population live in peripheral areas. Many are therefore highly reliant on cars, and mobility needs to include everyone.

Based on 12 semi-structured interviews conducted with representatives from business, trade unions and public authorities, mobility planners, an energy expert and an association representative, we show in this study how mobility and industrial policy could be linked. Our results suggest that (1) there is a narrow opportunity to produce and use sustainable electric vehicles; (2) multi-modality appears to be the best way to connect peripheral and urban areas; and (3) France needs more political spaces for stakeholders to contribute to industry-related decision-making.

LIST OF INTERVIEWS CONDUCTED

Date	Duration	Media	Role
7 January 2021	1:46	Video call	Head of energy laboratory
15 January 2021	1:00	Phone	R&D manager in automotive industry
18 January 2021	0:55	Phone	Trade unionist at carmaker
27 January 2021	0:50	Phone	Journalist and publication director
1 February 2021	0:50	Phone	Trade unionist in automotive industry
1 February 2021	0:45	Video call	Urban planner
4 February 2021	0:45	Phone	Trade unionist in foundry sector
9 February 2021	0:45	Video call	Urban planner
9 February 2021	1:05	Phone call	Trade unionist in automotive industry
9 February 2021	1:05	Video call	Independent expert on climate policy
22 February 2021	0:43	Phone	Representative of cycling association
15 March 2021	1:00	Phone	Manager at supply company

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ITALY

ITALIAN AUTOMOTIVE SECTOR AND ITS TRANSITION TO GREEN VEHICLES

MATTEO GADDI

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TABLE OF CONTENTS

INTRODUCTION

The aim of this study is to describe the situation of the automotive industry in Italy, its production volumes and employment levels, and whether and how this sector is preparing for the transition to green vehicles. At the same time, we wish to highlight opportunities and possibilities for converting the automotive industry into an ecological mobility industry, while also pointing out the limitations of this strategy: in our view, public transport can never completely replace the car, both as a mobility service and from an industrial/employment point of view.

There is substantial scope for supporting the spread of public transport services and enabling them to replace significant shares of private mobility, but this requires specific public policies and clear alternatives to neoliberal and austerity approaches. This goal implies the need to support local/regional/national public transport policy, and to preserve, strengthen and expand the industrial chain that produces the means of transport dedicated to these services. Only in this way can we combine environmental goals and the creation of new employment in developing industrial production capacities.

This report was compiled using a number of databases, but drew primarily on research in the field with trade union delegates, which allowed us to map and explore the situation of these industrial sectors in Italy. With a number of NGOs and the transport union, we discussed critical aspects of current policies and opportunities to promote an environmental transformation of the sector.

WHICH CAR MANUFACTURERS ARE PRESENT IN ITALY?

In Italy, the only car manufacturer of significant size is Fiat Chrysler Automobiles (FCA Group), as Lamborghini (Volkswagen Group) has very low production volumes, manufacturing 6,577 vehicles in 2018. Consequently, it is FCA's output that determines the total amount of production.

Italy has seen a collapse in car manufacturing, as shown by production data for the last 30 years (ANFIA n.d.):

- 1989: 1,971,969
- 1999: 1,410,459
- 2009: 661,100
- 2019: 542,472

(The provisional figure for 2020 indicates a production volume of 451,000 passenger cars.)

Essentially, domestic production of passenger cars fell by 1,429,497 between 1989 and 2019, a drop of around 72.5 percent. This is not the place to analyse the reasons for this collapse, which was caused by the choices made by Fiat's owners: substantial withdrawal from car production, offshoring of sizeable production volumes, increased involvement in financial operations, and so on. However, it is worth pointing out that this drop primarily affected the Fiat brand (i.e. the mass-market car brand), which lost more than a million cars (from 1.410 million in 1989 to 279,000 vehicles in 2019).

The collapse of traditional car production has not been offset by electric vehicles, as FCA manufactures only one electric model in Italy (Fiat 500 Electric) and fewer than 20,000 units were produced in 2020 (the production lines at the Mirafiori plant have a capacity for this model of 80,000 vehicles a year). Moreover, the numbers are set to be lower still in 2021.

FCA'S ITALIAN PLANTS FOR THE FINAL ASSEMBLY OF CARS ARE AS FOLLOWS:

Plant	Employees
Mirafiori (Turin)	4,700
Cassino	3,590
Pomigliano (Naples)	4,490
Emilia Romagna (Maserati)	1,330
Melfi	7,200
Atessa (Abruzzo)*	5,940

* This plant focuses on light commercial vehicle (LCV), rather than car production. Source: Data provided by trade union delegates

The situation is rather different for commercial vehicle production, where Italy seems to be maintaining good levels (albeit with a distinction between heavy vehicles, which are on a negative trajectory, and light vehicles, for which the trend is positive) (ANFIA n.d.):

- 1989: 243,727
- 1999: 287,671
- 2019: 376,671

WHICH AUTOMOTIVE SUPPLIERS ARE PRESENT?

The Italian component industry (NACE code 29) comprises 665 bodywork and 1,403 parts and components companies; the value of production in 2018 was €28,756,167, of which €14,986,183 was exported (52.1 percent). Obviously, as domestic car production in Italy is falling, parts and components manufactured in Italy are increasingly being exported to European countries that have maintained high volumes of final assembly, most notably Germany and France.

It should be borne in mind that the data on the production and export of parts and components are an underestimate as they do not take into account types of production that are not formally classified as automotive but are an important part of supply in this sector, such as textiles, rubber/plastics, batteries, etc.

If we look at parts and components companies in Italy with more than 1,000 employees and classify them in terms of employment levels, we get the following table:[17]

Company	Employees
Marelli Europe S.p.A.	5,097
Brembo S.p.A.	3,152
Tecnologie Diesel S.p.A. (Bosch)	1,822
Bitron S.p.A.	1,818
Lear Corporation Italia S.r.l.	1,706
ITT Italia S.r.l.	1,521
Marelli Suspension Systems Italy S.p.A.	1,297
Plastic Components and Modules Automotive S.p.A. (PCMA)	1,208
ZF Automotive S.p.A.	1,114
DENSO Manufacturing Italia S.p.A.	1,088

Of the top 10 supply companies located in Italy, only three (Brembo, Bitron and PCMA) are Italian, while all the others are foreign-owned. Further down the list we find the names of Vitesco Technologies (formerly the Continental Powertrain Division), Magna, Valeo, etc., all of which are foreign-owned.

17 Our calculation is based on data from companies' annual financial statements.

The Marelli Group companies became foreign-owned following the Fiat Group's sale of Magneti Marelli to Japan's Calsonic Kansei, thus making Italy's leading parts and components company foreign-owned and further weakening the Fiat Group. The majority of Italian component companies are small and medium-sized enterprises, without the presence of national champions. These firms, in turn, use a large subcontracting pool of small or micro enterprises.

LOCAL MANUFACTURING SECTOR AND LABOUR MARKET

The change in the production volumes of passenger cars has had a very clear impact on employment levels and structure. The table below shows the employment figures (full-time equivalent) for NACE code 29 (Manufacture of motor vehicles, trailers and semi-trailers), which includes both the final assembly of vehicles and the production of bodywork and parts and components.[18]

Year	Jobs (FTE)
1998	177,419
2008	144,890
2018	140,798
Change	-36,621

If we look at the employment trends in the sector, we can see that the nature and extent of the changes are radically different for final assembly compared with parts and components production, so much so that they are leading to a structural transformation of the sector. While final assembly employment has decreased, employment in components production has gone up.

EMPLOYMENT TRENDS

	Manufacture of Motor Vehicles	Manufacture of Bodies (Coachwork)	Manufacture of Parts and Accessories
1998	91,467	14,226	71,726
2018	53,089	9,736	77,979
Change	-38,378	-4,488	6,245

Source: Calculation based on data from the Italian National Institute of Statistics (Istat) and Eurostat (European Union statistical office) databases (Istat n.d.; Eurostat n.d.).

18 Our calculation is based on data from the Italian National Institute of Statistics (Istat) and Eurostat (European Union statistical office) databases (Istat n.d.; Eurostat n.d.).

As can be seen from the table below, whereas previously the majority of jobs were in final assembly, now the majority are in the production of parts and components.

	1998	2018
Manufacture of Motor Vehicles	52.00%	37.70%
Manufacture of Bodies (Coachwork)	8.00%	6.90%
Manufacture of Parts and Accessories	40.00%	55.30%

Source: Calculation based on data from the Italian National Institute of Statistics (Istat) and Eurostat (European Union statistical office) databases (Istat n.d.; Eurostat n.d.).

A broader classification, published annually by the Observatory on Italian Automotive Components (Moretti / Zirpoli 2020) and including sub-suppliers, sub-suppliers (machining), specialists (motorsport), specialists (aftermarket), engineering and design, module and system suppliers, indicates 2,198 companies and 164,305 employees.

The number of employees calculated by the observatory is higher than that calculated by us using only the NACE code and the Istat database (Istat n.d.), as their calculation includes a significant number of companies that are not part of the statistical classification of the automotive sector. The same publication shows that the highest concentration of these companies is, in order of importance, in Piedmont (33.5 percent of all automotive companies), Lombardy (27.4 percent), Emilia Romagna (10.2 percent) and Veneto (8.6 percent). However, beyond the strong clustering in these four regions, it should be stressed that in small local systems, such as Abruzzo and Basilicata, the presence of large Fiat plants (respectively, powertrain in Termoli, and Sevel in Atessa) determines a strong employment impact from automotive production.

The shift towards electric mobility will certainly have an impact on employment levels, as shown by the long list of components used in the internal combustion engine (ICE) model and no longer needed for the electric car. This is not the case for the hybrid model, which, combining both electric and ICE technology, requires a larger number of components and could therefore lead to higher employment levels.

We have identified the main components that would be eliminated with the switch to pure electric, and the main suppliers of these components, in order to ascertain the employment consequences that could arise. The number of workers in the Italian plants of these companies (e.g. Magneti Marelli, Pierburg, DENSO, Bosch, Valeo, Teksid) is about 10,500. However, this is not a completely accurate calculation

because, on the one hand, some of these may be employed in other productions; on the other hand, the number of second-tier or third-tier suppliers of these companies is missing from the calculation of jobs at risk. We have therefore tried to make a more accurate calculation, even if it refers only to powertrain production.

OVERALL, THE FCA GROUP'S POWERTRAIN PRODUCTION IN ITALY IS AS FOLLOWS:

Plant	Jobs
Mirafiori Powertrain	1,104
Verrone	602
Pratola Serra	1,785
Termoli	2,574
VM Cento	955
Total	7,020

Source: Data provided by trade union delegates.

As the labour coefficient for this sector is 2.55, the total number of jobs is 17,901 (e.g. for Teksid alone, 1,043 jobs in Italy). However, this figure of almost 18,000 jobs eliminated is also an underestimate as it does not include those engaged in the production of parts and components for powertrains intended for export. The number is therefore higher and gives an idea of the employment impact of a transition to pure electric power, should it occur (which will also involve other parts and components).

From the point of view of wage levels, the following table presents data for the sectors of motor vehicle manufacture and manufacture of parts and accessories for motor vehicles and their engines (Istat n.d.):

MOTOR VEHICLE MANUFACTURE – AVERAGE ANNUAL WAGES DIFFERENTIATED ACCORDING TO WORK CATEGORY (EURO)

	2015	2020
Clerks and Middle Managers	32,154	33,240
Blue-Collar Workers	24,222	24,803
Total, Excluding Executives	26,551	27,173

MANUFACTURE OF PARTS AND ACCESSORIES FOR MOTOR VEHICLES AND THEIR ENGINES – AVERAGE ANNUAL WAGES (EURO)

	2015	2020
Clerks and Middle Managers	28,684	29,351
Blue-Collar Workers	23,964	24,552
Total, Excluding Executives	25,286	25,896

Wage levels of blue-collar workers in the automotive sector are slightly higher than in manufacturing activities in general (€23,560 in 2015 and €24,458 in 2020). But from 2015 to 2020, while the wage levels of blue collars in manufacturing grew by 3.8 percent, those in the automotive sector grew by only 2.3 percent and in automotive components by 2.4 percent.

One of the reasons for the low wage growth in this sector, in addition to the economic policies of wage deflation, lies in the Fiat Group's decision to leave the perimeter of the national bargaining system of the metalworking sector and apply a specific collective labour agreement (CCSL) instead. This was imposed by former FCA CEO Sergio Marchionne, and has never been signed by the metalworkers' union FIOM-CGIL. This agreement actually worsened working conditions (pace, saturation etc.) and wage levels and interfered substantially with democratic rules. It should also be emphasised that in Italy, unlike in other countries, there is no law allowing for the democratic participation of workers in companies.

ROLE OF FOREIGN DIRECT INVESTMENT

The presence of foreign capital in the Italian automotive sector is very significant. The following table shows the main data relating to foreign control of enterprises:[19]

	2008	2018
Enterprises (Number)	130	114
Production Value (Million Euro)	7,607.5	12,778.1
Value Added at Factor Costs (Million Euro)	1,536	3,254.3
Gross Operating Surplus (Million Euro)	-96	135.8
Gross Investment in Tangible Goods (Million Euro)	256.7	658.5
Persons Employed	44,417	36,109
Investment per Person Employed (Thousand Euro)	5.8	18.2

19 Our calculation is based on the Eurostat database (Eurostat n.d.).

If we look at the nationality of the foreign control, we obtain the following data taking as our reference the value of production (million euro) in 2018:

Germany	**4,846.9**
USA	3,681
France	1,235.2
Japan(*)	752.9
UK	734.6
Canada	336.4
Switzerland	282.4
China	267.5

(*) The figure for Japan is an underestimate because in 2019, as anticipated, Magneti Marelli was sold to Japan's Calsonic Kansei

POSITION IN INTERNATIONAL VALUE CHAINS

A complete evaluation of Italy's position in international production chains would require a full report. In this section, therefore, we limit ourselves to indicating the data concerning exports of parts and components. Some evaluations will be carried out in the light of interviews conducted in the field, both with trade union representatives and with companies (they will not be quoted for reasons of anonymity).

In addition to the data presented in the previous sections, which showed how the weight of exports in overall production had grown over time, in this section we use some assessments carried out by the Italian Association of the Automotive Industry (ANFIA n.d.), which widened the field of observation by including some companies not classified (according to NACE code) as the automotive sector in the narrow sense. These figures also confirm a growth in the value of exports of parts and components, from €19.309 billion in 2013 to €21.966 billion in 2019.

If we look at the main destination/origin countries (figures in millions of euros, rounded), we obtain the following table:

Destination Country*	Export (Million Euro)	Country of Origin	Import (Million Euro)
Germany	4,632	Germany	3,925
France	2,297	France	1,775
UK	1,743	Poland	1,455
Spain	1,557	China	1,091
USA	1,320	Spain	775
Poland	1,277	Czechia	642
Turkey	914	Turkey	638
Austria	711	USA	524
Brazil	570	UK	405
Czechia	559	Romania	367
Hungary	487	Hungary	362

*Our calculation is absed in Anfia database

Looking at the macro-regions, the picture that emerges from the data on imports and exports of automotive parts and components appears to be highly regionalised: €16.036 billion is exported to the EU28, out of a total of €21.966 billion, while Italy's imports from the EU-15 account for €11.329 billion out of a total of €15.437 billion.

The relevant data on the value of exports complements the qualitative research conducted through interviews. According to the interviews we carried out, in some areas such as the north-east of Italy there are companies that generate 90 percent of their turnover with foreign customers. This situation, characterised by the collapse of domestic production and high levels of exports of parts and components, also threatens the presence of the supply chain in Italy, since multi-national companies present in Italy, in the absence of a national manufacturer able to absorb their production, could shift volumes to other plants abroad, in particular to low-cost countries located near to the final assembly plants (for example in Central and Eastern European countries, which are both low-cost locations and closely linked to the German automotive sector). Finally, other risks are determined by the fact that there is no national champion supplier in Italy (Magneti Marelli was sold by Fiat, while PSA retained control of Faurecia) and that most supplier companies are SMEs, or even micro-enterprises.

Furthermore, the merger between FCA and PSA has jeopardised even the supply chain for parts and components. For example, the new Bsegment models (400,000 vehicles) will be built in Poland (Tychy plant). PSA uses a modular multi-energy platform (CMP) on which the new Bsegment models will be built: this will have very important (and worrying) implications for the choice of components (component choices are related to the architecture used). The fact that PSA has imposed its own floorpan (platform or underbody) will have a very major impact on the supply of components, and our fear is that it is not only the parts directly involved that will be put at risk, but other parts too.[20] [21] Essentially, if PSA's entire architecture is being imposed, we fear that even for the mechanical, electronic and powertrain parts it will be PSA that will decide which solutions to adopt.

There will still be room for Italian suppliers that already supply parts and components for PSA, but those whose output goes mainly to FCA are at risk of disappearing. Hence the letter sent by FCA to its suppliers in which it told them to stop all research, development and production activities related to Bsegment vehicles.[22]

PUBLIC TRANSPORT AND THE ROLE OF PUBLIC PROCUREMENT

The possible conversion of the transport sector from individual to collective mobility implies the need for specific public transport policies and the ability to plan both an adequate industrial capacity and the capacity to create new jobs.

The forms of management of public transport services in Italy have been the subject of legislation pushing in the direction of service liberalisation/privatisation and seeking to introduce compulsory tendering for the provision of services in order to replace systems of public management/ownership.

The neoliberal approach that has been put in place needs to be questioned, including in the field of industrial production of public transport equipment. According to the EU's neoliberal policies, governments (customers) have to procure public transport vehicles (buses and trains) through procedures that allow competition to develop. This means that governments, when drawing up calls for tender, cannot include clauses which guarantee that production, or at least part of it, takes place on

20 For PSA, see The Wheel Network (2018).

21 For VW, see Newsroom Volkswagen (2019).

22 The hybrid model (MHEV) is allowed to use electric motors made by Punch Powertrain (a joint venture with PSA), and for electric batteries, PSA has announced a project with Saft.

national territory.[23] In fact, with regard to the need for local manufacturing presence, as a preliminary point, the Commission notes that EU procurement rules prohibit customers from disqualifying bidders that do not have local production assets.

The neoliberal approach applies the definition included in Directive 2014/25/EU on procurement by entities operating in the water, energy, transport and postal services sectors, which states:

Technical specifications shall afford equal access of economic operators to the procurement procedure and shall not have the effect of creating unjustified obstacles to the opening up of public procurement to competition. […] Unless justified by the subject-matter of the contract, technical specifications shall not refer to a specific make or source, or to a particular process which characterises the products or services provided by a specific economic operator, or to trade marks,

23 Articles 36.1, 60.2 and 60.4 of Directive 2014/25/EU of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC [2014] OJL 94/243, as explicitly mentioned by the European Commission when it assessed the Alstom-Bombardier merger process from the point of view of competition and the market (European Commission 2020: 39, specifically, footnote 225).

patents, types or a specific origin or production with the effect of favouring or eliminating certain undertakings or certain products.

Consequently, multinational companies that take part in public tenders launched by European governments for the construction of public transport vehicles, once they have won the tender, can decide to locate production wherever they like, obviously preferring countries with low labour costs.

This legal framework can lead to a paradoxical outcome: a country can invest billions of euros in building new public transport vehicles, without this creating a single job in the country. These contracts can be awarded to companies that are free to decide where to locate their production. However, in other parts of the world, including the neoliberal United States, it is clearly stipulated that a percentage of the value of the contract must be generated locally when public contracts are awarded. In the EU, in deference to neoliberal dogma, there is no local labour clause to protect workers and the industrial structure of individual countries.

BUS SECTOR

In Italy, the process of reorganisation has been accompanied by worrying *rationalisation* processes: between 2005 and 2018, both the number of employees in the local public transport sector and the number of vehicles used fell.

Year	Employees	Buses	Employees per 1,000 inhabitants	Buses per 10,000 inhabitants
2005	85,518	45,691	1.5	7.82
2010	86,526	46,290	1.43	7.67
2014	84,458	45,989	1.39	7.57
2018	81,038	43,967	1.34	7.27

Source: Calculation based on data from Ministry of Infrastructure and Transport (2018–2019). National Infrastructure and Transport Account: 191–192.

The situation is also worrying from the point of view of the quality of the fleet with regard to pollutant categories (Ministry of Infrastructure and Transport 2019):

Euro 0: 2.86%
Euro 1: 1.48%
Euro 2: 17.83%
Euro 3: 27.59%
Euro 4: 6.27%
Euro 5: 28.30%
Euro 6: 15.26%

Approximately 56 percent of the fleet is therefore in the Euro 4 category or lower. It should also be borne in mind that in the hearing document delivered to the Italian Parliament by public transport companies (Chamber of Deputies 2021), the average age of the bus fleet was reported to be 12.3 years, well above the average age in the main EU countries (7 years).

The resources available for renewing the local public transport bus fleet have not been particularly generous over the years. The mapping of public funding available as of 2019 for the renewal of road-based public transport vehicles was summarised in the SPL Monitor Report (*Servizi Pubblici Locali Monitor*, ReOPEN SPL project), which was based on data provided by transport association ASSTRA and Cassa Depositi e Prestiti: overall, between derived resources (state and European funds) and co-financing resources, Italian regions had €1.704 billion at their disposal.

Subsequently, the National Strategic Plan for Sustainable Mobility drawn up by the Ministry of Transport in December 2018 (Ministry of Infrastructure and Transport 2019) provided for a financial endowment until 2033 (through a National Fund introduced by the Budget Law for 2018) of €3.7 billion for new vehicles and related support infrastructures, as well as €2 million for studies and research and €100 million to support the production chain. Both the resources earmarked for supporting the industrial bus production chain and those for the renewal of the bus fleet seem insufficient, especially when compared with the ambitious objectives of the National Strategic Plan.

It is true that the €3.7 billion may be supplemented by the co-financing resources provided by the Regions, which we can calculate at around €1.5 billion, making a total of €5.2 billion. However, it is not certain that the Regions and local authorities will be able to contribute their own resources, due to the financial difficulties caused by the COVID-19 pandemic. But even if they were to top up the funding with their own additional resources, this is still a very low figure in view of the need to: renew a bus fleet characterised by a high number of polluting vehicles (below Euro 4) and a high average age; expand the bus fleet in order to improve the quantity and quality of local public transport services; introduce quotas of buses with alternative fuels to diesel, which are more expensive than traditional vehicles.

Since the budget is spread over 16 years (2018–33), the average figure is €231 million per year in total, rising to €326 million if we add the hypothetical

regional co-financing. This is totally insufficient. According to the memorandum drawn up by the organisations representing transport companies, €9.5 billion would be needed to renew the bus fleet. But if the fleet is to be expanded, as is absolutely necessary, a lot more resources would be required.

The Italian production chain is of crucial importance, hence the need to carry out an analysis of the national bus manufacturing industry. In Italy, local bus production, according to ANFIA (n.d.), has slumped dramatically in recent years. The following table summarises the collapse in domestic bus production, showing just how low the numbers have fallen in the last few years:

	Buses Manufactured in Italy	Buses Registered in Italy	Registered Buses Used for Local Public Transport
1980	6,945	-	-
1990	6,460	-	-
2000	3,163	-	-
2010	1,065	-	-
2015	765	2,381	950
2016	640	2,869	915
2017	390	3,427	1,416
2018	130	4,495	2,473
2019	148	4,357	2,208

The significant differences between manufactured and registered buses highlight the proportion of vehicles that are imported, including buses (both urban and extra-urban) used for local public transport. In fact, if we look at the make of vehicles registered in 2019, we find that domestic production is very marginal: the public resources invested in manufacturing buses for public transport services are being used to finance production at foreign plants, many of which are located in countries with low labour costs (Czechia, Poland, Turkey). This is due both to European rules on public procurement and to the lack of production capacity in Italy.

BUSES REGISTERED IN ITALY (2019) AND ITALIAN MARKET SHARE BY BRAND

Brand	Registered Buses	Market Share (%)
Iveco	1,651	37.9
Mercedes	901	20.7
Menarini	466	10.7
Neoman	246	5.6
Setra	241	5.6
Scania	114	2.6
Otokar	100	2.3
Ford	76	1.7
Opel	63	1.4
Volkswagen	60	1.4
Irizar	60	1.4

Source: Anfia database

The only production left in Italy is that of the Menarini brand, since Iveco buses are no longer manufactured locally but in other plants in Europe (France and the Czechia). Mercedes, Neoman, Setra (EvoBus, owned by Daimler AG) and Volkswagen are German companies, Otokar is Turkish, Scania is Swedish, Ford is American, Opel is part of the PSA Group, and Irizar is Spanish.

In recent years, Italian bus production has been significantly lower than in other countries, despite the fact that Italy once boasted good levels of production and companies that excelled in this type of manufacturing.

WHAT HAPPENED IN ITALY?

What happened was that in 2011 both of Italy's main bus manufacturers decided to cease production. The leading Italian manufacturer was Irisbus, part of the Iveco Group (FCA-CNH), which in 2011 decided to shut down production at the Flumeri (Campania) site following the Berlusconi government's decision not to finance the renewal of public transport vehicles. However, the closure of the Flumeri plant did not mean that Fiat was no longer involved in the bus sector, since it maintained production in France and the Czechia and in subsequent years continued to take part in tenders issued by the Italian authorities, winning some major orders.

A similar decision was taken by the group owning the second largest Italian bus manufacturer (Breda Menarini, a plant located in Bologna): in 2011, Finmeccanica

(a publicly-owned company) expressed its desire to exit the bus production sector, as it was not considered relevant to its core business.

In view of the crisis linked to these two companies, in 2012 FIOM-CGIL presented an industrial proposal to create a national public bus production hub by merging the two plants into a single company in order to safeguard this important industrial production, the jobs and the professionalism/skills of the employees. This solution was implemented more than two years later, following strikes and struggles by workers at the two plants, when in December 2014 the government promoted the creation of Industria Italiana Autobus (IIA), led by a private entrepreneur and with the participation of Turkish company Karsan. Karsan's involvement proved decisive in shifting production volumes to Turkey because IIA won public contracts from the Italian state to build buses with public Italian resources, and then moved these productions abroad.

IIA immediately manifested problems: the industrial plans repeatedly announced by the CEO were not implemented, and the investments promised to restart the production lines were only minimally realised. Production levels dropped to a minimum, the workers were forced to make massive use of social shock absorbers, and the plants and production lines were almost completely abandoned to decay and deterioration.

IIA acquired orders, but not having the production capacity to build buses (over the years it picked up orders for more than 1,000 vehicles) it moved production to Karsan's Turkish plants. IIA almost went bankrupt, and so in 2018 the new government decided to intervene with a drastic change in the company, which led to the exclusion of the private partner and a change in the shareholding structure, with Invitalia (Italy's National Agency for Inward Investment and Economic Development) owning 43 percent, Leonardo (formerly Finmeccanica) 29 percent and Karsan 28 percent. The overhauled company thus had a sizeable public shareholding and its new management determined to relaunch the business. The factories were restructured, and the production lines were restarted.

The company's plan to relaunch itself is also evidenced by a recent trade union agreement (30 December 2020), which acknowledged the return of all workers from the redundancy fund, the hiring of over 90 young people, and the sharing of some vocational training measures, particularly in the field of new technologies. In fact, the training plan explicitly mentions the transition from ICE diesel engine traction to electric/hybrid/methane traction.

IIA currently has good workloads, with the Flumeri plant expected to produce 303 buses in 2021 (with lengths varying from 8 to 12 metres, and including some CNG- and LNG-fuelled vehicles) while the Bologna plant is responsible for the re-styling of some vehicles and the production of new electric models (50–60 buses) and five prototypes. In addition, IIA took part in Consip's recent call for tenders for the construction of 1,000 new urban buses of different sizes (short, medium, long) and with different fuels (diesel, methane, mild hybrid, full hybrid and full electric). More specifically, IIA submitted bids for four lots, totalling 520 buses. In the remaining lots (480 buses), bids were submitted by companies (Iveco, Man, Solaris, Evobus, Otokar, etc.) whose production sites are abroad.

This raises the question of how public funds (in this case the €463,000 being paid by the government for the 480 buses) are used to support foreign production, which, moreover, is located in countries with low labour costs (Poland, the Czechia and Turkey). At the same time, the issue of how to reconcile environmental policies with industrial and employment policies comes up again: IIA did not participate in some lots for the production of green buses because it is not yet ready for these technologies.

The production capacity of the two IIA plants in Italy is currently around 700 buses per year. This number is still very low, especially compared with production volumes in other European countries. The expansion of production capacity seems to depend less on heavy investments in fixed capital than is the case in other sectors, although some such investment will still be needed. This is because bus production is a very craft-based process, involving a high proportion of manual labour and a low number of machines/equipment.

The fact that the production cycle involves a low level of machinery/equipment use does not mean that investments are not necessary, either to increase production capacity or to improve working conditions. For example, on the production line there are problems related to the handling of vehicles, which are moved between workstations manually. Also, in-line testing needs to be reinstated. This was formerly carried out for each step as a way of immediately identifying any defects that needed to be corrected, among other things.

Obviously, an increase in production capacity also implies investment in the machinery/equipment that is used, which mainly consists of welding machines and painting robots. In addition, IIA is undertaking some important technological developments. It has new and innovative products such as LNG buses, electric

and hydrogen-powered vehicles, and a battery module to be assembled has already been developed. An internal area has been set up in the plant to produce these batteries for buses and other vehicles.

RAIL SECTOR

The issue of infrastructure is of fundamental importance for a transport service that operates on fixed installations, such as rail, but the space available in this report does not allow it to be addressed in detail. We will simply say that the extent of the Italian rail network in relation to the population is one of the lowest in Europe, and that a large part of it (about 30 percent) is not electrified, and an even larger proportion (55 percent) is single-track.

In recent years, the public rail company Trenitalia has focused heavily on very-high-speed trains, which is the market segment for medium- and long-distance services, reducing the share of services (and trains) in the universal service.

	2015	2018
Passengers*km (Million)	20,387	20,596
Of Which Market-Based Services[24]	15,869	16,828
Of Which Universal Service[25] with Public Contribution	4,518	3,768
Trains*km (Thousand)	79,260	90,303
Of Which Market-Based Services	53,428	64,933
Of Which Universal Service with Public Contribution	25,832	25,370

Source: National Infrastructure and Transport Account (Ministry of Infrastructure and Transport 2018–2019: 144)

This decline in medium- and long-distance rail services could also be reflected in the data on rolling stock as set out in the Ministry of Transport's National Infrastructure and Transport Account (ibid.).

24 *Market-based services* in this context means that the rail market is fully liberalised, and the state does not subsidise the service. Customers pay for very expensive tickets, and often, in order to encourage customers to use these services, standard trains have been cancelled on many routes and replaced by very high-speed trains.

25 *Universal service* in this context means a public service (as defined by public authorities) which is partly subsidised by public funds.

	2001	2010	2018
Total Traction Vehicles[26]	3,580	2,837	1,494
Passenger Coaches	9,324	7,476	5,009

In Annex 9 to the service contract[27] entered into between the Ministry of Finance and Trenitalia in 2017 for non-market medium-/long-distance rail services, the decline in the amount of rolling stock used is also highlighted for the future:

	2017	2020	2026
Total Traction Vehicles	199	171	171
Total Coaches	1116	966	966

Due to Trenitalia's positioning on market services for medium and long distances, connections between cities and towns now rely almost entirely on regional rail transport. According to the *Pendolaria* report by environmentalist organisation Legambiente, the overall level of service supplied by regional trains in 2020 returned to the levels seen in 2010, after declining for many years. On many routes, the frequency of services is inadequate or poor (with trains running every 60, 90 or even 120 minutes on important regional lines). One particularly worrying fact is the average age of the trains in operation, which is over 20 years; this figure is confirmed by Trenitalia itself, which in the 2019–23 Industry Plan indicates an average age of 21 years for 2019, with the aim of lowering it to 10 by 2023.

An ASSTRA and Intesa Sanpaolo paper from 2020 (ASSTRA / Intesa Sanpaolo 2020) pointed out that the total amount of state resources dedicated to the renewal of rail rolling stock was about €1.6 billion, net of the co-financing share pertaining to the beneficiaries. Taking into account the local co-financing share, the resources were around €2.4 billion. This figure needs to be significantly increased, both to renew the fleet in operation and to increase the number of trains.

THE INDUSTRIAL STRUCTURE OF RAILWAY ROLLING STOCK

The industrial structure for the production of railway rolling stock is global in scope and the major manufacturers participate in the award of orders in all areas. The

26 Basically locomotives and railcars.

27 *Contratto relativo ai servizi di trasporto ferroviario passeggeri di interesse nazionale sottoposti a regime di obbligo di servizio pubblico per il periodo 2017–2026* (Contract relating to rail passenger services of national interest subject to a public service obligation for the period 2017–2026).

main suppliers of rolling stock on the European market, based on the assessment carried out by the European Commission as part of the Alstom-Bombardier merger process, are Alstom, Bombardier, Siemens, Hitachi Rail, Stadler and CAF.

The situation on the Italian market (2010–19) subdivided into mainline (self-propelled) and regional trains, with their respective EMU (electric multiple unit) versions, is as follows:

	(Self-Propelled) Mainline Overall	Regional	EMUs	Regional EMUs
Alstom	30–40%	30–40%	40–50%	40–50%
Bombardier	0–5%	0–5%	0–5%	0–5%
Combined	30–40%	30–40%	40–50%	40–50%
Stadler	10–20%	10–20%	10–20%	10–20%
Hitachi	30–40%	30–40%	30–40%	30–40%
CAF	0–5%	0–5%	0–5%	0–5%
Newag	0–5%	0–5%	0–5%	0–5%
Pesa	0–5%	0–5%		
Firema	0–5%	0–5%	0–5%	0–5%
Others	0–5%	0–5%	0–5%	0–5%

Source: European Commission - DG Competition, Case m.9779 - Alstom / Bombardier Transportation Regulation (ec) no 139/2004, Merger procedure: 87.

As can be seen from the table, the largest share of the market is held by the new company resulting from the Alstom-Bombardier merger, followed by Hitachi: both these groups have plants in Italy. Of the other companies represented, only Firema is present in Italy, the others being companies whose production sites are located abroad. However, since Alstom-Bombardier also has a widespread presence in Europe (and beyond), the fact that it has plants in Italy is not a guarantee for the future since European legislation prohibits the imposition of an obligation in public procurement contracts to produce locally.

It is therefore useful to look at the geographical distribution of Alstom and Bombardier's plants for railway rolling stock. In Europe, Alstom has 16 plants (10 in France, two in Italy and one each in Spain, Germany, Belgium and Poland) employing more than 16,000 people, with a strong French focus. Bombardier, on the other hand, has 18 sites (six in Germany, two in Poland and one each in France, Switzerland, Austria, Italy, Spain, the UK, Belgium, Sweden, the Czechia and Hungary). Overall, therefore, the new Alstom-Bombardier company will be able to count on a certain

number of plants located in EU countries with low labour costs: three in Poland (capable of producing regional trains, traction systems and bogies/car body units; together they account for about 3,600 jobs); one in the Czechia (car body units, over 1,300 jobs); and one in Hungary (bogies, about 650 jobs). In addition to these, the new group will have one site in Russia and one in Kazakhstan, eight sites in China (over 8,000 jobs), five in India and two in South Africa. These are sites where Alstom-Bombardier could decide to locate its production, regardless of the European country from which it receives the orders.

In addition to geographical location, another key factor at play is the particular organisation of production that has defined Alstom and which in some respects constitutes a true international production chain. In Europe, Alstom has an extensive network of production plants, organised according to two criteria: a) on the one hand, each plant has been assigned a specific production mission (by product type or service); b) on the other, many of them can be considered as part of the same European production chain. From the point of view of b), the construction of a train (rolling stock) is in fact divided between several plants, some of which are located in different countries. For each project, Alstom defines the allocation of the different manufacturing phases between the different sites, assigning to each site one (or more than one) of the four main phases of the overall train construction process. In this strategy, Alstom is guided by labour cost considerations, in particular as regards the Polish site (as well as non-EU sites such as India), which is used to carry out the first phase (sub-assembly), after which the product is transferred to other sites to complete the construction of the train.

In addition, Alstom has been able, over time, to expand its worldwide presence and thus access new potential markets. However, this has also meant building new production capacity in these parts of the world. This new production capacity has made it possible to serve new markets, but at the same time it could have an impact on existing European sites. For example, a significant proportion of train components could be manufactured in Indian plants, and engineering activities could also take place there.

Alstom has announced a reorganisation of its global train production that envisages 60 percent of rolling stock being manufactured outside of Western Europe (in this sense, the Polish site is considered to be external), bearing in mind that in 2014/15 this volume was 33 percent. Engineering activities are the subject of a similar project: both Alstom and Bombardier operate engineering hubs in India

(Bangalore and Hyderabad), and Alstom's strategy is to increase the volume of engineering activities supplied from India to 30 percent by 2023.

Also, as a result of the Alstom-Bombardier merger, a reorganisation of both upstream and final assembly manufacturing sites is possible in the coming years. Bombardier pursued a similar strategy to Alstom by identifying dedicated sites for bodywork (including painting and some assembly), bogies and traction systems mainly in low-cost countries such as Poland, the Czechia and Hungary. The acquisition of Bombardier, characterised by this low-cost manufacturing footprint, fits into Alstom's planned operational strategy and could accelerate its implementation.

The conditions set by the European Commission to enable the Alstom-Bombardier merger include an initial restructuring of the rolling stock plants network. The remedies aimed at preserving competitive conditions in the market include the divestment of: a) the Zefiro V300 train platform assets, which are to be acquired by Hitachi (these assets include Bombardier's Italian plant in Vado Ligure); b) the Coradia Polyvalent mainline train platforms (Reichshoffen production plant in France); and c) Bombardier's Talent 3 platform (Hennigsdorf plant in Germany). The consequences of this restructuring could be the closure of plants.

However, the Alstom-Bombardier merger, in addition to the risks mentioned above with respect to possible relocation processes, risks having further repercussions on European plants. Obviously, these considerations were not all addressed by the European Commission, whose only concern was to ensure that competitive conditions would be preserved in all product segments despite the merger.

THE SITUATION OF PLANTS IN ITALY

In Italy, orders for rolling stock come from European public tenders, which are generally managed by Trenitalia. The biggest tender was launched in 2015, and concerned a total of 500 trains for regional transport, worth €4.5 billion. For the purchase of rolling stock, Trenitalia used the system of framework agreements with a term of six years, potentially renewable for a further three years. This European tender was divided into three lots: 150 medium-capacity regional trains (single deck); 300 high-capacity regional trains (double deck); and 50 diesel trains.

The 300 double-deck trains were awarded to Hitachi, while the single-deck trains were awarded to Alstom. The diesel trains were initially awarded to Switzerland's Stadler, but the award was later revoked in favour of Hitachi (and in the meantime

the diesel trains increased from 50 to 135). In 2017, Alstom also won the Ferrovie Nord (Trenord) tender for 176 regional trains (€1.6 billion).

Aside from these major tenders, other smaller tenders are launched for the supply of rolling stock, including for tram and metro services. The problems associated with this type of rolling stock supply tendering are at least twofold: 1) since they are generally European tenders, it is clear that any European company can participate, regardless of its geographical location; 2) even if a company located in Italy wins a tender, since these companies have an extensive international network of plants, they can decide to locate their production volumes anywhere.

There is a further problem, related to the production network of these companies, which can organise the production of a train as if it were an international production chain, breaking the process down into different stages and assigning each of them to a different factory, as described above. In Italy, the Savigliano plant produces regional and intercity trains. As noted earlier, Alstom's global presence means that orders acquired in Italy are not guaranteed to be manufactured in Italy. For example, when the order for 150 regional trains was acquired, because the

rail companies demanded the lowest possible price, it was necessary for Italian workers to go on strikes and demonstrations to prevent this order from being fulfilled in low-cost countries.

Alstom's Italian operations have 2,339 employees and are split between several sites according to their specialisation:

- Savigliano: trains (final assembly)
- Milan: traction systems and maintenance
- Bologna, Florence and Bari: signalling systems
- Lecco: infrastructure (electrified lines)
- Rome: infrastructure

These plants are currently saturated, except for the Lecco site. Consequently, if Alstom were to take on new production orders, it could:

- increase its workforce and production capacity;
- localise production in foreign plants;
- increase the workforce with internal staff and fixed-term contracts.

Obviously, these are three very different solutions: only the first would be a solution to be supported, both industrially and in terms of employment and social issues.

There is also the problem of re-internalising phases that have been outsourced. The Savigliano plant, for example, only carries out final assembly of sub-assembled product arriving from the Polish plant. Until the early 2000s, when the plant was still owned by Fiat Ferroviaria, the whole train was made in Savigliano, including the mechanical and body parts. Nowadays, only welding, painting and outfitting activities are done there, as well as the final composition of the train.

Similarly, a key part of the train, the bogie, is no longer made at Alstom's Le Crusot plant in France. Savigliano could return to bogie production from the point of view of available space, but not from the point of view of technology, because the mechanical workshop has been dismantled, so investments would have to be made.

The Savigliano plant has the space to increase the number of trains produced. Suffice to say that years ago, when production was at its peak, there were 800 workers in the departments, 500 of whom were temporary workers. The proportion of artisan work is very high, and the majority of the equipment consists of manual tools that can easily be increased in number and availability if necessary.

Hitachi, the second-largest manufacturer in Italy (total workforce: 4,158), acquired the plants of the former Ansaldo Breda from the Finmeccanica group (which decided to sell off this business for similar reasons to its bus sell-off). Hitachi is different from Bombardier in that it has far fewer plants in Europe: apart from its Italian plants, it is present only in the UK. While Alstom is producing 150 regional trains for Trenitalia, Hitachi is producing the remainder of the order (double-decker trains). In the case of Hitachi, too, the factories basically do the final assembly, receiving all the necessary material from outside, including many externally assembled groups. The outsourcing is due to capacity issues: there is not enough space or employment within the Hitachi facilities to produce everything in-house; more staff and another 300 to 400 metres of hall would be needed.

At Hitachi, there is a strong tendency to outsource engineering work. For example, one of its objectives is to decentralise more engineering work to India, which is considered a country of low-cost talent. Hitachi has greatly increased its production capacity in Italy in recent years: while three years ago it was producing 15–20 coaches per month, it is now producing 35–36, with the aim of reaching 40. This increase in production capacity is due to its winning a large order for regional trains that needs to be satisfied.

Both the Pistoia and Reggio Calabria plants have made investments, but in order to increase volumes, work is needed to expand the factory space. At present, the Hitachi plants are very close to their maximum saturation point, and the volume could be increased by 20 percent at most, otherwise radical measures would be needed, which the company is considering because it wants to expand.

From the point of view of employment, there is a problem because expansion has taken place using third-party companies that work under contract at the Hitachi factory. At the production plant in Pistoia, there are at least 500–600 external staff (hired out by contractor companies) compared with 450 direct Hitachi employees. The FIOM trade union has put pressure on Hitachi and organised strike action to address this problem of precarious labour, although this conflict was temporarily suspended during the COVID19 crisis.

From the point of view of fixed capital, the picture is similar to that at Alstom: the only partially automated part is carpentry and welding, where automatic and semi-automatic machines (linear welders) are used; there are also lifting systems and gantry mills for 20-metre pieces. Outfitting, on the other hand, is entirely manual, and in this case the main innovations are organisational.

INTERVIEWS

The interviews were carried out between December 2020 and February 2021. Unfortunately, due to the COVID-19 pandemic, almost all were conducted online. The basic set of questions was emailed to interviewees in advance so that they could elaborate on the necessary data and information. The minimum duration of the interviews was one hour each, with some interviews taking up to two hours or more. Almost all the interviews were subsequently transcribed in order to preserve these valuable materials, which provided very important information and insights for this research. The interviewees included shop stewards from the automotive, rail and bus production sectors, automotive company managers, trade unionists and representatives of civil society (NGOs).

EXISTING BARRIERS FOR CONVERSION TO PUBLIC TRANSPORT VEHICLES AND RAIL VEHICLES

The civil society organisation Attac Italia, which has been following the processes of privatisation and liberalisation of public services for several years, has pointed out that the impact of private interests has, for example, influenced transport plans, which, instead of being geared to offering homogeneous coverage, have favoured routes with the highest frequency (and therefore capable of generating greater profits), leaving entire areas of Italy uncovered. Not only that, but private interests often have an impact on strategic choices in terms of infrastructure. When it comes to defining the models to be used to create transport links, private interest shifts the focus to the return on investment, which becomes a priority over other considerations such as harmonisation with urban planning choices or meeting the needs of people living in disadvantaged or isolated areas.

Attac Italy points out that due to austerity policies, local authorities have often been forced to open up the public service sector to private companies. Indeed, private participation is often the only way for authorities to raise the resources needed to ensure the construction of new infrastructure and the provision of services. There are several factors that force local authorities to move in this direction: the first is the Domestic Stability Pact, which by reducing the debt capacity of local authorities obliges them to resort to public-private partnerships, if only to guarantee the continuity of local public transport (LPT) provision. The second is a regulatory framework that forces local authorities themselves to interpret the management of public transport according to the principle of liberalisation. The Milan branch of the environmental and climate activist organisation Fridays For Future (FFF),

among others, is calling for public transport to be publicly owned, while Legambiente has stressed the need for the government to make clear choices, especially as it prepares the Italian Recovery Plan.

NECESSARY POLITICAL INCENTIVES AND INITIATIVES

FFF argues that LPT should be made free of charge, as a drastic change in mobility patterns is needed and public transport has to become socially accessible for all, especially for the weaker sections of the population. This proposal is also supported by Attac Italy. FFF associates the political objective of the right to mobility with the public character of this service. It also advocates increasing the frequency of public transport and the number of lines, and expanding all forms of shared mobility (car sharing with electric vehicles, bike sharing and car-pooling).

The objective of strengthening public transport and shared mobility requires a different design of cities and public spaces, as well as specific decisions taken by local authorities. FFF, in its national paper, intertwines the environmental objectives with an emphasis on the need to establish social objectives, i.e. the re-absorption of work through transition and the creation of new jobs. FFF argues that it is the task of the state to guarantee full employment, and for this reason the Ministry of Economic Development must guide polluting companies towards conversion.

The environmental association Legambiente also argues that zero-emission mobility and zero fatal accidents should be pursued in urban areas, highlighting the fundamental role of municipalities in planning and implementing policies and projects for multi-modal, shared or public transport services for people and goods, using only new local zero-emission (electric) vehicles, with a gradual ban on the most polluting vehicles (over 10 years old). Legambiente has submitted a very comprehensive document to the government with its observations on the national Recovery Plan, asking that within five years, with an investment of €20 billion, cities be redesigned with car-free districts and the objective of creating a 15minute city (where everything you need is just a few minutes' walk from where you live). As part of this transformation, Legambiente calls for the creation of 5,000 km of urban cycle paths and the promotion of shared electric mobility (bicycles, cars, vans and cargo bikes). Its demands also include increasing the number of urban public transport vehicles, with 15,000 new electric buses for LPT; building new tram and underground networks; as well as electrifying the public administration vehicle fleet and converting part of the public car fleet into shared fleets.

In order to overcome the ICE car model, Legambiente advocates developing the industrial supply chain for batteries, banning sales of new internal combustion vehicles by 2030 (2035 for trucks and intercity buses) and taking all combustion vehicles off the roads by 2045. Moreover, it supports the introduction of binding decarbonisation targets of at least 50 percent by 2030 in the Sustainable Mobility Urban Plans and limiting the use of polluting cars over 10 years old. Finally, on rail transport, Legambiente proposes building 500 new trains and adapting the regional network by completing the electrification of lines.

Many of these objectives are also found in the proposals of the Italian Federation of Transport Workers (FILT), an affiliate of the Italian General Confederation of Labour (CGIL). On urban transport, FILT supports the need for urban transport policies that aim to create a widespread network of public transport services closely integrated with other services (e.g. car and bike sharing). This requires a strong governmental role by public authorities, who are able to plan public transport services, infrastructure, spaces and timetables in urban areas and to also involve forms of freight transport (the so-called last mile) that have developed following the explosion of e-commerce. This public planning capacity must focus on the integration of different forms of transport, including shared mobility, which also requires regulation of the IT platforms necessary for its use. Shared mobility, therefore, could complement and reinforce scheduled public transport services, which are important for guaranteeing large passenger volumes, but are inflexible in terms of routes and – to some extent – timetables. This integration between different modes of transport must become widespread in order to guarantee everyone the right to mobility, otherwise a simple limitation of car use would be unpopular and limit people's rights. FILT supports the need to renew the public bus fleet with new forms of propulsion, while on rail transport there is a need to make trains faster and stations more accessible, also using public bus services.

POSSIBLE ALLIES IN THIS FIGHT

FFF in Milan worked together with other associations and movements (XR Milano, Cittadini per l'Aria, Coordinamento San Siro, Genitori Antismog, Comitato Rodotà, ISDE) on Milan City Council's Air and Climate Plan (PAC), highlighting the main critical aspects. On the issue of mobility, FFF Milan and the other associations criticised the lack of clear decisions and the length of time it took to implement some measures. In their view, there is a lack of clear decision-making on regulating access to urban areas, on reducing private traffic and increasing public transport, and on measures to encourage the replacement of ICE with electric motors.

In addition to these types of alliances, all the NGOs interviewed agreed that there needed to be close cooperation links with trade unions in order to keep environmental and social issues together. In fact, there are many public debates involving trade unions and environmental associations.

CONCLUSION

The production of trains and buses in Italy, from the point of view of final assembly and considering the companies mentioned in this report, employs between 6,000 and 7,000 people. This is a number that can and must be expanded to create new jobs and to improve the supply of new public transport vehicles, so as to improve the service in terms of both quantity and quality.

However, even a very significant expansion of these employment levels will not be able to completely offset the jobs currently provided by car manufacturing: moreover, the private car cannot be eliminated altogether, even assuming the integration of different transport modes. Car production should recover some of the volumes lost due to relocations and FCA's misguided strategies; it should explore new sectors, such as the manufacture of small shared cars for use in urban areas, and invest in the production of clean vehicles, such as hybrid models.

Strengthening local public transport can undoubtedly help to achieve both environmental and social (employment) objectives. To meet these objectives, however, it seems necessary first of all to restore a strong public role, understood both as a capacity to plan services and as public ownership of the companies that provide the public transport service. Moreover, as the economic data show, much greater investment is needed both to renew the current public transport fleets and to expand their size in order to improve the quality and quantity of the service. The current proposal for a National Recovery and Resilience Plan does not seem to allocate sufficient public resources to these objectives and does not adequately address the issue of how to develop an industrial supply chain in Italy capable of producing these goods.

The EU's current regulatory framework on public procurement, which is characterised by a neoliberal approach, exposes European industry to the risk of relocations, dismantling and the transfer of production volumes decided by multinationals without any social obligations. In order to consolidate and develop the industry in individual countries, it would appear necessary to change European rules to link investment in public transport with the possibility of producing locally the goods needed to develop public transport services.

Support for public transport also means building appropriate infrastructure, which requires adequate public planning and economic resources. Infrastructure construction could boost the steel, signalling and plant engineering sectors. The interviews conducted with associations/movements and trade unions reveal the possibility of identifying common objectives in the public role of planning and intervention, in the renewal and expansion of public transport and in infrastructures for ecological mobility. The issues of the environment and work do not appear to be in opposition to each other; on the contrary, the environmental transformation of mobility seems to be an area in which new jobs can be created, obviously without leaving this transformation to market forces alone, but rather including a strong role for the public sector.

LIST OF INTERVIEWS CONDUCTED

AUTOMOTIVE SECTOR

Shop stewards at supplier company, 15 January 2021

Fiom-Cgil in Monza-Brianza, 8 and 19 January 2021

Fiom-Cgil in Vicenza, 23 December 2020

RAIL/TRAIN SECTOR

Fiom-Cgil in the rail sector, 14 January 2021

Fiom-Cgil at Alstom Group Italia, 15 February 2021

Fiom-Cgil in Cuneo, 21 January 2021

Fiom-Cgil in Savona, 18 January 2021

Shop stewards at Bombardier Italia, 18 January 2021

Shop stewards at Alstom Italia (trains and traction), 9 February 2021

Shop stewards at Hitachi Rail (trains), 17 February 2021

Shop stewards at Hitachi Rail (bogies), 15 February 2021

Shop stewards at Firema (construction and repair of rolling stock), 11 February 2021

Supplier company (components for trains), 12 February 2021

BUS SECTOR

Fiom-Cgil in the local public transport (LPT) sector, 10 January 2021

Shop stewards at Industria Italiana Autobus, Flumeri plant, 10 February 2021

Fiom-Cgil in Avellino, 10 February 2021

Shop stewards at Industria Italiana Autobus, Bologna plant, 18 February 2021

Fiom-Cgil in Bologna, 18 February 2021

Industria Italiana Autobus, 19 February 2021

LOCAL PUBLIC TRANSPORT

Filt-Cgil in Lombardy, 19 February 2021

Filt-Cgil in Milan, 19 February 2021

NGOS

Attac Italia, 8 January 2021

Fridays for Future – Milan branch, 22 January 2021

Legambiente – Milan branch, 23 February 2021

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SPAIN

THE PRO-ENVIRONMENTAL TRANSITION OF THE AUTOMOTIVE INDUSTRY IN SPAIN

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TABLE OF CONTENTS

INTRODUCTION

The automotive industry is involved in a process of fundamental change due to the compulsory decarbonisation of transport, the growing computerisation of vehicles, and sociocultural changes and changes in society's consumption habits. This has taken the form of the emergence of the electric vehicle, replacing the internal-combustion vehicle, as well as connected vehicles, autonomous driving and new types of vehicle use, such as car sharing. All this has led to a new paradigm that is causing considerable uncertainty as to the future of the automotive industry. But it also opens up new opportunities in this sector, which is wrapped up in a cycle of constant renewal and innovation and is key to the Spanish production system.

This transformation of the automotive industry will affect employment, resulting in a downturn in the traditional industry, as electric vehicles and automation of the production process will require less labour. However, it will also provide an opportunity to create new jobs in emerging domains, relating to e.g. electrification, electric recharging infrastructure, information and communication technologies, and electronics, as well as a chance to provide new mobility services, which look set for ongoing expansion.

Spain may be one of the manufacturing countries that lose out in this game of chess that is taking shape, where the pieces are in constant motion. But it might yet also gain fresh impetus in the long-distance race – with all the obstacles it entails – which is already under way, and manage to hold onto its leading role in this struggle. Spain's history as an automotive industry hub and its solid manufacturing base give it a good chance of remaining one of the main global centres of production.

In 2019, Spain's automotive industry accounted for 8.6 percent of total Spanish manufacturing and 9.1 percent of employment. The country's position within the European Union is noteworthy, generating 5 percent of the EU's value added and 6 percent of its employment and boosting its production volume ratios. There has been a positive trend since 2012, with increases in the industrial production index (IPI) exceeding the EU average (for the EU28), but growth is likely in the countries of Eastern Europe, with the Czechia mirroring Spain's contribution to value added (5 percent) in 2019. The recession in Spain following the 2008 financial crisis slowed the country's growth with an accumulated differential, lower than the EU as a whole or Germany, which in recent years has decelerated and, in 2019, even fell behind the 2015 figures. However, it is the EU benchmark for

the industry, with 43 percent of value added. It is an industry with a considerable external market.

While the structure of the industry is less profitable than the European gold-standard industrial powers, with smaller companies and less value added per employee, Spain, from a business perspective, has the advantage of a lower mean salary cost, meaning that the operating ratio is not that far off that of Germany and even higher than that of France.

One of the main weaknesses is the high ratio of production costs (excluding salaries) to earnings. As a result, the value-added rate is lower than the national manufacturing mean, derived exclusively from the manufacture of motor vehicles. To improve the industry's competitiveness, actions must be taken on production costs associated with logistics, transport and energy, which will make it possible to generate more value added, to be more productive and to have a positive impact on employment in terms of quantity and quality, which will, in turn, potentially raise the level of the state's income, not only through companies (corporate tax) but also through indirect taxes from higher salaries (personal income tax), which will favour higher disposable income and, therefore, higher consumer spending (VAT).

The data on basic mobility infrastructure in Spain (latest data available from 2018) can be added to these considerations. Spain's road network comprises 165,624 km, of which 17,228 km are high-capacity roadways. The national rail network, run by state-owned company ADIF, consists of 15,290 km, of which almost 11,500 km belong to the conventional rail network and just over 2,300 to the high-speed rail network. Of these 15,290 km, 9,673 km are electrified. These are real strengths promoting mobility in Spain, which has the third largest network of high-capacity motorways in the world and is second in the world, after China, for high-speed rail. One weakness is the fact that 90 percent of goods in Spain are moved by road, on trucks, which provides plenty of scope for improving the rail network and intermodality.

THE AUTOMOTIVE INDUSTRY IN SPAIN

MANUFACTURING

In 2019, Spain, with 2,826,632 vehicles produced (3 percent of the global total), was the ninth country worldwide for vehicle manufacturing and second in Europe, behind Germany. Of these vehicles, 78 percent were private cars and SUVs, while

the remainder were commercial and industrial vehicles. The number of vehicles produced has remained virtually the same over the past five years. In 2019, manufacturing remained at 2018 levels, with a small drop of 1 percent compared with 2017, a decrease of 2 percent vis-à-vis 2016 and a small increase of 3 percent in relation to 2015, when 90,000 fewer vehicles were manufactured than in 2019.

VEHICLES MANUFACTURED IN SPAIN

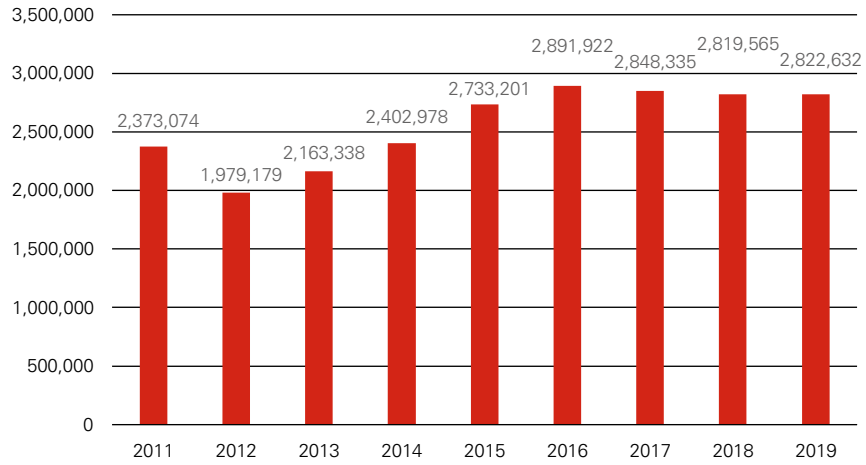


Figure 1. Author's own calculation. Source: ANFAC

In all, 82 percent of vehicles produced in Spain were exported in 2019. Of these exports, 93 percent were to European markets. Germany, France, the United Kingdom and Italy accounted for almost 70 percent of sales to Europe. Vehicle exports accounted for 12 percent of all Spanish exports in 2019. Specifically, Spanish production is closely linked to the behaviour of the European automotive market, where the demand for electric vehicles is rising, and Spanish manufacturers must meet their expectations. Beyond merely supplying Spain's domestic market, this means that Spanish manufacturers must produce electric vehicles to avoid losing market share in these countries. In parallel with the decarbonisation of the Spanish automotive fleet, Spain's manufacturers must work on meeting external demand, which is what they have been doing with most of the vehicles they produce.

ANNUAL VEHICLE EXPORTS

Year	Vehicles	% of Vehicles Exported	% of Total Spanish Exports (Value)
2012	1,729,172	87.4	15.3
2013	1,879,974	86.9	16.9
2014	2,039,893	84.9	17.6
2015	2,273,732	83.0	18.3
2016	2,432,401	84.0	19.4
2017	2,318,217	81.4	17.9
2018	2,304,418	81.7	16.9
2019	2,310,070	81.8	16.5

Includes the manufacture of vehicles and components
Author's own calculation. Source: ANFAC

VEHICLE EXPORTS BY COUNTRY, 2019

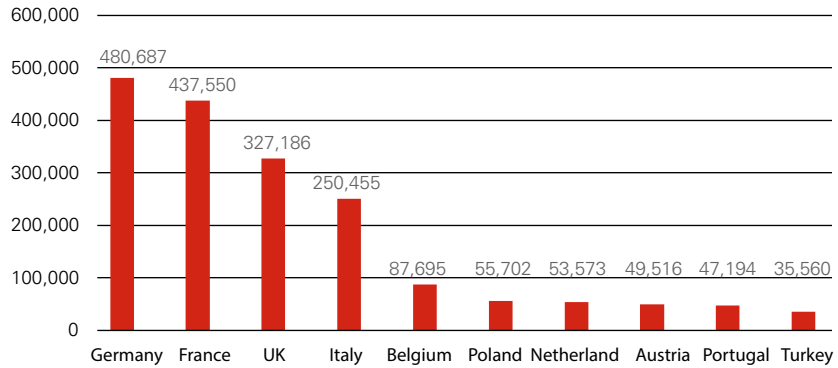


Figure 2. Author's own calculation. Source: ANFAC

It is interesting to note that the monetary value of exports has outstripped that of imports over the past decade, when the total amount of products manufactured in Spain are taken into account. As regards specific products, this was true in 2019 for family cars, SUVs, commercial and industrial vehicles, and coaches, which made up the lion's share of production. The opposite was true for parts and accessories, in particular engines and gearboxes, where imports were almost twice the value of exports (namely 86 percent higher). That is, Spain runs a deficit for

these two components, which represent just 6 percent of total exports, meaning that moving from internal-combustion vehicles to electric vehicles will not have a major impact on domestic manufacturing of engines and gearboxes in comparison with vehicles.

As for alternative vehicles in Spain, in 2019 a total of 272 plug-in hybrid electric vehicles (PHEVs) and 16,885 battery-powered electric vehicles (BEVs) were manufactured, i.e. 0.6 percent of all vehicles manufactured. This reality, however, had changed radically by 2020, when the production of plug-in hybrid vehicles came to around 84,000 units, while that of electric vehicles reached 56,000. Although this involved significant percentage jumps in terms of total production in Spain, taking them up to 3.7 and 2.4 percent, respectively, the production levels are still far too low.

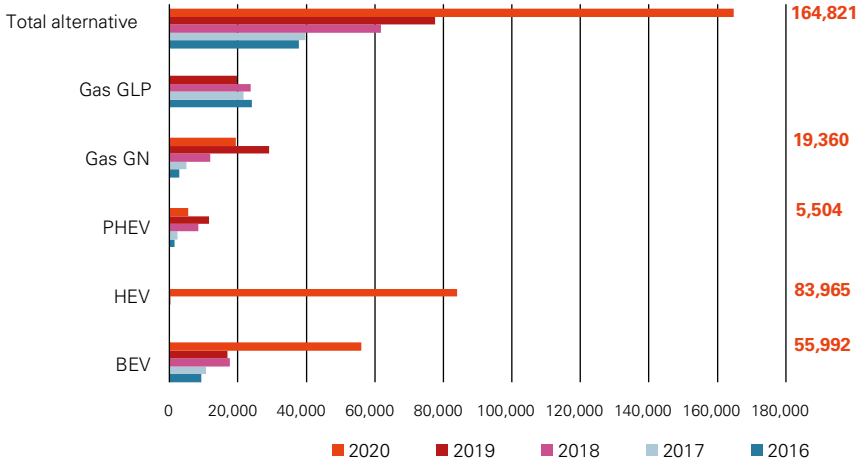
VEHICLE MANUFACTURE BY ENERGY TYPE

Year	BEVs	%	PHEVs	%	HEVs	%	NGVs	%	LPGs	%	Total alternat.	%
2016	9,383	0.32			1,475	0.05	2,858	0.10	24,127	0.83	37,843	1.31
2017	10,781	0.38			2,413	0.08	4,983	0.17	21,614	0.76	39,792	1.40
2018	17,632	0.63			8,466	0.30	11,913	0.42	23,756	0.84	61,768	2.19
2019	16,885	0.60	272	0.01	11,557	0.41	29,115	1.03	19,772	0.70	77,603	2.75
2020	55,992	2.47	83,965	3.70	5,504	0.24	19,360	0.85		0.00	164,821	7.27

Table 2. Author's own calculation. Source: ANFAC

BEV = battery-powered electric vehicle;
PHEV = plug-in hybrid electric vehicle;
HEV = hybrid electric vehicle;
NGV = natural gas vehicle;
LPG = liquefied petroleum gas-powered vehicle

VEHICLE MANUFACTURE BY ENERGY TYPE



Gas GLP = LPG (liquefied petroleum gas);

Gas GN = NGV (natural gas vehicle)

Figure 3. Author's own calculation. Source: ANFAC

Looking to the future, a forecast by Transport & Environment predicts that a total of 203,136 plug-in electric vehicles and 307,469 battery-powered electric vehicles will be manufactured in 2025, yielding a total of 510,605 vehicles. That is, these vehicles will reach 17 percent of all vehicles manufactured in Spain if Transport & Environment is correct (Transport & Environment 2019). In the same document, Transport & Environment forecasts an increase of 5 percent in the total number of vehicles manufactured in Spain compared with 2019. If this proves accurate, it will represent considerable growth in this type of alternative vehicle and a similar reduction in internal-combustion vehicles, and so might be characterised as bringing about a genuine transformation of the Spanish automotive industry. However, this would just be the start of the comprehensive change that is set to occur with the complete replacement of combustion vehicles with electric or hydrogen fuel-cell vehicles.

In 2019, 43 car models were manufactured in Spain, of which nine were electric: two Fords, two Mercedes, one Nissan, one Opel, one Citroën and two Peugeots. Six compressed natural gas (CNG) and liquefied petroleum gas (LPG) vehicles also came from Spanish factories: three SEAT family cars and three IVECO industrial vehicles (ANFAC 2020). Electric vehicles included battery-pow-

ered electric, plug-in hybrid and non-plug-in hybrid vehicles. Five years earlier, in 2014, of the 42 models manufactured in Spain, six were electric vehicles (ANFAC 2016). There clearly needs to be an upsurge in the country's manufacturing of electric vehicles.

It is striking that neither of the two factories in Spain manufacturing vehicles for Renault (the third largest manufacturing group in the country) produced a single vehicle powered by alternative energy sources. Similarly, not only did SEAT, the main Spanish manufacturer, produce no electric vehicles but its alternative vehicles were gas-powered. This appears to be more of a transitional technology towards emobility than a genuine commitment to the future.

However, this changed in 2020, which, on the one hand, demonstrates the delay in incorporating this technology and, on the other, shows how changes are taking place very quickly, given that the Renault range now includes two plug-in hybrid electric vehicles manufactured in Spain. SEAT, too, has a plug-in hybrid. However, the only battery-powered electric vehicle produced by the Volkswagen Group, of which SEAT currently forms part, is manufactured in Slovakia. All the same, a plug-in hybrid version of the new SEAT Cupra model is also being manufactured. However, the Volkswagen factory in Navarre manufactured no electric vehicles in 2020.

Spain's production of electric vehicles, though, is no guarantee of continuity, as it will depend on their weight relative to all production, and if the opposite happens and no electric vehicles are manufactured, then it will be more likely that there will be no continuity. In other words, manufacturing electric vehicles is necessary but not sufficient to ensure the future of the Spanish automotive industry. Unfortunately, the case of Nissan in Barcelona provides proof of this.

It is important to note that Spain has 17 manufacturing plants in, nine autonomous regions. But their influence is wider than this, with a greater regional distribution of the equipment and component industries. This tells us that this activity has an impact, in economic and social terms and, of course, on employment, in many regions and that its presence is essential to the development and wellbeing of those regions. Strategically speaking, its continuity is a priority goal for generating employment and wealth.

REGISTRATION

A total of 1,501,239 vehicles were registered in Spain in 2019. Of these, 23 percent were manufactured domestically and the rest were imported (ANFAC 2020). In 2020, at the height of the impact of the COVID19 pandemic, there were 1,030,744 vehicle registrations, 31 percent less than the previous year.

A total of 201,605 alternative vehicles (electric, hybrid, plug-in hybrid, and gas) were registered in 2020, representing 19.5 percent of all registrations that year. The corresponding level in 2019 was 10.8 percent. There was a dramatic rise (25 percent) in the number of registrations between 2019 and 2020 (Instituto de Estudios de Automoción (Ideauto) n.d.). That is, one in five vehicles registered in 2020 was powered by an alternative source of energy. According to the Spanish Association of Automobile and Truck Manufacturers (ANFAC), in 2020 there was an increase of 64 percent in registrations of battery-powered electric vehicles, coming to 20,156 units.

As regards the type of vehicle, the market share of battery-powered electric vehicles and plug-in hybrid electric vehicles was 4.2 percent. Of note is the strong growth in plug-in hybrids throughout the year. With 23,360 units, registration tripled compared with the previous year.

Non-plug-in hybrids, with 140,869 units registered during the year, grew by 28.3 percent more, accounting for a sales share of 13.6 percent. These are the best-selling alternative vehicles, which we could regard as an intermediate step in the process of moving towards emobility.

In 2020, a total of 17,220 gas-powered vehicles were registered – a considerable drop (of 47.7 percent) compared with the previous year.

The growth in the total number of alternative vehicles registered in 2020 is even more promising if we consider that the overall number of registrations fell by 31 percent. This drop has mainly affected internal-combustion vehicles, with a sharper drop in registrations of 38 percent.

VEHICLE REGISTRATIONS BY ENERGY SOURCE

Year	Conventional*	%	Hybrid**	%	Gas***	%	Electric****	%	Total Alternative	%
2014	971,701	98.4	12,114	1.2	1,620	0.2	1,846	0.2	15,580	1.6
2015	1,189,323	98.0	18,432	1.5	3,411	0.3	3,046	0.3	24,889	2.0
2016	1,301,156	96.6	39,046	2.9	2,609	0.2	4,533	0.3	46,188	3.4
2017	1,391,157	95.1	55,768	3.8	6,864	0.5	8,446	0.6	71,078	4.8
2018	1,449,312	92.7	76,113	4.9	24,585	1.6	13,440	0.9	114,138	7.3
2019	1,339,690	89.2	109,662	7.3	32,367	2.2	19,520	1.3	161,549	10.8
2020	831,225	80.5	140,869	13.6	17,220	1.7	43,516	4.2	201,605	19.5

* Petrol and diesel
** Hybrid petrol and diesel
*** LPG, CNG and NG
**** Electric and plug-in hybrid.

Table 3. Author's own calculation. Source: ANFAC

VEHICLE REGISTRATIONS BY ENERGY SOURCE

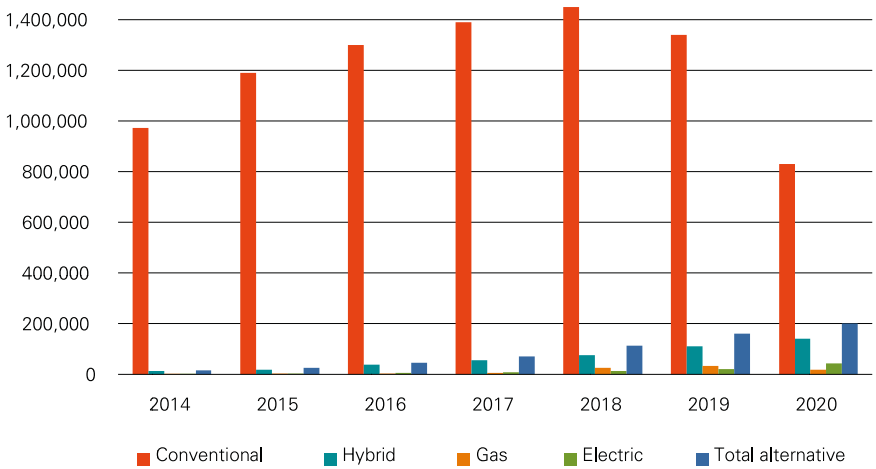


Figure 4. Author's own calculation. Source: ANFAC

The following two graphs show how, in a period of five years, registrations of vehicles with alternative energy sources went from being residual with close to 100 percent being internal-combustion vehicles to the current situation, in which the shares are 20 percent and 80 percent, respectively.

VEHICLE REGISTRATIONS BY ENERGY SOURCE, 2015

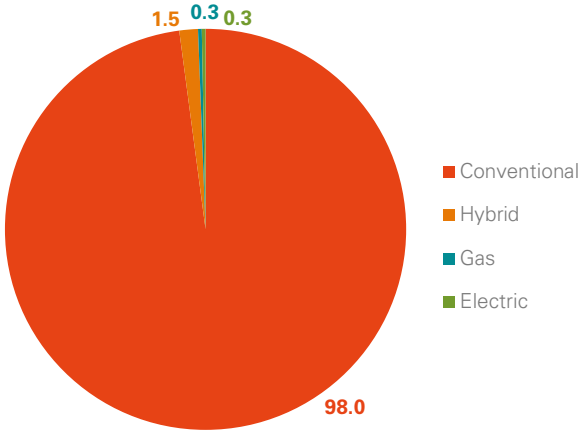


Figure 5. Author's own calculation. Source: ANFAC

VEHICLE REGISTRATIONS BY ENERGY SOURCE, 2020

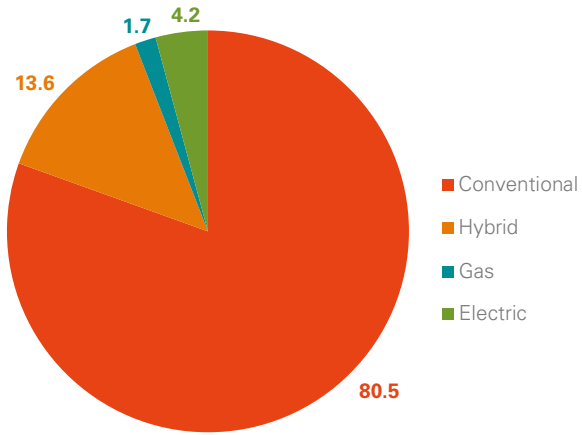


Figure 6. Author's own calculation. Source: ANFAC

If we look only at family cars and SUVs, the proportion of alternative vehicles registered in 2020 is greater than their proportion among all vehicles, given that, with 22.5 percent, they represented a bit more than one in five registrations. This is highly significant, taking into account that in the two previous years, the proportion was approximately one in 10 and in just three years, between 2018 and 2020, the number of registrations of family cars and SUVs with alternative energy sources almost doubled. Even more noteworthy is the case of battery-powered electric and plug-in hybrid electric vehicles, which have almost quadrupled. Registrations of gas-powered family cars and SUVs, however, fell by half between 2019 and 2020.

REGISTRATIONS OF FAMILY CARS AND SUVS BY ENERGY SOURCE

Year	Conventional*	%	Hybrid**	%	Gas***	%	Electric****	%	Total Alternat.	%
2014	840,522	98.3	12,083	1.4	1,298	0.2	1,405	0.2	14,788	1.7
2015	1,011,060	97.8	18,406	1.8	2,518	0.2	2,248	0.2	23,174	2.2
2016	1,110,788	96.8	30,897	2.7	1,670	0.1	3,654	0.3	36,224	3.2
2017	1,167,014	94.5	55,552	4.5	4,918	0.4	7,448	0.6	67,923	5.5
2018	1,213,008	91.8	75,773	5.7	20,842	1.6	11,813	0.9	108,435	8.2
2019	1,106,913	88.0	108,683	8.6	25,191	2.0	17,473	1.4	151,358	12.0
2020	659,469	77.5	137,425	16.1	13,084	1.5	41,226	4.8	191,753	22.5

* Petrol and diesel ** Hybrid petrol and diesel *** LPG, CNG and LNG
**** Electric and plug-in hybrid. Table 4. Author's own calculation. Source: ANFAC

REGISTRATIONS OF FAMILY CARS AND SUVS BY ENERGY SOURCE

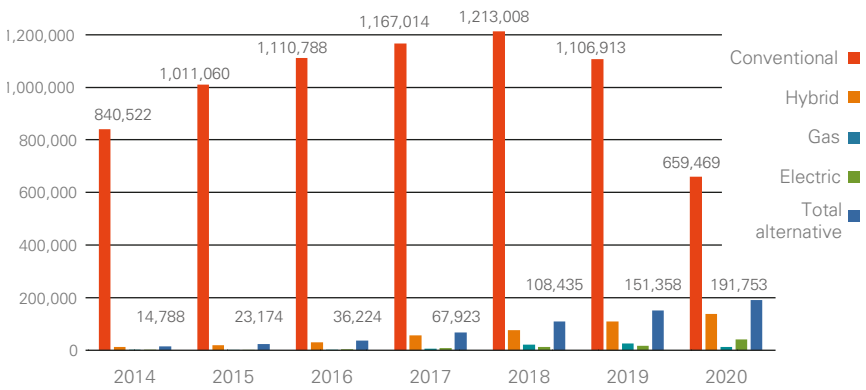


Figure 7. Author's own calculation. Source: ANFAC

It is clear that in the course of just one year there has been a major quantitative leap. This is promising in terms of completing the electrification of the country's vehicle fleet. However, there is also still a long way to go, and these registration growth figures need to be repeated year in, year out and consolidated as much as possible so that, certainly in a decade, the data surrounding the decarbonisation of the automotive fleet become more favourable. Moreover, battery-powered electric vehicles should play a more prominent role, sidelining all other types of alternative vehicles. Evidently, this will need to be accompanied by increased production of these vehicles in our factories.

If we look at the battery-powered electric models of family cars registered in Spain in 2020, the top five models, representing 42 percent of the total, were not manufactured domestically, as also incidentally in 2019. Of the top five best-selling plug-in hybrid vehicles, two were manufactured in Spain (a Peugeot and a Renault), together accounting for a market share of 11 percent. This represents progress in terms of the market penetration of vehicles produced domestically. In the previous year, the top five registered plug-in hybrid vehicles were all imported. As regards non-plug-in hybrids, the top five models of family cars registered were imported and accounted for 39 percent of all vehicles of this type registered in Spain.

Moreover, it should be remembered that in 2019, only 23.4 percent of vehicles registered in Spain came from Spanish factories. However, due to the large volume of exports, the trade balance of vehicles ended up in Spain's favour. Specifically, the monetary value of exports was 64 percent more than that of imports.

Also worth noting is that of all family cars and SUVs, almost half (47 percent) were acquired by private individuals. Those registered by companies accounted for 34 percent, or one in three vehicles registered; and 19 percent were registered by car rental companies, equivalent to one in 10 vehicles registered (Ideauto n.d.). This shows how much potential there is for companies to play a role in the expansion of alternative vehicles. This could, for example, form part of their corporate social and environmental responsibility policies and contribute their drive to enhance their image as sustainable businesses.

AUTOMOTIVE FLEET

Spain's total automotive fleet in 2019 was 29,463,309 vehicles (excluding motorcycles); of these, 53,847 were electric and 353,935 were hybrid. The sum total of these two types (i.e. 407,782) represented 1.4 percent of the country's automotive

fleet. There were 46,501 battery-powered electric and plug-in hybrid family cars alone (European Alternative Fuels Observatory n.d.; Observatorio del Vehículo Eléctrico y Movilidad Sostenible n.d.), accounting for 0.2 percent of Spain's total fleet of family cars in 2019.

SPANISH FLEET OF FAMILY CARS BY ENERGY SOURCE

	Total	Gas	%	Hybrid	%	Electric	%	Total Alternative	%
2015	22,355,549	5,119	0.02	84,164	0.38	5,044	0.02	94,327	0.42
2016	22,876,830	6,761	0.03	114,652	0.51	8,509	0.04	129,923	0.58
2017	23,500,401	11,615	0.05	169,599	0.76	15,983	0.07	197,198	0.88
2018	24,074,151	30,023	0.13	244,648	1.09	28,135	0.13	302,807	1.35
2019	24,558,126	53,725	0.24	352,031	1.57	46,301	0.21	452,059	2.02

Table 5. Author's own calculation. Source: ANFAC

SPANISH FLEET OF FAMILY CARS BY ALTERNATIVE ENERGY SOURCE

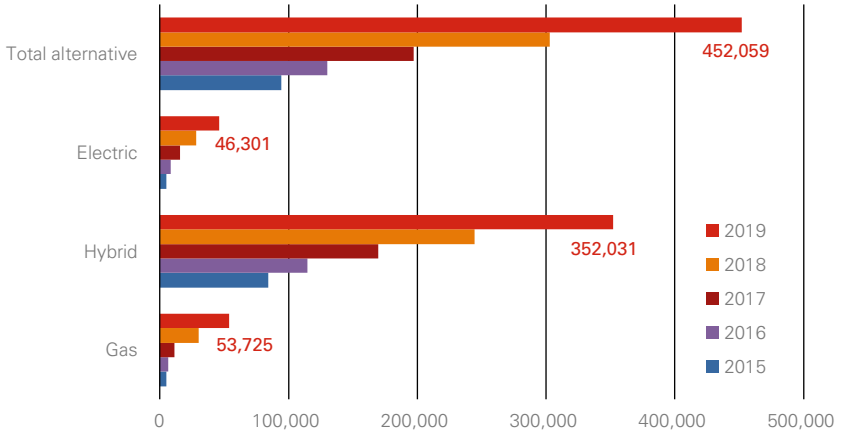


Figure 8. Author's own calculation. Source: ANFAC

ANFAC (2020) conducted a study of e-mobility in Spain with 2019 as the reference year. The study compared the situation in Spain with that of the EU15 countries. Among these nations, Spain came last in terms of the penetration of emobility within its fleet of vehicles in 2019. An analysis of the penetration of electric vehicles and recharging infrastructure shows that Spain (which only had 7,607 public

recharging points in the first quarter of 2020) scored 16.4 points out of 100 – well below the European average of 27.9 points (ANFAC 2020).

In summary, looking at the three parameters we used for 2019 (the total number of electric vehicles manufactured, registrations and presence in the automotive fleet), we see that Spain finds itself in a weak position, especially in comparison with other European countries. However, the situation could also be viewed from another perspective, which recognises that Spain has major growth potential as regards those three parameters as it strives to get into a position similar to that of its closest European neighbours.

Put in general terms, this should be accompanied by a conversion plan by automotive manufacturers and a significant increase in the number of recharging points. All of this should go hand in hand with a package of business support and tax incentives that will encourage consumers to buy electric vehicles, while also paying attention to redistributive variables. Just as importantly, prices must become more affordable, as, for example, currently the market price of the electric version of a vehicle manufactured in Spain can be as much as double that of the petrol version.

AUTOMOTIVE EQUIPMENT AND COMPONENTS

A more thorough examination of the automotive industry in Spain must include manufacturers of equipment and components that, along with vehicle manufacturers, form an intrinsic part of this group of activities. In other words, we cannot understand the Spanish automotive industry without taking into account these manufacturers, as they form part of the overall picture. Viewed like this, all the transformations taking place in the automotive industry affect both links in the chain equally. Moreover, it is clear that the strategies to manage these transformations require a shared roadmap. However, there are some structural characteristics that differentiate them and make it possible to examine the changes from different starting points and perspectives.

The Spanish industrial fabric that produces components for automotive manufacturers was created and grew around those manufacturers. It would not have been possible to develop a components industry without the substantial lure of the demand generated by automotive manufacturers. However, it is many years now since the components industry could be regarded as depending on manufacturers in Spain, because a growing majority of domestic component manufacturing is destined for export and, to a lesser extent, for the domestic spare-parts market (CCOO 2016).

The automotive equipment and components industry's main activity is the development and manufacture of all kinds of parts for vehicles, involving a high level of product specialisation. These range from basic metal parts, shafts, transmission and brake parts to complex safety systems, interior parts, systems to ensure driver and passenger comfort, air-conditioning equipment, electronics, microelectronics, next-generation materials and many more items besides (SERNAUTO 2014).

Components refers to all the parts required for the manufacture of a new vehicle. Components companies also manufacture automotive spare parts, although this makes up a relatively small share of their business. These are parts designed to replace or modify parts in existing vehicles.

It is worth including here, as an example of the transformation of the industry, the software within the intensive vehicle computerisation process, thus forming an essential part of vehicle components. In addition, there are of course all the appurtenances to the growth in emobility across the automotive industry. This will displace elements relating to the drive train which, to date, formed an intrinsic part of the internal-combustion vehicle, and will incorporate other new elements

which, until now, were not part of the industry. This means that the effects of the transformation of the sector may be greater for component manufacturers than for the vehicle manufacturers themselves.

According to the Spanish Association of Automotive Suppliers (SERNAUTO Agenda), the components industry is responsible for generating approximately 75 percent of the end value of a vehicle. This shows the considerable mutual dependence between these companies and the finished-vehicle manufacturers. Vehicle manufacturing must be understood as a pyramid, the base of which is made up of the components industry. In fact, most of a vehicle is manufactured by companies other than the big vehicle manufacturers. This is, of course, reflected in employment. These components companies account for approximately 225,400 jobs in Spain, or 76 percent of total direct employment associated with the Spanish automotive industry.

The automotive components industry consists of around 1,000 companies. These include foreign multinationals with production plants in Spain and, unlike the country's automotive manufacturers, companies having their main headquarters in Spain and subsidiary offices around the world. There is also a widespread network of industrial SMEs. Indeed, Spanish companies with an international presence have approximately 450 plants around the world.

This means that, unlike vehicle manufacturers, for many of them decision-making takes place in Spain, meaning that they do not have to defer very often to decisions made abroad. This gives them more room for manoeuvre in their strategic business planning as they try to keep up with the fundamental changes going on in the automotive industry.

While there are offices abroad because of the vehicle-manufacturing model, which requires proximity to suppliers of equipment and components, the main functions that provide added value (R&D, design, management, planning, etc.) remain in Spain and generate employment on the country's domestic market.

Precisely because of this proximity, if there is a reduction in the workload of vehicle manufacturers in Spain, the components companies that supply them will also suffer the same fate, whether they be Spanish or foreign companies. Another important consideration is the fact that approximately 28 percent of equipment and component manufacturing comes from sales to Spain's vehicle makers. As for these companies' remaining production, exports account for 57 percent of turnover and the Spanish spare-parts market is responsible for 15 percent.

There has been considerable growth in overall turnover and in exports in the components industry. This shows the robust health of the industry and its growing importance in the Spanish economy.

COMPONENTS BILLING AND EXPORTS (MILLION €)

Year	Billing	Exports	%
2013	28,020	16,988	60.6
2014	29,723	17,602	59.2
2015	32,964	18,897	57.3
2016	33,239	19,510	58.7
2017	36,239	20,015	55.2
2018	37,170	21,415	57.6
2019	35,822	20,754	57.9
Growth, 2013–2019	27.8%	22.2%	

Table 6. Author's own calculation. Source: SERNAUTO Libro Blanco

COMPONENTS BILLING AND EXPORTS (MILLION €)

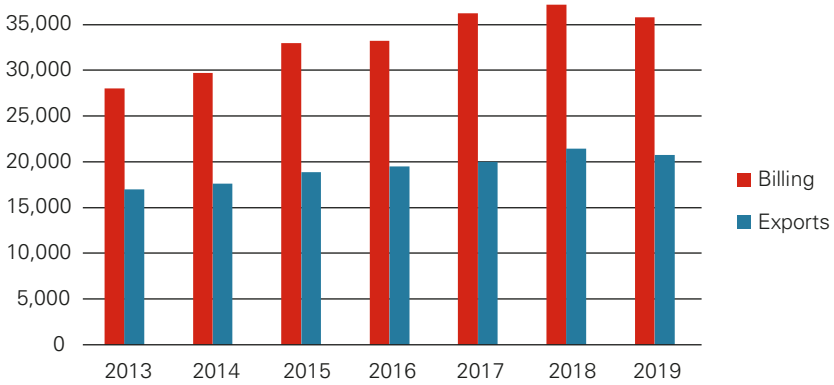


Figure 9. Author's own calculation. Source: SERNAUTO Libro Blanco

Another notable factor here is that Spain is the fourth largest manufacturer of components in Europe. Most of the products exported are destined for the main European vehicle-manufacturing countries: Germany, France, the United Kingdom and Italy. In total, 72 percent of products are exported to other European countries, followed by the United States (4.9 percent) and Morocco (4.6 percent). In this case,

too, we see the importance of the behaviour of the European automotive industry, which the Spanish components company serve, and the need to adapt to its needs.

PRINCIPAL COMPONENT EXPORT DESTINATION COUNTRIES, 2019

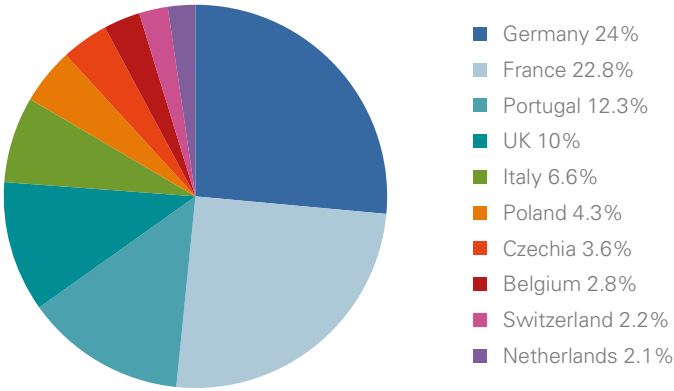


Figure 10. Author's own calculation. Source: SERNAUTO Memoria

In other words, there is much at stake, as how the European industry fares in the face of the major transformations lying ahead will have a major impact of the future of the components industry in Spain.

IMPACT OF COVID19 ON THE AUTOMOTIVE INDUSTRY

It is clear that, as in other areas, the COVID19 pandemic has had an impact on the automotive industry, particularly during the strict nationwide lockdown in Spain and subsequently in light of some of the measures taken to mitigate its effects – measures which were still in force at the time of writing. These were short-term effects basically caused by the limitations on mobility introduced around the world as the pandemic spread. The most striking aspects here were the interruption in manufacturing, both of components and of core manufacturing due to mobility restrictions, and the drop in sales brought about by the economic crisis. However, other (perhaps less obvious) aspects should also be noted. All this makes it worth considering how this pandemic will affect the process of technological change in the industry.

The first direct consequence of the pandemic, caused by the shutdown of manufacturing plants and the slow recovery of production capacity, was a substantial decrease in the number of vehicles manufactured in Spain in 2020.

Here we would like to point out the extent to which the pandemic has highlighted the Spanish economy's absolute dependency on other countries, specifically when it comes to the automotive industry. The difficulties in supplying the industry's intermediate products due to the impact of the pandemic on supply chains worldwide, which have been plain to see in the sector in countries such as China, have led to the paralysis of the automotive industry. This has shown that industrial policies, at the regional, national and European level, must boost the autonomy of our industrial sector. This pandemic will not be the last and it is necessary to shift production processes towards a circular and proximity model. These two elements represent a major change in the design of production processes (specifically in the automotive industry in this case), increasing its autonomy of supply of intermediate products (components) in potential future health crises.

We should also bear in mind the economic recession accompanying the pandemic, which may lead to a reduction in vehicle registrations and a move away from buying new vehicles to purchasing second-hand ones, which are cheaper and also, generally speaking, more polluting. The loss of income, especially among the working class, may extend the crisis in demand beyond the duration of the pandemic itself. Economic forecasts predict a return to pre-pandemic GDP levels in 2022.

Of course, this fall in demand will have a major impact on the demand for cars, not only as a result of the reduction in new registrations, as mentioned, but also because of a shift in demand towards cheaper products (in this case, older products like internal-combustion vehicles).

In the economic crisis that began in 2008, there was a marked trend in this direction across the vehicle market. In 2007, a total of 2,350,101 vehicles were registered in Spain. When the crisis reached its peak, involving the steepest decline in registrations, in 2012, only 924,310 vehicles were registered – i.e. 60 percent fewer registrations than in 2007. Furthermore, economic recovery has been slow, being hampered by other inhibiting factors, to the point in fact where registrations in 2018 were 1,831,556, so still 20 percent below the figure for 2007 (Ministry of Transport, Mobility and Urban Agenda 2019). However, the vehicle fleet has continued growing.

All this, while shrouded in great uncertainty surrounding the impact the pandemic and the accompanying economic crisis will have on vehicle registrations, suggests

that the penetration of electric vehicles within the Spanish fleet will slow in terms of total volume, albeit not in percentage terms.

Another factor to bear in mind is the relationship between second-hand vehicles and new registrations. If we count all vehicles sold (registrations and second-hand vehicles), second-hand vehicles represented 60 percent of sales in 2007, but by 2012 they had reached 76 percent (Ministry of Transport, Mobility and Urban Agenda 2019). Moreover, approximately 60 percent of second-hand vehicles sold each year are over 10 years old and half of them are more than 15 years old (Fernandez 2019). The question here is to what extent these high sales figures for second-hand cars will counteract the effects of the increase in sales of new electric vehicles in the Spanish vehicle fleet. Registrations of new vehicles are one thing, but the trend in the makeup of the vehicle fleet in the medium term until combustion vehicles have been replaced is quite another. However, it is reasonable to suppose that, as the electric vehicle becomes more common, the number of second-hand vehicles of this type will grow. Indeed, this is something that is just starting to be seen in Spain.

By way of comparison, the mean age of all vehicles on the road in Spain in 2018 was 12.4 years, higher than that of countries such as the United Kingdom, where the mean age was 8 years, France, where it was 9 years, or Germany, where it was 9.5 years (ACEA 2021). That is, the renovation of the automotive fleet in Spain is slower than in most of its European neighbours.

EMPLOYMENT IN THE AUTOMOTIVE INDUSTRY

The numbers speak for themselves: of an overall workforce of 19.3 million people in Spain in 2018, including a little over 2.2 million employed in the transport sector (industry and warehousing, automotive and components, roads, passengers, goods, rail, air and sea), the automotive industry accounted for 300,817 direct employees in 2018; of these, 70,717 were employees of motor-vehicle manufacturers (National Statistics Institute) and 230,100 employees in the equipment and components industry (NE National Statistics Institute). This represents 12 percent of industrial jobs in Spain. Thus, the impact of the changes that are taking place in the automotive industry is highly significant for employment in the Spanish production system as a whole.

Furthermore, if we take into account the period from the start of the Great Recession to 2018 (the latest data available), employment in vehicle manufacturing, even allowing for some fluctuation, has increased.

EMPLOYMENT IN VEHICLE MANUFACTURING

Year	Jobs	Annual Variation
2008	67,263	-
2009	63,039	-6.3
2010	61,158	-3.0
2011	60,641	-0.8
2012	58,084	-4.2
2013	57,858	-0.4
2014	60,481	4.5
2015	64,449	6.6
2016	71,614	11.1
2017	70,948	-0.9
2018	70,717	-0.3
Increase 2008–2018		5.1

Table 7. Author's own calculation. Source: National Statistics Institute (n.d.)

EMPLOYMENT IN VEHICLE MANUFACTURING

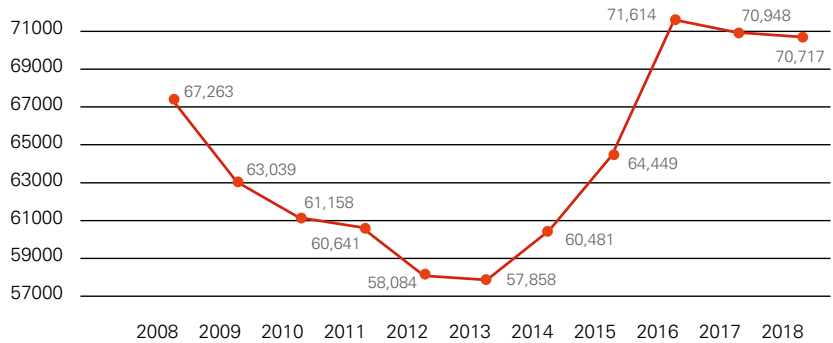


Figure 11. Author's own calculation. Source: National Statistics Institute (n.d.)

The equipment and component manufacturing industry also saw a gradual annual increase in the five years from 2013 to 2018. However, there was a drop in employment from 2018 to 2019. Remarkably, even with the aforementioned decrease, there was a substantial increase of approximately 35,000 jobs for the whole period for which we have data.

EMPLOYMENT IN THE COMPONENTS INDUSTRY

Year	Jobs	Annual Variation
2013	190,940	-
2014	196,580	3.0
2015	204,170	3.9
2016	211,800	3.7
2017	224,720	6.1
2018	230,100	2.4
2019	225,400	-2.0
Increase, 2013/2019		18.0

Table 8. Author's own calculation. Source: SERNAUTO Libro Blanco

FIGURE 12. EMPLOYMENT IN THE COMPONENTS INDUSTRY

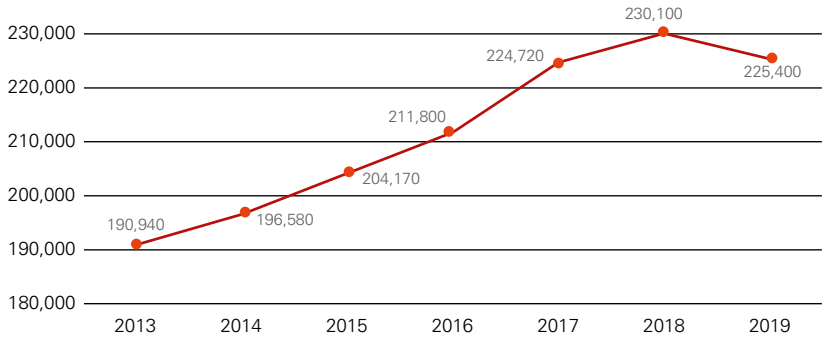


Figure 12. Author's own calculation. Source: SERNAUTO Libro Blanco

As a result of the disruptive transformation of the automotive industry as it switches over to electric, autonomous, connected vehicles and mobility services, the industry will have to manage a lengthy, fundamental and complex labour transition with implications for both the type and amount of employment. Skills such as software programming and vehicle electronic engineering, to name just two examples, are becoming increasingly important. These are new jobs that are to a greater or lesser extent already emerging and will very likely sideline others that have played a key role up to now, based on automotive mechanics and

motorisation. This means that the industry will continue to create a host of job opportunities, but there is a need for a reorientation of employment there.

INTERVIEWS

The interviews were conducted in May 2021 over the phone or using video conferencing solutions.[28]

MIGUEL ÁNGEL BOIZA (NISSAN COMISIONES OBRERAS TRADE UNION DELEGATION)

"At Nissan, we were the first in Spain and almost [the first] in Europe to commit to and build an electric vehicle. We're criticised for having got too far ahead of ourselves, for moving too quickly in making a commitment to the electric car and manufacturing electric cars when very few were being sold, but in the end, we were the victims, with the announcement of the closure of the plant as a result of a decision by – and the interests of – the Renault-Nissan alliance, which prioritises

28 We translated the interviewees' words.

the manufacture of electric cars in France. Closing plants when money should be coming in from Europe to make investments was bad luck and made no sense. We're trying to salvage the situation by switching over to a battery plant or by attracting another vehicle manufacturer."

"The market's changing, and that's irreversible. Now everyone is banking on the electric car, but other […] options will be arriving on the scene, such as the hydrogen vehicle and driving with autonomous vehicles."

"The risks of the transition clearly include the risk of losing jobs. You need less labour to make an electric car. That is going to be a challenge. There's a simple cliché in that regard: you need to train the employees. It's true that some of these people will go on to make the batteries needed for electric vehicles. But the amount of labour will decrease anyway."

"The key to the whole process lies in the manufacturing aspect and the battery plants. But they require three assemblies or manufacturing phases, and the process does not necessarily have to be concentrated on a single location. In Extremadura, where there are lithium mines, you could locate a plant to process this mineral. But the assembly of batteries in the cars has to be done in the manufacturing plants themselves; and the manufacturing of the battery cells, which logistically needs to take place near the manufacturing plants, can be sited elsewhere. We need to be strategic in how we handle all of this."

"Not having the power in Spain to make the big marques' business decisions is a stumbling block for the process because the corporate headquarters are in Germany, France, Japan or elsewhere. The case of Nissan is a clear example because, due to the politics of the Nissan-Renault alliance, it was decided that electric vehicles would be produced in France. This has a lot to do with the fact that the French government holds considerable stock in Renault. The same applies to Volkswagen and Germany. However, the situation is different in Spain, because we don't have our own marques – and those that do exist, like SEAT, are subordinate to Volkswagen."

"Even so, if the Spanish government does not make a clear commitment to the environmental transition of the automotive industry, things won't turn out well. It isn't a matter of keeping the manufacturing plants in Spain for its own sake; it is a question of influencing which vehicle models are assigned to them by the multinationals. That is the key."

"If Renault, for example, doesn't assign electric vehicles to its Spanish factories but gives them hybrids instead, what it's doing in the final analysis is facilitating the environmental transition of the industry only in France, and not in Spain."

"In the components industry, the position is a little better in relative terms because Spain has quite a lot of domestic suppliers. However, these are generally companies that, to date, have been oriented toward manufacturing components for combustion-engine vehicles – and those that make exhaust pipes, for example, won't have a future with [the emergence of] electric vehicles. The components industry must also deal with conversion, but this process is much slower in the case of suppliers than in that of the big manufacturers, and this may be a problem for the entire process."

"European funds provide an attractive incentive for conversion in the industry, and that's why all the agents in the industry are meeting politicians and governments to coordinate their positions. However, it isn't just about getting hold of a load of money to spend; we need to create appropriate projects that must spearhead the environmental transition of the automotive industry."

"We need to ensure that the Next Generation funds don't go just to the multinationals, who are the ones with the ability to present projects, because if that happens, it will leave the politicians and smaller or components companies without any scope to make decisions. This contradiction needs to be resolved through politics: a commitment is required from the headquarters of companies outside Spain, and this must be secured by showing them that the whole Spanish industry, including suppliers and components, is tailored to the needs of the transition."

"SEAT-Volkswagen's announcement of its intention to manufacture its small electric car in Spain is a step in the right direction, and it has been announced that a public-private consortium will be established. It's also good news that Renault is promising that it will build hybrid vehicle models at its plants in Spain. But is this really the transition we want? Because the future isn't hybrid. It's the electric car, and those Renault models have been earmarked for France."

"This situation shows that Spain mustn't give up on the implementation of new factories, whether these be Chinese or North American. Nissan's departure is an opportunity for its plant and its workers to attract new operators."

"Europe is a good market for electric cars, and the marques that realise this will come to Spain. In fact, this is already happening with the manufacture of electric motorcycles and trucks."

"The transition was already in the pipeline, but the COVID19 crisis has brought everything forward. In little over a year, we've gone from seeing [things happen in the] distant future to having it brought much closer – and we need to be prepared for foreign companies wanting to manufacture electric cars in Spain and yet saying that they have too many workers."

"The automobile business today relies on direct sales, especially in Europe. There are factories that produce a lot but don't earn so much when vehicles are rented out or other forms of acquisition and mobility emerge. We need to be clear that most of the industry's future profits won't come from car sales but from the technology and software used in the cars. This will dramatically change everything. That's because there will be demand for qualified personnel rather than for the unqualified labour that is so abundant today. Providing all these employees with work, after training and retraining them, means attracting all the added value of a new production chain, namely batteries, to Spain. If the car batteries that are manufactured in Spain end up being imported because they're produced abroad, this will lead to an inevitable loss of labour."

"The new automotive industry's added value is provided by the guarantee that jobs won't be lost, but this means training people, and this can only be done with the passage of time and a carefully thought-out national strategy. The major marques have already realised that bringing about such a transition takes two or three years, and that's the amount of time we have to adequately deal with the process of converting and training labour. If we don't manage this in time, we won't be able to participate in the transition of our industry in the right conditions."

"The Nissan process isn't a good sign – because it's never a good sign when you close an industrial plant that has been around for over 100 years. But things would be different if that closure made it possible to put a bigger company in that plant to spearhead a change in the industrial model. It could provide an opportunity for other companies. We would be happy with a new vehicle manufacturer, aligned with the electrification of mobility, or a battery plant. In this way, we might be able to also attract new components companies and so reactivate the chain across the industry as a whole."

RAFAEL GUERRERO
(SEAT COMISIONES OBRERAS TRADE UNION DELEGATION)

"The electric car is the future of the automotive industry. This means overcoming multiple obstacles, some of which can only be dealt with gradually. This has been demonstrated by the problems the sector has experienced in understanding that the electric car wasn't a whim but a necessary transition geared towards the future. In general, the automotive industry adapts well to change precisely because it is an industry that has been consolidating for a century. However, this very stability in this case has helped to foster a resistance to change. The case of Volkswagen is significant, as it has refused to give a clear timetable for the demise of the combustion vehicle. This symbolises the reticence of an industry that manufactures a consumer product that is completely entrenched in society – something that has been around forever and has barely changed in decades, involving an engine, a gearbox and a chassis. This blueprint hasn't undergone major changes in a century, beyond the vehicles' aesthetic design and safety features."

"Google and Tesla already started committing to electrification some time ago, but for too long the automotive industry, out of a combination of privilege and arrogance arising from its status as an established market player, looked down on their ability to innovate. It resisted change until it was hit by the double whammy of Volkswagen's Dieselgate scandal and the COVID19 pandemic. But even before all this, there was the [2015] Paris climate agreement, which companies like Volkswagen had signed up to. The fact that people have become more aware of climate change and that the EU has beefed up its measures has made the process unstoppable."

"The problem is that the process of transition began late and, in Spain, we had no hybrid engines. The trigger that broke the will of the manufacturers was the Dieselgate scandal. And the pandemic has accelerated all these changes towards electric cars."

"Even so, there are still local obstacles facing the transition process, including the uncertainty of consumers. To counteract this, governments need to provide guarantees and accelerate projects. For example, people do not know that they can install a recharging point where they park their car outside their home. There hasn't been enough outreach and in Spain, the average time needed for such a point to be installed, which is key to getting the transition to consumers, is nine months, and so charging infrastructure projects need to be accelerated."

"Hybrid cars are a natural intermediate step for the coming 10 years, but the future has to be the electric vehicle. We can see this clearly in France and Germany, where [companies] are siting the production of these future models. Compared with these countries, Spain has some disadvantages, but it also has advantages, as there are seven large automotive manufacturers and a firmly established industry in Spain. And there is a components and logistics industry that is appropriately tailored to the needs of this transition."

"There is also the capacity to generate renewable energy, which is at a very high level in Spain, and this is a big advantage that may shore up a key element in the future of the automotive industry. As the transition goes hand in hand with a change in the value added of this industrial sector, which will no longer be provided by the engine but by the batteries and the software. Cars are already smartphones on wheels. Therefore, companies like Volkswagen have created software subsidiaries, which, employ 5,000 engineers in Germany, and aim to ensure that two thirds of the software needed for the car of the future will be produced by the automotive industry itself."

"One of the opportunities for Spain is the fact that it's the second largest European carmaker and that it has lithium mines in Extremadura with the capacity to provide this raw material needed for batteries for at least 30 years. There is agreement, especially in light of the pandemic, on the need to achieve industrial sovereignty – and this means having a lithium-battery plant associated with electric vehicles. We're in an unbeatable position. The disadvantage is that the major decision-making centres for the automotive industry are outside Spain, and the designs that SEAT does have won't compensate for all the various Volkswagen and other foreign marques."

"Where Spain has potential is its ability to generate renewable energy and to export it, for example in the case of green hydrogen. While the value chain in the automotive industry used to be very linear, it's now become much broader and more extensive, and the energy and financial industries are playing a major role. There needs to be cooperation between companies and different sectors. Nor should we forget the commitment to the circular economy, as Renault has opened a factory in France for this purpose, allowing it to reintroduce corporate fleet cars and second-hand vehicles into the circuit, and even to recycle electric-car batteries as renewable-energy accumulators [and therefore] It's very likely that [in the future] we won't be talking about the automotive industry as an industrial sector but about sustainable mobility."

"A major problem facing us in Spain is the 'headquarters effect'. This is something that it will be very hard to overcome. Renault, for example, talks about Spain as its second most important industrial hub in Europe, but it is continuing to manufacture its first wave of electric vehicles in France, as Volkswagen has done in Germany, leaving Spain with hybrid cars. But the future is the electric vehicle. That's why SEAT's commitment to manufacturing Volkswagen's small electric model in Martorell is important, although it isn't enough to fulfil the [required] level of occupancy, because SEAT is more than just a production centre; it's a big company with five plants and two marques (SEAT and Cupra), on which many components businesses depend, such as those who make gearboxes."

"In the transition, it is necessary to retrain employees because future assembly lines will require less labour. Just as it is necessary to invest in equipment, there's also a need to invest in people – and the key to the transition is knowing when to train employees, and in what. To help with this, we'll need the government to provide an instrument similar to ERTE [i.e. Spain's furlough scheme (ed.)]. It's clear that the transitional period needs to be used to train workers in a more appropriate framework than the one provided by furlough."

"In terms of job retention, the message is "retrain" – and business leaders need to understand this, otherwise we're going to have a problem, because the new industrial model must work for people and not against them. This includes not linking the guarantee of future work to a reduction in salaries, as has been the trend for years. All companies have their vices. But given the automotive industry's commitment to the environmental transition and the support provided by the European Next Generation funds, companies are going to have a hard time selling the idea that they need to make efforts to rein in salaries."

"When the workers and trade unions sign an agreement, we should be doing so at the same time as signing an industrial and sales plan. This needs to be the core of the collective agreements of the future: having the ability to hold negotiations that are conditional upon a sales plan."

"The EU has understood that it would be making a big mistake if it were to abandon industrial sovereignty in many industries, including the automotive industry. The COVID19 pandemic has helped to make this clear: Europe can't compete economically without its own industry. However, the pandemic hasn't changed anything – it's just accelerated a process that was already under way and for which there

would've been European resources. Now there will simply be more of them and they will be more concentrated."

"Fortunately for Spain, the countries of Eastern Europe have rested on their laurels while we've got into gear. Take SEAT for example, with its commitment to the electric car and its strategic alliance with components, financial and energy companies, such as Ficosa, Caixabank and Iberdrola. If we don't mess up by taking the short-term approach that can be all too common in Spain, this strategy might pay off. However, this does require us to be where we need to be in terms of defending the interests of workers, although some aspects might not be to everyone's liking. We also need to make progress in the field of industrial digitalisation and boost the required social and regional cohesion. In this context, we can't submit projects for a single autonomous region, and this seems not yet to have been understood by all the regional governments."

"The main onus in the transition will of course fall on the manufacturing of batteries, and an industrial infrastructure for this purpose can't be too far away from the assembly plants if [such an operation] is to be profitable. To be clear: the battery plant mustn't be in Extremadura, where there may be a cathode plant, as the lithium mines are there; the battery plant needs to be in Catalonia or Aragon."

"It's true to say that, because Spain is more given to strident tones than calm explanation, it's sometimes hard to discern what the actual situation is and the keys to this industrial transition. But the explanation has already been given in many forums. Among other things, the idea is for large suppliers who aren't currently operating in Spain to be able to come here. In the transition process, we need to make use of the manufacturers and suppliers of components we already have and to attract new ones – and this must not be for political reasons, as the big companies have their headquarters in other countries, but for industrial ones. We need to see what it is that makes a sector in transition more competitive, and that is where we are right now. For this to work out [satisfactorily], politicians need to do less talking and only the ones who know what they are talking about should be speaking up, such as the Ministry of Ecological Transition, for example, or the Ministry of Industry."

"The media must also play a key role in the transition process, and so far they haven't been doing so. This is essential if we want to really change the economic model for the better. We need to be courageous and tell it as it is: the commitments to the electric vehicle involving different companies and economic sectors

that generate wealth are nationwide projects that contribute to dignified, stable jobs involving decent [employment] conditions and good social coverage."

IVAN RAMOS
(FICOSA COMISIONES OBRERAS TRADE UNION DELEGATION)

"Society is demanding this change in the industrial and production model, but we aren't ready. There are no types of employees who are trained for this transition, and no formal training behind it that is able to support this technological change. In addition, vocational training in Spain is out of date."

"Companies run the risk of destroying jobs if they don't commit to retraining their personnel. This is a challenge not only for big industry but also for the auxiliary industry, which relies on poorly qualified labour. In short, the need for training is the main barrier for the transition of the automotive industry in Spain."

"In terms of opportunities, Spain has a wealth of natural resources that can help it deal with the change in production model, especially in terms of generating renewable energy: we have sun, wind and biomass – because a real change in mobility requires an energy transition. Our culture clashes head on with the needs of the planet and industry must face this change, whether it likes this or not."

"To cope with this transition, we need to think about a labour market of qualified workers: the youth unemployment rate is at 40 percent, and good training could help with tackling this problem."

"The political decisions taken are forcing us to adapt to this transition, but the automotive industry and all the manufacturers have a lot to say about it: what will we do, for example, with the petrol stations or small neighbourhood mechanic workshops? When we talk about an environmental transition, we think mainly about the big car-manufacturing plants, but we mustn't forget the entire auxiliary industry that comes with them, and there is a lot of it. Everyone should have the chance to retrain, and governments have a lot of say in that."

"The crisis resulting from climate change has made everyone aware of the need for change in production. And the automotive industry is essential. Because the public transport deficit doesn't help; mobility in industrial estates is what it is. People travel many kilometres to go to work and largely depend on motor vehicles for their mobility requirements."

"The COVID19 pandemic may help to unlock or accelerate some aspects of the transition, but the economic crisis associated with the pandemic doesn't aid change. There's a risk that in the middle of the crisis, investment aimed at training and at changing the industrial model will be cut off. It's true that there's a lot of talk about the European Next Generation funds, but we'll have to see how this works and how these funds are shared out."

"At Ficosa, for example, the technological change took place right in the middle of the 2007 economic crisis, and that led to some very tough years without much work. Companies in the auxiliary industry like Ficosa will obviously have to participate in coordinated benchmarked projects in the European funds. This cooperation between companies and even between industries or sectors is already a reality. But how it will end up working is still unknown, because it will be difficult [to pull off]."

"It's true that the move from the internal-combustion engine to batteries changes the industrial paradigm and no longer uses many parts that are currently made by the auxiliary industry. However, this industry will continue to be more important than it appears. The transition is viable and must not leave anyone behind. It's possible that the transition leads to fewer jobs but, at the same time, it provides an opportunity to commit to products with greater added value. When it comes to cheap labour, for example, we can't compete with Asian countries. But our labour market does have a level of volatility that is closely linked to happenings in the rest of the world. In addition, we've seen many companies move away due to the 2007 crisis, and we know what that means. That's why we need to commit to added value, to quality employment and to training. Perhaps, at the end of the process there will be less employment, but there will also be more work taking place under better and more stable conditions."

"One of the risks involved in this process is that decisions are made outside Spain, as the industry's big companies have their headquarters abroad. However, multinational companies such as Ford and Renault have highly competitive plants in Spain, and this should be seen as a benefit in this transition process. To highlight this, we need a political process to accompany this change in mobility and to facilitate the viability of manufacturing electric vehicles in Spain."

"The components or auxiliary industry does not need to react to the changes and rhythm set by the big marques. Ficosa is a clear example of a company that has undertaken the technological conversion of production over a decade, going

from making 90 percent mechanical parts to making parts that mostly contain some technological, electric or computer components. This is an example of how a components company decided to commit to the electric car and, although it had a tough few years, managed to convert a production model based on small factories to a model based on a central plant and various international offices."

"Ficosa was lucky to have personnel, inherited from Sony, who were highly trained in electronics, along with its plant in Catalonia, which was designed in a way that was cut out for the new challenges. Of the 1,500 current employees, approximately one third are production operators, while the rest are technical and administrative personnel, and there's a strong commitment to R&D. In the past, everything was [focused on] production-line manufacturing that hadn't changed for years, while now, production is based more on custom design of components and can change much faster. The staff have had to adapt to the new situation through training and the incorporation of more technical personnel. Although there have been some difficulties in the process, these have been due to the economic crisis more than technological change, to which staff adapted easily."

"Of course, a change in mentality and in work culture has been necessary, in terms of safety conditions, for example. This is because the components that are manufactured now aren't the same for a television as for a car, and because stable production has given way to a more volatile situation, where production is almost on demand and made to measure, and [so] you end up making more parts or components but in less volume or inferior quality. Of course (and here, perhaps, the case of Ficosa isn't an example that can be extrapolated), most of the staff came from the former Sony facility and this facilitated the conversion, as there was already a culture of innovation in the workplace, and the employees included a good number of people specialising in programming, IT and robotics. What I mean is that the production transition may be easier, even just in terms of change of mentality, between Sony and Ficosa, where it's from manufacturing televisions to components for electric cars, than between SEAT and Volkswagen, where it's from manufacturing combustion vehicles to electric vehicles."

"Whatever the case may be, the change in production model is necessary and inevitable. There is no other way, and the automotive auxiliary industry must also adapt. This change in the production model must also be an opportunity for the region, providing opportunities to industrialise non-industrial areas. This is because the new model will be more environmentally friendly, with a strong presence of

renewable energy, and this must lead to employment opportunities in sectors and regions that suffered the most in the most recent economic crisis."

DANIEL PI
(PLATFORM FOR THE PROMOTION OF PUBLIC TRANSPORT)

"It's clear that electric vehicles reduce polluting emissions but not traffic congestion in cities or social discrimination in public mobility. Even if it's electric, a car is still a 1,200kg machine that uses batteries to move people who weigh, on average, 80 kg. Let this initial statement make it clear that certain technological solutions on a significant scale, such as the electric vehicle or the self-driving vehicle, are of no use for certain mobility models."

"However, we clearly need to see as an opportunity the change or transition in the automotive industry that involves not only switching from the combustion engine to batteries but from selling cars to selling mobility. After all, the key isn't that cars are evolving toward electrification but that this is just part of the change in mobility, and what we might call shared transport, which reaches far beyond public transport, plays a very important role here."

"The technological change under way is driving us towards a transition across the field of mobility, for which there are no magic solutions, as conditions vary depending on the initial situation and the geographical area. The transition and change in mobility in a densely populated city aren't the same, for example, as in a rural area or, of course, an entire country."

"In cities we need to electrify fleets of high-frequency vehicles, such as taxis, and goods-delivery vehicles, despite the problems raised by the Amazon model. On the other hand, in cities, it isn't as useful to electrify private fleets if this means investing public money in vehicles that operate very little in relative terms and in a type of mobility for which there are better, public-transport alternatives. Indiscriminate subsidies for electrification aren't an appropriate option; in cities, they need to be focused on mobility solutions involving taxis and buses and on commercial deliveries."

"A comprehensive environmental transition strategy in the mobility sector can't just focus on the automotive industry. Although it's true that in a country like Spain, most transport is by road, and that rail logistics are very complicated, only 4 percent of goods are transported by rail. This needs to be improved by creating the appropriate corridors and optimal loading and unloading systems. Changes to

the mobility-transition strategy also need to be made in air transport. We need to stop subsidising flights of less than 1,000 km because tax dumping in aviation makes no sense when we're trying to promote a different type of mobility."

"Spain has opportunities and space to grow in this transition due to renewable energy. Overall, and in particular in regions such as Catalonia, the lag in the development of renewable energy is currently more of a problem than an opportunity. We talk a lot about electrification, but we must remember that we're putting in place technological solutions that require more energy consumption. This is the case for green hydrogen, which is a good idea, but it is something that consumes a lot of energy – and in Spain today, this capacity to produce energy isn't there unless it comes from nuclear or coal-fired plants. This means we need to be careful about the message we're sending."

"The energy question permeates everything, starting with the definition of mobility, which is simply transforming energy into movement. We need to make efforts to reduce movement, or the demand for mobility, but it's also essential to work on consuming less energy without changing the level of movement."

"As Spain doesn't have large domestic or home-grown multinational automotive and mobility companies with headquarters in the country, the transition must involve the creation of a highly attractive market for these foreign companies. For example, Alstom is a company with no Spanish headquarters, but it does have a very big production plant in Catalonia that has just hired 700 new employees because it's just been awarded a highly lucrative rail contract. What can we offer this company and others? A rail investment plan wouldn't be a bad idea, as it would generate continuous demand that would ensure work, production and employment. When you create an attractive market, companies, even those not having headquarters in the country, will get involved."

"The renewable-energy sector is a key player in the industrial transition of the mobility sector. All in all, we need to recover lost ground, as over a decade ago we were a leading power in renewables technology and then everything stopped thanks to legislation that penalised the production of this energy in order to benefit the traditional big energy companies. We have sun and wind, but we've wasted a lot of time, and our business fabric isn't yet capable of translating this potential, while certain policies, being regional rather than nationwide, don't exactly help to overcome these barriers."

"The electric car must develop on its own. If our society doesn't understand that industrial developments and transitions like this are how we can face up to climate change, we're in bad shape. But that shouldn't be an excuse for supporting the transition to the electric vehicle using public funds. Dumping in this sector may act as a brake on other solutions and mobility transitions that are equally necessary. If we encourage the purchase or ownership of electric vehicles, we may prejudice other forms of mobility (and economic nodes) that also generate employment and which, to a large extent, aren't vulnerable to the threat of delocalisation and also operate around the clock."

"It's clear that if SEAT, or any other automotive plant, closes, it will create a big crisis. But we should not forget that no fewer than 400,000 jobs have been created across Spain as a result of public transport. This ranges from the bus driver to the bus mechanic, and they meet an ongoing demand that can't simply leave the country. This means that we should be careful with obsessing about the electric-car industry, for the reason that there are people whose natural destiny is not to have a car."

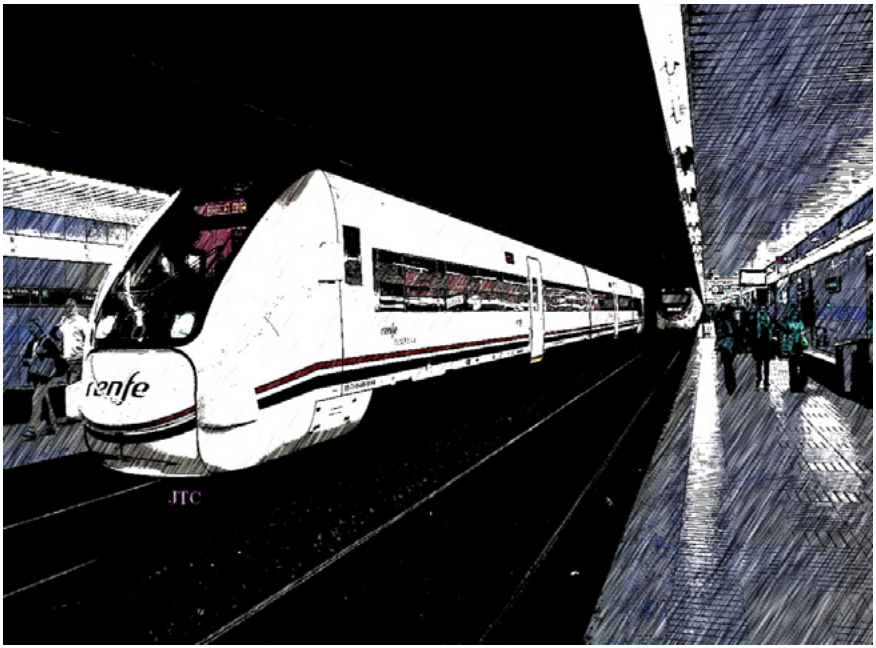
"All of this means that big companies like SEAT and others don't have to make money out of mobility. However, there does need to be a change in the profit model and even the sales model, along with the production model – and the feeling is that we don't always understand what this entails. We can't just limit ourselves to another financial incentive for people to buy a new car so that they will purchase an electric vehicle now or encourage the idea, industrially speaking, that we've reached a situation where it's everyone for themselves."

"Politics has become a game in which there are interests and people who have to make decisions, sometimes without clear strategic aims – and the level of reflection by the public sometimes doesn't help. Sometimes there's also no clear vision at business level. It seems that executives are fighting for one plant or another but not for strategic visions. We also need actors who have a clear vision and are able to build consensus. Moreover, the trade unions have an important role to play here."

"The COVID19 pandemic has affected this mobility transition, but not really in a negative way. It's true that some public-transport operators reduced mobility during 2020 by between 65 and 70 percent, depending on the case, but this decrease wasn't as dramatic as it might have been. Mobility fell due to the 'teleworking' effect, but the biggest reduction was due to people having lost their

jobs as a result of the [economic] crisis associated with the pandemic. So from the perspective of a change in approach to life and mobility, the effect of the pandemic hasn't been that great. The trend is towards returning to pre–COVID mobility patterns as soon as possible."

"On the other hand, there are other impacts that aren't associated with the pandemic and that are really important in terms of the future of mobility. These include the abolition of some motorway tolls, which is outrageous if we consider it from the point of view of the transition of the mobility model. Why should RENFE29 pay a toll to ADIF, and to the state, for the use of the rail infrastructure, while drivers of private cars no longer have to pay tolls not only to the motorway franchise holders but to the public owners of the infrastructure? We should consider public tolls; otherwise we're sending mixed messages when it comes to sustainable mobility. You can't move forward with the idea, for example, of an urban toll in Barcelona while removing metropolitan toll barriers in Martorell or Mollet del Vallès."



29 The Spanish national train operator

"The European Next Generation funds unquestionably provide an opportunity. However, in general, there are few mobility-related projects that aren't linked to electric vehicles and the automotive industry. Leaving aside the aeronautics industry, which is not so susceptible to electrification, it's surprising that the rail industry is in such a poor position when it comes to the Next Generation funds. This is because Spain has no vision of the role that rail can play, beyond high-speed rail. However, it should be acknowledged that in certain corridors, high-speed rail is an effective driver of change in the mobility sector. But just as it was necessary to modulate the commitment to high speed, local and regional rail is a huge field that has yet to be explored in Spain, along with its implications for intermodality."

"The feeling is that rail isn't going to be awarded any Next Generation projects. This is the fault of the government and the public operators, who've been unwilling to do the work [required for this]. At the same time, we have to acknowledge that private operators and those with their own initiative or autonomy may end up using the Next Generation funds to gain ground and competency when it comes to rail mobility. This reveals another stumbling block for the industrial transition of the mobility sector, namely that we always consider infrastructure projects rather than service and operating models. If this mentality were to change, we could do different and interesting things. In the Mediterranean corridor, for example, projects centred around three or four rail-truck intermodality points are viable – not to mention maritime transport."

"The social aspect is a major thematic link in the transition of the mobility industry, reaching beyond climate change. If we base the entire transition on the automobile, for all the electric cars that may be produced we leave major segments of the population (children, the elderly and adults with low purchasing power) out of the economic and direct-use model and we introduce a major barrier, because with an economic model of medium to low salaries, it's difficult to plan mobility based on the acquisition of an expensive vehicle. Even if we stoutly defend electric vehicles, they can't be claimed to be the only product of the transition process. If an electric-car model elbows out trams in Barcelona, it might be that the SEAT factory won't close, but the Alstom factory will do so instead, while both factories create jobs. We need to find the right mix and, like everything in life, not put all our eggs in one basket."

CONCLUSION

We are at a turning point where many of us are fearful for the future of the automotive industry in the medium and long term. Against this backdrop, our production system has begun to react, adapt and take part in the changes. Our industry is advancing in all of the four main parameters of this major transformation: electrification, connectivity, autonomous vehicles and mobility services, but it is doing so at different speeds.

It has reacted late and slowly to the emergence of electric vehicles, especially in the context of globalisation, in which Asia and, to a lesser extent, the United States are leading the way – and not just at the level of state industry but also at European level. However, once we have made up our lost ground, in recent years there has been a major reaction, encouraged by European and state policies, that has clearly aimed to reduce the CO_2 emissions of our vehicles and, at the same time, ensure that we are competitive manufacturers on the global market we have referred to.

In our present case, while the manufacture of electric vehicles of all types in Spain has made a leap forward, it still finds itself on the margins. Spain is home to factories of subsidiaries that have their decision-making hubs abroad, and so to date it has not come out on top when manufacturing contracts for electric vehicles have been awarded, putting the country at a disadvantage vis-à-vis other European countries. Although the manufacture of electric vehicles would result in a decrease in the demand for direct labour, making them essential to the industry's survival in Spain.

In 2020, however, in light of all the difficulties caused by the pandemic, there was a change in the trend and the number of models and the volume of electric vehicles coming out of Spanish factories increased. This shows a move in the right direction, and the various marques' forecasts of increasing their production over the years ahead confirms this.

Where there has been a clear change is in registrations. Following very poor levels, there has been a positive trend, year on year, over a relatively short period, from just one vehicle in 100 using alternative energy to one in 20 by 2020.

The main success story in terms of registrations has been non-plug-in hybrid vehicles. While this is not the end goal, which is total electrification with battery-powered electric vehicles, it is a necessary intermediate step on a market

such as the Spanish one where not long ago, there was a lot of resistance to acquiring these vehicles. Now they are seen as a viable option.

Nor should we neglect three obstacles that are slowing down the penetration of battery-powered electric vehicles: the lack of recharging points, the long recharging times and the sale prices, which, even with purchase subsidies, are higher than those of combustion vehicles, not to mention second-hand vehicles. However, it seems that the days of these persistent obstacles are numbered due to the major efforts to roll out recharging points, faster charge times and a drop in prices, mainly due to the reduction in battery costs.

This increase in registrations is still not enough to change the Spanish fleet (a meagre 2 percent) – all the more so if we consider the importance of second-hand vehicles, which will probably increase as a result of the economic crisis caused by the pandemic. However, we are moving in the right direction.

A fundamental question is the manufacture of vehicle batteries, as there is a struggle going on with other countries to attract a facility of this kind to Spain. The importance of batteries in the value chain, where they have a weighting of approximately 40 percent, speaks for itself in terms of the need to manufacture them in Spain to consolidate the industry and enhance the country's role throughout the process of manufacturing electric vehicles. We are working on this, and a number of announcements have been made about the potential establishment of a battery plant in Spain, but no concrete steps have yet been taken.

LIST OF INTERVIEWS CONDUCTED

Miguel Ángel Boiza
(Nissan Comisiones Obreras trade union delegation)

Rafael Guerrero
(SEAT Comisiones Obreras trade union delegation)

Ivan Ramos
(Ficosa Comisiones Obreras trade union delegation)

Daniel Pi
(Platform for the Promotion of Public Transport)

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CZECHIA

TRANSITION OF THE AUTOMOTIVE INDUSTRY TO AN ECOLOGICAL MOBILITY INDUSTRY

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TABLE OF CONTENTS

INTRODUCTION

The Czech mobility industry comprises several established producers operating in the country as far back as the beginning of the 20th century. This puts the country in a unique position when it comes to discussions about transformation of the car industry into the ecological mobility industry: alongside three car manufacturers, producers of trains, trams, buses, bicycles and trucks also operate here. Nevertheless, many of these established producers were privatised in the period of transformation after the fall of socialism, making Czechia[30] dependent on foreign capital in a manner similar to other Central and Eastern European (CEE) countries. The overwhelming presence of foreign companies in the automotive industry means that Czechia might have a limited influence on the final result of upcoming changes, especially in the automotive sector.

The aim of our research was to discuss the possibilities local actors in the country have to reverse eventual losses in employment due to automatisation and vehicle electrification in the car industry, and prospects for producers of other mobility vehicles to expand and thus to compensate for eventual losses in the automotive sector. We also discuss the readiness of car producers to transform production away from cars. For that purpose, we provide an insight into the composition and position of the mobility industry in the country in the first part and continue with actors' opinions on future prospects in the second part. For the analysis, we conducted nine interviews with relevant stakeholders.

QUANTITATIVE PART

While car production in Western Europe has stagnated or declined in recent decades, it has boomed in Czechia. Neighbouring Slovakia may be the world's number-one car producer per capita, but Czechia has not been far behind in recent years, producing 135 cars for every 1,000 inhabitants. Production rose from 197,000 cars in 1991, to over 1,400,000 in recent years (Figure 1). Prior to the COVID19 crisis in 2020, the country ranked as the 15th largest car producer in the world (and fourth in Europe, behind Germany, France and Spain).[31]

30 In the body of this paper we use the official short form of the Czech Republic's name which is Czechia.

31 COVID-19 led to the biggest year-on-year fall in recent history, at almost 20 percent (Figure 1).

ANNUAL CAR PRODUCTION CZECHIA

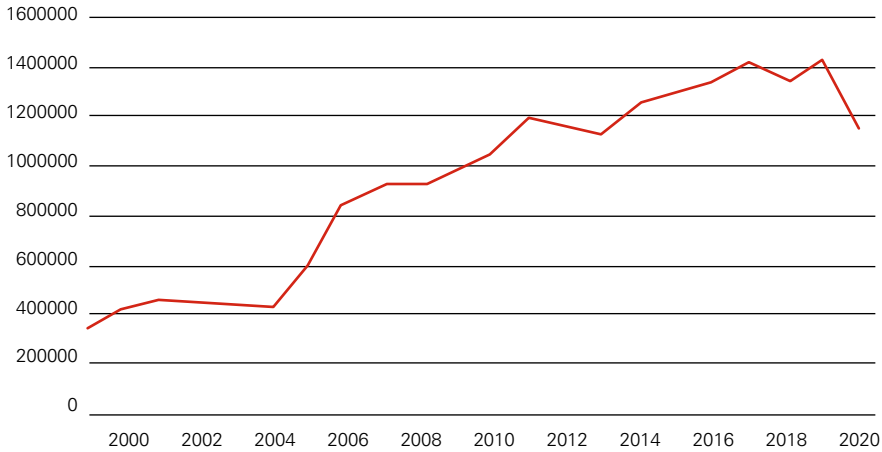

Figure 1. Annual Car Production. Source: OICA 2021

Since the Czech economy opened to foreign capital in the early 1990s, the automotive sector has become the single largest industry in the country (9 percent of total GDP) and is now the single largest export sector (about 22 percent of total exports). Factoring in direct and indirect employment, it employs around 400,000 people and accounts for about a quarter of total industry in Czechia.

Unlike neighbouring Slovakia, Czechia has a long automotive tradition, predating the First World War, and the industry therefore has long-standing cultural importance. Škoda Auto, for example, is the flagship Czech brand, originally founded as the bicycle and motorcycle maker Laurin & Klement in 1895. It was acquired by the Škoda Works industrial group in the early 20th century and Škoda cars are now sold around the world. Similarly, Tatra – now most famous for truck production – first started producing luxury cars in 1897.

While the global automotive sector faces considerable uncertainty regarding its future, Czech manufacturers have already seen significant ruptures and production shifts throughout their history: whether wartime conversion for producing tanks and armaments during the Second World War, nationalisation and integration into a centrally planned economy by the Czechoslovak socialist government thereafter, or the disruptions and uncertainties of moving to a market system in

the 1990s. As the country began to specialise in passenger car production in the latter period, suppliers retooled and refocused their production, for instance away from commercial or military vehicles.

Under the socialist government, Škoda was produced at Mladá Boleslav by the nationalised *Automobilové závody* (Automotive Plant). It was one of the prestige enterprises of the regime, manufacturing more than 3.6 million cars between 1968 and 1989, and providing a key source of foreign currency (Vilímek / Fava 2017). Now a subsidiary of Volkswagen, the company is Czechia's largest exporter and, with over 30,000 employees, the second largest private employer.

Unlike Slovakia, which exports almost all its cars, Škoda has a strong consumer base in Czechia (half of the cars bought in Czechia are produced there). The industry has globalised, however, and is generally very export reliant – while 66 percent of company sales in 1990 were to buyers in Czechoslovakia, by 2006 the combined Czech-Slovak share of Škoda sales was just 15.7 percent (Pavlínek 2008).

Czech automotive production is currently overwhelmingly focused on passenger cars, though the country does have more production diversity than many of its neighbours – including in trucks, buses, motorcycles, bicycles, tractors, trains and trams. Indeed, Czechia is supposed to be the largest per-capita producer of buses in the world, a development which will be discussed below.

ROLE OF FOREIGN DIRECT INVESTMENT AND POSITION IN INTERNATIONAL VALUE CHAINS

As is typical for the CEE region, FDI has played a pivotal role in the automotive sector in recent decades, primarily providing a spatial fix for profit-seeking companies. One researcher writes that "the success of Czech passenger car manufacturing has been based on FDI, and that passenger car manufacturing would have most likely collapsed in Czechia without large inflows of FDI" (Pavlínek 2008: 264). The automotive sector in general, of course, is one of the most global, and this is no exception in the case of Czechia: one index ranks the country third in Europe for foreign control of its automotive industry (Table 1).

INDEX OF FOREIGN CONTROL IN THE EUROPEAN AUTOMOTIVE INDUSTRY, TOP 3 AND BOTTOM 3, 2015

Country	Index Value	
Slovakia	97.1	Top 3
Hungary	94.9	
Czechia	91.4	
France	22.5	Bottom 3
Italy	20.9	
Germany	14.6	

Table 1. Top three and bottom three countries selected from Pavlínek, 2018. The index is the average value of the share of foreign-controlled enterprises in terms of production value, value added at factor cost, gross investment in tangible goods, number of persons employed and turnover or gross premiums written.

As Table 2 shows, 95 percent of automotive jobs in Czechia in the decade up to 2016 were created by foreign firms. In Germany, by contrast, this proportion was effectively reversed, showing the extent of foreign influence. In the same time period, out of 460 new factories built in Europe, 95 percent were built in the eastern reaches of Europe, with the majority (410) of these being in Czechia, Slovakia, Poland, Romania or Hungary (Pavlínek 2020). Out of the CEE countries, however, Czechia also saw the highest number of plant closures (20) – potentially showing how capricious automotive producers can be in their search for profit.

JOB CREATION BY FOREIGN AND DOMESTIC FIRMS 2005–2016

Country	Total Jobs	Domestic Firms	Foreign Firms	Share of Foreign Firms	Share of Domestic Firms
Czechia	72,598	3,725	68,873	94.9%	5.1%
Germany	50,926	47,591	3,335	6.5%	93.5%

Table 2. Source: Pavlínek 2020

The principal OEMs operating in Czechia are all owned by overseas entities: Škoda (owned by VW, from Germany), Toyota Peugeot Citroën Automobile (TPCA) (a French-Japanese joint venture[32]) and Hyundai (from South Korea). Škoda cars, which make up the largest fraction of final production (Figure 2) are produced in the company's three factories: Mladá Boleslav, northeast of Prague, which is the Škoda headquarters; Kvasiny, which currently produces the brand flagship Superb model and SUVs; and Vrchlabí which produces gearboxes for Škoda and the rest of the VW Group. As in the case of Slovakia, inward FDI has been attracted by cheap (relatively docile, non-militant) labour, located at the heart of the EU, and bordering large automotive markets like Germany – but Czechia is also attractive because of its underlying manufacturing legacy dating to the pre-socialist era.

SHARE OF PRODUCTION BY MANUFACTURER, 2020

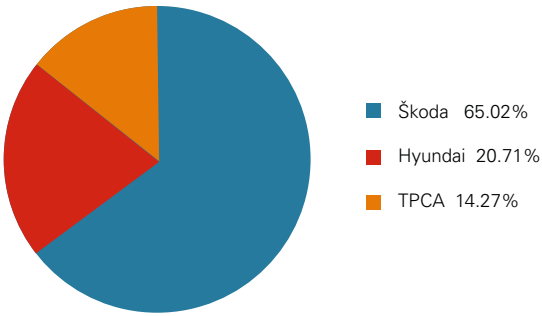

Figure 2. Source: AutoSAP 2021a

With the fall of state socialism, there was some competition between Western carmakers to take over the outdated and near-bankrupt Škoda production plants. Aside from offering low production costs, it was seen as an opportunity to access the emerging CEE markets – predicted to grow throughout the 1990s. Volkswagen won the bid to take over Škoda ahead of Renault, with a privatisation agreement signed in March 1991. This agreement came with conditions which the Czech government hoped would protect the brand and maintain some key functions in the Czech subsidiary. These included preserving the brand identity, maintaining final assembly of cars at Mladá Boleslav, and increasing production capacity.

32 At the start of 2021, this transferred into the sole ownership of Toyota, with plans for the production of a hybrid Toyota Yaris model.

Given mismanagement and corruption elsewhere, the Škoda takeover is seen as one of the success stories of post-socialist privatisation – despite initial challenges (a lack of knowledge regarding marketing and retail, for instance, and issues of quality control and workplace discipline), the brand would allow VW to sell budget cars without tarnishing perceptions of its core brand, helping the group to compete with Japanese competition. Conflicts and concerns over VW's intentions have lingered since the start, however, including suspicions that VW headquarters wishes to hold back the now successful Škoda brand, seeing it as a threat to profitability in its more core German brands (Cremer 2017).

With the introduction of extensive incentives from 1998 onwards, including corporate tax relief, zero customs duty on imports, job creation grants, and the provision of land, a secondary wave of car manufacturers was attracted to greenfield sites around Czechia. This contributed to the competitive bidding wars for automotive investment which have taken place among the Visegrád countries since the turn of the millennium (Kureková 2018). In 2005 and 2006, respectively, TPCA and Hyundai established themselves in the east of the country, in the Moravia-Silesia region. As a result, the many automotive suppliers located in Czechia have become less reliant on Škoda as its linchpin.

Foreign capital's reach extends up the supply chain, far beyond the OEMs. By 2000, for example, 50 joint ventures had been established between western companies and Škoda's Czech suppliers. This resulted in Czechia having relatively robust and embedded internal production networks – domestic suppliers provided around two-thirds of Škoda's required components at this time. As Pavlínek (2008) reports, however, standardisation and increasing global sourcing across the family of VW brands has meant that this rate has fallen – while 70 percent of components for the Felicia model were Czech-produced, this fell to 31 percent for the Octavia. Benefiting from economies of scale, VW has increasingly used a 'platform' model, sharing underlying components between brands and merely changing the outward appearance of the cars. In the face of such standardisation and cost cutting – and with local labour costs rising – local suppliers are often edged out of the market. With the ongoing consolidation, Tier 1 suppliers are the most internationalised, while Czech companies are more likely to be found further down the supply chain, undertaking more standardised and lower value-added

activities.[33] This process creates a self-perpetuating cycle. These joint ventures work in two directions, however, with lower-cost Czech companies able to access worldwide distribution to supply to other VW brands – for example, through just-in-time links to Germany – and not remain entirely dependent on Škoda. Indeed, in 2017, Czechia was the largest supplier of automotive parts to Germany (to the value of €5.78 billion) (Dębkowska et al. 2019).

As Pavlínek (2008: 254) notes, the Czech economy is "becoming increasingly dependent on the passenger car industry, which by its nature is plagued with instability and cyclical crises. Increased export dependence on few successful sectors […] to only a few countries increases the vulnerability of the entire economy".

This was visible after the 2008 financial crisis (Drahokoupil et al. 2015) and has continued to be the case given the increasing tendency of companies to move factories further east, to locations like Romania.[34]

Scholars, furthermore, are sceptical of entirely optimistic views regarding the impact of FDI in Czechia, arguing that its spillover effects are limited and that high value-added activities remain concentrated in the core countries. Indeed, adopting policy measures which prioritise large transnational corporations (TNCs), as the Czech state has done, can be actively harmful to local industry – creating skills and labour shortages in local companies which are not receiving enormous incentives. The counterproductivity of this could be further evidenced by a greater prevalence of high value-added non-production functions (strategic planning, supplier selection, R&D, etc.) in domestic firms over foreign-owned firms (Pavlínek / Ženka 2016).

While Czechia is positioned as a peripheral automotive producer, utilised as a low-cost producer and controlled from abroad, it is also in the unusual position of leading its own peripheralisation processes – Škoda now has its own production operations in countries like India, Ukraine, Bosnia-Herzegovina and elsewhere. Despite having its own flagship brand, however, Czechia remains in a dependent position in global production networks, with key decision-making capabilities resting outside the country. OEMs from Germany and elsewhere have mostly

33 Pavlínek and Žížalová (2016) note that foreign firms in Czechia source 86.5 percent of their supplies from other foreign firms, whether based abroad or in Czechia. The majority of Czech automotive suppliers are Tier 3, making up just a small fraction of the total profit, assets and R&D expenditure of the industry (Pak 2016).

34 In general, personnel costs in the industry in Romania in recent decades have been roughly half of those in Czechia (Pavlínek 2020).

held onto premium car production, while smaller and more price-sensitive budget vehicles are produced in Czechia, taking advantage of low labour costs.[35]

STRUCTURE OF EMPLOYMENT AND WAGES

Job growth in the CEE automotive sector has grown substantially in recent decades, in an almost 1:1 ratio with its decline in western countries (Pavlínek 2020).[36] In the two decades to 2017, employment increased by over 41 percent. As a result, car manufacturing as a share of total employment in Czech manufacturing has risen from 11.4 percent in 2009, to 13.7 percent in 2018 (Eurostat SBS_NA_IND_R2), with 181,488 people directly employed in the automotive sector in 2018, up from 137,732 in 2009 (NACE C29 – sbs_sc_sca_r2).

Most of the employment is geographically concentrated in the Central Bohemian and Moravian-Silesian regions, in the northern and eastern parts of the country, respectively (Figure 3). As previously mentioned, Škoda is the country's second largest private employer, with over 33,000 employees. CzechInvest, the national business development agency, lists 925 automotive suppliers operating in Czechia: 290 in Tier 1, 353 in Tier 2, and 404 in Tier 3. The largest supplier by employment is Continental, a subsidiary of the international producer which supplies a wide range of automotive components, employing 8,959 workers across 11 plants in Czechia. One of the sites in the east of the country is the largest tyre manufacturers in Europe.

35 Part of Czechia's rapid recovery from the post-2008 slowdown stemmed from various scrappage schemes introduced in Western Europe, which incentivised consumers to trade in older cars for smaller, inexpensive ones. The recent controversy surrounding the market placement of Škoda is an interesting example of how countries in the integrated periphery are kept primarily producing 'entry-level' budget vehicles.

36 Between 2005 and 2016, Western Europe lost 387,000 automotive jobs, while CEE countries gained 329,000 (Pavlínek 2020).

INDICATIVE MAP OF REGIONAL CLUSTERING OF TIER-1 SUPPLIERS

Figure 3. Source: CzechInvest 2019

Regarding general employment conditions, Pavlínek (2008: 194) notes a (perhaps counter-intuitive) shift in labour conditions – from relative autonomy on the shop floor under state socialism, to a more managerial and controlled environment under foreign capital. These conditions also vary from workplace to workplace. Researchers posit a rough division in Czechia between German and Asian employers, in terms of their willingness to respect employment law, and recognise and work alongside trade unions. Further differences between OEMs have been noted, with German carmakers introducing structures "to encourage ideas for innovation from the shop floor" (Drahokoupil et al. 2015: 228), while Hyundai brought "a history of adversarial labour relations" and minimising worker input in production processes.

Wages in the industry have risen in recent years, lying about a quarter above the overall average wage in Czechia. However, this conceals great disparities both within companies – between production and administrative workers (Figure 4) – and within the industry – especially between wages paid by OEMs and the much lower pay received by workers in suppliers. In the 1990s, hourly labour costs were about 90 percent lower than those in Germany. This has since narrowed to about

75 percent. With this growth, of course, comes something of a threat – whether through relocation or automation – to the low-wage model which Czechia has capitalised on to attract investment.[37]

GROSS MONTHLY WAGES IN THE CZECH AUTO INDUSTRY, 2003-2017

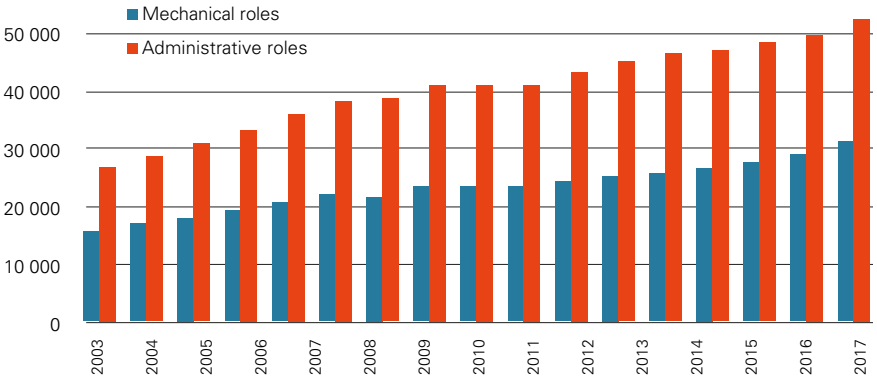

Figure 4. Source: Drahokoupil et al. 2019

With an increasing focus on electric vehicles (EVs) among manufacturers, there are concerns that imminent shifts to EV production would reduce employment along the supply chain, due to lower requirements for parts. This could hit Czechia particularly hard, coupled with the high level of routine manual tasks concentrated there, which could be undertaken by robots. The relative complexity and labour-intensity of transitional hybrid technologies could, however, contribute to overall employment gains. Similarly, core countries may shift internal combustion engine (ICE) production to countries like Czechia in the short to medium term, while focusing on domestic EV development and production.

Most of the trade unionists in the automotive sector are associated with the metalworkers' trade union organisation OS KOVO, the largest sectoral organisation in Czechia. The unionisation rate in the automotive industry is 34 percent, exceeding an average level of only 11.7 percent in Czechia (Visser 2019), well below the Western European average. In the 1990s, Czech and Slovak govern-

37 In Czechia, as in Slovakia, low labour costs should disincentivise mechanised methods. However, there is a relatively high rate of robotisation, with many manual and routine jobs expected to decline or disappear entirely (Martišková 2020).

ments encouraged "union pluralism, allowing any union with three members to claim the right to sign any collective agreement that might apply" (Drahokoupil / Myant / Dumonkos 2015: 230). Hungary, by contrast, which adopted a system of works councils resembling those in Germany, has thus seen more links with German unions in their industrial relations system.[38]

The dominant level of collective bargaining is at the company level, which contributes to a dualisation of working conditions in the automotive sector. Despite the legal system of collective bargaining allowing for sector-level agreements between employers and employees, there is no automotive sector agreement. The main reason for this is the reluctance of the employers' association in the sector, AutoSAP, comprising around 200 companies operating in the sector. OS KOVO filed a court case to force AutoSAP to participate in collective bargaining in 2018. Nevertheless, there is a dialogue between OS KOVO and AutoSAP, and a signed memorandum of cooperation from 2012.

Links with foreign unions and broader social solidarity have limited weight in Czech industrial relations. As Drahokoupil, Myant and Dumonkos (2015: 223) note, "[g]iven the relatively weak industrial relations institutions in the region, the relative strength of labour is conditioned primarily by market factors and parent company contexts". Nevertheless, at multinational companies where European work councils operate, trade unions from Czechia usually participate and consider this a useful source of information about the company's future.

Škoda has the largest union organisation and has generally played a key role in setting union agendas (Drahokoupil / Myant / Dumonkos 2015). However, the union landscape has fragmented in recent years, with Škoda splitting away from OS KOVO in 2013. Czech dependence on FDI fundamentally weakens labour power, as employers can simply threaten to move jobs elsewhere. Worker bargaining power also varies on a regional basis, according to availability of local labour[39] and the culture of the respective factory. Soon after establishing in Czechia, for instance, Hyundai's plant became renowned for more conflictive worker-manager relations and even labour unrest – leading to an hour-long strike by 400 employees over compulsory overtime, shortly after the plant opened in 2009. The company was later fined.

38 Czech and Slovak unions resisted such councils, seeing them as "a threat to union dominance in collective bargaining" (Drahokoupil / Myant / Dumonkos 2015: 230).

39 There are usually worker shortages for Škoda, for example, but this was not the case for Hyundai.

A *Flexikonto* system has developed in the wake of the 2008 crisis, with legislation allowing its implementation at the company level, based on the agreement with employee representatives (trade unions).[40] Currently, around 8 percent of agreed collective agreements comprise a regulations of flexible work accounts (Myant 2019). Like Slovakia, however, finding well-trained and suitable labour has increasingly proven to be a bottleneck, with agency and migrant labour (often from Serbia, Poland or Ukraine) providing a flexible body of workers for employers. On Škoda production lines, for instance, workers are differentiated by the colour of their clothes: grey for Škoda employees, green for foremen, and blue for agency employees. While their presence was controversial in the past, working conditions of agency workers found itself on the agenda of trade unions at both company and sector level. However, agency workers are generally the first dismissed during crises, as happened in the face of COVID–19 in 2020. A dual labour market has therefore emerged, with pay and conditions in certain companies sitting way above others, while agency workers face irregular employment and more precarious living conditions (Kureková 2018).

ROLE OF R&D AND INNOVATION IN THE SECTOR

FDI dependence, such as that exhibited by the Czech automotive sector, can have very disparate impacts in relation to R&D, with the potential to both enhance or marginalise it. FDI has certainly modernised and functionally upgraded parts of the industry, bringing new technologies and capabilities to OEMs and suppliers. However, attracted by the low cost of 'unskilled' manual labour, it can also reduce these locations to mere assembly sites and adversely affect investment in non-production activities (Pavlínek 2008). Both dynamics have played a role in the Czech context, with OEMs having the majority R&D spend across the value chain – albeit heavily skewed by the dominance of Škoda in this regard (Pavlínek / Ženka 2016). State-owned firms already had substantial R&D departments prior to the end of socialism (Kureková 2018). While it was believed that Škoda's R&D would be moved to Germany after its acquisition by VW, as Pavlínek (2008: 216f.) writes, "the quality and experience of Škoda's engineers combined with their low cost compared to German ones, have not only saved R&D at Škoda but led to its substantial expansion". While "platform development" for the entire VW range has been concentrated in Germany, "Škoda's R&D has focused on the adjustment of the VW Group's platforms to use Czech-sourced components".

40 *Flexikonto* refers to a flexible labour accounting system Volkswagen uses to adapt labour to changes in demand.

Production in Czechia is still largely focused on the traditional ICE vehicle, with more novel processes reserved for 'core' automotive countries, like Germany.[41] Most of the major producers have, however, signalled their intention to produce EVs. Volkswagen said in 2018, for instance, that its last launch of a combustion-engine vehicle would begin in 2026 and is investing about €33 billion in electric mobility between 2020 and 2024, aiming to produce 3 million EVs by 2025 (Wappelhorst 2020). According to the main industry group, AutoSAP, out of 104,576 cars produced in January 2021, 3,493 were either EVs or Plug-in Hybrids (3.34 percent of the total) (AutoSAP 2021b). All of these non-conventional cars were produced by either Škoda or Hyundai.

At national level, Czech R&D expenditure rose from 1.23 percent of GDP in 2008 to 1.9 percent in 2018 – one of the largest proportional increases in that period across the EU (Figure 5). This remains well below spending in neighbouring Germany, however (Figure 6).

R&D EXPENDITURE (% of GDP)

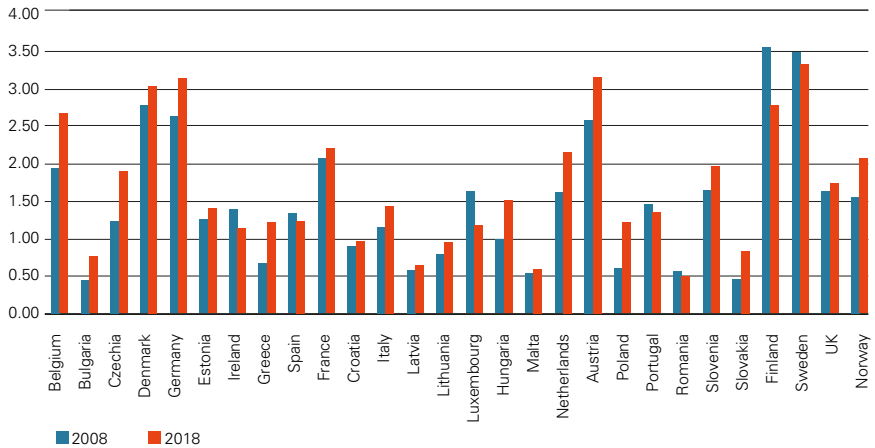

Figure 5. Source: Eurostat database, rd_e_gerdtot

41 For instance, with VW moving the production of their ICE Passat model to Czechia from 2023 (Drahokoupil et al. 2019).

R&D EXPENDITURE (% OF GDP)

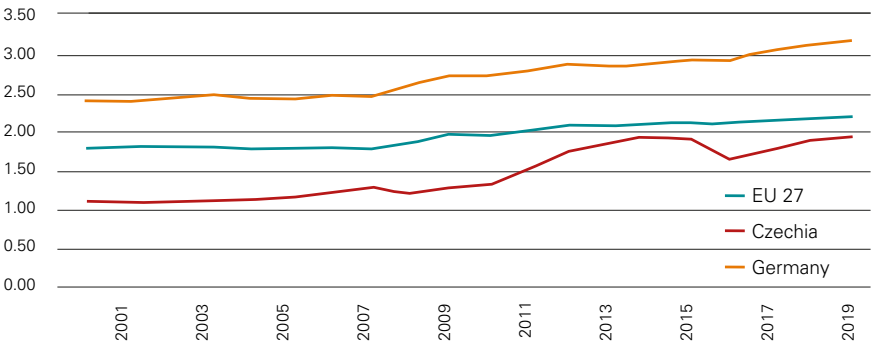

Figure 6. Source: Eurostat database, rd_e_gerdtot

With its own established car brand, the general landscape of automotive R&D is more developed when compared to neighbouring countries like Slovakia, for instance. Czechia spends more on automotive R&D than its Visegrád neighbours (Kureková 2018), with one calculation indicating that it spends more than the rest of the CEE region combined (Pak 2016). Numerous projects indicate this growing focus on creative and knowledge-based activities:

The private Škoda Auto University was founded in 2000. It is the only company-owned university in Czechia and, at any one time, offers Bachelor's and Master's programmes to over 1,000 future Škoda employees.

A Moravia-Silesia automotive regional cluster was founded by the Czech government, supporting "innovation activities, competitiveness and export capabilities of its 62 members (domestic and foreign firms, engineering service providers, universities, technical high schools and a regional development association of producers), through inter-firm cooperation and close links to state and regional institutions" (Pavlínek / Žížalová 2016: 343).

Most recently, a state-backed Mobility Innovation Hub was unveiled, in which Škoda is a key partner, which will facilitate collaboration and coordination between universities, industry, and the public sector on questions such as emobility, alternative drive systems and digitalisation.

EXPERIENCE WITH THE PRODUCTION FOR PUBLIC TRANSPORT AND OTHER VEHICLES

Looking beyond the car industry, Czechia has a rich history in the production of alternative transport – including public transport, such as trains, trams and buses. 24,374 people are employed in the "Manufacture of other transport equipment" in Czechia (NACE C30 – sbs_sc_sca_r2), an increase from 17,434 a decade earlier. This is substantially more than in neighbouring Slovakia, for instance, and the seventh highest in the EU, behind France, Germany, Italy, Spain, Poland and Romania.

According to the available data, Czechia is the biggest per-capita manufacturer of buses in the world (AIA 2017).[42] It produces around a third of all buses produced in the EU-27 (5,217 out of 15,510 in 2019, according to OICA, 2021), including electric buses and trolleybuses. While relatively small in terms of output, this production proved more resilient than the car industry in the face of COVID19 – declining only 2.8 percent year-on-year, producing a total of 5,070 buses.

42 Bus use accounts for 55 percent of public transport use in the EU.

The European Automobile Manufacturers' Association (ACEA) lists three bus producers in the Czechia – IVECO (formerly Karosa) in Vysoké Mýto is historically the largest, although its competitor SOR Libchavy, based less than 25 km away, has recently made production gains. Daimler AG (Mercedez-Benz) has had one of its six European production locations in Holýšov, in the west of the country, since 1998, employing 420 people in the production of buses (under its subsidiary name, EvoBus). Both SOR Libchavy and IVECO emerged from privatisation of state-owned companies at the start of the 1990s. SOR – which prior to 1990 had produced agricultural machinery – predominantly sells buses domestically (including to the City of Prague). IVECO, meanwhile, produced a record 4,612 buses in 2019, directly employing more than 3,900 people – making it one of the largest companies in the Pardubice region. It has a larger export market than SOR, exporting over 90 percent of its production (Hubený 2016). In all, 10,306 are employed in Czechia in the 'Manufacture of railway locomotives and rolling stock (NACE C30.2 - sbs_sc_sca_r2), one of the highest numbers in Europe. Based in the city of Pilsen, for instance, Škoda Transportation – no longer connected to Škoda Auto, though the companies share company branding – employs more than 5,000 people and produces around 100 trams and 200–300 trolleybuses per year. It recently fulfilled its largest order, providing 250 low-floor 15T trams to the City of Prague. Both conventional and metro trains are also produced in Pilsen and Ostrava and exported around the world. In 2015, Škoda Transportation bought a subsidiary in Finland – Škoda Transtech – which employs 650 people, producing locomotives and trams for harsh climates. In early 2021, Škoda Transportation won a contract to supply 40 trams to the city of Brno – the largest such order in Czechia in the previous decade (Sura 2021). The company has also recently supplied trams to a variety of cities, including Helsinki, Tampere, Bonn and Mannheim. The diversity of mobility producers creates substantial synergies and potential for collaboration. SOR Libchavy is working with a subsidiary of Škoda Transportation in the production of trolleybuses and electric buses. These have gone into service in various municipalities around Czechia and Slovakia. Suppliers also benefit from the strength of the sector – for instance, CIEB Kahovec supplies seats to both SOR and IVECO, as well as tram and metro manufacturers, employing over 200 people. The Třinec Iron and Steel Works (employing 7,115) supplies the automotive sector but also provides components (such as railways and tram tracks) for public transport infrastructure.

The Tier 1 supplier, ABB (a manufacturer of power and automation systems), is also a notable presence with 3,777 employees and a turnover of more than half a billion euros annually. The Swiss company has worked in rail infrastructure since 1891, today providing systems for electrification, rolling stock and much more. Siemens also has a strong position producing railway vehicles and providing among other mobility solutions and development of railway solutions in cities. Recently, Czech engineers in Siemens Czechia were involved in the supply of 20 electric railway units for the German state of Baden-Württemberg. Siemens employs around 8,600 employees, of whom 1,000 work in R&D.

More marginal in this area – in part due to unsuccessful joint ventures after the economy opened up – are truck and motorbike production. Tatra trucks – which throughout its long and illustrious history has also produced trains and cars – produces just over 1,000 trucks annually, while the historic motorcycle manufacturer JAWA (which has been producing motorbikes for almost a century) saw its production fall by nearly half in 2020.

Finally, Czechia is also a relatively large producer of bicycles, producing 476,662 units in 2019 (Eurostat PRODCOM – DS-066341), a 55 percent increase since 2012. The largest manufacturer is Bike Fun International (BFI), who employ almost 500 people, and produce about 200,000 bicycles annually (both traditional and electric) in the east of the country. BFI was started by a group of Dutch investors in 2001 and – given some of the potential crossovers between industries and skills bases – is located within the Tatra industrial complex in Kopřivnice. BFI also produces bikes for the Škoda brand, a tradition recognising that the car company started as a bicycle company.

QUALITATIVE PART – METHODOLOGY

For the qualitative part of the study, we conducted nine interviews with relevant stakeholders in Czechia (see Table 2 below). All interviews were conducted through online tools such as Zoom or Skype, and lasted around 60 minutes each. Interviews followed a pre-defined protocol of questions which respondents received ahead of the meeting. Interviews were transcribed and analysed with a qualitative text analysis software (Dedoose), using a pre-defined set of codes.

Code in text	Type of representative	Date when the interview was conducted
CZ01	Trade union representative at final car manufacturer	9 November 2020
CZ02	Trade union representative at final car manufacturer	27 January 2021
CZ03	Representative of automotive industry employers´ association	13 January 2021
CZ04	Expert, University of Ostrava	9 December 2020
CZ05	CzechInvest (state investment agency)	28 January 2021
CZ06	NGO/climate activist	21 December 2020
CZ07	Journalist	8 January 2021
CZ08	Management, final car manufacturer	4 February 2021
CZ09	Manufacturer of railway vehicles	5 March 2021 (written answers)

List of interviewees

QUALITATIVE PART

As in many other European countries, the transformation of the Czech automotive industry into an ecological mobility industry seems a challenging task. Based on qualitative analysis of the interviews with relevant stakeholders, we have identified the following types of barriers and opportunities for converting the production of vehicles with combustion engines to the production of electric and hydrogen vehicles and other ecologically more sustainable methods of personal and public transport.

EXISTING BARRIERS FOR A CONVERSION

First of all, it is important to note that Czechia has a long tradition in the production of different types of vehicles, beside individual cars, including production of buses, trains or bicycles. Exporting these around the world, it is clear that Czech companies do not lag behind the world leaders in terms of work organisation, productivity or technology. However, personal and public transport are still quite different worlds, which do not compete directly, and there are no significant discussions evident between the producers. However, as the representative of the company that produces electric buses, trams and trains for public transport

explains: "[A] certain development process is taking place, when individual and public transport are looking for their future place in transport. In the future, the two worlds will be much more technologically interconnected, especially in energy resources, digitisation, IT, etc. Public transport will see further improvements in terms of comfort and reliability. Passenger transport will look for new uses and operational approaches." (CZ09)

In general, while Czech employers in vehicle production sector consider themselves relatively ready for transformation in the broader sense, carmakers are more interested in the growth of sales than in active efforts to switch to ecological and public forms of mobility. They can imagine other possibilities than just the shift to individual e-mobility and they are not afraid that Czechia wouldn't be relevant for this kind of production. However, OEMs are focused on increasing sales of EVs, and are more concerned about the readiness of consumers for individual e-mobility than any more comprehensive challenge to their business model. They are "much more worried that the market isn't there. That they are forced to change their product and at the same time see that there is no demand. This is a much bigger problem" (CZ06). Due to a presumed conservative attitude of Czech citizens, the strategies of companies in this region are specific even for individual electro-mobility: "I think that mental or ideological readiness, as you say, is very low. We try to present the user experience with the car, how it is driven, how comfortable it is, how it works, rather than waving the flag that it is a low-emission hybrid car." (CZ08) This conservative attitude to alternatives in the transport system is considered to be one of the main barriers for conversion by most of the respondents and is represented in other barriers too, as we will point out.

When we look at the readiness of employees, another barrier emerges. According to our respondents, every company has its own strategies or business plans for the future, meaning that the outcome of the transformation (of both individual and public transport) for the employees cannot be generalised. On the other hand, we perceive that company representatives tend to undervalue this issue when compared to trade unions. For employers, it is just a simple question of the change in the structure of working positions: "Some will disappear, and a number of new ones will emerge. Complex transport with complex competencies will create a number of new professions requiring a higher professional level." (CZ09) However, trade unionists feel that some employers don't care enough about the future challenges for workers that will come with the electrification of production and with other trends such as automation, Industry 4.0, etc. As a result, the

employees themselves don't think a lot about these impacts either and they are not interested in preparation for the changes: "They can't imagine it, and then one day they [employers] come and say, 'You, look, we already have the law here, we have to have people with such and such a stamp'." (CZ01)

Employers and trade unions agree that the industry will move towards increasing technological and knowledge demands. If the industry does not want to downgrade in value chains (produce simpler parts, carry out more assembly activities, etc.), it is necessary to focus on the employees' education and requalification. As an expert in the field of the automotive industry noted: "The demand for technical education is not enough to satisfy the demand of companies" (CZ04). Therefore, employers have to invest in the lifelong learning of employees. "We need workers who will change the know-how in the areas of batteries, replacement, battery management, all of which undoubtedly lead to an increase in the number of at least medium-skilled workers in our industry, at the expense of the less qualified" (CZ03). According to trade unions, this is already happening: "So far, the only thing that's going on is that they're trying to retrain a certain group of employees and, to put it mildly, turn them into light electricians. These are the people who do repairs to those cars in terms of electrical wiring, fuses and the like. And now they're doing some kind of training for them so they can work with that electric car." (CZ01) But the problem is the pace of changes in the working conditions related to trends of automation and digitalisation: "This is where the IT trend begins relatively quickly. Those people can't do it because they haven't been given enough care to understand the manuals." (CZ02) Therefore, trade unionists stressed that their role is to push the employer to invest more money in training and education and those areas that are highly needed (not short field visits to Korea or Germany for one week). "The unions should not start dealing with this when it happens because then we are in the role of, as they called it, firefighters, trying to put out what we can at the last minute. We need to proactively try to inspire the management in some way right now, so that the employees are already starting to educate, requalify and so on." (CZ01)

Even though employers could have a proactive attitude, other obstacles make it more challenging – namely, administration and bureaucracy. The companies that need to engage in this process the most (small businesses) cannot afford to set aside a person or an entire department to deal with the complex administrative side of education and requalification activities. "And eminently, it should also be of interest to the state, which should support it at least financially, because it

will pay off for them in the sense that these people will not end up in the labour office, they will not have to pay them unemployment benefits. This money can be effectively invested in getting those people paid for courses, which will be run, for example, by a private entity or a university, and the employer will actually organise it, i.e. it is necessary to have it as a cooperation of these three entities." (CZ03)

This leads us to another barrier mentioned by respondents and that is the state and policymakers' readiness in the process of conversion to individual e-mobility and public mobility. Both the employers and the trade unions are of the opinion that legislators have fallen asleep at the wheel. So far, there are no obligations in the legislation for employers to train employees for high-current work, for example. "Even in this, there is a rare agreement with employers who are active in automotive. They care about the business, and unions care about people. Well, the third player in the tripartite dialogue is missing because he is asleep. This is neither the fault of trade unions nor employers. The legislators have other worries now." (CZ01) Respondents argue that the readiness for low-emission transport is not a highly discussed topic in Czechia, and they think that the government should play a crucial role in this. "When you talk about low-emission traffic in Czechia, a single word emerges: that word is subsidies, or scrap fees, or something that, [which] of course, no one wants to give and approve because it is complicated and expensive." (CZ08) Even in an international comparison, the Czech state is considered to be a brake that is slowing down the shift. The interviewed climate activist, who has also been involved in the automotive sector, points out the parallel with the foot-dragging of the state in climate politics in general. "And these are normal tools that politics has, and they could regulate or intervene in that market. But so far, they are not used here in Czechia. But at the same time, it is consistent, that is why we are climate sceptical in this country." (CZ06) Some of the respondents suggest that the upcoming changes in the industry are also not a hot topic for the current government because Czech Prime Minister Andrej Babiš is seen as an "agrarian deep in his personality" who "has no engineering DNA in him at all" (CZ02).

The unpredictability of the changes in the automotive sector is an obstacle with which all of the stakeholders have to work in some form. More strategic and long-term thinking appears to be absent among carmakers, as they are often simply reacting to a new European legislation: "Carmakers and the market in general simply need a kind of transparency and a little idea in advance where they are going and what will happen. They also need some time to adapt to those standards. In fact, every year,

a new standard, new rules are created; they don't even have time to catch up with the previous standard and a new one is already on the table. So, here the complexity of the process actually complicates life a bit in the sense that not everything is being prosecuted as planned on paper." (CZ05) It is difficult for producers to predict which technologies to invest in more. Especially when the development process requires huge amounts of finances and a lot of time to produce relevant products for the market in terms of financial availability and security. "[I]t is important to realise that the research and development of these new technologies today is 99 percent financed by internal combustion engines." (CZ03)

This unpredictability has a negative impact on employees as well. A member of the trade union brought this issue up in relation to the requalification process. "The EU will give the deadline: 'Then and then it will be ready'. And they will launch it quickly, and it will not be sufficiently prepared at all." (CZ01) Because no one can learn fast enough, unprepared employees might be the hardest hit, with trade unions that cannot change the situation or protect their members. Actors across the sector as a whole appear to be playing catch-up, then, leaving the underlying mobility paradigm unquestioned.

Moreover, the unclear market direction could become a significant barrier to conversion towards public ecological mobility in general. Growing support for the simple shift of production from passenger cars with combustion engines to cars with electric engines means that the companies do not count with more radical changes in their production in the near future. "In terms of those production programmes, the carmakers today in many cases simply bet everything on electro-mobility, and now they will have to stick to it, tooth and nail, because they invested a lot of money into it." (CZ08) A representative of the employers' association in the automotive industry was sceptical about the transition to e-mobility that is currently being pushed by the European Commission: "Emobility is just beginning. We all know in the industry that this will be the case for 20 years and that it is a dead end and a fashion choice into which the European Union is simply forcing us now. There is no choice, so we will simply have to look into that dead-end for 20 years, and we will have to endure it. And then they find out it doesn't work." (CZ01) On the other hand, for the journalist in our sample of respondents, electric cars are the future, because the variability of electric power sources. While electric power resources can change towards ecological and efficient way of production and distribution, the power train in the electric car will remain the same (CZ07).

Partly related to this issue is Czech anti-EU sentiment, perhaps reinforced by the fact that much of the industry is controlled from outside of Czech borders. As one of our respondents described: "In Czechia, the basic attitude is that the bad Brussels dictates it. This is a basic attitude among the public, experts, carmakers, politicians, and so on. And this is the basic enemy against which everyone stands." (CZ08) We even observed this attitude during our interviews when one of the trade unionists stated: "So we will slowly change the world, and if you make a car, you will pay a fine and it will be shared in Brussels. And they'll get it as a salary, or they'll put it into research and buy a device that sucks up CO_2 and improves the climate, and Greta will be happy." (CZ02) Insufficiently explained and implemented EU regulations in this region are often seen as counterproductive interventions: "And when they start to feel that the EU is forcing them with electric cars that they don't want, that can be a problem." (CZ07)

It is impossible not to mention the barrier of undeveloped and underfinanced infrastructure for both individual and public ecological mobility. While Czechia has extensive public transport infrastructure, stakeholders agree that further investment in technological infrastructure is needed. However, municipalities do not have many tools or resources, so it needs to be managed from a more central

level. On the other hand, as already mentioned, the state is not proactive on this issue. "The problem is that it requires quite a large financial investment and, most importantly, it must be grasped conceptually. So, I think it also takes time to come up with it and somehow compile the strategy of how to proceed so that it is as advantageous and meaningful for the given city" (CZ05). The producer of public transport is aware of EU strategy which clearly states the need to reduce individual passenger transport in larger cities. This relates to the need of fundamental development and improvement of public or shared transport. However, "[u]nfortunately, I don't know many projects that follow this trend. At present, the most well-known trend (a partial success) is probably the construction of cycling routes, which will not solve traffic fundamentally. In many cases, this is solved only by repainting the current roads without any connection to other existing networks." (CZ09)

Even in terms of individual electro-mobility, the situation with infrastructure is not clearer: "It's a long-distance run for decades. On the other hand, it's still a debate about chickens and eggs: which was here sooner? This means that if there are not enough cars, there are not enough supplies at those stations, it is not worth building more stations, and if there are not enough stations, there will never be enough cars." (CZ03) According to a member of the trade union, the shift to 100 percent e-mobility (individual and public) is not possible at all right now. "First of all, there is no infrastructure here; it is not clear how much electricity would be pumped into it and from what sources; if we are completing Dukovany [nuclear plant], or another power plant that is already here, whether there are enough resources to produce batteries, etc." (CZ02) There is no discussion of the energy sources for charging and producing a 100 percent emobility fleet.

The last noteworthy barrier that we have identified in this region is a strong perception of owning a car as a symbol of social status. In Czechia, shared mobility or ecological mobility concepts is still considered as a necessarily evil and not as an appealing future of socially and ecologically sustainable forms of transport. "There is a lot of talk about the fact that it is more pleasant than owning a car, but in Czech conditions, for example, this is not the case at all. When people put their car keys on the table, it means something to them." (CZ08) Again, the state is seen as a crucial mover and shaker in this transformation: "I don't think we're mentally prepared for that. In our country, the car still has status, in the sense that in which car people see you, they will judge you accordingly and so on. But I think the state could do a lot about this without having to spend a single crown on subsi-

dies, they should explain why it is harmful. It's a stupid example, but once upon a time the state played a big role in this, for example, in [discouraging] smoking." (CZ08) Stakeholders consider it necessary above all to change the thinking of both citizens and politicians. For those who are trying to come up with a solution, this situation is really frustrating: "This is what I experience every day as a climate activist. It's annoying actually to go against the flow with that activism. When I buy an electric car, here in the Czech context, I am the jerk who paid more. And I still cannot drive 800 kilometres, but only 300 kilometres." (CZ06)

Changes in the technological field will not be crucial for success; it is instead a question of changing consumer behaviour, social patterns and organisational change. However, the technological area has the most attention, and also contains the most significant advances (efficiency of internal combustion engines, development of alternative engines, etc.); on the other hand, people buy more SUVs and larger cars with higher consumption, and we see an increase in the use of cars in general. Zero-emission mobility is not a possibility while maintaining current developments and consumer behaviour (CZ04). Furthermore, more radical thinking will be needed if environmental goals are to be met: "In Czechia, we have 5-6 million vehicles in the fleet and the change every year is 200250,000 new vehicles. Making a calculation on that basis, if we constantly change the fleet, then the real exchange of all vehicles in that fleet will take place no earlier than 2530 years from now." (CZ03)

OPPORTUNITIES TO SUPPORT A CONVERSION

NECESSARY POLITICAL INCENTIVES AND INITIATIVES

As we have already mentioned in the text above, a lot can be done at state level. The representative of the economic planning authorities suggests changing the setting of investment incentives to support higher added value. By law, there is no help or motivation to support green technologies. "I don't think there is a financial advantage, or a higher tax deduction, or anything like that. Compared with some other countries, for example, we are missing a bit because the support is simply not so significant." (CZ05) Trade unions would like to see a greater effort on the part of the state to set a social trend that will address the future of transport systems. The problem is that the politicians themselves have not fully grasped the magnitude of upcoming changes: "I often have discussions with various political representatives and so on, but they actually see only subsidies, only direct money to buy new cars" (CZ08). If we look at the regional level, we see that there are

no policies or cooperation, even though cooperation between municipalities and companies would be worthwhile for both carmakers and manufacturers of public transport infrastructure.

What we cannot omit in this section are highly discussed incentives from EU level. The automotive employers' association observes a significant discrepancy between how the tax policy towards zero-emission mobility is regulated at the European level. According to them, it is incredibly inconsistent across Europe, and the tax policy is dependent on the GDP of a particular country. Today's purchases of vehicles are basically based exclusively on either subsidies or a significant tax advantage in the strong economic states in Europe, which is probably not the right model. The carmakers propose a uniform tax rule for the EU states. However, there are some other options: "There are various models of how to motivate zero-emission mobility. Currently, CO_2 taxation is being considered based on the mileage using a CO_2 registration tax, or it is possible to support zero taxation in territories such as Czechia. And it is there where we see a discrepancy between the fact that the European Union, on the one hand, regulates manufacturers in order that they should produce those vehicles. On the other hand, customers are not motivated to buy and operate those vehicles in many countries. It's just that ecology plays no role from a human or fiscal perspective. So, of course, the situation is tough, while the direction of Europe to some reasonable economic path can be controlled." (CZ03) The carmakers would, therefore, like European policy towards zero-emission mobility to be more precise.

The final set of proposed political incentives and initiatives is related to the development of infrastructure. Manufacturers of public transport infrastructure stressed the need for international cooperation: "For better and more efficient operation of future transport, some discussion and harmonization will be very important, quite possibly essential. One of the opportunities is the C-Roads project." (CZ09) Even though the CRoads[43] project does not seem to be relevant to these manufacturers, they claim: "It should bring about substantial connectivity between means of transport and systems. We certainly cannot see all the benefits that this connection can bring us today. There will certainly be a number of new business and development opportunities." (CZ09) When it comes to development of infrastructure for e-mobility, some discussion, for example, with the most important

43 According to CRoads (n.d.), this is "a joint initiative of European Member States and road operators for testing and implementing C-ITS [Cooperative Intelligent Transport Systems] services in light of cross-border harmonisation and interoperability".

energy authority, about special tariffs for charging points is definitely a topic that could help develop the network in Czechia: "We have free motorways here [and] free parking, which are […] great things, but they are not things that would clearly motivate you to buy an electric vehicle." (CZ03)

EXISTING THEMATIC LINKS

The transformation of the industry into the ecological mobility industry will most likely be achieved through development of public transport and shared mobility. This development will also be prompted by the share of individual cars being too high, making car transport less and less comfortable. Thus car saturation might be an important factor which will increase demand in public transport and shared mobility (CZ08). The three biggest cities in Czechia (Prague, Brno, Ostrava) are well connected by train and it is more comfortable to travel those routes in this way than by car; nevertheless, other cities are much more difficult to reach by train (CZ06; CZ08). The car industry employers' representative also claimed that especially in the cities and urban agglomerations, public transport should be given greater importance (CZ03).

A trade union representative in a final producer mentioned changing consumer preferences towards shared/public mobility as an important factor in conversion to an ecological mobility industry: "It used to be a value to have a car, but now more and more young people consider it only a means of transport, no matter what type it is" (CZ02). This was also backed by a climate activist: "Young people say 'I have enough of my own troubles; I don't want to have to bother with a car and its maintenance'" (CZ06).

For many respondents, the transition to electric cars is viewed as a clear improvement in terms of meeting climate goals and thus proposed several reasons why the car fleet replacement should be supported in Czechia. Respondents emphasised that not just ecological reasons need to be highlighted when arguing for the transition to ecological mobility industry. "We should speak about non-ecological reasons such as lower costs of electric car services and longer durability of parts. Most probably, also batteries will be replaceable in the future, so the life of one model will prolong significantly." (CZ07) Another advantage of electric cars which should be emphasised when arguing for transition is that the source of electricity is variable. "There are several potential ways that electricity can be produced in the future, and thanks to electric cars we won't need to switch to other power technology in the cars, since the problem with power sources will be placed

outside the car, to the power plants." (CZ07) Another practical aspect worth discussion is how electric/hybrid cars are much simpler to use than conventional vehicles. There should be more opportunities to try these cars and demonstrate how easy to drive they are (CZ03; CZ07). A representative of the state investment agency thinks that more incentives to convert to zero-emission cars are needed in Czechia (CZ05). "These practical reasons are better to pronounce in discussion here than the abstract calls to ´save polar bears´", concluded one of the respondents regarding this issue (CZ07).

Another set of arguments for the transition to electrically powered vehicles was about improved air quality in cities. As one respondent suggested, similar to discussion of the consequences of smoking on health, it is important to pronounce that current extensive use of conventional cars causes a high incidence of respiratory diseases. "The reason to care about zero-emissions cars is similar to reasons why we recycle or why we care about our lifestyle" (CZ08). A climate activist added: "There is always talk of how painful this change is, but no one talks about how painful the current situation is" (CZ06).

POSSIBLE ALLIES IN THIS FIGHT

Respondents perceived consumers to be an important element to reach conversion into the ecological mobility industry, but at the same time claimed that people are not ready, are uneducated about changes, or sceptical about them. They also lacked incentives to increase consumer interest in ecological modes of transport, be it education campaigns (CZ08) or financial support for buying electric cars (CZ03). The NGO activist claimed that demand for non-individualistic mobility solutions should be population-driven: "There is no point in simply replacing conventional cars with electric cars, it is not a solution" (CZ06). Diminishing the preference for car ownership might be also an important factor in reducing demand for cars and at the same time may contribute to the increase in shared mobility concepts (CZ05).

The state is an important actor when it comes to conversion to ecological mobility, not least because it could accelerate the change through incentives. "Market forces will finally lead to conversion, but this might be too late. We need incentives to make [conversion] the cheapest and the most comfortable solution." (CZ06) The state should provide more support for companies in their ecological conversion. "This is not supported at all in Czechia, [there is] no legislation to make use of renewable resources in companies more advantageous for them." (CZ05) The

government itself should be more oriented towards ecological mobility support, but this is lacking for now (CZ03). Also, the allocation strategies for building infrastructure seems to be mismatched to the actual needs. In the future, cities could more easily eliminate individual transport, and thus less chargers might be needed there, while the countryside will more likely remain dependent on individual transport, but chargers are not being built there. The state should also improve life-long learning and coordinate it with employers' needs to ensure a just transition (CZ03).

Representatives of final producers of both public transport vehicles and cars together with the NGO activist highlighted the importance of local level initiatives and policies when it comes to transition into ecological mobility. "This is not happening now, but if there is a relevant demand from a specific city, any car producer would be ready to cooperate," claimed an OEM representative (CZ08).

Trade unions should be more active in convincing/forcing companies to search for ecological solutions in their operations and to ensure employment for people. "If trade unions want to survive, they need to start to say: "Hey, we do not want now this percentage increase now, but rather we want you to invest in ecological heating or solar energy in our company"" (CZ02). "Trade unions should force employers to give more money on education to those areas that are expected to be needed in near future" (CZ01), claimed a trade unionist from another OEM operating in Czechia.

IMPACT OF CONVERSION ON EMPLOYMENT AND DIVERSIFICATION OF THE INDUSTRIAL PRODUCTION

In our interviews we noticed significant differences between employers and other respondents when discussing the impact of conversion on employees. Employers' representatives claimed that they are not expecting a big switch in terms of production or employment reduction. "For workers, there won't be a huge change, but sure they will need to requalify. These requalification courses should be short and focused, lasting several months only. We need to define curriculums, and places where it will be taught – [such as] high schools and universities." (CZ03)

Nevertheless, other respondents, who were able to recognise profound changes in the industry claimed that transformation will undoubtedly be painful for employees. The reason for this is that current goals for emissions reductions are increasing quickly, which also forces the automotive industry to accommodate quickly. Without radical safety nets this will not be without negative consequences

on employment, claimed the representative of trade unions and the activist (CZ06; CZ08). An academic researcher added that most of the actions in facilitating just transition will mostly concentrate on harm reduction for employees (CZ04). The climate activist expects that transition will be painful for employees, especially for older ones who will need to requalify. For those, early retirement schemes may be necessary (CZ06).

The main reason why employers do not expect major changes in the industry is that they still hope for a smooth replacement of ICE cars in favour of alternatively powered cars. "I would say that a final outcome for automotive will remain the same in terms of production. We should continue production no matter what power is used." (CZ03) Nevertheless, the OEM trade union representative claimed that he expects that shared mobility will increase demand for vehicles able to transport several persons at once, a view shared by the climate activist.

In terms of diversification of production, the OEM representative claimed his company is ready to produce non-conventional cars if demand for other solutions increases. The manufacturer of railway vehicles (trams) also suggested that since it is difficult to ensure truly zero-emission vehicles, saying: "[W]e should concentrate on higher efficiency of the vehicles we have at our disposal now" (CZ09).

Diversification of industrial production might hit suppliers more than final producers. First, because of the uncertain outcome of the transition, they need to follow several promising technologies and solutions and invest enormously in different technologies (CZ03). Second, if e-mobility developed, production of simpler parts with lower value added would remain here, while batteries would be imported from Asia (CZ08).

CONCLUSION

In the study, we focused on two interconnected and emerging issues in the mobility industry. The first was the accelerating production of alternatively powered vehicles in the automotive industry, the second was the consumption of mobility, i.e. individual preferences and local-level options to increase the use of ecological mobility. The first topic, the transformation of the car production into alternatively powered vehicle production was a highly relevant issue for employers and trade unions because of the high level of employment and economic importance of the car industry for the country. The second topic was mostly pronounced by the experts and climate activist who emphasised the need of more comprehensive changes in transport patterns to save the environment. These two topics interact,

especially when it comes to individual mobility patterns and local level initiatives to improve local transport systems towards green mobility solutions, where the important actors are the state and local-level institutions.

Transformation of the production capacities of car producers to products other than individual cars was not an unknown topic to interviewees, but was not deemed relevant for current production plan changes in the companies. In other words, employers conceive of the possibility of conversion of their production and recognise this as a back-up strategy at the multi-national corporation level, but this does not affect immediate strategies focused on production volumes. From a consumption side, transformation to ecological mobility patterns (shared mobility, public transport) was demanded by some respondents but at the same time not observed at the local level because of missing local capacity and a lack of consumer preferences for ecological mobility.

Czechia is in the relatively unique position of having existing high usage of public transport and a series of public transport manufacturers (e.g. of buses and trams) already meeting internal demand for ecological mobility. The Czech case shows, however, that despite diversified production capacities in the country, these are disconnected from changes in the car industry. First, this is because of the lack of political preferences for ecological mobility and the absence of local-level strategies to enhance public transport as an alternative to individual mobility. Second, it is because of unobserved changes in employment level in the car industry, and thus lack of comprehensive strategies from trade unions demanding a just transition in the industry. Last but not least, this disconnect stems from the significant presence of foreign capital in the country, with decisions about production and regulation made outside the country. Connected thinking regarding the role of the state in creating a framework conditions for ecological mobility, and the role of the municipalities in providing ecological mobility options, is crucial in the transformation process of the industry.

LIST OF INTERVIEWS CONDUCTED

Trade union representative at final car manufacturer
9 November 2020

Trade union representative at final car manufacturer
27 January 2021

Representative of employers´ association in the automotive industry
13 January 2021

Expert, University of Ostrava
9 December 2020

CzechInvest (state investment agency)
28 January 2021

NGO/climate activist
21 December 2020

Journalist
8 January 2021

Management, final car manufacturer
4 February 2021

Manufacturer of railway vehicles
5 March 2021 (written answers)

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SLOVAKIA

TRANSITION OF THE AUTOMOTIVE INDUSTRY TO AN ECOLOGICAL MOBILITY INDUSTRY

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TABLE OF CONTENTS

INTRODUCTION

Slovakia is a small, export-oriented economy, where the car industry dominates exports and GDP. The vast majority of car producers and their suppliers settled in Slovakia in the 2000s and 2010s. While an increasing share of car production made Slovakia the world's biggest producer of cars per capita, at the same time it became highly dependent on this industry and thus vulnerable to changes not under its control. In a situation where the industry itself is facing multiple challenges, Slovakia is threatened by an eventual decrease in employment in this industry, but also by a changing composition of production. Transformation to an ecological mobility industry might be an opportunity to preserve workplaces in the country, but would require the active involvement of local actors.

This report aims to provide an answer to the question of what the transformation of the industry could look like in Slovakia and what should be done to make it just for employees. For that purpose, seven interviews with relevant stakeholders were undertaken and desktop research concentrated on examining the current situation in the automotive and other mobility industries. In the first part, we introduce the basic figures and numbers of the Slovak automotive/mobility industry and discuss its position from a global perspective. In the second part, we analyse interviews and discuss barriers and opportunities for transformation in the country. In the last part, we analyse Slovakia's prospects for the transformation of the automotive industry into an ecological mobility industry.

QUANTITATIVE PART

After decades of rapid growth in the automotive manufacturing sector, Slovakia now stands as the world's number-one producer of cars per capita, producing 202 cars for every 1,000 inhabitants in 2019. The acceleration in car production over recent decades has been rapid: While Slovakia produced fewer than 3,000 passenger vehicles in 1993, it had broken the 1million mark by 2015 (Pavlínek 2017: 186). While it does not have the largest automotive sector in absolute terms, it is the sixth largest producer in Europe and the country in central and eastern Europe (CEE) in which the industry plays the most central role, accounting for 49.5 percent of total industrial production. Cars are now Slovakia's number-one export, amounting to USD 21.6 billion and accounting for almost half of its total exports.

Production dipped slightly in the wake of the 2008 financial crisis but quickly rebounded (Giorno 2019). This relative resilience was repeated with the initial production shut-downs during the initial stages of the COVID19 pandemic in early

2020. According to OECD figures, the immediate recovery from COVID19 shut-downs in the automotive industry was faster in CEE countries than the rest of the EU, returning to normal production levels by September 2020. However, overall production still ended up 11 percent lower than in 2019 (Figure 1).

ANNUAL CAR PRODUCTION SLOVAKIA, 1999–2020

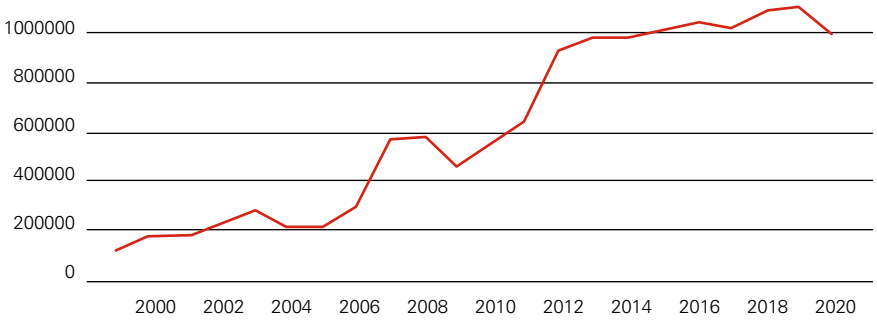

Figure 1. Source: OICA 2021

The importance of this industry to Slovakia's formal economy is a relatively recent development, however. Unlike neighbouring Czechia, the country does not have an automotive history preceding World War II (Pavlínek 2017), though there is a history of post-war manufacturing of light commercial vehicles, tractors, locomotives and some cars in the regions of Trnava and Žilina, under the control of the socialist government (Jacobs 2016). Despite botched attempts to build a large automotive factory (known as BAZ – *Bratislavské automobilové závody*) in Bratislava in the 1970s and 1980s – a place with no prior history with the industry – it was not until the late 1990s in the post-socialist era that automotive manufacturing took off.

Since the Slovak economy opened up to foreign investment, the automotive sector has come to comprise about 13 percent of GDP and provides one in ten of the country's jobs – almost 300,000 – directly and indirectly. The industry is overwhelmingly dominated by the production of the private car. OICA figures, for instance, show Slovakia produced just 450 commercial vehicles in 2000, falling to zero by 2004, where it has remained until very recently when production of off-road buses was launched in 2016, but this involves the rather niche production of specialised vehicles.

THE ROLE OF FOREIGN DIRECT INVESTMENT AND SLOVAKIA'S POSITION IN INTERNATIONAL VALUE CHAINS

Since the decline of the Eastern Bloc, shifting production to CEE has been a key tactic in the automotive industry's search for profit: of 460 new automotive factories built in Europe between 2005 and 2016, 95 percent were located in this region (the vast majority in Poland, Czechia, Slovakia, Romania and Hungary) (Pavlínek 2020). Similar to other countries in the region, Slovakia's automotive sector is defined by export-oriented Foreign Direct Investment: 95 percent of jobs created in the region's automotive industry in recent years have been by foreign firms (Pavlínek 2020). By way of contrast, in Western Europe, the trend is reversed: 60 percent of jobs were created by domestic firms, and 40 percent by foreign firms. The domestic firms which are present in Slovakia are usually found in lower tiers of the automotive supply chain (Tiers 2 and 3).

All four of the key OEMs located in Slovakia are from abroad – Volkswagen (Germany), Groupe PSA (France), Kia (South Korea) and Jaguar Land Rover (UK/India). Out of all the CEE countries, Slovakia has the highest level of foreign control of the automotive industry – foreign capital accounts for 98 percent of production value, 97 percent of gross investment in tangible goods, 93 percent of people employed in the industry, and 96 percent of value added at factor cost (Pavlínek 2018). One index of foreign control in the automotive industry – including factors such as turnover and number of employees – ranks Slovakia first in Europe (Table 1).

INDEX OF FOREIGN CONTROL IN THE EUROPEAN AUTOMOTIVE INDUSTRY, TOP 3 AND BOTTOM 3, 2015.

Country	Index Value	
Slovakia	97.1	Top 3
Hungary	94.9	
Czechia	91.4	
France	22.5	Bottom 3
Italy	20.9	
Germany	14.6	

Table 1. Top three and bottom three countries selected from Pavlínek, 2018. The index is the average value of the share of foreign controlled enterprises in terms of production value, value added at factor cost, gross investment in tangible goods, number of persons employed and turnover or gross premiums written.

In a pattern replicated elsewhere in the region, the Slovak car industry first emerged with direct acquisitions of local manufacturers and joint ventures, later taking the form of greenfield plants (Domanski / Lung 2009). Volkswagen (VW) was the first company to enter in 1991, taking an 80 percent stake in formerly state-owned BAZ in Bratislava (rising to 100 percent in 1994) (Jacobs 2013). The company was attracted by labour costs which at the time were around a tenth of those in Germany (Pavlínek 2017). To this day, VW remains Slovakia's largest industrial exporter and employer (currently with around 14,000 employees) (Jacobs 2013). Germany is also the largest export destination for Slovak-produced cars, with about a third of total production ending up there.

For Jacobs (2016: 9), the development of the west and north-west of Slovakia into an automotive manufacturing hub "has been a prime example of how FDI has driven economic growth within certain post-Socialist nations". The country's attractiveness for investment has not just depended on access to low-cost labour, however (Domański / Lung 2009). Like neighbouring states, such as Poland and Czechia, Slovakia has provided attractive growth and profit opportunities to foreign capital due to a combination of: a) its low wage structure and 'docile' labour force; b) being geographically close to large markets and automotive powerhouses, such as Germany; c) being part of a macro-regional trade agreement (the common EU market in the case of Slovakia); and d) the provision of lucrative investment incentives by the state (Pavlínek 2018).

The newly independent Slovak government, while initially not oriented towards attracting FDI, eventually repositioned itself on this issue around 1999, when it launched its *Development of the Automotive Industry* initiative (Jacobs 2016). These emulated developments in neighbouring countries, particularly Czechia, and was strongly encouraged by existing investors (particularly VW, which followed with strong expansion) and neoliberal institutions like the IMF and World Bank (Jacobs 2016; Pavlínek 2017). At this time, apart from lowering the corporate tax rate and adopting a more flexible labour code, the Slovak government offered tax holidays of five years to qualifying investors.

Groupe PSA followed VW's lead and entered Slovakia in 2002, drawn in by labour costs 75 percent lower than those in France. Kia started production in 2006 and, most recently, Jaguar Land Rover opened its plant in Nitra in 2018. The decision by foreign capital to locate in Slovakia is generally preceded by company management playing neighbouring countries off each other, facilitating escalating incentive concessions. The Slovak state has been particularly accommodating in

this regard, resulting in a condition described by researchers as 'corporate capture' and at times prompting protests from neighbouring governments for possible violation of EU regulations. For the most recent entry, JLR, the Slovak state even tweaked its *Investments of Significance* law to allow it to offer greater incentives (Foy / Sharman 2015).

Incentives offered by the Slovak state have gone beyond tax breaks, and, in the case of VW, include building a motorway connection to the VW plant (at a cost of €330 million), constructing 1,000 apartments for VW workers in Bratislava, upgrading a railway station and providing land for supplier parks. Similar incentives have been laid out for other car companies, including a French school in Trnava (for PSA) and an English-language school for the children of Kia's South Korean employees. Kia's incentive package was the most lucrative for private capital, amounting to approximately €982 million (Jacobs 2016). The recent JLR investment amounted to €1.4 billion, for which Slovakia provided state aid of €129 million.

As a result of this pattern, decisions with major impacts on the region are often made in multinational headquarters in Germany, France or South Korea. The government is highly dependent on the whims of foreign capital and the immediate possibilities for local innovation and autonomy in responding to global developments are thus relatively low. For instance, automotive producers generally move their more price-sensitive models and lines to CEE, while keeping their premium lines and R&D activities in closer proximity to company headquarters (Krzywdzinski 2019). Indeed, Slovakia's role as a place of more routine assembly-based tasks is evident from its domestic value added in the automotive industry (standing at just over 30 percent). This is the lowest out of the Visegrád Four countries – in Poland, by comparison, this figure is 53 percent (Dębkowska et al. 2019).

Investigating Slovakia's position in the division of labour of automotive global production, Jacobs (2016: 2) draws on world systems analysis to argue that, while creating jobs, FDI has cemented the country's status on the economic periphery. The city-regions of the Bratislava-Žilina Corridor, where most production is located, are "important loci for car production, [but automotive FDI] also has made the economies of its city-regions overly dependent upon core-based, foreign transnational corporations (TNCs) in the highly cyclical motor vehicle industry" (ibid.).

STRUCTURE OF EMPLOYMENT AND WAGES

The past two decades have seen enormous growth in automotive manufacturing employment in the CEE region in general (Figure 2), with the Slovakian automotive industry being a particularly striking case. 122,800 people were employed directly in the car industry in 2019 (84,000 men, 38,800 women) (Eurostat [lfsa_egan22d]). Alongside the OEMs, employment is distributed among around 400 automotive companies operating in the country, of which 57 are Tier 1 suppliers, 79 Tier 2 suppliers, and 83 Tier 3 suppliers (Martišková 2019).

While automotive manufacturing enterprises provide 18 percent of the country's industrial employment, this is very concentrated: VW alone provides 14,000 direct jobs, as noted above. Indeed, VW is the largest private employer, not just in the automotive sector, but in the entire country.

AUTOMOTIVE INDUSTRY EMPLOYMENT GROWTH IN THE VISEGRÁD FOUR COUNTRIES

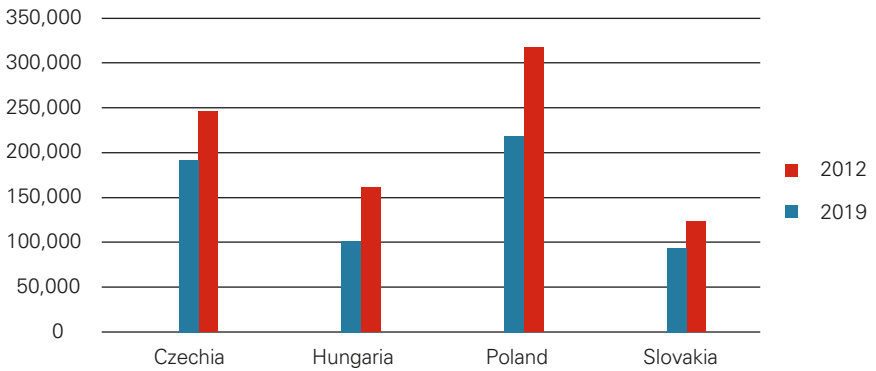

Figure 2. Source: Eurostat, lfsa_egan22d

Employment in the automotive sector has a very striking regional geographical spread, with most of the sector's employment concentrated in the "Bratislava-Žilina Corridor" (Jacobs 2016) in the west and north-west of the country, towards the borders with Czechia and Poland (Figure 3). The majority of large automotive suppliers, not just OEMs, are also clustered in these regions, exacerbating Slovakia's already extreme (largely east-west) regional inequalities. Based on regional employment statistics, regions where OEMs are located report higher share of automotive employment on total employment in the region, reaching more than

50 percent in Žilina (KIA location), Trnava (PSA location) and Bratislava (VW location). This accounts for employment at both OEMs and suppliers.

DISTRIBUTION OF AUTOMOTIVE SECTOR,
AS A PERCENTAGE OF REGIONAL INDUSTRIAL EMPLOYMENT.

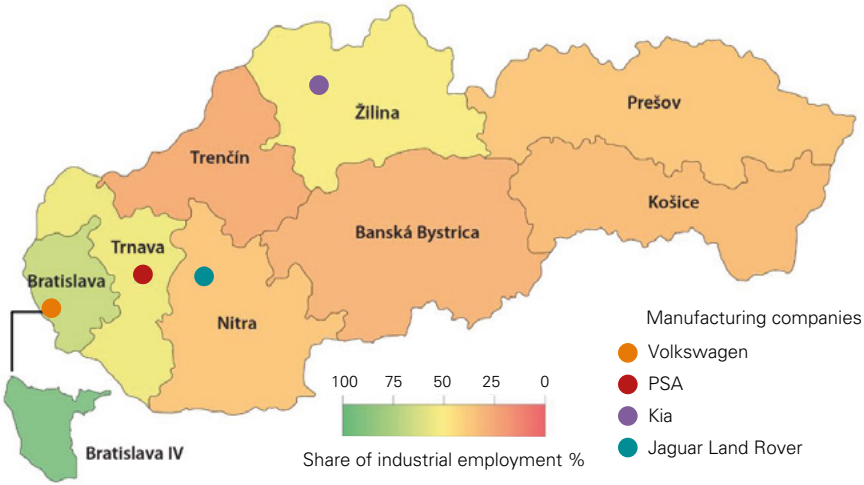

Figure 3. Assistance with map composition: Christopher Sargeant

With an unemployment rate of 19.5 percent in 2001, Slovakia had a surplus of cheap labour to be employed by automotive manufacturers. Hourly costs in Slovakian manufacturing in 1996 were 92 percent lower than in Germany (Pavlínek 2020). Since then, the unemployment rate has fallen dramatically and 20 years later, the labour cost difference had narrowed to 73 percent. More than half of automotive manufacturing suppliers report a lack of qualified staff (PwC 2019) and, due to ongoing shortages, the sector is increasingly dependent on imported labour, either from more distant regions of the country, or in the form of agency and migrant workers.

In the face of the labour shortages just mentioned, wages have been on the rise. They remain, however, just a fraction of the equivalent German figure. Across the industry as a whole, the gross average monthly salary was €1,503 in 2019 (Figure 4), comparable to neighbouring countries such as Hungary and Czechia. Given Slovakia's position in global production networks, workers are often building

cars that they simply could not afford to buy. For example, 99 percent of the vehicles manufactured in Bratislava by Volkswagen in 2013, and 99.8 percent of their total value, were exported out of the country (Jacobs 2016). If anything, this tendency is exacerbated with the increased expense of electric vehicles.

AVERAGE WAGE AND WAGE INCREASES IN THE SLOVAK AUTOMOTIVE SECTOR 2009–2019.

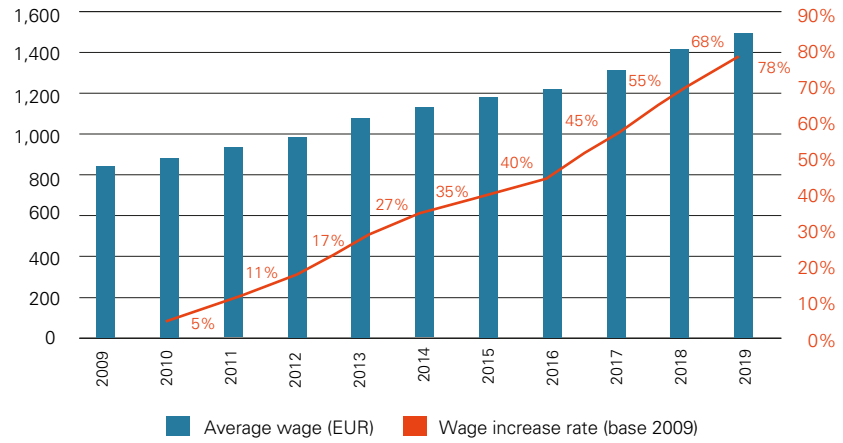

Figure 4. Source: Own compilation based on data from the Slovak Statistical Office (data on the average wage in the automotive sector, NACE C29, SSO 2020, pr0201ms_data

With the rise in FDI, and in response to the 2008 economic crisis, deregulation has led to two important developments in employment in the sector: 1) *Flexikonto* working time arrangements; and 2) agency work.

1. The development of *Flexikonto* as a form of working time arrangement was firstly applied in VW and later adopted in the Labour Code as a measure available to all employers. In the *Flexikonto* scheme, employees may be paid to stay at home for a certain time, in the case that there is no work for them at employer, thus remaining employed. Hours at home are counted and expected to be worked later. In practice, this means that an employee staying at home for two days need to work an additional 16 hours over the upcoming 24 months (thus doing this as overtime work). The use of this provision has been increasingly normalised across the automotive sector in the last 10 years. These flexible working time accounts were used to stabilise employment post-crisis, but are the subject of controversy

for increasing the precarity of labour in the sector. Unions and employers have disagreed over the adequate length allowable for the period in which 'minus' hours should be worked (24 months suggested by employers vs 34 months perceived as adequate by trade unions) (Kahancová 2016: 30), given the uncertainties it introduces (including in relation to overtime pay and discrimination).

2. The majority of agency workers in Slovakia work in the automotive industry – 72 percent of 57,000 workers in 2016, according to Kahancová (2016) – which leaves workers vulnerable to fewer legal protections and weakens the bargaining power of employees in the sector as a whole. Collective agreements at automotive companies generally did not cover agency workers (Kahancová 2016), creating two-tier employment. The situation has improved slightly in recent years with legislative changes meaning agency workers have similar protections to core workers (Martišková / Kahancová / Kostolný 2021). Agency worker contracts have been limited to 24 months, and legislative proposals to cap agency work as a proportion of total employment in companies have been made.

The Slovak Automotive Industry Association (ZAP) is the main industry body representing suppliers and all the main OEMs. Over recent years, fragmented worker unrest has emerged, amidst feelings that wages have stagnated while the pace of work has increased. Labour productivity has certainly risen rapidly – increasing 79 percent between 2010 and 2017 (Dębkowska et al. 2019). Demonstrations, threats of strikes and prolonged negotiations resulted in a €70-per-month increase in wages at PSA in 2018. Furthermore, 8,000 of the workers at VW Slovakia held a six-day strike in June 2017; this was the first work stoppage at a Slovak car factory. It successfully resulted in a 14 percent increase in pay (Pavlínek 2018).

Trade unions in the automotive sector are present in all four OEMs and in several suppliers, mostly Tier 1. The majority of trade union organisations are associated with the metalworkers' trade union KOVO (OZ KOVO), or in 'Modern Trade Unions' (*Moderné odbory*). OZ KOVO is the biggest sectoral trade union organisation in the country, albeit with a declining membership base. Modern Trade Unions are much smaller, associating workers only in a few automotive companies. The main activity of the company level trade unions is collective bargaining, where they aim to bargain better working conditions than those guaranteed in legislation. The core part of such negotiations regards wage increases, while broader issues such as just transitions and industrial conversion are not discussed. Other than that, trade unions often organise leisure activities for their members, and/or offer services to them, such as legal advice.

Trade union membership rates oscillate around 30 percent at the company level. The number of Slovak workers covered by collective agreements roughly halved between 2000 and 2016 (Visser 2019). The result is that working conditions are now mostly defined in the Labour Code, collective bargaining coverage is decreasing, and the statutory minimum wage is gaining importance despite the fact that the automotive industry is considered a high wage sector (Martišková / Kahancová / Kostolný 2021; Kahancová / Martišková / Sedláková 2019).

Recent years saw a significant split in the automotive trade union movement when, in late 2016, the new Modern Volkswagen Unions (*Moderné odbory Volkswagen*) split from OZ KOVO. Volkswagen is the OEM which has traditionally had higher union membership, reaching about 75 percent (Kahancová 2016). This means the automotive sector has started to echo wider splits in the Slovak unions between the 'old' unions focused on collective bargaining and social pacts, and 'new' unions that seek to expand their influence beyond this. Currently, new and old trade unions in the automotive sector co-exist. Both OZ KOVO and Modern Trade Unions have their company-level organisations in VW and Jaguar Land Rover. In both, Modern Trade Unions cover more employees than OZ KOVO. On the other hand, OZ KOVO is the only trade union organisation in PSA Peugeot in Trnava (recently changed to Stellantis) and in KIA Motors Slovakia in Žilina. As a result, it is not clear whether the split within the labour movement has brought anything new to employees, because OZ KOVO remained the strongest at the sector level. Meanwhile, Modern Trade Unions only gained several companies and, similar to their traditional counterparts, concentrate on collective bargaining at the company level as the most important tool of advancing working conditions of employees.[44]

In 2019, 3,000 workers were let go from VW's Bratislava plant, along with 500 Hungarian contractors, at a time when VW was looking to expand production in neighbouring, lower-cost countries. These were said to be the first layoffs in the industry for a decade and caused unions to step back from demanding pay increases. The head of the Volkswagen union, Zoroslav Smolinský, for example, was quoted as saying: "At the moment, we do not focus on salaries, the priority is job stability" (Reuters 2019). In a prime example of the race-to-the-bottom, this worker discontent is met by an increasing threat of jobs moving to even lower cost regions, such as Romania or Serbia (Domański / Lung 2009; Jacobs 2016).

44 Based on interviews with trade unionists in summer 2020.

ROLE OF R&D AND INNOVATION IN THE SECTOR

Some observers have maintained that considerable upgrading and capacity building of local enterprises in CEE countries was taking place "based on investment by TNCs [transnational corporations]" (Domanski / Lung 2009: 9). Krzywdzinski (2019: 215), furthermore, asserts that "CEE plants have developed from being mere 'extended workbenches' into modern production facilities which are competing with German locations on an increasingly equal footing as far as products and process technologies are concerned." There are signs that Slovakia's position in production networks is shifting. At the end of 2019, given news that a Porsche subsidiary was planning to invest almost €14 million to open a new R&D centre in Horná Streda, one headline proclaimed "Slovakia is not just a car assembly hall anymore" (Liptáková 2019). To meet the growing global demand for European electric vehicle production, there are also plans for a new battery production facility (InoBat and Wildcat Discovery Technologies) and a Slovak Battery Alliance was launched in 2019 to solidify new developments in the battery value chain.

Others have been less confident in any fundamental change in Slovakia's peripheral position in global production networks, however. Most innovation is driven by international OEMs (Figures 5 and 6) and, with the majority of the parts for vehicles finished in Slovakia being imported from 'core' nations, Slovakia has been slow to foster local enterprise and import substitution (Jacobs 2016; PwC 2019). As it stands, the majority of Slovak automotive suppliers do not undertake any R&D activities (PwC 2019).

WHO LEADS INNOVATION ACTIVITIES AT YOUR COMPANY?

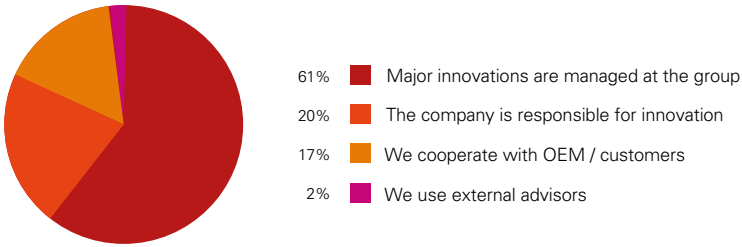

Figure 5. Innovation responsibilities at Slovak automotive suppliers Source: PwC 2019

NEW PRODUCTION TECHNOLOGIES ARE ALWAYS INTRODUCED AND TESTED FIRST IN OUR PLANT

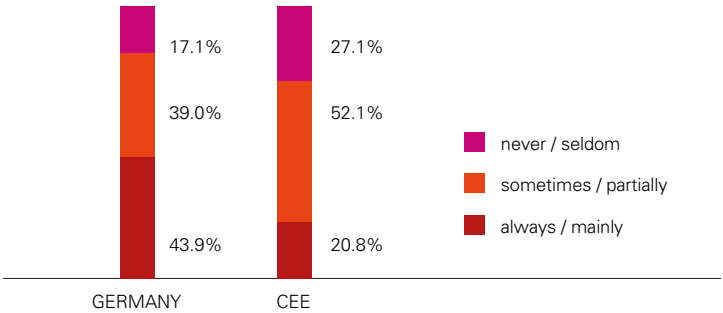

Figure 6. Pattern of introduction of innovations, Germany and CEE Source: Krzywdzinski 2019

Although R&D expenditure has grown over the last decade, Slovakia still has one of the lowest rates in the EU (Figure 7). Moreover, when looked at over a longer time horizon, starting in the 1990s, this figure is rather stagnant (Figure 8). Given the multiple ongoing changes in the automotive sector, including changes to a number of fundamental production and end-use technologies, the Slovak govern-

ment is starting to give greater importance to R&D. Reportedly in response to the fact that growth of the automotive industry seems to have levelled off, the state introduced an R&D 'super-deduction' from 2018, allowing R&D expenses to be deducted from the tax base twice. At the same time, the government has been criticised for failing to reform education, with employers complaining about huge mismatches between educational attainment and labour market needs.

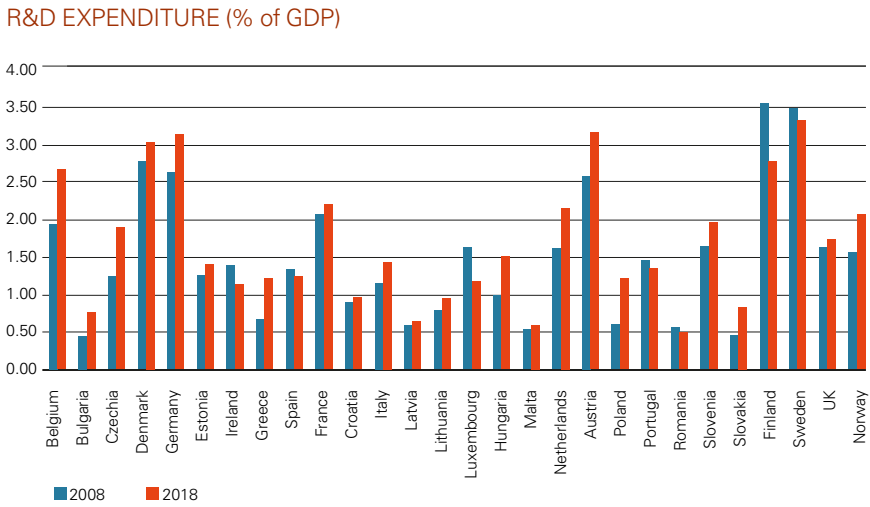

Figure 7. R&D expenditure in selected European countries Source: Eurostat database 2021, rd_e_gerdtot

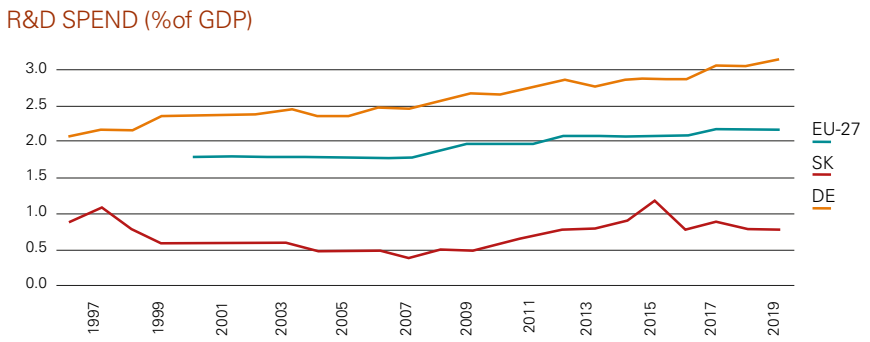

Figure 8. Comparison of R&D spending in Slovakia, the EU-27 and Germany. Source: Eurostat database 2021, rd_e_gerdtot

The impact of foreign ownership of the industry means that Slovak plants often lag behind the latest developments and lack autonomy in R&D and technology development. Partly, this is due to the persistent gap in labour costs, which incentivises more labour-intensive and lower-added-value production, and disincentivises upgrading of the industry. For Pavlínek (2020: 536), this is a factor causing "ongoing uneven development in Europe". The peripherality of Slovakia at the cutting edge of production can be seen in the responses to a survey by Krzywdzinski (2019), for instance, showing that new technologies are often introduced first in German plants, before CEE ones. Moreover, Krzywdzinski (2019: 232) stated that over 50 percent of companies in Germany reported highly automated production, "whereas in CEE this is only the case in about 20 percent of companies. The dominant model in CEE is mixed production, with automated and manual production areas existing alongside each other."

With sales of electric vehicles growing, Slovakia appears to benefit from its close proximity to one of the largest markets – Germany – which was the second-largest market for EVs in the world in 2020 (400,000 sold). While the CEE region may lose out on the gains of a shift to EVs by becoming designated sites of ICE production, for example, with more western European plants gain responsibility for producing electric cars (Krzywdzinski 2019), this is not certain. Slovakia's export of non-ICE/alternative vehicles is already the highest in CEE, for example. In 2017, PSA replaced the idea of only producing ICEs at its Trnava plant with the production of small electric vehicles, producing its first electric car (Peugeot e208) in March 2019. Battery assembly is also planned at the plant. Volkswagen's e-up! model was first produced in Bratislava in 2013, while Kia electrified its Kia Sportage powertrain in May 2018, introducing others from 2019 onwards. Slovakia is therefore at the forefront of electric car production. However, as already seems to be the case, OEMs may move their smaller, cheaper EV models to places like Slovakia, to maintain cost effectiveness in an increasingly competitive market. Automotive suppliers appear divided on the implications of this. 41 percent of automotive suppliers surveyed in 2017 noted that they are considering changing their products as a result of this new development, while almost half did not expect electrification to change their strategic focus (Figure 9).

EXPECTATIONS OF THE IMPACT OF ELECTRO-MOBILITY ON SUPPLIER STRATEGIC FOCUS.

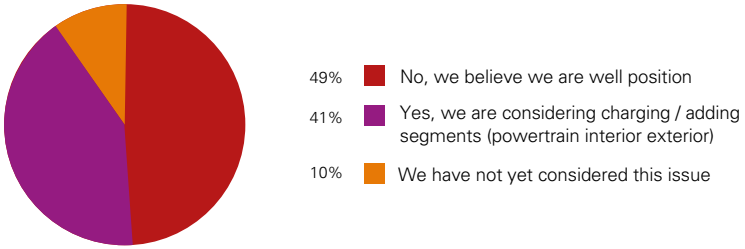

Figure 9. Source: PwC 2017

EXPERIENCE WITH THE PRODUCTION OF PUBLIC TRANSPORT AND OTHER VEHICLES

Where there were 122,800 employed in car production in Slovakia in 2019, there were 5,200 employed in the 'Manufacture of other transport equipment' (C30). This includes trains, bicycles and other modes of transport, and is down from 11,400 in 2010. There are nine companies, for instance, manufacturing 'railway locomotives and rolling stock' (Eurostat, NACE C30.2) (down from 14 in 2012). In 2018, there were 3,056 employed in the manufacture of trains – a number which has remained stable over the last decade. Total turnover in this industry reached €350 million in 2018 (Figure 10).

SLOVAK TRAIN PRODUCTION TURNOVER.

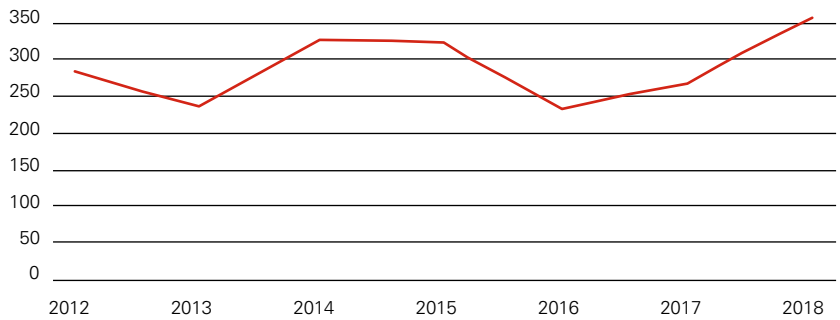

Figure 10. Source: Eurostat [sbs_sc_sca_r2]

ŽOS Trnava, for instance, operates the largest rail carriage repair centre in Central Europe, with the capacity to refurbish up to 6,000 rail carriages per year. Much of this stock goes abroad, including to neighbouring Czechia. The company has a history going back to the 1920s and, while it used to focus on modernising and repairing freight and passenger wagons, it now also produces new freight wagons and has recently reoriented towards electrical passenger locomotives. ŽOS Trnava recently cooperated with the Czech company Škoda Transportation in the production of 25 electric passenger trains for the Slovak national rail company (ZSSK), as part of the largest tender in the history of ZSSK. ŽOS Vrútky, another domestic producer, delivered an initial eight diesel engines to ZSSK, as part of the same order.

While Slovak automotive production has been dominated by cars, the Czech specialist off-road bus manufacturer, Torsus, is one new actor producing a variety of specialised and commercial vehicles in a plant in Slovakia since 2018. Moving away from motorised transport, the production of bicycles has also been increasing in Slovakia, from 68,353 in 2014 to 104,667 in 2019 (Eurostat 2021 [PRODCOM - DS-066341]). This makes it a rather marginal figure in the field of bicycle manufacturer compared with the main European manufacturers, Portugal and Italy (2,652,392 and 2,089,277, respectively in 2019).

QUALITATIVE PART – METHODOLOGY

For the qualitative part of the study, we conducted 11 interviews with relevant stakeholders in Slovakia (see Table 2 below). All interviews were conducted through online tools such as Zoom or Skype, and lasted around 60 minutes each. Interviews followed a pre-defined protocol of questions which respondents received ahead of the meeting. Interviews were transcribed and analysed with qualitative text analysis software (Dedoose), using a pre-defined set of codes.

LIST OF INTERVIEWEES

Code	Type of representative	Date of interview
SK01	Management, final car manufacturer	2 February 2021
SK03	Sector-level representative of trade unions	10 December 2020
SK04	Trade union representative at final car manufacturer	22 January 2021
SK05	Trade union representative at final car manufacturer	27 January 2021
SK06	Representative of local-level administration	26 January 2021
SK07	Representative of automotive industry employers association	10 December 2020
SK08	Expert on transport policies	24 February 2021
SK09	NGO activist	19 February 2021
SK10	Expert on railway infrastructure and policies	18 March 2021
SK11	Ministry of Transport	March 2021 (written answers)

QUALITATIVE PART

It is impossible to understand all the various pathways, barriers or possibilities of converting the mobility industry (of which automotive is a dominant part) in Slovakia without dialogue with relevant stakeholders. Not just because it helps to support the contextual overview from the desk-based research empirically, but more importantly, it highlights many contradictions in real-world practice that would otherwise be hidden. As we will show in this part of the study, this dialogue is extremely important, especially in the case of Slovakia, a small open economy highly dependent on car production.

EXISTING BARRIERS FOR A CONVERSION

There are many different types of barriers that impact the conversion of the dominant car industry into an ecological mobility industry (i.e. the production of vehicles for public and rail transport). Some of the more general ones are present in western European countries too, but we will focus on the specific Slovak economic, political and historical context.

The first important barrier to consider is the readiness of employers in contrast to the readiness of employees. This is precisely one of the issues where the different perspectives of stakeholders can be observed. While most OEM representatives consider their workers perfectly prepared for upcoming changes in production towards electro-mobility, trade union representatives believe that employers' readiness for this kind of change is much higher than employee readiness. Moreover, according to trade unionists, workers do not demand training or other support measures to increase their readiness: "Optimal would be bottom-up pressure from employees, but this is not happening" (SK05). One of the reasons for this is continued production of conventional ICEs and the perception that there is therefore no acute need for requalifications. Employees do not see an immediate threat to current methods of production yet. Another approach is problematic too: "Those who are aware of the changes, somehow, I would say that they piously hope that 'tomorrow it will not be me who will be replaced by the robot'" (SK05). It seems that unions do not have any complex programmes or strategies to help employees to adjust to trends such as emobility, automation and digitalisation, other than occasional efforts at education. According to trade unionists, there are no significant differences in readiness between core and agency workers either – instead, differences in the age structure affect employee readiness or ability. Younger employees can be transferred into some other position or requalify to supplement some of their skills and knowledge. Agency workers have higher probability of being laid off, compared to core workers, according to a trade union representative (SK04).

When we look at the level of suppliers and subcontractors, we see that domestic suppliers might be threatened the most. "80 percent of suppliers are managed by a foreign owner, and they are doing what they need and must. And then there are the 20 percent made up of domestic suppliers, who cannot look forward, but mostly live in the present. And this is our concern as an employers' association: how to help them. Not only our association but the state should be concerned about it as well." (SK07)

In the end, however, all of the stakeholders stress that workers' relatively high level of skill in producing passenger cars with combustion engines may not be so easily transferable to the assembly of electric or hydrogen vehicles (e.g. manipulation at high voltages) or other types of products for public transport.

Closely related to this, another barrier emerges – the quality of high school and university education and requalification of the workforce. Almost every stakeholder

emphasised the importance of these processes. The most vocal requirements to improve the situation are coming from the associations of employers. While they are proud of employee readiness in Slovakia, highlighting that "this is not thanks to our education system, but thanks to those companies which developed a system of education for employees and they train them. The education system is not ready. Study programmes at the universities are outdated and difficult to transform; this is the main problem. We have at least done something with high school education, but this is not enough." (SK07) The latter refers to the system of dual education at the secondary school level implemented six years ago. Employers highlight high costs for graduate training and thus demand that the education system be more efficient for them: "To train a mechatronic graduate with a university education [for an employer's specific needs] takes six months, a mechatronic with a secondary school education can be trained in 1-2 years. It is therefore a great advantage for us to have a dual education system in secondary schools that prepare mechatronics as the company needs it." (SK07) Moreover, there is no appropriate life-long learning system (LLL): "We do not have legislation on LLL appropriate to the needs of the 21st century" (SK07). Therefore, the innovativeness of the automotive/mobility industry is suppressed by a lack of appropriate education, especially at universities.

Trade union involvement in discussions about production conversion to both electric cars and vehicles for public transit/rail is relatively low. Age structure plays a prominent role: "The younger part of the trade union movement in Slovakia is more aware of this need. The older ones pay more attention to employment and the fact that those people may lose their jobs and are afraid of it, and they focus more on the economic part." (SK04) In the leadership of today's trade union movements, especially in the traditional ones, there are just a few people who are more serious about these broader issues. The scarcity of trade union activities is not only an outcome of apathy or lack of awareness of the coming changes and trends, but insufficient capacities to deal with the topic. Trade unions are mostly trying to deal with current problems (low wages, working conditions, etc.), and their capacity is overstretched in terms of staff, so that within these organisations "everyone does everything" (SK03). To solve future problems which are given more attention by their western European colleagues, they need to resolve the situation in their own ranks: "And that is why I am telling you that we are somewhere on the first step while the rest of Europe may be on the tenth, eleventh or so. And they'll still go up those stairs, maybe slower, but getting to the eleventh level – when will it be? This has been said to me by several our members when I come up with such

sophisticated ideas from Brussels and start talking and they say, well, say it and go back to our reality. We solve the bread dough and you're already making some pineapple cake, huh? That's what they tell me, and I say, well, you're actually right." (SK03) More dialogue is necessary inside the trade unions, but also among social partners: "Social dialogue is dead in today's Slovakia. We do not realise that social dialogue might be a platform where these changes should be discussed." (SK03) While some of them even consider workers' international solidarity as the vital impulse of change, this does not seem to be working in practice.

In Slovakia, unbalanced readiness is visible also when we look at other actors of possible conversion to more ecological types of mobility. Governments, municipalities, customers and legislation may be lagging behind the companies: "We are ready, [but] the question is how ready are customers, infrastructure, individual countries (within the EU)?" claimed the employer´s representative (SK07). Another critical question, though, is what various stakeholders have in mind when they talk about transformation. A representative of the trade unions emphasised that the conversion of car production to other means of transport does not seem to be an option for employers: "Of course, for emissions reduction, there are other ways than electromobility, especially in support of public transport, especially railways, but employers do not want to hear about it, because this would reduce their car sales." (SK03) On the other hand, some employers expressed their eventual readiness to change their production to other types of vehicles than cars: "[M]anufacturers are able to adapt because basically, this is their only way to survive" (SK01). However, they emphasised that the change would be difficult and a significant investment would be needed, which moreover depends on the decision of the parent company (e.g. in Germany, France or South Korea): "We basically produce five different bodies on the line, five different cars, so there is that flexibility. But we can't suddenly make a bus. Now again, we would need press tools, press lines, just the whole factory. You would have to rebuild the entire factory." (SK01) For this reason, respondents mostly discussed transformation within the car industry through expanding car services (e.g. car sharing) or extending charging infrastructure.

Infrastructure is a further example where we can see an unbalanced readiness amongst different actors. The majority of our respondents understand its (non-) development as the main obstacle for both electric automobility and electric mobility in general. On the employers' side, alliances are being formed building their own charging networks. Still, they complain that all the costs are falling on the side

of companies: "Personally, for me as a person, a citizen, it's sick that the car manufacturer should build a charging network. On the one hand, it is understandable; on the other hand, why should it be so? Petrol and diesel pumps were also not built by car manufacturers." (SK01) In any case, Slovakia cannot be considered a leader in infrastructure readiness for transport transformation. There is still a lot of work to be done, especially on building the infrastructure needed for the daily use of cars with alternative propulsion: "The European Commission has [prepared] a directive where it has presented its vision to everyone and wants infrastructure to be built, whether within the individual Member States or on those transport corridors, etc., but nothing is happening" (SK01). There are many technologies available, but their application is still difficult and expensive. It is also challenging to build needed infrastructure in the short term. Moreover, the electric power network's capacity may be insufficient as we can observe in the countries with a higher share of EVs.

When it comes to railway infrastructure, this is assessed as insufficiently maintained and renovated. Recently, the Slovak railway company has been criticised by the analytical unit of Ministry of Finance that their investments in railway revitalisation are slow and are missing defined direction. The expert on railways in our interview claimed that there is large ongoing investment on the main route connecting eastern and western parts of the country, and because of this, smaller, less complicated and more efficient renovation of other railways is not happening. As a result, local trains are slow and often delayed, which decreases interest in public transport and increases demand for individual mobility (SK10).

Another barrier to an ecological mobility transition is the small share of public passenger transport in the total number of passengers in the Bratislava region[45], as representatives of the cities and regions stressed. There are no state strategies that would somehow tackle this issue. According to OEM representatives, there are huge differences between central and eastern countries, western EU countries and Nordic countries. "There are pressures on producers to produce, but other components [for the conversion] may be failing." (SK01)

Time constraints are another much-discussed topic. The uncertainty of steps in the process of transition to electric and hydrogen mobility plays a significant role in the decisions made on the company level: "We are talking about the fact

45 Despite respondents perceiving use of public transport to be insufficient, data published by Eurostat suggest that around 10 percent of passengers use trains, 16 percent use buses and coaches and 74 percent use individual cars in Slovakia, as opposed to the EU average which is 8 percent for trains, 8.7 percent for buses and 83 percent for cars (Eurostat 2021 [tran_hv_psmod]).

that the internal combustion engines are to end in nine years, but last year we invested €70 million in the remodelling of our motor plant, because in addition to cars, we also produce engines in Slovakia. Unless there is an overall transition, we have currently invested in gasoline engine production, which will replace the previous engines. The process is very demanding, and the carmaker has to make a decision, because no one will tell you when there will be a change, when the infrastructure will be ready, and so on." (SK01) In general, they emphasise that they perceive change, and it is inevitable. However, it is questionable whether the pace that has been set is sustainable for the carmakers themselves: "When you think about the fact that combustion engines have been developing for 100 years and now in 1015 years we are supposed to transform the whole industry, this is too quick. Although transformation is necessary, the direction is questionable, the question is whether electro-mobility is the only correct direction." (SK01)

This leads us to the question of the direction of conversion, or whether e-mobility is the only way or other alternatives are possible. The expert on transport policies argued that e-mobility is the best option since electricity can be produced from several sources, while the distribution and storage of hydrogen would be even more demanding and problematic. Similarly, employers asserted that for now there is no other alternative technology more developed than emobility, but at the same time emphasised that this is not the best solution for emissions reduction. They realise that it may be more efficient for emissions reduction to invest more in high-capacity vehicles: "Of course, these technologies can be combined, so I say that it may be more efficient to produce a hydrogen-powered bus or truck, because if you take how much that truck drives in one year compared to a car and what is the price for that cargo, development, etc. And basically, through those emissions, when you recalculate it, you will have a much greater positive impact on the environment than if it is put into cars." (SK01)

Every stakeholder has their own vision of the conversion; therefore, finding some common ground from which other steps could be undertaken is really challenging. Arguments also emerged that raise concerns about economic dependence: "In five or 10 years, when we are producing only electric cars, this might put us in a precarious position, dependent on very few battery producers in the world. If they for some reason deny delivery, I don't know what we will do." (SK01) They admit that a possible response could be diversification of battery technologies, which, according to trade unions, is still problematic because it does not resolve that resources and workers might be exploited in many other countries.

Last but not least, a key barrier for the transformation of production in the broader sense is a much-needed change of consumer behaviour. In Slovakia, we see similar trends in customer preferences as those observed in the rest of Europe. Demand is increasingly for big SUVs, contradicting the need to reduce emissions as well as non-decreasing demand for individual mobility instead of public transport. Carmakers are aware of the risks of this: "We, as car producers, […] produce only things which people will buy. We cannot sell things which won't be bought on the market. It would mean liquidation for us." (SK01) The expert on transport policies and representatives of cities and regions both stressed that in individualised transport, the change must be much more complicated than the shift from internal combustion engines to electric – it requires a more complex change in user habits. While EVs can become a mass segment in urban transport, in long-distance transport, behaviour needs to be changed. However, this requires support for public passenger transport and the interconnection of public and individual transport. Therefore, it is necessary to motivate people to use public transport or improve integration of public and personal transport (SK06; SK08).

OPPORTUNITIES TO SUPPORT A CONVERSION

The situation in Slovakia is quite complicated, as we described in the previous chapter. However, several opportunities or advantages for this region could be identified, and we will inspect them more closely in the following subchapters, describing necessary political incentives, existing thematic links and possible alliances to support transformation.

NECESSARY POLITICAL INCENTIVES AND INITIATIVES

The general agreement among all stakeholders is that the idea of transforming to ecological mobility can never be fulfilled without much-needed strategies at various levels of the state. Representatives of cities and regions emphasised the need for intensive rethinking of policies, supporting public transport ahead of individual mobility. Concerning this, OEMs declared relatively high technological readiness for transformation when considering the production of electric buses or hydrogen. However, they demanded that the state be more involved and active, mostly in terms of preparedness for emobility infrastructure: "I have not openly seen any effort that, whether the government or I do not know, the electricity producers, have presented that yes, here is some strategic plan, we should move to [emobility] by 2030. And I expect in real-time, for example, 30 percent will be purely electric cars, the rest will be combustion, which will be phased out and, for example, we will increase production this way, we will increase distribution this way, we will create a network like this, there will be so many chargers. But this is not happening anywhere." (SK01)

Both, trade unions and employers would like to see more strategies for requalification of employees and better cooperation between various ministries: "This means that when there is some change coming, the transformation process would take place for a year, so that these people could be retrained through some active labour market policy instruments in cooperation with labour offices, and would not have to become unemployed at all, but continuously either just moved to another workplace or completely to a new company, maybe to another industry. And so, at least for now, I absolutely miss this continuity." (SK03)

According to trade unions, the state should also encourage and recover the importance of social dialogue. This is necessary to at least start the discussion about an ecological shift of transport systems: "We need a body where not only social partners but also other important stakeholders will be involved and discuss the future transformation change." (SK03) Without social dialogue, trade unions feel

omitted and unmotivated to change something: "I see that, although we do, for example, collective bargaining strategies, where I justify some things of need to respond to the situation, but these suggestions do not get into those collective agreements in any way." (SK03) Employers would benefit from better dialogue too: "Personally, I think that those who sit in those ministries do not understand the issue as we do. And if they don't understand it, they don't even ask about it. So that's the problem, as I see it." (SK07) The dialogue would also be useful to counteract the perceived rigidity of national and regional institutions and officials.

Regarding trade union initiatives, they acknowledge their weaknesses and mostly passive attitude. Most of the time, they are waiting to see what employers come up with: "If you ask me now what should be a priority, honestly, I do not know. But what we should do is to listen to experts and discuss topics" (SK04). There are some efforts to engage with the topic among employees: "I would say that unions need to explain to people what problem is, and that it is a bigger problem than that his/her variable pay is not high enough" (SK05). This effort is just sporadic and not transformed into some kind of strategy: "I did not find any topics related to just transition in the company level collective agreements. But when I come up with this topic, this is too far and too abstract; in negotiations we are still discussing basic 'bread[-and-butter] issues' like wages, but this is not the topic there." (SK03)

European Union incentives are much discussed as well. Employers and OEMs are aware of the many pressures imposed on them by the EU. However, they acknowledge and welcome the Alternative Fuels Infrastructure Directive as a tool to boost infrastructure preparedness at the state level (SK07) because state-level initiatives are weak, short-lasting or non-existent. But the expert on transport policies warns that EU policies focus too much on car production and transport, while aviation and maritime transport are sidelined, where emissions can be reduced much more. "There is weak technological development and weak taxation – paradoxically, aviation fuels are favoured." (SK08) Trade unions would like to see more pressure on member states in terms of participation or requalification of employees in the companies: "I expect that no recommendations will come from the European Union this time, but direct regulations that those Member States will have to implement into national legislation. And if the legislation were thoroughly implemented, for example, in Slovakia, it could contain things that would move employees' representatives deeper into the company, thus increasing their ability to participate in many decisions. Thus, they could be able to create some budgets, which would be designed to train (re-educate) employees." (SK03) This

pressure is also necessary in terms of greater greening of transport – for example, when buying trains, it is not taken into account whether they are diesel or electric, and at the same time the purchase of trains and buses is not coordinated within the Slovak regions (SK10). A Recovery Plan for Europe could become such an instrument.

Some incentives at a local level to support electro-mobility were mentioned (e.g. policies of zero parking fees for electric cars) but these were perceived insufficient to boost changes in broader mobility patterns, and more significant initiatives are missing (SK07). For example, for the representative of the Bratislava higher-level administrative unit (*Bratislavský samosprávny kraj*, or BSK), building railways (and their electrification) and transfer terminals outside the city are priorities. The representative from the state level argued that it would be more efficient to invest in track maintenance rather than investing only in modernisation and building new tracks. The construction of car parks at railway stations is also important (SK10).

There are also more general suggestions for political incentives and initiatives that arise from the interviews. Given the low share of EVs in Slovakia now, concentrating on other emission production sources (energy efficiency of buildings) would reduce emissions more efficiently (SK08). During interviews, examples of mobility sharing concepts were mentioned that were successfully applied at the local level (e.g. electric car sharing in Madrid).

EXISTING THEMATIC LINKS

Most of the respondents mentioned important thematic links for conversion to alternatively powered vehicles in the transport industry. One was reduction of emissions as an obvious reason for our discussion and for transition. This would result in a cleaner environment in the cities, where air-quality improvements are most needed. Related reductions in costs for treating respiratory diseases were mentioned by a trade union representative and NGO activist (SK05; SK09). As opposed to conversion to electric mobility, conversion to ecological mobility is expected to contribute to a reduction of cars in the cities, since it should lead to better public transport (especially railways), with a limited need for cars in the city (SK06; SK10). On the other hand, the expert on transport policies thinks that "[e]lectric cars have potential in urban mobility, but otherwise, for longer distances we need to change behaviour to use public transport" (SK08). This is in contrast with the representative of the Bratislava region who claimed that there is a need to reduce cars in the city through support of public transport and micromobility

(including bicycles), while individual transport will remain important outside the cities (SK06).

POSSIBLE ALLIES IN THIS FIGHT

Respondents from trade unions, the employers' organisation and local-level administration mentioned local-level initiatives as an important factor in transformation. The representative of the Bratislava region explicitly mentioned a strategy of the Bratislava higher-level administrative unit aimed at achieving a 5050 split between individual and public transport (SK06). Also, a trade unionist noted that "it is becoming more and more common that cities concentrate their strategies on improvement of accessibility of public transport, which was not common 15 years ago" (SK04). On the other hand, representatives of employers consider these local initiatives marginal, especially when it comes to support for the spread of EVs. The Bratislava region also mentioned local-level cooperation with employers on possible future investment needs in the region as part of the strategic planning related to transformation.

The NGO activist added that local-level representatives are often afraid of embarking on 'green' policies, limiting individual mobility in the cities and supporting public transport. "Nevertheless, those who had courage – and there are few mayors in Slovak cities who have had this – [have] delivered significant changes in the cities and, despite critique from individual mobility proponents, [have been] re-elected." (SK09) He claimed that, despite citizens not always calling openly for green solutions in their cities, it seems they accept these changes and so political representatives should not be afraid to make such changes (SK09).

Employers primarily mentioned customers as an important element contributing to transformation. Employers' representatives expect increased demand for shared mobility to which they are partially accommodating their strategies. On the other hand, they emphasised that, until now, customer preferences have gone in the opposite direction: instead of ecological cars, large SUVs are demanded. The NGO activist added that customers are citizens who should express their demand for better environments more.

The majority of respondents emphasised the need for active involvement of the government in preparing for the transformation. They see it as having a number of roles, including being an agent of knowledge transfer, demanding that the government create the framework conditions for cooperation between companies and universities to boost R&D in the country (SK07). "There is cooperation between

universities and companies, but it is not systematic. It is there, but something is missing [for it] to be more developed. I do not understand why in 20 years we were unable to manage this." (SK03) The government should also prepare a new system of life-long learning. "We do not have an act on life-long learning for these times, for this century," claimed the employer representative (SK01).

Trade union representatives emphasised that social dialogue and cooperation with employers is needed. "*We should be more involved in debates and strategy development at the company but also sector/national level.*" (SK05) At the sector/national level, something similar was emphasised by another trade unionist: "Yes, sometimes they (employers) are annoying, but for keeping standards for employees as we have them, we need to discuss with employers their plans for the future, how they are planning to expand, not only to survive" (SK03). Cooperation with employers is vital also for pragmatic reasons because most of the innovations are produced there. For instance, Hyundai has developed hydrogen technology for buses and trucks, with railways also having tested hydrogen technology.

There are currently only very weak connections between social partners and non-governmental sector representatives. The only positive example would be trade union participation in Fridays for Future protests in Slovakia at the end of 2019. It should be added, however, that the climate movement as such is weak in Slovakia and mostly concentrates on a just transition in the coal industry, not covering the broader topic of mobility conversion. NGOs active in the field of conversion to ecological mobility mostly concentrate on transformation of the local-level conditions to support public means of transport and cycling. Therefore, they interact mostly with local-level representatives, either by providing consulting on the issue or creating pressure to achieve change.

Last but not least, an important ally in this fight will be the EU and its incentives in the form of regulations and/or funding. A recovery fund was explicitly mentioned in our interviews as a great opportunity for Slovakia to "jump up the ladder"; however, it is not certain if the capacities exist to implement it. "I'm not sure we have projects ready and have the competent people to use it adequately." (SK03) At the local level, representatives also count on EU funds to implement changes. For that purpose, they prepare projects while mapping needs of the region. They plan to use EU funds to help to improve transfer of knowledge between universities and companies. There is an expectation that a new programming period 2021–2027 will concentrate on this in the Bratislava region.

IMPACT OF CONVERSION ON EMPLOYMENT AND DIVERSIFICATION OF THE INDUSTRIAL PRODUCTION

Impact on employment and working conditions will have positive and negative consequences, according to respondents. Negative, of course, is the threat of losing jobs in the automotive industry because of the simpler production methods and fewer components needed for electric car production, if that is the direction taken. The expected decrease could reach around one quarter of current employees (30,000 out of 122,000 employed in 2019).

Transformation to ecological mobility, which would include increased production of public means of transport, does not seem to provide adequate job opportunities for released workers. For now, firms other than car companies in the transport sector employ only 5,200 employees. Out of the four companies operating in the sector of manufacture of railway locomotives and rolling stock, only one produces diesel locomotives, two provide only repair works and train modernisation, and the last one produces wagons. The position of companies producing or repairing locomotives is peripheral in production chains and have little chances to upgrade, according to our respondent (SK10) and thus their ability to create workplaces is limited. Focusing on vehicles other than cars was mentioned by employers in the automotive industry, but only as a survival strategy of last resort. Otherwise, they expect to remain car producers as long as possible. Except for cars, in Slovakia, few other vehicles are produced.

Employees thus should expect they will need to requalify, but as already mentioned by our respondents, requalification strategies have not been developed. Employers claimed that companies will train employees, but obviously only those who they will need in the future, while the rest will need to be accommodated through other channels.

Industry transformation might also bring a few positive effects, claimed trade unionists. Trade unions demand and expect that transformation will entail a reduction in working time, which is also their strategy to fight mass layoffs. There is also a demand to decrease the share of night work and make it as expensive as possible. "These are the issues trade unions should engage with more when it comes to the industrial revolution. We should connect it with decreased need of manual work, because clearly if one employee works less time, more employees will be needed." (SK04)

CONCLUSION

Reorientation to the production of other vehicles might be difficult in Slovakia for two reasons. First, as mentioned in the first part of the study, the car industry settled in the country through foreign direct investment and obtained large investment incentives from the state. Foreign ownership of car companies makes it difficult for local actors to seize the initiative. At the same time, production capacities are not diversified and are skewed significantly to car production when compared to other countries of the Visegrád region. Slovakia does not only produce cars, however. Train repairs and production, bicycle production, and some limited bus production, do exist, albeit rather marginally, employing only around 5,000 employees, compared with 122,000 in the automotive sector.

Second, it is unclear what the reorientation should look like, and what the direction of transformation of the car industry should be. As respondents mentioned, there is a need to concentrate on railway modernisation and electrification. This is partially done from the EU funds, and more investments are expected to come in the future. Nevertheless, production of trains and wagons for the country's needs will not only bring about a significant increase in employment levels. If this was the reorientation strategy, competitiveness at an international level should be supported in order to produce higher volumes and reach higher employment levels in the industry. This would require innovation of production and products in this segment. There is almost no production of vehicles (such as buses, vans or trucks) which would be more similar to car production, and in the case of increasing demand could absorb more employees.

Therefore, in the case of Slovakia, changing the dependency on car production and diversifying production in the mobility industry will not be possible without the intensive involvement of public institutions (our respondents referred to it as "a state"). For now, the option available would be the support of domestic producers and domestic innovations, along with building more efficient education systems and life-long learning systems. Another option would be attracting foreign capital for ecological mobility industry to settle in Slovakia, but this strategy has been criticised by several experts and might not be preferred by policymakers for now. Greater involvement of social partners is necessary and trade unions themselves will need to size up their capacities to take the lead in these issues. In relation to this, the willingness of the workers themselves to play an active role in the process of transformation – in dialogue and solidarity with transnational partners – needs to be further studied. An important driver of

changes will remain the European Union, providing funding and binding regulations as important incentives to act in this regard.

LIST OF INTERVIEWS CONDUCTED

Type of representative	Date of interview
Management, final car manufacturer,	2 February 2021
Sector-level representative of trade unions	10 December 2020
Trade union representative at final car manufacturer	22 January 2021
Trade union representative at final car manufacturer	27 January 2021
Representative of local-level administration	26 January 2021
Representative of automotive industry employers´ association	10 December 2020
Expert on transport policies	24 February 2021
NGO activist	19 February 2021
Expert on railway infrastructure and policies	18 March 12021
Ministry of Transport	March 2021 (written answers)

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SERBIA

THE AUTOMOTIVE INDUSTRY AND THE ECOLOGICAL TRANSITION

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TABLE OF CONTENTS

INTRODUCTION

Climate change is now one of the main drivers in the search for new mobility solutions. However, the room for manoeuvre in designing sustainable transport and production is limited by state policies and social relations. The design and implementation of a programme that moves in the direction of a transition to environmentally friendly forms of mobility have become an important issue today. This research tries to answer the question of whether Serbia is taking steps to create and plan a comprehensive public policy that will provide an environment for the transition to an ecological mobility industry. To offer at least a partial answer to this question, it was necessary to start by analysing the current situation of the automotive industry in Serbia. Through desktop research, we analysed the role of the Serbian automotive sector in the global automotive market, characteristics and effects of foreign direct investment in this sector, the importance of this sector for the entire economy, and the effects of changes in the urban economy in regions where this industry is concentrated. We paid particular attention to labour-related issues in this sector by analysing the workforce structure, the characteristics and working conditions in this industry and the level of wages.

Thus, the purpose of the first part of the research was to describe and evaluate the automotive industry's situation using available and official statistics and the relevant literature and previous empirical research results. Given that some data could not be found on the official websites that deal with data collection and processing, especially for issues related to wages, union organising and working conditions, we also relied on interviews with actors informed on these research issues.

After analysing the automotive sector situation, we moved on to whether there is a strategic framework in Serbia that would enable the re-conceptualisation of the mobility industry with a focus on environmental standards. The interview questionnaire consisted of three parts. The first part emphasised mapping barriers and challenges that prevent or slow down the transition to ecological mobility forms. In the second part, respondents were asked to anticipate favourable circumstances that would support this transition. This included three additional research questions:

1. What political and state measures and incentives are essential for achieving conversion?
2. What types of cooperation and associations are necessary for the transition to take place?
3. What are the possible thematic links that support the discussion on the conversion of production?

The last part of the questionnaire addressed the implications that this transition would have in terms of diversification of industrial production and employment of workers.

Interviews were conducted with a sample of 18 respondents consisting of union representatives, managers employed by companies operating in the automotive sector, experts from the scientific community, representatives of decision-makers, civil society representatives and journalists.[46] The actors discussed these research issues at the level of systems, organisations and individuals. At certain moments, the respondents emphasised that this was their personal opinion and not an articulated and exact position of the organisations or institutions within which they operate. It is essential to stress that most of the respondents are not experts on the transformation of the automotive industry. However, this fact is an important indicator of how well these groups are informed and involved in monitoring and policymaking related to the transformation of the automotive sector to an ecological mobility industry. Semi-structured interviews were conducted individually, with conversations recorded and audio transcribed to guarantee confidentiality regarding identity and transcript storage.

REVIEW OF VEHICLE PRODUCTION IN SERBIA

During the socialist era, when it was part of the Socialist Federal Republic of Yugoslavia, Serbia had a strong automotive industry, dominated by the output of former Yugoslav giant Zastava Automobiles based in the city of Kragujevac. Zastava operated from 1945 until its privatisation in the 2000s, producing more

46 The interviewed trade union representatives are from three representative trade unions: the Confederation of Autonomous Trade Unions of Serbia, the United Branch Trade Unions (UGS Nezavisnost) and the United Trade Unions of Serbia (USS SLOGA). The surveyed managers are from three companies: Bosh, Lear and Leoni; and representatives of the scientific community come from the University of Belgrade's Faculty of Transport and Traffic Engineering and Faculty of Physics. Representatives of decision-makers are employed by the Ministry of Environmental Protection. Respondents from the civil society sector are from the following organisations: Zajedničko.org, Streets for Cyclists, Ministry of Space and Polekol. Interviewed journalists come from the Energy Portal and the weekly magazine *Vreme*.

than 4.5 million vehicles, of which 650,000 were exported (Development Agency of Serbia 2020: 5). Initially, Zastava simply carried out car assembly, but over time it started producing all necessary components based on the independent design of complete vehicles. The automotive industry's growth led to the development of supplier companies across the former Yugoslavia region, forming a strong automotive sector network. In the 1990s, the break-up of the socialist republic and economic sanctions limited production significantly and enabled export, which led to a reduction in profits and investments. After the 2000s, this sector's privatisation process made the automotive industry utterly dependent on foreign capital.

One of the Serbian government's priorities was to revitalise the automotive industry by attracting foreign direct investment (FDI). The largest inflow of FDI in car production started in 2008 (ibid.: 7), following the privatisation process in this sector. The most significant FDI has been that of Fiat. Based on the joint investment agreement signed in 2008 between Fiat and the Government of the Republic of Serbia (referred to below as the "RS Government"), a joint company for passenger car production, Fiat Chrysler Automobiles Serbia (FCA), was established in Kragujevac, the former centre of the Yugoslav car industry. The ownership structure was defined, with 67 percent of the company belonging to Fiat and the remaining 33 percent to the RS Government as a minority partner. The government undertook to provide a package of incentives for FCA in the form of grants and tax relief for employment, exemption from income tax, exemption from local taxes and fees, the establishment of a free customs zone including the factory and its industrial zone, as well as a suppliers' park and duty-free exports to EU countries and the possibility of not charging duties on a certain number of cars under the Free Trade Agreement with Russia. All manufacturing plants at the former Zastava factory and an additional 67 hectares of land for capacity expansion were ceded to FCA.[47] This marked the end of the Zastava car factory and the independent automotive industry based on domestic investments.

With the privatisation of Zastava, the production of complete vehicles declined as foreign capital in Serbia focused on investments in marginal components including engine parts, plastic and rubber items. Fiat's investment has attracted a large number of car parts manufacturers to Serbia. Other significant investors include Michelin, Cimos, Robert Bosch, Cooper Tires and Yura Corporation. Many suppliers in Serbia produce parts for the Fiat 500L. Most of the companies within

47 For more information about the agreement, see Republic of Serbia and Fiat Group Automobiles (2008).

FCA's factory circle (Magneti Marelli, SCGM, Adient, Yanfeng) or in the Kragujevac free economic zone (HT&L, Johnson Controls, Sigit and PMC Automotive) are Fiat subcontractors. All of them started their business in Serbia due to Fiat's decision to enter the Serbian market. That is why almost 100 percent of their production is destined for Fiat. For example, Magneti Marelli manufactures bumpers, Magneti Marelli Automotive exhaust systems, Dräxlmaier electronic installations, Sigit plastic parts, PMC Automotive shock absorbers and metal parts (ibid.: 9). Companies such as Dräxlmaier, Mecaplast and NORMA Group supply only part of their output to FCA, with the bulk going to other major vehicle manufacturers. On the other hand, companies such as Yura Corporation, Leoni and IG Bauerhin sell almost all their production abroad.

Besides the automotive industry, another important factor in the development of a country's transport sector is the production of public transport and rail vehicles. While it was part of the Socialist Federal Republic of Yugoslavia, Serbia had significant experience in the manufacture of rail vehicles. Several economic giants were present in the country, whose production programmes included locomotives, passenger and freight wagons, railways, structures, electrical equipment, bridges and switches. Factories such as Goša, Mechanical Industry Niš-MIN, Wagon Factory Kraljevo and others were at almost no technological disadvantage in design and production, and used to make wagons for European countries and the Yugoslavian region. Thanks to synergies between a small number of state companies, an electric locomotive was developed back in 1972, and in 2002 a highly comfortable Z1 passenger car capable of travelling at speeds of up to 200 km per hour. Other developments included railbuses.

In terms of comfort and services, the Serbian railway was a top performer in Europe. These factories employed several tens of thousands of workers, creating world-leading mechanical experts in the rail industry. As well as manufacturing new rail vehicles, the factories also repaired worn-out trains. All these factories met the same fate as most of the former Yugoslavian giants, mirroring the situation in the car industry.

Today, rail vehicle production is virtually non-existent, having first been privatised in the 2000s and then pushed into bankruptcy. Some plants stopped operating completely, while a few continued at a much-reduced capacity compared with the Yugoslavian period. Successful companies that used to employ several thousand people and supported their home cities and the surrounding areas closed or drastically reduced production, leaving many workers without their jobs and living

on the edge of existence. The expertise of domestic companies, which could have been used to manufacture electric trains, is being wasted, and such trains are now being imported. Serbia has been left with low-skilled "screwdriver jobs'' without the participation of domestic knowledge and resources, and with a large outflow of highly qualified personnel. Today, the production of rail vehicles has been cut to a minimum or completely stopped. Recently, Siemens took over a Serbian manufacturer based in Kragujevac and started the production of trams that are being exported to Bremen, Germany. Since there is still no union organisation in this factory, there are no precise data on the volume of production or working conditions.[48]

Regarding the production of public transport vehicles, there used to be several domestic manufacturers making city buses, intercity buses, tourist buses and buses running on natural gas. Although several such companies once operated successfully, producing both for the domestic market and for export, in recent decades they have been systematically run into the ground, so that today their output has virtually ceased. Serbia's bus industry was in full swing until 2010, when buses were predominantly made for public transport needs in larger cities.

Today, priority in the procurement of new vehicles is given to foreign manufacturers from countries from which the domestic government receives loans with a guarantee that their companies will get a job. That is why the tenders are formulated in such a way that domestic companies cannot even participate in them. This has led to domestic companies ending up in bankruptcy and waiting to be privatised, with most workers already laid off. These companies had all the required production capacities, even for electric buses, but have been driven to insolvency by the negligence of the local authorities, which give an advantage and a privileged position to foreign companies when procuring new vehicles.[49]

IMPORTANCE OF CAR MANUFACTURERS AND THE SUPPLY INDUSTRY FOR THE LOCAL ECONOMY

Considering the overall process of deindustrialisation that accompanied the period of post-socialist transition, the automotive industry is undoubtedly one of Serbia's most important industrial sectors today, accounting for 10 percent of Serbian

48 For more details, see Stevanović, K. (2016; 2017; 2018b); Dragojlo (2018); Insajder (2018); Opština Smederevska Palanka (n.d.); Wikipedia (n.d.); Godišnji konsolidovani izveštaj (2011); Krug Portal (2020); Novaković (2017).

49 For more details, see Kostić (2019) and Krainčanić and Cvetković (2020).

exports and employing 60,000 workers (Development Agency of Serbia 2020: 5). The revival of the automotive sector in the last decade has been driven exclusively by FDI. However, foreign companies' interest in increasing profits is based on cheap labour, available natural and other material and intangible resources, and the enjoyment of the effects of various types of subsidies and incentives by the RS Government.

Given that FDI in the automotive sector has been concentrated in Kragujevac, formerly the headquarters of Yugoslavian car giant Zastava, this city can be seen as representative of the way that foreign investment has affected local development. Kragujevac has approximately 180,000 inhabitants, and experts expected an FDI inflow of about €1.2 billion to bring real benefits in terms of local economic development (Rapajić 2016: 282).

One way to assess local development is the change in the number of employees. In 1991, Kragujevac had about 55,000 employees, including more than 40,000 industrial workers. Around 30,000 people worked at Zastava alone (Stevanović 2018). FDI has had a negative effect on employment in these municipalities, as it has mostly come in the form of privatisations of factories that previously employed the local population.

After the privatisation and the transfer of factories into foreign investors' hands, many employees were laid off. The number of employees continued to vary during the 2000s, but after the outbreak of the global economic crisis in 2008, there was a dramatic decline in employees in the manufacturing sector (Republički zavod za statistiku, Anketa o radnoj snazi: Srbija 2003-20212). FCA took advantage of the dire situation in the economy and the automotive sector, and in cooperation with the RS Government, Zastava's privatisation and restructuring began. In the first period, this meant the dismissal of many employees, whose number was reduced to about 3,000 when FCA started its production. In terms of periods, the number of employees at the car factory in Kragujevac was 11,364 in 2001, falling to 2,976 in 2009 and just 1,169 in 2011.50 Today, FCA employs around 2,000 workers.[51]

Fiat's investments were followed by the arrival of its suppliers, many of whom started production within the former Zastava factory circle, which was turned

50 See Grad Kragujevac (2013).

51 Since there is no official data about the current number of employees at FCA Serbia, this number is based on an interview with Jugoslav Ristić, President of the Federation of Independent Trade Unions in Kragujevac.

into a free customs zone. Although, according to official statistics, the number of employees in Kragujevac today is 54,000 (Republički zavod za statistiku, 2021) it is estimated that only 7,500–8,000 of these are industrial workers.52 It is hard to imagine developing a city with a population of over 180,000 with such a small number of industrial workers.

In addition to the number of employees, the quality of jobs created through investments in the automotive sector is also essential for local development. Most FDI is aimed at creating low-quality jobs for manual workers. Thus, Kragujevac has been turned into a destination that attracts foreign capital based on advertising cheap low-skilled labour, with a low level of intra-sectoral spillover of technology and knowledge.

The level of automotive exports is usually considered an important parameter in assessing the country's economy, especially in local communities where the automotive industry is concentrated. Despite declining export values in recent years, this sector continues to dominate Serbia's total exports. Following a period of rising exports that lasted until the mid-2010s, exports in the most recent period have been falling. This is mostly due to the decline in FCA's production, which went from exports of €1.5 billion in 2013 to less than half that in 2018, dropping to just €251.6 million in the first half of 2019 (Radovanović 2019).

However, when we consider net exports, FCA's position is significantly less favourable than the export value position since most parts are imported. The problem is even more significant when we consider that other companies that act as suppliers to FCA are themselves large importers, and those purchases for FCA are not recorded as imports even when the supplier imports parts from abroad. Therefore, if the value of FCA's net exports were calculated, it would be far lower, but since data on imports are not available, it is impossible to perform a realistic analysis of the effect of exports (Jeremić / Milojević 2015).

The usefulness of foreign investment for the host country is mostly reflected in the degree of integration of the local supplier network. As a result of privatisation, most domestic large-capacity factories ended up in transnational companies' hands in the first years of Serbia's transition process. In this regard, a tiny number of domestic companies which are integrated into global value chains also pose a big problem (Arsovski / Rejman Petrović 2017). Most foreign companies operating in Serbia generally bring their own suppliers, with whom they have long-term

52 This information comes from the interview with Jugoslav Ristić.

cooperation arrangements, while domestic companies that operate in this sector are small and medium enterprises that do not have the capacity to produce in large series.

Besides this, the subsidy policy implemented directly by the RS Government has contributed to the unequal development of Serbia's regions and further undermined regional development.

For example, the intense concentration of suppliers in Šumadija, with Kragujevac as the main centre, relies entirely on FCA production. If FCA decides to leave, this could lead to severe regression in this region's economic development. On the other hand, the region of Vojvodina is less dependent on one company because suppliers located here direct a large part of their production programme to other markets. In this way, the region of Vojvodina is in a better position because suppliers do not depend entirely on FCA's business (Makojević / Veselinović 2017).

A key point to note is that the main actors in attracting foreign investments are not local governments, but central state authorities. In fact, the state limits local governments in their capacity to manage property and finances and thus local governments are constrained in pursuing their own local economic development policy. However, the Serbian government is very untransparent in its dealings, which is reflected in the fact that the contract that Serbia has concluded with FCA, as is the case with many other companies, remains a state secret.[53] Consequently, the Serbian public cannot know whether companies like FCA are keeping their end of the bargain and whether the government has invested more than has been publicly announced.

EMPLOYMENT AND WAGES

The cost of labour in Serbia has traditionally been low. There is a huge gap between the wages workers in Serbia receive, especially the minimum wage, which is a reality for more than 300,000 workers, and the real costs of living (Blic 2019). Serbian auto industry workers are among the cheapest in Europe and the world. The average monthly gross salary in the automotive sector is €778 (€385.2 net), including housing, transport and other benefits. This is slightly higher than the average gross salary for the economy as a whole (€706). Salaries vary drastically between different automotive careers, ranging from €355 (the lowest gross average) to €2,220 (the highest average, although the actual maximum salary is

53 For more details, see Insajder (2017).

higher). Around 25 percent of people working in the automotive sector earn less than €500 gross. The median gross salary is €763 per month. If they make a profit, foreign companies that receive subsidies from the state, i.e. most companies in the automotive sector, are obliged to pay 20 percent above the national minimum wage, which is €349 gross (€233 net).[54] The assumption is that many workers in the automotive sector have salaries that are just a bit higher than minimum wage. There is a large gap between Serbia's legal minimum wages and what workers would need to provide for themselves and their families. For example, Serbia's legal minimum wage is 30 percent of a worker's estimated minimum living wage.[55] The share of labour costs in the total value of output is undoubtedly low for employers. In the manufacturing sector in particular, productivity is growing faster than the cost of labour. The gap between labour productivity and labour costs began to widen at the beginning of the 2010s, and this trend has intensified in the last few years. Thus, observed in euros, labour productivity (expressed in value added per person employed) in the manufacturing industry has increased 2.4 times faster than labour costs in the last 10 years (Chamber of Commerce 2019: 18).

Concerning employment structure by qualifications, the vast majority of car industry employees are blue-collar production workers.

According to official data, only 13 percent of the total number of employees are employed in occupations that require a high level of knowledge and skills and 11 percent in technical occupations. Data on employees' educational structure show that the largest number of employees (57 percent) have a secondary education level, almost a fifth have no qualifications, and only a quarter have higher education. The highest employment growth is among people without qualifications.

Specifically, in the industrial sector, the workforce is engaged in jobs that require a lower or middle level of professional qualification. In practice, the arrival of foreign investors usually means opening a company that is not oriented towards product finalisation but towards producing auto cables and assembling parts. The consequence of this is demand for lower or middle-level qualifications. This is also confirmed by data on the unemployment rate by educational level. While in economies based on knowledge and innovation, the lowest unemployment rate

54 Information gathered from interviews with trade union representatives and local managers.

55 For more details, see Clean Clothes Campaign (2017).

is among the highly educated, and the highest among the unskilled, in Serbia the lowest unemployment rate is among the unskilled (12.4 percent), followed by the highly educated (13.9 percent), and the highest among those with secondary education (16.7 percent) (Bradaš 2017).

Due to high unemployment rates (9.7 percent), it is easy to increase labour-intensive projects. In order for the automotive industry to remain competitive, government bodies recommend that capital "ride[s] […] economy class" (Development Agency of Serbia 2020: 18). Besides low taxes and low utility costs, Serbia provides cheap labour with a relatively high level of skills and education, readily available for foreign direct investors. There are considerable discrepancies in salaries between Serbia and other European countries, across different qualification levels. For instance, average managers' salaries in the EU-28 are 5.03 times higher than in Serbia, compared with 3.92 for technical professionals, 2.93 for machine operators, and 2.67 for low-skilled and unqualified labourers (CEVES 2017: 117f.).

As for working conditions, many workers in the automotive industry face violations of basic labour and human rights: disrespectful treatment, intimidation, pressure from supervisors; an atmosphere of fear, and the constant threat of dismissal and relocation; overtime above the established legal maximum; unpaid or inadequately paid overtime; reported cases of women being fired, or their contracts not being renewed, due to pregnancy, and so on. Most low-skilled workers have little chance of finding another job, and low wages remain a key factor in keeping workers tied to poor working conditions. Trade unions operating in this sector have flagged up systemic irregularities in occupational health and safety, in particular shortcomings in state labour inspections. Another significant problem is that many workers are employed on short-term contracts, exacerbating their precarious position.[56]

Unlike other branches of the manufacturing industry, the automotive sector has a relatively high rate of unionisation, at between 30 and 40 percent sector-wide, although it should be borne in mind that this average is skewed by the higher degree of union organisation in companies such as Fiat and its suppliers, which stands at around 50 percent. Following privatisation, these companies inherited many workers who previously worked at Zastava and then continued with their union work at the new companies. By contrast, there are many companies in which trade union organisation is suppressed or kept to a minimum, and management does not treat the unions as relevant actors in the negotiation process.[57]

It should be noted that workers themselves have lost confidence in the unions because of their failure to resist the subordination of workers to market discipline and to fight for better working conditions, leading to a decline in living standards, acceptance of poor working conditions and wages, unpaid overtime, and so on. Trust is also undermined by the fact that certain unions have reached agreements with managers at company level, mostly for the personal benefit of union leaders and to pacify employees.

When it comes to the decision-making process, it is understood that strategic decisions are made at the level of original equipment manufacturers (OEMs) abroad and that local companies in Serbia have little autonomy. The role of management in local companies is primarily in finance, organisation of work processes and disciplining the workforce, with no influence over the strategic development of production and the company.

56 Information gathered from interviews with trade union representatives.

57 Ibid.

Local managers are expected to act in accordance with the directives from OEMs, and their activities are reduced to defining the budget, delegating tasks, monitoring, and motivating workers to achieve higher productivity. While they may be privy to information about the company's general strategies, they have no influence over the formation of business policy. They must fully implement the goals set, but rarely (almost never) have the opportunity to set them themselves. Local managers usually take on leading roles in a factory, but they do not make the most critical product development decisions. They are directly responsible for operational tasks and are the first to be hit if the work within the smaller unit is not completed on time and therefore bear the full burden of laying off employees.[58]

Generally speaking, manual workers have almost no say over the strategic decisions of the company. Since they work mainly in low-skilled jobs, they are not able to impose their perspective and influence the direction of production development. There are several cases in which companies consult employees by installing so-called innovation boxes in which workers can put written suggestions for improving the work process, which management may or may not take on board.

Very occasionally, some companies ask for opinions and proposals from the unions, especially during crises, to find a suitable way of preventing labour force fluctuation. However, there are no institutionalised mechanisms that workers can use to influence the company's strategic decisions and improve their position in practice.[59]

ROLE OF FOREIGN DIRECT INVESTMENT

The automotive industry has attracted almost 14 percent of total FDI in Serbia over the past two decades, amounting to over €30 billion. More than 25 percent of all foreign companies that decide to invest in Serbia look to the automotive industry. Some 110 international companies have invested in this sector, representing a total capital value of over €4 billion and creating over 60,000 jobs. The largest investment is that of Fiat, amounting to €940 million (Development Agency of Serbia 2020: 5f.), which has also attracted many other car parts manufacturers to Serbia. Other significant investors include Michelin (€138 million), Cimos (€120 million), Robert Bosch (€71 million), Cooper Tires (€50 million), Yura

58 Information gathered from interviews with trade union representatives and local managers.

59 Information gathered from interviews with trade union representatives.

Corporation (€41 million), Johnson Electric (€20 million) and Cooper Standard (€24 million) (Development Agency of Serbia 2016).

The availability of cheap, skilled labour and the support provided by national and local government are the main draws for foreign investors. To attract foreign investors and facilitate new business ventures, the RS Government offers financial subsidies for greenfield and brownfield projects in the automotive industry. The state offers grants ranging from €4,000 to €10,000 per newly created job for standard projects. For large projects, special packages are available, provided that the value of the investment is at least €50 million and that the investor employs at least 300 people. These projects are entitled to a subsidy of up to 20 percent of the investment's total value. For projects with an investment value of more than €100 million, subsidies of 17 percent of the total investment value are available (SIEPA 2015).

Most foreign investors in the Serbian automotive industry have received state subsidies, including Fiat, Michelin, Bosch, Continental, Johnson Controls, Aptiv and many others.

In addition to having one of the lowest corporate tax rates in Europe, Serbia offers a wide range of possible tax breaks, especially for export-oriented investments. For example, companies are exempt from income tax for 10 years if they invest more than €9 million in fixed assets and employ at least 200 full-time workers during the investment period. Companies are also exempt from income tax and social security contributions for two to three years provided the investor employs workers who are entering employment for the first time or those who are currently registered as unemployed. VAT is not paid on the import of raw materials and intermediate goods for export-oriented production. Currently, the Republic of Serbia has signed double taxation agreements with 48 countries around the world. This means that if a taxpayer makes a profit by doing business in another country, and if the tax on that profit has already been paid in another country, the company will be entitled to a reduction in corporate income tax in Serbia up to the amount of tax paid in that country.[60]

Investment in municipalities with different levels of development also results in different levels of subsidies and tax breaks:

60 For more details, see SIEPA (2015).

Level of development of the local municipality	Percentage of two-year total salary cost covered by the state	Percentage of investment in fixed assets (optional) covered by the state
I	20%	UP TO 10%
II	25%	UP TO 15%
III	30%	UP TO 20%
IV	35%	UP TO 25%
V	40%	UP TO 30%
BONUS FOR LABOUR-INTENSIVE PROJECTS		
Over 200 employees: +10% of total two-year gross salaries	Over 500 employees: +15% of total two-year gross salaries	Over 1,000 employees: +20% of total two-year gross salaries

The incentives are designed to offer the highest grants to the least developed municipalities (Serbia's municipalities are divided into five development categories). The subsidies are calculated as a percentage of the two-year salary expenses or as a percentage of the investment (Development Agency of Serbia 2020: 34).

Additionally, under an agreement between the RS Government and FCA, Serbia was obliged to give the status of a free customs zone to the area where the FCA factory is located, so that FCA and its suppliers are exempt from customs duties on imports of parts, components, raw materials and business equipment.

It is clear that, in its efforts to attract FDI, the RS Government is directly creating conditions conducive to worker exploitation. The low accumulation and deficient national savings level pressure the government to make all possible concessions to foreign capital because foreign investors remain in the country only if wages are lower than in other countries. To ward off the constant threat of relocation of production, the state provides new and additional concessions to foreign investors. Serbia is thus stuck in a vicious circle of maintaining low taxes on profits, allowing tax exemptions for 10 years, refraining from controlling transfer prices, providing generous subsidies, and so on. At the same time, foreign investors are manipulating tax balances and, when in their interest, leaving Serbia with untaxed profits.[61]

61 For more details, see Radenković (2017).

POSITION IN INTERNATIONAL VALUE CHAINS

The automotive industry in Serbia is geared to the production of marginal and less valuable parts. Apart from a few companies that produce complex elements, all the rest perform assembly of finished parts or manufacture less complex elements. There is no production of items such as engines, instrument panels, braking systems or steering wheels in Serbia. Even big multinational companies operating in Serbia produce parts with low added value. For example, Jura, Dräx-lmaier and Leone produce cable sets, Bosch wiper systems, Magna seat covers, Norma and Continental rubber and plastic hoses, while Michelin and Cooper Tires make tyres (Development Agency of Serbia 2020: 8).

Another characteristic of the Serbian automotive sector is the short production chain, with most companies importing all raw materials and semi-finished products.

Most of the foreign companies that operate in Serbia have not included domestic firms in their value chains. Larger companies tend to bring existing suppliers with whom they have a long-standing collaboration to the local market. This provides them with quality stability since these suppliers are already familiar with their standards and way of operating the business. Additionally, foreign companies tend to have large-scale production that surpasses most domestic firms' capacities.

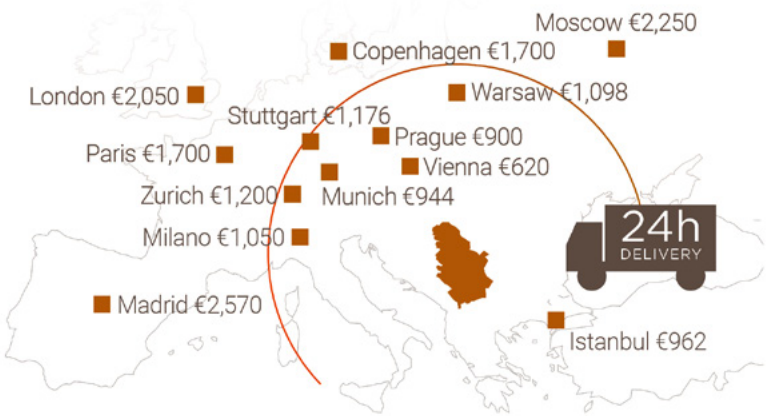
The domestic SME sector is dominated by family firms that operate either as small-scale workshops or as small businesses engaged in essential industrial production, meaning that they cannot produce long runs of vital components. It is estimated that less than 10 percent of private domestic firms in the automotive sector currently meet the conditions required to enter the value chains of globally integrated companies (CEVES 2017: 161).

The production structure of the Serbian automotive sector means that it relies mainly on unskilled work requiring brief training but not advanced education. Labour costs in Serbia are among the lowest in Europe, while skills and flexibility are relatively high. Serbia's average annual labour cost is lower than in all EU member states, except Romania and Bulgaria. Labour costs are lower in other sectors in Serbia as well, but in the automotive sector labour productivity is high enough to put Serbia ahead of its competitors in terms of value added and unit labour costs. The main competitive advantage is usually the cost of labour and its availability and adaptability (CEVES 2017: 118f.).

As pointed out by CEVES (2017: 119), electricity costs are also among the lowest in Europe, with the average kWh price for industry, for all consumption ranges,

being lower than in the vast majority of EU countries. Meanwhile, many foreign companies enjoy a preferential electricity tariff guaranteed by the RS Government.

Additionally, transport costs are also favourable because of Serbia's proximity to the EU and its excellent connection to the Asian and Russian markets (Development Agency of Serbia 2020: 20).



Given that the value added per unit of cost per employee is generally higher in Serbia and that the cost of capital is mostly the same, the combination of low labour and energy costs makes a significant contribution to Serbia's competitiveness. In the post-crisis period, the sector's productivity is increasing, and more importantly, it is growing faster than average labour costs.

A favourable balance between the level of productivity and the cost of key inputs allows Serbian companies to provide a higher level of price competitiveness. The combination of cheap inputs (labour and energy), workers' ability to be sufficiently productive and the proximity to key markets are the main factors that make Serbian automotive production competitive.

ROLE OF R&D IN THE SECTOR

The Serbian automotive sector is mostly production-based, while R&D activities are usually located outside Serbia, mostly in the countries where corporate headquarters or other company branches are based. Therefore, companies operating in Serbia tend not to employ skilled personnel who produce complex products or

perform activities that require the most complex technological knowledge. As a consequence, little know-how is generated in Serbia.

R&D and innovation are currently hampered by insufficient public and private investment. Only 0.9 percent of Serbian GDP is invested in R&D, well below the 2.03-percent average for the European Union.[62] Investments in R&D and innovation by private capital operating in the automotive sector are staggeringly low.

R&D used to be a highly developed and internationally recognised sector of the Yugoslav economy. However, in the early 1990s, Serbia abruptly entered a deindustrialisation phase when both physical infrastructure and accumulated knowledge collapsed. In the early 2000s, the Serbian automotive sector entered the transition process in a state of devastation, characterised by technological backwardness, redundancies and financial problems, and so became utterly dependent on foreign capital.

Authorities frequently emphasise how important it is that foreign investors in Serbia, in addition to opening production facilities, also invest in R&D centres that work with the education system to train up staff with the right qualifications, who will then directly participate in the process of creating new value. However, the fact is that companies are primarily looking for workers with low levels of knowledge and skills, who are cheaper to employ than those in competitor countries (primarily new EU members). There can be no doubt that, in the global division of labour, Serbia performs production with low added value.

The lack of investment in industrial production and insufficient investment in R&D leaves the country trapped in low-wage, low-tech and low-value-added production. The implications of such a policy are quite atrocious, especially since state investments are planned entirely and exclusively according to private investors' strategies.

If we observe the labour market's current needs in Serbia, the most sought-after commodity is unskilled labour.[63] The Serbian government seeks to leave education to be dictated by market forces, which will lead to further collapse of both the education system and the economy. This is especially evident in its strategy of implementing the dual education concept with the idea of harmonising the needs of the labour market, i.e. the economy, with the system of secondary vocational education, in other words the employment of high school students

62 For more details, see Šušić (2014).

63 For more details, see Bradaš (2017).

(aged 15 to 18). Considering the high demand for low-skilled workers, this practice will provide companies with labour below the minimum wage. Pupils' wages are 70 percent of the minimum wage for a 30-hour working week (Zakon o dualnom obrazovanju, article 34). Moreover, because they are performing low-skilled tasks that do not require any kind of training, pupils will not gain any qualifications in return that will help them to achieve a better market position in the future. Thus, the dual education system provides private companies with a secure supply of cheap labour, while schools are encouraged to turn out low-skilled workers such as cable winders, this being the primary demand of foreign investors (Reljanović 2017).

On the other hand, the entry of students into the labour market means that the labour force is expanding, thus further intensifying competition for already scarce jobs and ultimately further lowering the already pitiful cost of labour. What's more, the Serbian government offers tax breaks and financial incentives for companies that decide to enter the dual education system, yet these companies are under no obligation to offer jobs to the students after they finish their education, but can simply employ a new intake of youngsters each year. Without a clear economic development strategy, dual education remains just another resource that companies can use to exploit cheap labour.

INTERVIEWS WITH STAKEHOLDERS

EXISTING BARRIERS TO CONVERSION

Given that the European Parliament and the Council of the EU are negotiating about reducing greenhouse gas emissions by 55–60 percent by 2030, the demise of internal combustion engines is likely to cripple the automotive industry globally. European countries are turning to the future when planning comprehensive public policies for the transition to ecological mobility. Ecological mobility is defined as mobility using modes of transport such as walking, cycling, public transport and rail traffic.

Implementing this concept requires a new industrial strategy that can comprehensively replace outdated transport with new forms of mobility. The ecological mobility industry therefore includes the production of vehicles for collective public transport and rail transport of passengers and freight. Although the term ecological mobility among the wider public is often synonymous with electric vehicles, especially electric cars, only energy-efficient electric vehicles, such as electric

bicycles and cargo bikes, can be considered more eco-friendly than combustion engine cars. Electric cars cannot therefore be considered a form of individual ecological mobility, in view of what might be termed their ecological baggage.

Respondents interviewed for this research had different perspectives on what constitutes ecological mobility. Some understood ecological mobility industry to mean the transformation of the automotive sector exclusively through electric car production. Those were mostly the respondents whose jobs directly depend on automotive production. Even when asked about the possibilities of manufacturing public transport vehicles such as rolling stock or buses, this group did not see the significant production of other modes of transport as realistic in the near future. By contrast, other groups of respondents emphasised these alternative modes of transport, in particular public transport, speaking from an idealistic view of what urban transport should be like.

Although respondents' views on what constitutes ecological mobility differ, almost all of them are not overly optimistic that this transformation towards environmentally friendly modes of transport will take place soon. For them, it seems that the prevailing view in Serbia is that such a transformation is something far away that we do not have to think about yet. However, they believe that this transition will undoubtedly take place, despite Serbia's inadequate political framework around this issue, but that when the time comes we will not have the mechanisms to overcome the economic and financial challenges of developing this transition. The longer this issue is delayed, the more severe the consequences for citizens and the environment could be. That is why all of them are determined that steps must be taken now because no one will wait for Serbia to start working seriously on planning, designing and implementing projects towards ecological mobility.

As a critical obstacle to a potential transformation towards an ecological mobility industry, union representatives refer to Serbia's position in the international division of labour. The end of the socialist regime marked the start of ownership transformation processes, in the form of privatisation of state and social property and establishment of the market as the dominant mechanism for regulating social production. These processes led to the cessation of production, deindustrialisation, social polarisation and an increase in indebtedness. This positioned Serbia on the periphery of both European and world centres of capitalist power, on which it ultimately depends.

The dominant economic policy aimed at attracting FDI has led to the state's complete economic dependence on foreign capital. As early as the beginning of the 2000s, the state stopped investing in its industrial production and practically left the entire field to private capital. Today, the conversion of the automotive industry also depends on the interests of private investors. This structural economic position was most clearly emphasised by the trade union representatives, who point out that the use of ecologically sustainable transport will not become a reality in Serbia any time soon since the country today finds itself "at the tail end of Europe".

In this connection, the main problem identified by the union representatives is that the state does not have the economic sovereignty to decide on the strategic direction of its transport sector at all. As things stand, the state does not own the means of production or manage modern technology. They contrast this situation with the previous system, in which the producers, i.e. workers, owned the means of production and managed technology and knowledge through self-governing bodies. "In Yugoslavia, the state used to invest heavily in knowledge. All firms had development branches. People who worked in the transport industry were great authorities who designed production tools in collaboration with international experts. We used to create and produce new models ourselves, and today we don't even know how to make panels for vehicles. We threw away our technology."

Union members from railway companies see potential in the production of alternative modes of transport such as rail vehicles. Speaking about the barriers to successful production in this sector, they state that Serbia has outdated and poorly maintained rolling stock, which is why rail transport operates so poorly. Add to that the neglected infrastructure, outdated maintenance facilities, technological backwardness in comparison to developed railways and inadequate government policy that neglects the real transport needs of the population, and that leads us to conclude that the entire rail system needs to be overhauled, a view diametrically opposed to the government's vision. The respondents point out that almost the entire rail vehicle industry has been shut down in the last few years. The companies that operated in it had a distinguished reputation for the quality of their products. However, the Serbian government is taking a laissez-faire approach to the rail vehicle industry, although it should actually be supporting it as it is strategically crucial for domestic industrial production. The railway machine industry produces exclusively by order for markets with limited buyers, and therefore the nature of the contracts is such that it is impossible to conclude most of them without state support.

In the last two decades, no domestic rail vehicle factory has landed an order for the procurement of new rail vehicles. In the period of sanctions in the 1990s,[64] that industry lost most of its business abroad, and domestic companies were not developed and became indebted. According to the respondents, the state took out loans to purchase new vehicles and build new infrastructure, but foreign companies were hired. The creditors make the approval of funds conditional on the majority participation of their companies in the business, thereby preventing participation by the domestic machine industry. This creates a situation where money is returned to the economy only for cheap labour and cheap materials.

In the early 2000s, Serbia's railway system entered the restructuring process conditioned by European loans, but due to poor management, the process came to a virtual standstill. Frequent changes in management due to political decisions have prevented a strategic approach to running a company. There was no readiness on the government's part to start investment cycles on the railways, so the infrastructure and rolling stock were in a state of technical write-off. Until a few years ago, the average age of locomotives, passenger cars and freight wagons was over 35 years old, and more than two thirds of the railways have not been repaired in the last 30 years.

Due to all these factors, passenger traffic intensity has dropped to only 11 percent of the European average. For these union member respondents, the main problem is the government's vision for rail revitalisation, which is based exclusively on the construction of high-speed lines for trains capable of travelling at up to 200 km/h. They have already started the construction of new lines for these speeds and the procurement of faster trains by borrowing funds from Russia and China. Serbia had the technical ability to build and maintain lines for speeds of 120 km/h, electric locomotives travelling at 140 km/h and electric trains at 160 km/h. The fundamental problem with developing high-speed railways is their cost-effectiveness, especially bearing in mind social conditions in Serbia. As high-speed trains are equipped for passenger comfort, tickets are more expensive than for standard trains. High-speed trains are intended for passenger transport because the usual cargo is not transferred at speeds higher than 100 km/h. The business world is the

64 During the 1990s and early 2000s, several rounds of international sanctions were imposed on the Federal Republic of Yugoslavia. The first round of sanctions lasted from April 1992 to October 1995 when Yugoslavia was placed under a United Nations (UN) embargo. From 1998 until the beginning of 2001, Yugoslavia was sanctioned by the UN, European Union and United States. Serbian GDP dropped from USD 24 billion in 1990 to below USD 10 billion in 1993 and USD 8.66 billion in 2000. This period saw the devastation of Yugoslavian industry. For more details, see Becker (2017), itself an excerpt from Becker (1997).

main user of high-speed trains, a tiny number of people in Serbia. Most passenger transport needs along the rail corridors are suburban and regional movements with an increased number of stops, for which maximum speeds of 120–140 km/h are applied. The frequency of the stations prevents the attainment of higher speeds. For these high-speed lines to be cost-effective, daily traffic of at least 15,000 passengers, ready to pay for expensive tickets, is needed.

The respondents emphasise that what most people in Serbia need is affordable transport solutions with a basic and not elitist system of transport standards. They believe it is almost certain that travel by luxury trains will be subsidised, either by the rail company or by the state. The respondents also point out that the government is hiding the financial implications of building such ambitious facilities and is making decisions without any public discussion. They think that a good alternative to this would be an overhaul of the existing railway system to enable speeds of up to only 150 km/h. In their opinion, this is enough for a fast trip, while the whole project would cost incomparably less and therefore the price of a train ticket would be much more affordable for ordinary people.

Almost all respondents emphasise that the state has no strategic determination to move towards the ecological mobility industry, and that is why there are currently no significant changes in this area, although that should be the first and the most crucial step. The authorities in Serbia, a country on the periphery of the capitalist system, which depends on foreign capital for economic development, are dragging their feet on this issue. As the union representatives point out, the most important thing for the state is to attract foreign investment, which explains the absence of strict environmental standards in Serbia.

For almost all respondents, including those from state institutions, strategic planning should be a priority for government action since "we are a country at the very bottom of Europe in terms of economic development and living standards". In reality, it is clear that the state is neither addressing these issues nor strategically investing in the production and use of sustainable/clean transport and energy.

All respondents agree that this type of transformation requires numerous resources (knowledge, technology, financial resources and public support, to name just a few) to move all areas of development towards ecological mobility in a strategic way.

On the subject of finance, the civil society respondents emphasise that the funds allocated to this area in the national budget are insufficient for progress. They

state that the governance of ecological mobility, based on public and rail transport, is set to pose a major problem for Serbian society in the coming period. If Serbia wants to join the EU, the estimate is that it will have to invest approximately €15 billion in the field of environmental protection (Chapter 27 of the EU accession negotiations). This is a large sum for a country like Serbia, whose entire budget amounts to €30 billion. At present, the portion of the budget dedicated to environmental protection represents around 0.6 percent of GDP.

This mismatch between what will need to be invested and the current level of investment justifies the assumption that the EU integration process will pave the way for public-private partnerships and direct privatisation in the sphere of environmental protection. As civil society representatives point out, this could lead to long-term catastrophic consequences for ordinary citizens, whose incomes are among the lowest in Europe. This does not mean that Serbia should not improve environmental standards and policies, but that it should not be done at ordinary citizens' expense. The government's announcement of further privatisation of public utilities, land and other natural resources represents the most urgent problem that needs to be addressed.

It should be noted that the civil society respondents, from both climate and urban movements, best identify the problems associated with establishing an industry that insists on ecological mobility forms including the production of public transport vehicles, rail transport of passengers and freight, and individual green mobility solutions such as electric bicycles. In addition to financial constraints, they point out that the state is doing almost nothing to establish an appropriate framework for transition and, in this regard, is not working on developing projects that respect economic, social or environmental specifics that would enable an adequate transition to the ecological mobility industry. To enable this transition, early and efficient planning is needed.

The state is failing to analyse specific socio-economic circumstances for all regions in the country, as would be necessary to identify the context, challenges and opportunities for implementation. These respondents see the most significant problem as the lack of finance, especially in those regions where many companies produce parts for cars with internal combustion engines, given that these factories might be closed without state investment to provide alternative employment.

Measures are needed to guarantee workers that any losses they suffer will be compensated. However, there is not even a plan to support vocational training and

reintegration of workers, nor a plan to renovate production facilities and reorient them to maintain local employment. The state is thus failing to take any steps to provide access to appropriate training and education of personnel, whether in green jobs or any other kind of work.

Even respondents working in government bodies acknowledge that the transformation of the transport sector towards more functional public transport and increased use of e-vehicles is still inadequately included in strategic and planning documents, thus prolonging the transition. For example, they point out that only a little progress has been made regarding legislation. Although Serbia, as part of compliance with EU standards, has agreed to develop an integrated city-level programme as a Plan for Sustainable Urban Mobility, there are still no indications of whether or how this will be implemented.

Respondents dealing with the climate, commons and urban issues especially express the fear that the public authorities, as many examples in the past can testify, will implement these measures with a lack of transparency, which will prevent adequate oversight of the state institutions carrying out the transition to the ecological mobility industry based on adequate public transport. In practice, the government conducts state policy in a very non-transparent manner, often approving financial resources or signing contracts and agreements of public importance in secret. This is also highlighted by the members of the railway union, who state that the government gives priority to projects with China and Russia when it comes to rail modernisation.

Serbia is modernising its railways through numerous loans from these two countries, although it has received non-refundable loans from the EU for some of these projects. For example, the public is unaware that Serbia's loans from Russia are projected to be €1.73 billion according to the budget plan for 2020 and that this amount is increasing all the time, while at the same time loans from the European Investment Bank and the European Bank for Reconstruction and Development are also available to Serbia on much more favourable terms. However, the government continues to borrow from Russia and China without trying to justify these irrational economic practices in public.

Civil society respondents from organisations dealing with traffic issues also highlight another problem, namely that the state does not conduct publicity campaigns to inform citizens about switching to new types of mobility, including walking, cycling, public transport and rail. They emphasise that it is essential that all Serbian

residents become familiar with this message to ensure timely public support for these new modes of transport. They all highlight the lack of information about the benefits of different approaches to solving mobility problems at the local or state level.

Environmental activists working in NGOs also cite a certain "learned" attitude towards different types of transport, in the sense that specific patterns of behaviour show great resistance to change. One aspect of this is a definite "cult of the car", with car ownership in Serbia being perceived as a status symbol. "As a society emerging from transition, we want to live the 'American Dream' in which one arrives everywhere by car, and this is regarded as 'freedom of choice'." Another problem identified is resistance to change on the part of car owners unwilling to sacrifice their comfort and convenience: pressure from this group will most certainly be reflected in the actions of political parties.

All respondents also highlight inadequate cooperation between the public sector and other actors, even though the pooling of ideas and resources, and interdisciplinary and cross-sectoral projects are necessary for the transition to take an

acceptable form. These collaborations should also include unions, universities, companies, business sector organisations, education centres, environmental NGOs and other stakeholders. The diversity of actors is necessary for the cooperation to be genuinely inclusive, starting from developing programmes for the transition to the ecological mobility industry, via the implementation of measures, all the way through to their evaluation.

The inertia of trade unions can be seen as a major problem, as they need to become much more involved in this issue. From the interviews with union members, one may get the impression that unions are not even aware of how vital their role is in monitoring and creating policies promoting the transition to the ecological mobility industry, regardless of their different perceptions of what that transformation should look like. This topic is currently not on the trade unions' agenda, so there is a real fear that they will not significantly impact these processes and will not do what is needed to support workers through this transition.

OPPORTUNITIES TO SUPPORT THE CONVERSION

NECESSARY POLITICAL INCENTIVES AND INITIATIVES

Given the absence of public debate about ecological mobility and of any government initiatives seriously addressing this issue, most respondents want to see greater state intervention in this field. Thus, most of the interview responses recognise the state as the main driver in creating favourable opportunities for the industry to reorient itself towards alternative forms of mobility. Opinions on how the state should intervene vary among the different respondent groups, from legislative changes, state investment in sustainable modes of transport such as rail and public transport, to subsidies for specific e-vehicle production programmes, including electric bicycles, buses and even electric cars.

When it comes to the production of alternative forms of transport in Serbia, manager respondents operating in automotive companies mainly focus on the manufacture of electric vehicles, and for them that means mostly e-cars. They are enthusiastic about the newly discovered lithium reserves in Serbia and think that this has great potential which the state should exploit as a comparative advantage. Indeed, according to the available data, Serbia has the largest reserves in Europe, amounting to 10 percent of the world's lithium. In the respondents' view, Serbia should therefore be much more ambitious in its industrial strategy. The state

should insist that this material be treated as more than just an export resource and should force companies to process it in Serbia to produce electric vehicles.

Additionally, according to the respondents, the state should lower the lithium price for domestic and foreign companies that plan to open production plants on Serbian territory. Instead of just exporting this rare raw material, Serbia should leverage this opportunity to position itself in the supply chain not only as a country that offers tax relief and cheap labour for the production of less essential parts but also as an exporter of final products with added value and greater product complexity, requiring a higher level of knowledge and skills. Some civil society respondents dealing with climate issues do not view this opportunity positively, citing a potential environmental catastrophe in the region where lithium reserves have been found. Specifically, the announcement that international mining company Rio Tinto is one step away from a decision to open a lithium mine in Serbia has caused great anxiety among citizens.

These respondents say that the riskiest part is the exploitation of lithium because the extracted ore would be treated with concentrated sulphuric acid at 250 °C. The vapours from aggressive acids used for lithium extraction will enter the atmosphere and pose a significant risk to animals and human lungs. Also, this extraction requires a large amount of water for processing, and there is no information yet on how the wastewater will be treated before it is discharged into rivers. Furthermore, contaminated water containing impurities from the ore, acid residues and their salts could potentially spill into fertile fields in the river valley, leading to the devastation of agricultural land throughout the region. There is no information on how this ore will be exploited and whether it will be owned by Rio Tinto or some other company, but in any case the mineral tax in Serbia is only 4 percent. It is unacceptable to permanently destroy agricultural land and water resources for the insignificant mineral tax.

Another comparative advantage that Serbia has, as noted particularly by trade union activists operating in the automotive sector, is its location. Like the automotive sector managers, these respondents identify an ecological mobility industry with the production of individual electric cars. The current pandemic has caused disruption to supply chains, which has significantly affected the car industry. Strategic portfolio reviews in the automotive sector will undoubtedly lead to the optimisation of capital allocation, taking into account market proximity. These respondents believe that supply chain logistics and length are being re-examined more than ever, which could work to Serbia's advantage. This economic/

geographical criterion could lead to global economic actors recognising Serbia as a potential investment location precisely because of its proximity to sales markets. This position is backed up by the answers of the company managers, who believe that the state, now more than ever, should promote and exploit Serbia's geostrategic position to attract companies engaged in the production of electric vehicles, mostly e-cars.

As well as exploiting geostrategic advantages, these respondents believe that the state should work more on reorienting the existing products in the car sector towards the electric vehicle industry. In this regard, union representatives and managers believe that given the state's generous tax approach towards foreign investors, the government could pressure companies already manufacturing in Serbia to reorient at least 30 percent of their capacity to the needs of electric vehicle production.

Also, company managers believe that the state must provide tax incentives, direct subsidies and other forms of support to interested manufacturers that want to develop the Serbian electric vehicle market, primarily that of electric cars. Other respondents, such as journalists, believe that state support should be focused primarily on domestic producers. They cite examples of domestic companies that already produce electric bicycles, e-rickshaws, scooters and other electric vehicles. They are mainly talking about small producers, but there is significant potential in this branch of industry which could only be successfully exploited if the state were to subsidise the production and purchase of electric vehicles.

Respondents from the media sector believe that the state measures should not be limited exclusively to the domestic production of electric cars, but that incentives also need to be provided for using these vehicles. For example, they say that users and owners of e-vehicles should be allowed to drive in the yellow lane (normally reserved for public transport), be exempt from tolls, have free parking spaces and free electricity. In this regard, these respondents think that a useful measure would be for local governments and state-owned enterprises to be legally obliged to replace their existing vehicle fleets with electric cars and buses. In addition, they believe that by promoting socially responsible business policies, the state should encourage employers in the private sector to support electric car use by their employees.

Almost all of these respondents believe that, unless the state subsidises the production and purchase of electric cars, it will not be possible to create the right

commercial conditions in our market. To this end, the state must finance the development of a network of charging stations to enable the widespread use of electric vehicles in Serbia. In this connection, the respondents emphasise that if Serbia wants to connect with international corridors, along which electric cars will undoubtedly travel, developing a charging network is imperative.

Not all respondents see the potential of electrification as a means of transforming the transport sector. Unlike trade union activists active in the automotive sector, trade union members in railway companies state that rail is the only sustainable land transport model. To combat climate change, they believe that we urgently need to increase rail transport, which in Serbia lags far behind in terms of its modal share, and for that we need a significant turnaround in freight and passenger transport. The Serbian government must act immediately to promote the transport of passengers and goods by rail. These respondents think that if we want to protect the environment, the goal must be to redirect traffic to railways across the country. In order to achieve these goals, comprehensive technological modernisation of the Serbian railway sector is necessary. There is a need to raise awareness of this issue, secure funding and decide on a fair transport policy.

These respondents point out that when we entrust strategically vital projects for the economy, such as train production, renewal of infrastructure or construction of the metro, exclusively to foreign companies, we build a debt economy. When a loan is required, the state lends to foreign companies. However, in their view, Serbia is not yet such a technically and technologically backward society that it should entrust most of these projects to foreign capital. In their opinion, the government should seek to maximise the participation of the domestic machinery industry and construction companies.

In the current conditions, the most realistic expectation is that projects for the production of metro trains, trams, wagons and train sets would be carried out in cooperation with some of the large producers from the creditor country. It is estimated that it is realistic to achieve domestic industry participation totalling 30 to 40 percent of the business's financial value. Such projects should be distributed throughout Serbia. Apart from the Belgrade metro, these could be projects related to the tram system and suburban railways in all major cities. These respondents believe that we still have the trained engineers and technicians necessary to produce modern rail vehicles.

Until the 2000s, domestic companies produced all types of rail passenger cars for speeds of up to 200 km/h. All development capacities were at a high level and there were plenty of experienced staff. For example, an electric-motor train model was developed, but it did not enter serial production, and during the 1990s a 10-year plan for the introduction of an urban and suburban electric rail service was drawn up, but the entire project was stopped due to economic sanctions and NATO bombing. In the meantime, domestic factories have been privatised, not a single domestic rail vehicle has been built for several decades, and the state is borrowing from foreign creditors to buy electric trains from foreign companies that domestic firms could also produce. The respondents think that although most of these factories are now bankrupt, the state must revitalise them and start up production to ensure the technical conditions needed to manufacture electric trains. Financial assistance from government institutions is therefore necessary for the development of an ecological mobility industry.

Respondents from the scientific community and civil society organisations dealing with climate, urban, commons and traffic issues also believe that the future of ecological mobility should be based on rail vehicles and better public transport. They note that currently, Serbia's sole focus is on developing road transport, while other modes of transport and mobility are being ignored. For them, it is vital to address this at the political level. These respondents expect the state to implement the construction and expansion of adequate infrastructure that is not intended exclusively for cars. Improving public transport would encourage more citizens to use it and thus reduce their environmental footprint. They believe that it is necessary to reduce the number of private vehicles in city centres and improve public city and intercity transport. For these respondents, at the city level priority in mobility should be given to pedestrians and cyclists, followed by public transport vehicles, with the provision that tram and trolleybus lines should be extended, while bus lines should be switched to more environmentally sustainable fuels (electricity, methane, hydrogen, etc.).

The suburban railway also needs to be improved. Cars and other modes of individual transport should be at the bottom of the priority list, and the number of people in the car should be taken into account by rewarding those drivers who drive at least three people and discouraging drivers who travel alone. Nevertheless, for the time being, only the promotion of alternative modes of transport is possible, and the introduction of disincentives for driving a car. Although resistance is to be expected, the first steps should be a ban on diesel vehicles, which are the

biggest polluters, and a ban on importing cheap cars that do not meet the required standards. According to civil society respondents dealing with traffic issues, the state should take an active role in promoting alternative forms of mobility, so for example, instead of the subsidies announced for hybrid cars, the purchase of ordinary and electric bicycles should be subsidised.

In the view of these respondents, the state should undertake an extensive, long-term campaign to encourage a change in learned behaviour and raise awareness of the harmfulness of the existing transport system and the benefits of an environmentally sustainable alternative. Respondents also list a set of legislative and institutional changes that must accompany the conversion plan. For example, responses often point to the need to amend traffic safety laws to improve conditions for cyclists and pedestrians. Some respondents would also like to see changes to parking rules in urban areas to discourage the use of private vehicles.

Almost all respondents cite the lack of national consensus on the necessary policies for conversion to ecological mobility as a significant obstacle. For some of them, the solution lies in producing and using e-cars, while others think that the primary focus should be on collective public transport rather than private vehicles. However, all of them stress the need to pressure the state to create the necessary conditions and encourage conversion. When it comes to conditioning the state to take an active role in conversion, the respondents point out that pressure from international institutions is a favourable circumstance. By signing the Stabilisation and Association Agreement, opening accession negotiations with the European Union and joining the Energy Community, the Republic of Serbia has committed to harmonising its public policies with the EU system. The EU's long-term climate and energy policy envisages achieving carbon neutrality by 2050, which is why Serbia has committed to reducing its greenhouse gas emissions by increasing the share of energy obtained from renewable energy sources by 2030.

Even respondents from state institutions point out that the EU is Serbia's leading foreign trade partner since most of its production is placed on the EU market, and thus the EU has mechanisms to exert pressure on Serbia to transition to an ecological mobility industry. Use must be made of the resources from the EU accession funds related to improving transport and energy use, especially from renewable sources.

Interestingly, respondents from climate and urban movements see trade unions as critical players who should take the lead in this whole process. For these

respondents, trade unions need to play a central role in assessing and anticipating the needs of the transition to environmentally friendly modes of transport with a primary focus on public transport and rail vehicles. Anticipating these trends and their impact on automotive sector workers should be among the unions' priority activities. These respondents also list the mechanisms and activities that unions should adopt to include workers in the transition from the automotive industry to an ecological mobility industry focused on collective transport.

A key priority here is moving this topic up the trade union agenda and giving it greater prominence in union documents. According to respondents, it is also vital that unions inform their membership about the consequences of climate change and the implications for the world of work by broaching this topic at trade union meetings and organising talks and seminars with relevant experts. If unions participate in creating policies for the transition to environmentally friendly mobility and engage in public debate on these issues, this could, in turn, help to strengthen their role and power in society. It would potentially contribute to the mobilisation of new members, and it would stop the erosion of influence and trust in trade union activities. Interestingly, such views were expressed by respondents from civil society and not by the unions themselves, who have yet to recognise the importance of this process for consolidating their resources and power as well as strengthening their negotiating position on labour issues.

EXISTING THEMATIC LINKS TO THE QUESTION OF ECOLOGICAL MOBILITY

Despite their different views on ecological mobility, all respondents realise that this concept has implications extending beyond mobility itself. When asked about topics related to this issue, most respondents gave similar answers, citing identical ecological mobility problems and environmental protection.

The most common topic highlighted in answers was local micro-pollution. Since this mostly affects urban areas, people living in these areas should be all the more interested in reducing transport sector emissions.

This topic also raised questions about the health of individuals. Respondents often stated that alternative modes of transport, such as walking and cycling, have a positive effect on the body's psychophysical well-being, consequently reducing hospital treatment costs linked to physical inactivity and pollution. For example, pedestrians and cyclists exercise more than drivers and are therefore less susceptible to cardiovascular diseases. The discussion about the transition to the production of eco-friendly vehicles, such as public transport and rail, should

always take account of the facts given to us by the health sector about the number of illnesses and deaths directly caused by pollution of an environment. Some respondents also pointed out how important it is to continually appeal to people's awareness of what kind of air we breathe, what kind of land we cultivate, whether villagers are moving out due to mines, whether we have clean water, etc.

In addition to air pollution, the scientific community as well as urban and climate movement respondents pointed out that a big problem for individuals' health is the noise generated by cars with internal combustion engines. Constant exposure to noise negatively affects stress levels and psychophysical health in humans. As a result, many people are prevented from using public spaces such as parks and private spaces such as balconies and gardens in close proximity to busy city roads.

In addition to air pollution and noise, another related factor identified by all of the respondents is traffic jams. They note that congestion impairs quality of life due to the large amount of time spent in daily traffic, which reduces individuals' free time. This is one reason why civil society respondents, including those dealing with climate, urban and traffic issues, claim that electric cars cannot be a solution to this problem and that widening roads only encourages the use of private vehicles. The only way to reduce traffic jams is by improving public transport and increasing the modal share of rail transport such as trams and metro.

Furthermore, the respondents from organisations advocating for commons believe that the construction of roads and car parks, which Serbian authorities promote as a way of garnering political support, represents the usurpation of public space.

The answers also highlight the problem of animals being injured and killed on unsecured roads. In addition, the construction of new roads creates divisions in the ecosystem and prevents contact and migration in a number of species.

Representatives of the scientific community and climate protection NGOs see the issue of energy transition as directly related to the switch to ecological forms of mobility based on public transport and rail vehicles. They believe that the transition to electric vehicles is not sufficient to solve the problem, bearing in mind that electricity generation, especially in Serbia, is based predominantly on low-quality fossil fuels and therefore harmful for the environment.

Civil society respondents also state that cars are exclusive assets that create inequality and contribute to class differences. In particular, NGOs dealing with urban transport issues believe that the *right to mobility* must be a fundamental

right for all citizens. Therefore, as one of the solutions, they point to the need to improve public transport, which would reduce the segregation that occurs due to reduced mobility opportunities.

Also, these respondents believe that the topic of social equality in the field of mobility should be extended to the issue of urban/spatial segregation, i.e. balanced urban development, which, among other things, concerns the distribution of public transport and transport links between the places where people live and other urban functions (schools, health centres, workplaces, etc.). A balanced city and equal access to life opportunities depend mainly on how far apart all the functions related to social reproduction are. Sustainable mobility should also insist on an evenly distributed transport network (for public transport, bicycles and pedestrians) to every informal settlement, every block of social housing, and so on.

Respondents from the scientific community raise the issue of travelling and sustainable tourism. The question is whether it is really necessary to fly several thousand kilometres to spend a day or two at a conference. They believe that the concept of travel needs to be seriously re-examined, with greater use of rail instead of mass air travel: after all, "why would someone travel thousands of kilometres by plane for something that can be done or obtained online in a couple of hours?".

This necessarily leads on to the idea of sustainable tourism. Scientific community respondents problematise the current tourism model and the format of annual leave, which forces people to use private vehicles and mass air transport more frequently during a smaller number of free days. Their answers thus emphasise the importance of energy intensity, which inevitably raises the issue of a re-conceptualisation of free days and encroaches on labour policies.

POSSIBLE ALLIES FOR THE CONVERSION TO ECOLOGICAL MOBILITY

Although respondents' attitudes towards the ecological mobility industry differ, they all emphasise the need to bring different actors to work together on changing public policies and raising awareness of all stakeholders in the transport production and consumption chains. However, they all note the lack of such cooperation as a significant problem.

They agree that the transition to an ecological mobility industry is a very complicated task that requires a multidisciplinary approach, bringing together trade unions

and experts in climatology and environmental protection, traffic and mechanical engineers offering technical solutions and green technologies, urban planners, architects and journalists.

Continuous efforts therefore need to be made to build up a pool of experts who can work together in a meaningful direction. Almost all respondents see this cooperation in terms of developing a platform involving all actors directly and indirectly engaged with these issues, such as trade unions, universities, education centres, associations, civil society organisations including NGOs, existing car companies, and so on. This platform would also have to incorporate scientific and technological research, requiring the support of many educational and research institutions.

Respondents from the climate and urban movements highlight the need for a network uniting labour and other civil society organisations, such as progressive political parties and emancipatory political movements, environmental organisations, feminist associations and other progressive actors, which would work together towards ecological mobility in terms of better public transport. They note that there are a number of citizens' associations and initiatives in Serbia fighting to change urban development policy in order to promote people-centred cities, walking, alternative forms of self-propelled transport and cycling infrastructure within city limits. This can be achieved by simultaneously tackling air pollution from traffic and encouraging better public and personal transport subsystems instead of cars.

Among the most important initiatives are Streets for Cyclists and other organisations that actively work to prevent the commodification of public goods and environmental protection, such as the Right to Water coalition, Ministry of Space and Zajedničko.org (The Commons). Although these organisations work closely together, the problem is that this cooperation is limited to the narrow confines of the network of civil society organisations.

Certain progressive political parties and initiatives were also cited, such as the Party of the Radical Left (*Partija radikalne levice*) and Don't Let Belgrade D(r)own (*Ne da(vi)mo Beograd*), with which these organisations have close cooperation ties and in whose programmes the issue of the green transition features prominently. These respondents believe that cooperation between civil society and the public sector is vital for this issue. While they stress that cooperation with state and public institutions is currently superficial, and virtually non-existent, they believe that it is necessary to find progressive actors operating in public institu-

tions and government bodies, establish communication with them, and work on building a network. In the future, this new organisational model and structure could enable and facilitate the transition process. Although there is already cooperation with some progressive actors in the scientific community, this is limited to a few enlightened individuals working at universities or research institutes, and a firmer alliance has not yet taken root. Respondents from civil society believe that the state has to make a strategic commitment to act to promote the green transition, and the cooperation of all sectors at all administrative levels is needed. Currently this does not exist in Serbia.

The union representatives also believe that cooperation must be established with stakeholders in a range of sectors. They acknowledge that environmental issues do not feature in their current activities. While they realise that this transition could hit the existing automotive sector hard, leading to job losses, they still do not see any urgent need to organise trade unions around the transformation of the automotive industry and environmental protection. Instead of strengthening cooperation with other stakeholders operating in a local context, union representatives believe that a greater focus on international integration might be more beneficial in this area, i.e. networking with trade unions outside the national borders, both regionally and globally. They state that some countries have already entered the transition process, so the unions operating within these countries have devised specific mechanisms to protect jobs in the industries vulnerable to the energy and ecological transitions.

Interestingly, one of the trade union representatives also said that, in his view, if the union wants to get out of the current crisis, it should enter the political arena as a political party. The concept of a partnership between a trade union and a political party that would directly represent trade union interests is noteworthy because the existing parties mainly pursue an anti-union agenda. The solution envisaged is therefore to form a political party focused on policies that would ensure decent working conditions and quality jobs. Although there are various progressive initiatives and small progressive left-wing parties in Serbia, union activists did not mention close cooperation with them as an option.

Respondents from government bodies believe that it is necessary to map key actors who could support and secure such changes at different national and local levels. They pinpoint local environmental associations as crucial actors because they know best what the local environmental issues and needs are. For this reason, in their opinion, these associations should be more encouraged to partic-

ipate actively in discussions concerning the transformation of the automotive industry, especially in the regions where production sites are located.

Managers and some representatives of government bodies see the involvement of the domestic SME sector as valuable because the development of this type of cooperation in the future could be a powerful lever for Serbia's economic prosperity. Connecting companies in this way, especially in the transport industry, would promote more harmonious regional development of the economy and is key to creating new jobs.

IMPACT OF CONVERSION ON EMPLOYMENT AND DIVERSIFICATION OF INDUSTRIAL PRODUCTION

Many respondents believe that the transition of the automotive sector to an ecological mobility industry will profoundly reshape the labour market in ways that create new risks for the workforce. It is expected that certain sectors and regions, especially those that depend entirely on the conventional automotive industry, will be more affected than others.

This is emphasised most by trade union members. They stress that a potential shutdown of the conventional auto industry's production facilities could lead to a further reduction in the number of jobs. When asked for their opinion on what form the automotive industry's transformation will take, the unions had no ready, concrete answers as to what the production strategy should be. However, all respondents directly involved in the auto sector, both managers and union representatives, see the solution and the ultimate scope of this transformation as lying in a shift towards individual electric vehicle production.

Consequently, trade union activists are not too pessimistic about the situation because this transition could open up new opportunities for workers: new jobs, the replacement of existing occupations with new ones, and the need for new competencies and skills. Considering that Serbia's production activity is mainly based on low-level technology, the so-called "screwdriver industry", for workers employed in the existing auto industry, will not significantly change if production is shifted to less valuable and less complicated parts for electrified vehicles. In this regard, they state that the only way Serbia will prosper from this transition is if all vehicle production phases take place within the domestic economy, from work on body and platform construction to control functions. If the entire car's production in all its phases occurs in Serbia, it would require a more skilled work-

force because the current market needs are such that only low-skilled labour is in demand, namely workers who are trained quickly to perform simple tasks.

From the managers' perspective, this could lead to greater employment of a high-skilled workforce and at the same time prevent the brain drain of highly educated and technically skilled workers who are emigrating from Serbia. This would create much better jobs that would employ people with special technical expertise such as scientists and engineers. In the view of these respondents, the state and the automotive sector should work closely together to mitigate the workforce impact and find ways to create new jobs in the industry. In this regard, the state should already start drawing up plans for additional training, retraining or other employee assistance in this sector. These respondents also believe that the opening of the e-vehicles market would provide small and medium-sized enterprises in Serbia with a more promising future than they have now. This would, in turn, enable the creation of new high-quality jobs for IT professionals, engineers, designers and the like.

Contrary to the trade union activists from the automotive sector, representatives of railway union members put the least emphasis on the production of individual electric cars. For them, the conversion to ecological mobility will positively impact the creation of new jobs in rail vehicle production and renewal of rail infrastructure because it will require a larger share of rail and public road transport. Given that Serbia had experience in producing this type of vehicle, this conversion should enable the revitalisation of the railway sector. This could also influence job creation in related sectors such as the machine industry and construction. Serbia also has the knowledge to manufacture both conventional and electric buses and other vehicles for road freight transport. Many workers from these industries have been laid off in the last few decades and have not yet found new jobs where they can employ their skills and knowledge or the opportunity to retrain adequately. Of course, this revitalisation would require a specific type of training and learning of new knowledge and skills, because production in this sector has improved in the meantime. However, Serbia has the right staff for this type of production so the conversion to the ecological mobility industry should positively impact the labour market.

On the subject of automotive sector transformation, civil society organisations working to promote commons share a similar attitude to respondents from the railway union. Given that this group of respondents sees the change towards environmentally friendly types of mobility as centred around improving urban public

transport, they think that the auto industry could reorient itself to bus and rail vehicle production. By switching to ecological mobility, Serbia could renew its production capacities, which could reverse the fortunes of the decimated factories used to produce these types of vehicles. In addition, factories making scooters and regular and electric bicycles could be opened at several locations, while the number of workshops that repair these products would increase. Because it does not require large plants, this type of production could be spread throughout Serbia. A better distribution of public transport and traffic connections between all Serbian regions might lead to increased employment. A larger number of city and intercity passenger lines, and more frequent services, would require many more drivers than at present. The same respondents emphasise that the economy is much more diversified than it used to be, which opens up many opportunities. For example, given the global transition towards renewable energy sources, Serbia could redirect its production capacities to this fast-growing industry. This would involve training new staff and could have a positive impact on job creation.

Respondents from government bodies state that a growing number of smaller companies in Serbia are adopting sustainable business principles, including behaving responsibly towards society and the environment. Small businesses are characterised by a high degree of flexibility and adaptability to new market conditions, which is why they contribute to faster economic development. Entrepreneurial initiative and innovation come to the fore in these companies, which makes them an excellent testing ground for the development of green economics. Green entrepreneurship is an essential tool for developing rural and economically hard-hit areas and ranges from organic farming to various innovative business activities inspired by nature, tradition, local resources and sustainability. There is great potential for green start-ups, but the state has to recognise these ventures and provide them with adequate support and promotion.

Journalist respondents believe that the transformation of the existing automotive industry requires a change in production technology in terms of digitalisation and in the approach to managing production, distribution and consumption of all services and products in the transport sector.

Building on this, some of the scientific community respondents, who deal directly with traffic issues, presented a more complex perspective on the conversion of mobility towards more sustainable modes of transport and the automotive industry's role in this. This transition entails a shift from traditional modes of transport to holistic intermodal mobile solutions that will require more integrated technologies

and digital strategies. In this vision, all modes of transport, including public transport such as buses, trams and rail vehicles, as well as all forms of private vehicles such as cars, bicycles and scooters, would be integrated into a joint system of transport services that would be available to users according to their preferences. These respondents assume that the need for car ownership would decrease since there would be more emphasis on the process of mobility and the easiest way to get from A to B. Only an integrated set of different mobility options can provide the right choice for the fastest city and intercity travel. In this concept, cars are no longer a product but a service and the car industry is transformed according to the slogan "selling mobility instead of cars".

Experts and representatives from the scientific community see this change primarily as a transition to digital mobility with the continuous development of intelligent mobility, including software, platforms and various other applications. The traditional way of producing and selling cars will have to be redefined using digital technology, enabling dynamic connection of all existing traffic capacities. Serbia will also have to apply these new business models, which will undoubtedly determine the further development of existing companies in the automotive industry. Respondents from the scientific community see this as a positive transformation because the transition would enable better cooperation and a greater exchange of goods and services. For example, the sharing economy is the basis for better use of resources, creating new employment opportunities, strengthening digital awareness among the public, and raising awareness of the importance of ecology and sustainable development.

Journalist respondents emphasised the role of small and medium-sized enterprises in the Serbian economy and in diversification of production. Due to their flexible organisational structure, SMEs can make decisions quickly and be receptive to change, which allows them to be innovative and keep pace with environmental trends and fast-changing markets. The most promising niches these respondents see are information technology, electronics, software, mobile services and relevant infrastructure.

CONCLUSION

Although foreign direct investment is presented as a driver of economic development in Serbia, the results of our empirical analysis show that the effects of this industrial strategy in the automotive sector are feeble. Investors come with the clear objective of taking advantage of the benefits that the state generously grants them, but they give no guarantees in return that they will base production in Serbia for a more extended period. The poor working conditions and low wages, combined with numerous tax breaks and subsidies, create favourable conditions for investment by the automotive industry. This was demonstrated through desktop research in the first part of this report.

Emissions in the transport sector could lead to stricter environmental regulations and the shrinking of the global automotive industry. With this in mind, the question arises as to whether Serbia is ready to take an active role in creating comprehensive public policies that regulate the issue of transition to ecological forms of mobility.

Interviews showed that respondents' perceptions of ecological mobility differ and consequently they have different visions of the industrial strategy for transforming the transport sector. For managers and union member respondents operating in the automotive industry, the solution is to produce green motorised vehicles, i.e. individual electric cars. This perspective is understandable considering that the jobs of respondents from these groups directly depend on car manufacturing, and therefore their interest is to keep the automotive industry alive through the transformation to electric car production.

By contrast, respondents from the other groups exclude the production of electric cars from the ecological mobility industry. For instance, railway union members think that ecological mobility could only be achieved through an increased modal share for rail as the ecologically sustainable mode of transport for passengers and freight.

For respondents from civil society and the scientific community, ecologically sustainable transport is based on the production of various types of vehicles for collective public transport. Ecological mobility is seen primarily as a rationalisation of the spatial use of transport and the transport network. This implies the dominance of collective transport, which must be public and accessible to all, and thus support for non-motorised traffic is needed. Respondents from both sectors believe that the state must take an active role in the campaign to change learned

behaviour and raise awareness about the harmfulness of the existing transport system, and hence the benefits of an environmentally sustainable transport system. They state that there must be sufficient public investment in the transition to ecological forms of mobility to make the latter affordable for working-class people. In other words, for this group of respondents, social equality in the field of mobility is a priority.

Almost all the stakeholders interviewed for our analysis agree that Serbia has not even started strategic planning to transition to ecological forms of mobility. Respondents see this inertia of state institutions as the main barrier. However, all emphasise that the state is the most powerful actor because of the concentration of expertise and financial resources, and for that reason, this transition cannot be implemented without extensive public investment and subsidies.

Besides the state's negligence, the union respondents also point to Serbia's limited economic capacities and role in the international division of labour. They state that Serbia today does not have the economic sovereignty necessary for a country to be more ambitious in its industrial strategy on this issue. Respondents from civil society anticipate three levels of problems and challenges (not necessarily listed in order of importance). One is undoubtedly economic because existing actors in automotive manufacturing, trade and related business areas generally tend to maintain the status quo or are willing to make only specific, non-structural changes. The second set of challenges is political and refers to the lack of political will to subordinate particular economic interests to the wider public interest, which is environmentally sustainable mobility. Finally, the dominant learned attitude towards different types of transport (patterns of behaviour) points to the lack of awareness (information and knowledge) about the harmfulness and benefits of different approaches to solving mobility at the local or state level.

While connections between all relevant actors are necessary to improve the capacity to address ecological mobility, the reality shows that these are currently deficient. Although cooperation between actors from civil society and the scientific community exists, it is mostly occasional and sporadic. Interestingly, this research has shown that NGOs recognise trade unions as key actors who must systematically design and implement the programmes of this transition, whereas the unions do not see themselves as relevant actors on this issue.

While trade unions best recognise the structural economic factors necessary for the transition to an ecological mobility industry, their perspective is overly pessi-

mistic. For them, adequate change can occur only if the state's overall position in terms of its sovereignty and role in the global division of labour changes. Although these respondents may see the importance of ecological problems at the individual level, they do not directly connect them with labour policies. Managers view this problem exclusively through the economic parameters of business activities.

Representatives of the scientific community have the greatest knowledge about environmental issues and the infrastructure needed to drive the transition to an ecological mobility industry. However, these actors remain isolated, primarily due to state institutions' lack of political will to use and operationalise this knowledge.

In this regard, although respondents from government bodies, i.e. the Ministry of Environmental Protection, have insights into the harmfulness of certain processes to the environment and the importance of the green transition, they tend to shift responsibility for the current situation onto other government institutions. From this, it can be concluded that even within state institutions, there are no clearly agreed measures for implementing ecologically responsible policies.

Journalists specialising in ecological subjects have many useful insights into environmental issues and technological innovations in a given field. However, they lack understanding of the social aspects and labour-related consequences of this conversion to the ecological mobility industry.

The overall impression gained from the interviews is that this issue is taken most seriously by civil society organisations, which view the transformation towards ecological mobility holistically based on an assessment of the complex environmental, social and economic challenges involved.

From all this, it is clear that operationalisation of the transition to ecological mobility has yet to even begin. It remains to be seen whether Serbia will move towards the systematic design and implementation of a strategy to transition to ecological forms of mobility or continue with bad practices that severely affect both the environment and people.

LIST OF INTERVIEWS CONDUCTED

Date of Interview	Duration	Background of Respondent
7 October 2020	120 minutes	Member of trade union operating in automotive industry
11 November 2020	90 minutes	Member of trade union operating in automotive industry
11 November 2020	60 minutes	Member of trade union operating in automotive industry
13 November 2020	80 minutes	Climate expert
15 November 2020	60 minutes	Member of urban planning and traffic NGO
18 November 2020	45 minutes	Government institution employee
19 November 2020	55 minutes	Traffic engineering expert
21 November 2020	65 minutes	Member of urban planning and policy NGO
23 November 2020	50 minutes	Government institution employee
27 November 2020	120 minutes	Member of commons and environmental policy NGO
30 November 2020	85 minutes	Manager at automotive company
30 November 2020	65 minutes	Journalist specialising in energy policy
2 December 2020	50 minutes	Manager at automotive company
4 December 2020	70 minutes	Member of environmental protection NGO
5 December 2020	45 minutes	Environmental journalist
7 December 2020	45 minutes	Manager at automotive company
15 December 2021	30 minutes	Member of trade union operating in rail industry
16 December 2021	120 minutes	Member of trade union operating in rail industry

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BRAZIL

THE CURRENT TRANSITION IN THE AUTOMOTIVE INDUSTRY

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TABLE OF CONTENTS

INTRODUCTION

In partnership with the Rosa-Luxemburg-Stiftung, Brazil's Institute for Energy and Environment (IEMA) is pleased to present this study on the transition that the Brazilian automotive industry is experiencing. Its aim was to identify the challenges that the industry will have to overcome in order to contribute to inclusive, low-emission mobility, protecting, creating and improving jobs, as well as maintaining and developing domestic production capacity. The focal aspect of the inclusive, low-emission urban mobility which forms the focus of this chapter is the prioritisation of public transport over private individual transport, as well as the application of technologies with lower environmental impacts.

The study was conducted from January to March 2021 using document research and interviews with key representatives of the sector (see the list at the end of this chapter), including various segments of the automotive and public-transport equipment and services industries, public managers of urban mobility, workers, researchers, NGOs and specialised journalists. The first part of the text provides a brief characterisation of the Brazilian automotive industry, with a special focus on the production of supplies for public transport. The second part discusses the challenges and outlook associated with the desired conversion of the industry to ensure inclusive, low-emissions mobility.

BRIEF INDUSTRY CHARACTERISATION

The automotive industry is characterised by the participation of large economic groups, which concentrate global production in a few groups of carmakers. The sector constantly makes big investments in research and development (R&D) of new products, advertising and production infrastructure. Economies of scale are the sector's main and emblematic strategy. The vast majority of companies are transnational, operating on a global scale or serving regions of countries. The companies' manufacturing operations are often spread across various countries, with a view to servicing the various end markets and the needs of subsidiaries (Ministry of Economy 2017).

The automotive production system has undergone major transformations since the 2000s, characterised by the creation of commonhold properties and industrial consortiums (bringing together parts suppliers and carmakers), with Lean, modularised and flexible production, representing the transition from Fordism to Toyotism. There is a multi-level production organisation, in which the carmakers transfer to first-, second- and third-level suppliers the responsibility for the supply

of parts and components for vehicle assembly. Another aspect that stands out is the globalisation of the supply chain with greater integration between countries, involving two strategy types. The first is *follow sourcing*, encouraging suppliers to set up their production units close to the carmakers, and the second is *carry over*, where the same project is used in several countries with suppliers around the globe. Level 1 and part of Level 2 comprise multinational suppliers, while Level 3, usually made up of parts with lower value and aggregate knowledge, features small and medium-sized national companies (De Toni / França 2014).

VALUE CHAIN MODEL OF THE AUTOMOTIVE INDUSTRY

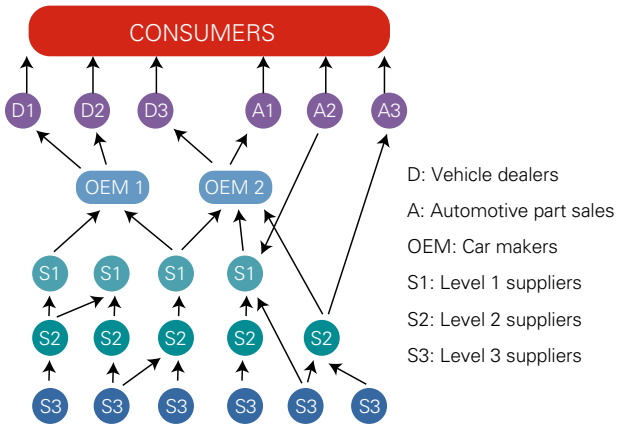

Figure 1. Source: Translated and adapted from Torres 2011, cited in De Toni and França 2014

From the 1950s onwards, Brazil developed and organised a vehicle and transport equipment industry with large-scale installed production capacity. Unlike many Latin American countries, Brazil is served by local factories, despite the fact that almost all the companies are subsidiaries of carmakers having their headquarters in the Northern hemisphere. The country has 26 manufacturers of automotive road vehicles, of which 23 produce vehicles for passenger transport (three produce only agricultural machinery). Currently, only six manufacturers (CNH-Iveco, Volvo, Scania, Agrale, MAN Volkswagen and Mercedes) produce bus chassis, and of these, Agrale is the only company having its headquarters in Brazil. The key statistics for the Brazilian industry can be found in Figures 2 and 3.

PRODUCTION OF BUSES BY COMPANY

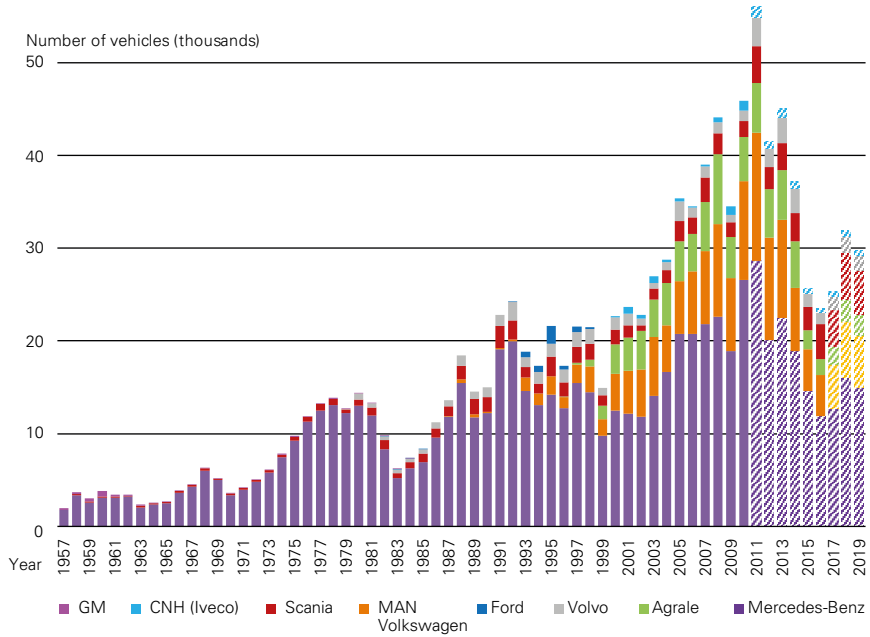

Figure 2. Source: Own compilation based on ANFAVEA data (ANFAVEA 2020)

In the period from 2000 to 2013, Brazil increased its installed capacity for vehicle manufacturing, with new carmakers arriving in the country, and a substantial increase in the production of new vehicles, from around 1.3 million units to about 3 million per year, becoming the worlds sixth largest manufacturer in 2009. In this period there was also an increase in the registration of new vehicles, which, coupled with the imports, made Brazil the fourth largest consumer market in the world in 2013. In recent years, the registration of new cars has decreased, in line with the slowdown in the economy. The COVID19 pandemic meant that 2020 saw an intensification of the downward trajectory in Brazilian production. The industry will only operate at about 50 percent of its installed capacity (around 5 million cars per year) to meet the expected demand for new vehicles in 2021.

PRODUCTION OF CARS AND LIGHT COMMERCIAL VEHICLES BY COMPANY

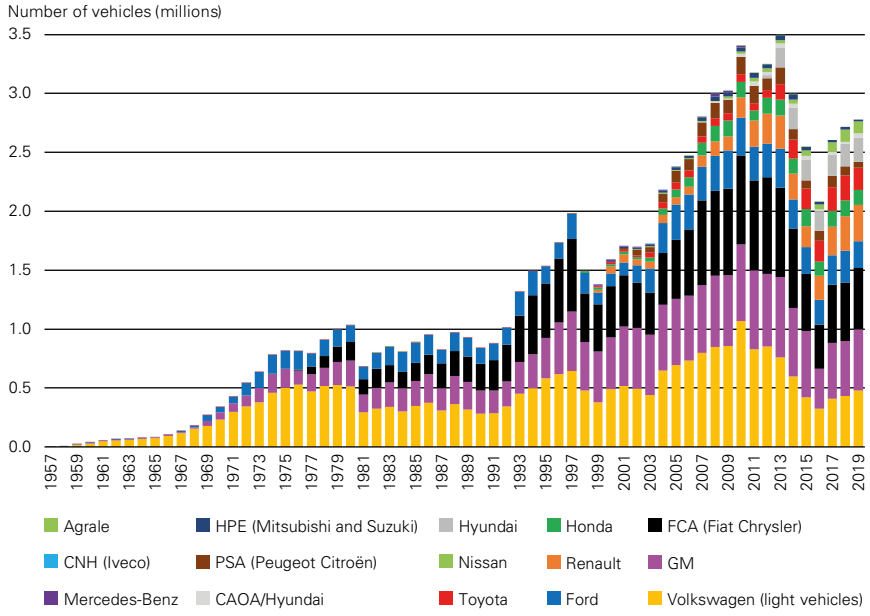

Figure 3. Source: Own compilation based on ANFAVEA data (ANFAVEA 2020)

Like other countries, Brazil is currently experiencing a period of high levels of idle capacity in its automotive industry, which may lead to the closure in the short term of production lines other than the recent cases of Mercedes, Audi and Ford. The announcement of the closing of Ford's production activities in the country was the change in strategy that had the biggest impact on the press and politicians and their entourage. In a press release issued on 11 January 2021 (Ford Media Center 2021), Ford announced the end of vehicle production in Brazil and that the market would be serviced by imports, including SUVs, pickups and commercial vehicles, produced mainly in Argentina and Uruguay. According to Ford Media Center (2021), Lyle Watters, President of Ford South America and the International Markets Group said that the changes were in line with the global strategy of "expanding connected services and new automated and electrified technologies in South America", including the launch of a plug-in hybrid vehicle. In addition, Ford Media Center (2021) points out that this strategy intends to invest to achieve "an

8% company adjusted EBIT[65] margin and generate consistently strong adjusted free cash flow". The price adjustment was adopted by many carmakers in Brazil throughout 2020 as a way to increase profitability.

Motorcycles

The production of motorcycles also experienced significant growth in the period from 2000 to 2011, from around 635,000 units to 2.3 million units in 2008, with a drop in 2009 and a slight recovery in 2011, when it reached around 2.1 million units. Although this mode of transport demands particular attention due to its participation in the mobility of the Brazilian population, this study does not dwell on motorcycles.

BUS INDUSTRY

Brazilian cities with more than 60,000 inhabitants commonly have bus transport systems, with a total fleet of urban buses in operation of about 150,000 vehicles, i.e. one of the largest in the world. The system in the city of São Paulo stands out, where approximately 14,000 buses operate, making it one of the world's largest municipal public-transport fleets. The system of exclusive bus lanes known as BRT (Bus Rapid Transit) was developed in the Brazilian city of Curitiba in the 1960s and 1970s and is now used in several countries and, in many cases, implemented with the support of engineering consultants and a bus fleet of Brazilian origin. The importance of public transport by bus in Brazil is reinforced by a bus industry with an international reputation with performance levels to match, establishing itself as a major exporter of these vehicles. In 2020, around 18 percent of Brazilian bus production was destined for export (Associação Nacional dos Fabricantes de Ônibus 2020), mainly to MERCOSUR[66] countries. However, since 2011 we have seen a sharp decrease in the licensing of new buses. In 2011, production peaked at around 50,000 buses, plummeting to less than 20,000 in 2016. For 2021, the expectation is that production will not reach 20,000 vehicles again, meaning that there are idle capacity levels of around 60 percent.

One characteristic of bus production in Brazil is that it is divided into the manufacturing of chassis, on the one hand, and of bodywork, on the other. The chassis for diesel vehicles are manufactured by multinational carmakers with a presence

65 Earnings Before Interest and Taxes (EBIT) is the profit earned before discounting taxes and financial expenses.

66 Southern Common Market, the trade bloc for South American countries.

in the country – mainly Mercedes-Benz (which is responsible for more than a half of the market), Volvo, Scania and MAN (Volkswagen Trucks and Buses) – which recently announced new investments (Feltrin 2021) in Brazil for the manufacture of trucks and buses. Mercedes-Benz do Brasil is Daimler's global competence centre for bus-chassis development (Ramos 2021).

Electric Buses

There are currently around 300 trolleybuses and almost 50 battery-powered electric buses in operation in Brazil according 2021 EBUS RADAR[67] data website. Eletra is a Brazilian company founded in 1988 and produces electric buses in trolleybus (aerial network), hybrid (motor generator+ batteries) and standard electric (battery) versions (Eletra n.d.). The main supplier of battery-powered electric buses is BYD (see BYD n.d.), who set up in Brazil in 2015, establishing its factory in the city of Campinas in the state of São Paulo.

Bus bodyworks are manufactured by Brazilian companies – mainly the Caio Induscar (founded in 1946), Marcopolo (founded in 1949), Comil (founded in 1985) and Mascarello (founded in 2003) groups. The bus bodywork manufacturers employed around 25,000 workers in 2009, but at the time of writing, in a weakened market, it is estimated that there are approximately 16,000 employed workers. This information was obtained during the interviews with representatives of this sector done for this report.

The Caio Induscar Group is made up of the companies Busscar (bus manufacturer), CPA (aluminium processing centre), Fiberbus (manufacturer of fibre parts), GR3 (aluminium distribution centre), Inbrasp (manufacturer of automotive plastic parts) and Tecglass (manufacturer of tempered glass). Currently the bus-bodywork manufacturer has around 3,100 workers, and the Group has about 5,300 workers in all.

Marcopolo (see Marcopolo n.d.) is the largest company in the sector in Brazil and one of the biggest in the world. In addition to its headquarters, located in Brazil, it has controlled companies manufacturing bodyworks in South Africa (MASA), Argentina (Metalsur), Australia (Volgren), China (MAC) and Mexico (MP Mexico) as well as subsidiaries in Colombia (Superpolo) and India (TMML). In its 2019 management report, cited in IEMA (2021), the company reported having a workforce of nearly 14,200 workers, of whom 9,100 were in Brazil. In addition to the

67 E-BUS RADAR: www.ebusradar.org (25 August 2021).

bodywork factory, the group operates in the form of Marcopolo Parts, supplying parts for buses, and since 2019 with Marcopolo Next, a developer of technology, projects and new products.

Marcopolo Next develops vehicles (Marcopolo Next Mobility); complete mobility systems and turnkey solutions for projects that involve infrastructure and complex financing models, additional services for public transport (Marcopolo Next Services); and new collective mobility concepts, relating to information management, preventive maintenance and specific innovations for the development of smart cities (Marcopolo Next Labs). Marcopolo Next incorporated Marcopolo Rail with a view to working on rail transport projects. Its first product was the light rail vehicle (LRV) Prosper VLT, an entirely domestic product, launched at the end of 2020. This equipment can be used in tourism and in urban and interurban transport. Marcopolo envisages producing 60 to 100 LRVs per year (Marcopolo 2021).

METRO-RAIL INDUSTRY

Relatively few Brazilian cities have urban passenger rail transport, compared with bus transport. The most extensive system and the one with the highest passenger numbers is in the São Paulo metropolitan region. The São Paulo metro network has six lines, with a total length of 101.1 km and having 89 stations, serving around 5 million passengers per day. The São Paulo state-government operator Companhia do Metropolitano de São Paulo (Metropolitan Company of São Paulo) (see Metropolitan Company of São Paulo n.d.) operates Lines 1 (Blue), 2 (Green) and 3 (Red) and the monorail of Line 15 (Silver), having a total length of 69.7 km, 62 stations and around 4 million passengers per day. The public network is complemented by private companies: Via Quatro, which operates Line 4 (Yellow) (11.4 km and 10 stations), and Via Mobilidade, which operates Line 5 (Lilac) (20 km and 17 stations).

The metropolitan rail system is operated by Companhia Paulista de Trens Metropolitanos (CPTM) (see Companhia Paulista de Trens Metropolitanos n.d.), also a São Paulo state-government company, with 271 km of lines and 94 operational stations, serving 23 cities and carrying an average of 3 million passengers per day. There is also rail transport in the cities of Rio de Janeiro (RJ), Porto Alegre (RS), Belo Horizonte (MG), Brasília (DF), Salvador (BA), Recife (PE), Teresina (PI), Fortaleza (CE), João Pessoa (PB), Maceió (AL) and Natal (RN). There are LRV systems in Santos (SP), Sobral (CE) and Cariri (CE). Brazil also has Aeromovel

technology (Aeromovel n.d.), operated by a pneumatic propulsion system, and has been working on the development of the maglev (magnetic levitation) train technology Maglev Cobra.

Brazil has railway equipment factories for both passenger and freight transport and a workforce of 4,9 thousand employees (SIMEFRE 2020). Unlike the bus segment, where Brazil manufactures all the new vehicles that expand and revitalise its fleet, Brazilian factories operating in the passenger metro-rail industry face international competition. Brazil's production output of railcars for passenger has fluctuated wildly over the past 10 years. Despite an installed capacity of 1,200 railcars per year, production peaked with only 473 units in 2016, and the worst consolidated result was in 2019 with 99 units. Subsequently, the decline has continued, with one forecast presented on 14 December 2020 at a meeting of the SIMEFRE trade union for the railway and highway materials and equipment industry (SIMEFRE 2020) being that 2020 would close with 72 units having been produced and the expectation being that this would drop to only 43 in 2021.

Among the findings from the interviews for this study was the fact that the manufacturers of metro-rail vehicles for passenger transport had virtually stopped production, instead seeking to only keep on highly specialised workers who had a systematic knowledge of the company because, if they were demobilised, there was the risk of capacity and know-how being lost. Interviewees pointed out that there was a risk of the Brazilian metro-rail industry completely dying out because there was no interest from the government or the private sector in passenger rail transport.

CONTRIBUTION TO JOB CREATION

The transport industry makes a substantial contribution to job creation and industrial GDP in Brazil, although this has been decreasing in recent years. Industry as a whole (the manufacturing, extractive and construction sectors) accounted for 19.5 million jobs in 2018, a year when the agricultural and livestock sector generated 13.4 million jobs while the service sector generated 71.5 million.

A look at just the activities of the manufacturing industry, of which the transport industry (automotive, bus, truck and other transport equipment manufacturing) forms part shows that the transport sector was responsible for generating

almost 547,000 jobs in 2018, accounting for 1.42 percent of CLT jobs in Brazil[68] (pursuant to the Labour Relations Code). The trend for jobs created in the period from 2000 to 2018 is illustrated in Figure 4.

TOTAL INDUSTRY JOBS BY ACTIVITY (2000–2018)

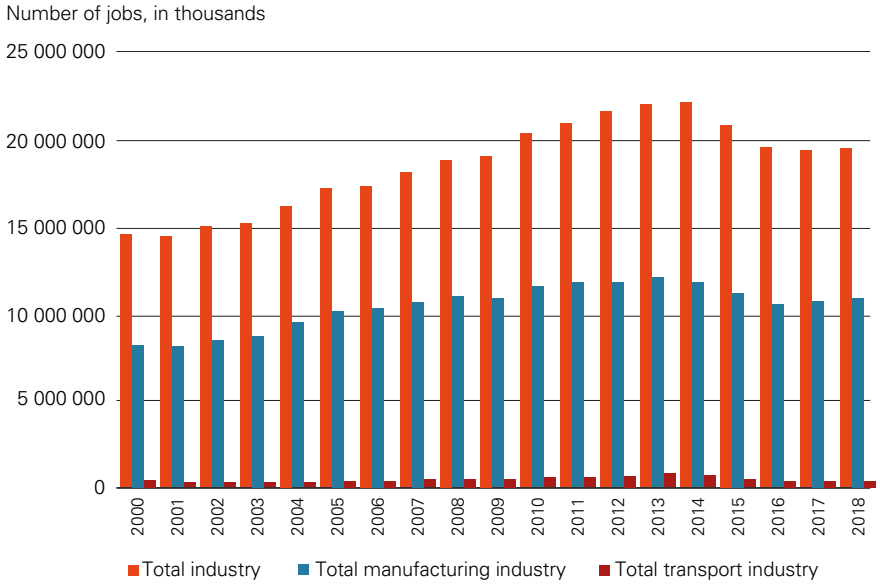

Figure 4. Source: Own compilation based on IBGE data (IBGE n.d.)

In turn, transport industry jobs, based on Brazilian Institute of Geography and Statistics (IBGE) data from 2018 (IBGE n.d.), are divided into 'Automobiles, vans, trucks and buses' (160,623 jobs), 'Parts and accessories for motor vehicles' (305,030 jobs) and 'Other transport equipment' (81,368 jobs). The trend for jobs generated in the period from 2000 to 2018 can be seen in Figure 5.

68 In Brazil there is a specific federal code regulating the relationship between workers, employers and trade unions. Established in 1943, it is called the 'Consolidation of Labour Laws' (also referred to as 'CLT', the acronym in Portuguese for this legislation). All contracted workers under this code have labour rights such as annual leave and additional remuneration. These benefits have been under attack from recent neoliberal governments, with the last amendment of this legislation taking place in 2017.

EVOLUTION OF JOBS IN THE TRANSPORT INDUSTRY

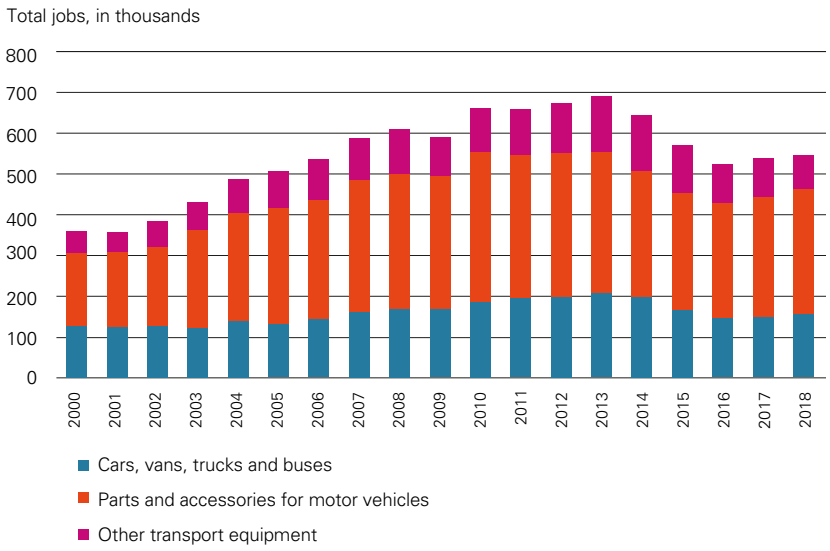

Figure 5. Source: Own compilation based on IBGE data (IBGE n.d.)

Brazil also has a strong industrial fleet of automotive parts suppliers. The 2020 edition of the industry's main association Sindipeças' *Auto Parts Industry Yearbook* (Sindipeças 2020) included 592 member companies in 2019, accounting for a total of 167,014 formal jobs, which represented a 4.5 percent decrease from 2018. ANFAVEA, in turn, estimates that each job at vehicle and automotive machinery makers generates eight jobs in the production chain, involving sectors such as rubber, metal, glass and marketing (ANFAVEA 2021). According to data in the entity's 2020 yearbook (ANFAVEA 2020), the sector employed 1.3 million workers (direct and indirect jobs combined) in 2019.

CONTRIBUTION TO GDP

The share of industry in general and the manufacturing industry in particular, of which the transport industry forms part, in Brazilian GDP declined in the period from 2000 to 2018, peaking at 24.3 percent in 2004, and falling to its lowest point (18.2 percent) in 2017.

When it comes to the car, van, truck and bus industry segment, its share in Brazilian GDP has also been shrinking, based on an analysis of the same period.

There was a peak in 2008, when this segment's share of national GDP reached 1.1 percent, but this had dropped to just 0.3 percent by 2018. The trend can be seen in Figure 6.

SHARE OF VALUE ADDED IN GDP – CARS, VANS, TRUCKS AND BUSES

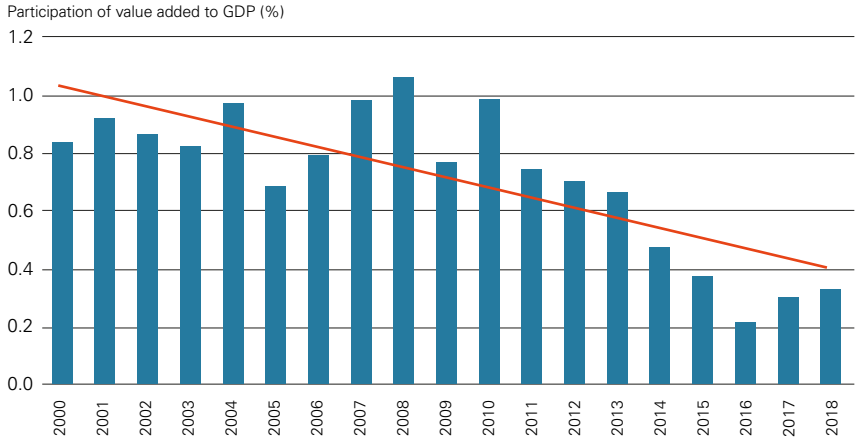

Figure 6. Source: IBGE Supply and Use Tables (TRU) data compiled by Juliana Trece (Brazilian Institute of Economics (IBRE) – part of the Getulio Vargas Foundation, FGV 2021

INCENTIVES AND TAX REVENUES

The transport industry is characterised by ongoing and high levels of investment in research and development of new products, which results in skilled jobs and the projects having a high added value. The size of Brazil's domestic market means that it can implement industrial policies that would be impossible in a smaller country, such as the establishment of local content rules and tax incentives. Given its contribution to GDP and the creation of skilled jobs, in recent decades the sector has been the target of its own nationwide policies, known as automotive regimes, which rely on tax exemptions (mainly the Industrial Products Tax (IPI), which is the Brazilian federal government's responsibility). The most recent examples were Inovar-Auto incentive programme[69] (in effect from 2013 to 2017) and the Rota 2030 programme (still in force).

69 Or to give it its full name, the *Programa de Incentivo a Inovação Tecnológica e Adensamento da Cadeia Produtiva de Veículos Automotores*, or Incentive Programme for Technological Innovation and Densification of the Automotive Supply Chain.

In the words of the Brazilian Rota 2030 Program Law 13.755[70], Rota 2030 aims to "promote technological development, competitiveness, innovation, vehicle safety, environmental protection, energy efficiency and the quality of cars, trucks, buses, motor chassis and automotive parts". As the Ministry of the Economy indicates, the programme has three components: (i) the establishment of mandatory requirements for marketing new vehicles produced in Brazil or importing new vehicles, related to the corporate goals of vehicle labelling, energy efficiency, structural performance and driver assistive technologies; (ii) tax breaks for companies that invest in research and development (R&D) in the country; and (iii) exemptions from import taxes on automotive parts without equivalent national production, in exchange for importers spending 2 percent of the customs value on research, development and innovation projects and priority programmes to support industrial and technological development for the automotive sector and its supply chain.

The law that established Rota 2030 also instituted a Programme Monitoring Group, which is required to publish an annual evaluation report presenting the programme's impacts on production, employment, investment, innovation and value added for the automotive sector. As at the time the present text was originally drafted, minutes had been made available for two meetings of the Monitoring Group (i.e. those held on 26 June and 6 December 2019), but there was no sign of a follow-up report. Nor were there records of the meetings of the National Transport and Logistics Observatory[71].

As well as nationwide federal initiatives, there have been others by Brazil's federal government and the governments of its individual states aimed at certain regions of the country. The State of São Paulo launched IncentivAuto[72], a programme that authorised special financing for companies, providing a 25 percent discount on ICMS[73] for those investing at least BRL 1 billion and generating 400 jobs in São Paulo. In October 2020, the federal government sanctioned a law[74] that extended

70 BRAZIL. Federal Law No. 13.755/2018. 10 December 2018.

71 The National Transport and Logistics Observatory was established by Ordinance No. 2.203 SEI of 28 December 2018, promulgated by the Ministry of Industry, Foreign Trade and Services.

72 State Law 17.185/2019.

73 ICMS is the acronym in Portuguese for the Tax on the Circulation of Goods and Services. All trading companies pay taxes based on the type and price of goods they sell.

74 Law originated in Provisional Measure 987/2020.

tax incentives for carmakers and automotive parts manufacturers in the North-east, North and Midwest regions (i.e. less industrialised areas of the country).

The tax exemption for the automotive industry has been a topic of discussion and the butt of criticism for many years in Brazil, mainly because it is a sector that works with high-value products, thereby targeting the higher income brackets of the population, as the exemption applies in periods of high vehicle sales and not only in times of economic crisis. Data from the Ministry of the Economy copied by ANFAVEA, indicated that tax breaks for car manufacturers, also referred to as tax expenditure, would reach BRL 43.7 billion between 2010 and 2020[75]. The trend for tax breaks in this sector is shown in Figure 7.

FEDERAL GOVERNMENT TAX EXPENDITURE ON THE AUTOMOTIVE SECTOR

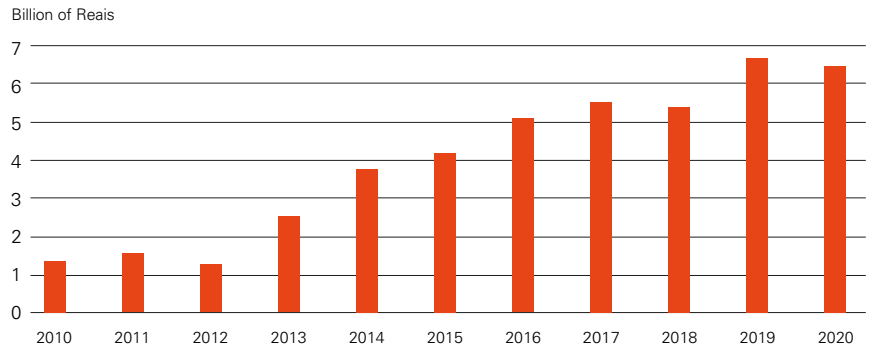

Figure 7. Source: Own compilation based on ANFAVEA (2021) data; 2018, 2019 and 2020 are projections informed

Based on information available in the press, these values are aggregated and take into account the incentives for the companies in the sector because, as Fernandes (2021) pointed out, the individual data are confidential. This makes it impossible to identify from publicly available information the tax breaks of individual carmakers.

75 Until 2017 the incentives accounted for BRL 25.24 billion, corresponding to the effective base. The data for the period from 2018 to 2020 are projections.

Another aspect that is a cause for discussion is the effectiveness of sectoral tax incentive or general policies. Porsse and Madruga (2014) concluded:

the tax incentive for the automotive sector appears to be more regressive from a distributive point of view than the general tax incentive, benefiting higher income brackets. Therefore, in the case of the IPI[76], tax-relief policies with a general scope seem to improve income distribution at the expense of sector-specific policies.

However, there are also those who defend the IPI tax breaks (Amaral / Olenike / Amaral 2014; IPEA 2009), as the resulting increase in vehicle sales boosts the collection of PIS/COFINS[77], more than making up for the amount that is no longer collected. This has again become a major topic of discussion, especially in the press, due to the closure of Ford's production activities in Brazil, announced by the carmaker in January 2021. It benefited from tax breaks for its site in the state of Bahia in the early 2000s, following disagreements with the Rio Grande do Sul state government.

The National Association of Automotive Vehicle Manufacturers (ANFAVEA) published a brief presentation entitled *Carga Tributária x Incentivos* (Tax Burden x Incentives) in February 2021 (ANFAVEA 2021) in which it argues that the sector is one of the biggest contributors to the country's tax revenues and, proportionally, the one with the lowest tax break, also called tax expenditure, which, in this case, corresponds to the reduction in taxes due to sectoral or regional policies to boost industrial development or investments in research and development.

In the period from 2011 to 2017, the sector paid around BRL 292 billion in taxes, and its tax breaks amounted to around BRL 25 billion. Thus, according to ANFAVEA (ibid.), the sector had the best ratio in this regard of any sector of the economy, with BRL 11.1 collected for every BRL 1 exempted by the government.

76 All manufacturing industries pay this tax based on product type.

77 *Programa de Integração Social e de Formação do Patrimônio do Servidor Público/Contribuição Social para o Financiamento da Seguridade Social* (PIS/COFINS, or Programme for Social Integration and Training of Civil Servants/Social Contribution for Financing Social Security).

FEDERAL TAX COLLECTION AND TAX BREAKS IN THE AUTOMOTIVE SECTOR

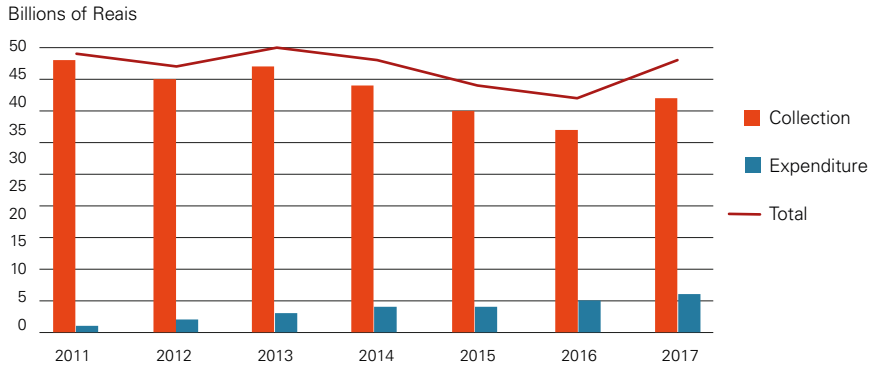

Figure 8. Source: Own compilation based on data from ANFAVEA

Among authors studying the sector, there is no consensus on the implementation of automotive regimes, which is associated with the provision of other incentives such as loans in state-owned banks, municipal authorities giving carmakers sites where they can operate, and a reduction in state taxes. One of the situations that has been called into question is from the most recent period of expansion in automotive-industry production (from 2000 to 2013). According to Sarti and Borghi (2015: 10)[78]:

From 2008, when the international financial crisis began, until 2014, profit and dividend remittances reached US$ 24.6 billion, while the new flows of foreign investments made by carmakers were only US$ 11 billion. While promoting high profit and dividend remittances to their corporations, the automotive companies took on hefty loans at highly favourable rates from BNDES[79] to finance their investments. While the automotive sector's contribution to BNDES's total disbursements decreased in the period from 2008 to 2014, the carmakers secured loans of around BRL 37.8 billion, equivalent to US$ 20 billion.

The period from 2000 to 2013 saw a dynamic growth in sales in the automotive sector in Brazil, as the result of a combination of enhanced macroeconomic conditions, improvements on the labour market, better credit conditions, increased income and incentives for the industry. There have been investments in produc-

78 The quote below is a translation of the Portuguese.

79 Brazilian National Development Bank.

tion expansion, resulting in recent years in an installed capacity of 5 million cars. The growth in sales resulted, as was to be expected, in an increase in the fleet in operation in Brazil and in the motorisation rate (calculated by dividing the fleet by the number of inhabitants). In this period the total number of vehicles in operation rose from 22 to 52 million, with the bus fleet growing from 230,000 to 382,000 and the truck fleet expanding from 970,000 to 1.7 million.

It is worth pointing out that the automotive industry introduced some major technological innovations in recent decades, such as the development of the 'flex' engine, which allows the use of a mixture of petrol and ethanol (in any proportions). In the case of diesel oil, the country started to rely on S10 fuel (10 ppm of sulphur) from 2010 onwards. Since 1986, Brazil has also had the Programme for the Control of Air Pollution from Motor Vehicles (PROCONVE)[80], under the responsibility of the federal government, which has gradually been introducing more restrictive emission limits for new vehicles. In the case of heavy vehicles (a category which includes buses), PROCONVE has followed, after some delay, the emission standards established in Europe. Implemented in 2014 in Europe, the Euro 6 standard is scheduled to come into force in Brazil in 2022, but carmakers have requested that this be postponed because of the impact of the COVID19 pandemic on the sector.

Biofuels

Another mark of the Brazilian situation is the relatively high level of biofuel use. Biodiesel[81] must be mixed with petroleum diesel, accounting for 13 percent of the total volume in 2021. Brazil is well known for its ethanol industry fuelling passenger cars, with the required mixture with petrol making up more than 25 percent of the total. Both biofuels are produced from commodity crops (ethanol from sugar cane, and biodiesel from soy) affected by international markets. Biodiesel production was initially boosted by a social programme for small-scale producers, but most biodiesel is now produced from plantation soy-based oil. Today the RenovaBio[82] programme is Brazil's main programme for promoting biofuels.

80 PROCONVE was set up by National Council for the Environment (CONAMA) Resolution No. 18 of 6 June 1986.

81 The national policy aimed at introducing biodiesel in Brazil was established by Federal Law No. 11.097/2005.

82 RenovaBio is the National Biofuels Policy, established by Federal Law No. 13.576/2017.

INDUSTRY CHALLENGES AND PROSPECTS OF A CONVERSION

This second part of the paper presents the results of the documentary research and interviews conducted with experts to identify the challenges and prospects for the industry in the context of Brazil's sought-after conversion aligned to inclusive, low-emission mobility. For this conversion to happen, there must be an increase in the production of vehicles for public transport, including the adoption of technologies with a low environmental impact, while the production of cars for individual travel is no longer strategically prioritised. The findings of the survey and the interviews revolve around: (i) the redesign of the mobility model in Brazilian cities; (ii) the conversion of the industrial fleet; (iii) the impact on jobs; and (iv) the digital transformation and emobility.

As reported in the first section, Brazil has a structured, well-established and nationwide transport industry, including the production of vehicles for public transport (buses and equipment for metro-rail systems). The industries can meet the country's demand but a lot of the production capacity is currently idle. Its contribu-

tion to GDP has been decreasing in recent years, but it still accounts for much of industrial employment. Its economic and political significance has led to the creation of automotive regimes and tax incentives that are challenged by economists due to their regressive character. The automotive market is supplied by carmakers with a presence in Brazil but having their headquarters abroad, and a small portion of their production is exported to Latin American countries. In the case of the bus industry, the bodywork companies are almost all Brazilian but have a presence in other countries, in the form of controlled or affiliated companies. In the case of the metro-rail industry, although Brazil has various factories (of foreign companies)in Brazil, they face fierce foreign competition.

The question that arises is what the future of this industry is going to be like, considering the major trends in the global automotive industry and the need to generate jobs and income and improve mobility in Brazil.

REDESIGNING THE MOBILITY MODEL IN CITIES

We noted a consensus in the interviews that there will be no conversion of the industry aligned with inclusive, low-emission mobility, based on the industry's own vision alone. Such a mobility scenario would not come about only by force of the industry, but as a result of mobility policies, demanding the transformation of production by the segments of the transport industry. Without external guidelines providing the contours of inclusive urban mobility, there is a lack of guarantees and incentives for carmakers to completely roll out a change in the equipment market to this end. The proposed transformation would depend not only on the availability of products, but also on the relationship between passenger demand for individual or collective public transport, or on how urban populations are spatially organised to move around in Brazilian cities. The growth of the public transport equipment market goes hand in hand with public policies that encourage the expansion of public transport services.

However, the analysis is that there is insufficient political will to bring about this structural transformation of mobility. The public transport sector is experiencing a period of crisis, one of the main reasons being the exhaustion of the financing model for operational costs that was based on users paying fares, a situation exacerbated by the pandemic. Overall, there is, at the moment, no concern with public transport among most political forces; and virtually the entire political agenda has focused on short-term emergency issues, without long-term plans. It is considered that only a social commotion demanding solutions from the authorities could

ensure the necessary attention for the sector. The federal government is regarded as having a key role to play in the recovery of the sector.

It has been pointed out that the future will most likely be marked by rising unemployment; tax difficulties for the federal government, which have extended to states and municipalities; low levels of investment in infrastructure; a funding crisis for operational costs; and pressure for the deregulation of the public transport market. There are those who see a tendency towards the complete disruption of the public transport systems in the years ahead and until January 2023 there will be an ongoing risk of regression, as the new regulation required from the Brazilian state will not come from the current federal government. There is a risk here of the return of clandestine transport[83], as is already happening in Rio de Janeiro, against a backdrop similar to that of the 1990s.

The car, a mode of transport which has been historically prioritised in Brazilian public policies, needs to be repositioned in an inclusive mobility scenario. To this end, two factors have emerged as particular important in this study. The first is the need to change the widespread car dependence culture among the Brazilian public. The second is the fact that the car has been elevated to a symbol of development by the state, which has traditionally granted subsidies and privileges to this means of transport.

For a more inclusive mobility, it would be worth improving public transport by rolling out medium- and high-capacity systems (BRT and metro), exclusive bus lanes and a bus fleet renewal policy and adopting of zero-emission vehicles in the long term, as well as reducing fares and implementing travel management tools (TDM). Brazil already has a legal and technical framework for encouraging this development in the form of the National Policy on Urban Mobility (PNMU)[84], consolidating knowledge about minimum requirements for mobility plans, and the National Policy on Climate Change. However, only social demand could drive such structural transformations.

Overall, public policy instruments should be effectively applied and focused on developing the role of public transport in the urban modal share and the relevant industry with a view to generating jobs and income. There is a greater need for command and control instruments, dictating legal requirements, as well as

83 Clandestine or informal transport refers to the services provided by operators without local or state authorisation, obtained after a statutory public concession process. For more information about this problem in Brazil, see Boareto (2002).

84 This policy was instituted by Federal Law No. 12.587/2012.

economic instruments that promote public transport, for renewing the fleet and reducing costs for users. Tax breaks or exemptions and financial incentives could be used to increase the demand for buses, trains and metro services and therefore also the number of workers employed by the manufacturers.

CONVERSION OF THE INDUSTRIAL FLEET

It is clear from the previous sections that Brazil is experiencing a period of general economic crisis, resulting in a major setback for the country's development and, specifically, for its automotive industry. From the existing literature and the interviews, it appears that Brazil is going through a process of deindustrialisation, with little structure being provided for industrial and environmental policy.

The flagship of the automotive industry, the car, despite its popularisation in the 2000s, has become less accessible to the general public in recent years. It has been pointed out that the sale of vehicles today depends on there being buyers who can commit a significant portion of their income to paying for a vehicle bought on credit. This requires some stability in their employment situation and a wage level that makes it possible to purchase durable goods. However, since 2012, workers' purchasing power has declined and their consumption capacity has stagnated. The consecutive economic crises have resulted in an increase in unemployment, and the economic recovery has generated a lot of informal work, including those with a high level of education. The market will tend to concentrate its offer on the wealthiest bracket of the population, in a situation closely mirroring Mexico, where only a small, privileged section of the population buys new vehicles. As is apparent from the profile of new cars registered in the country, there is a trend towards the predominance of higher-value models, with a growing share of medium-sized SUVs and the prospect of the entry of small SUVs in 2021/2022.

The 'Brazil cost' is an argument widely used by manufacturers to characterise their business difficulties. They often blame the wage and tax burden. However, a contradiction is revealed here with the low wage levels in Brazil. As has been reported, the Brazilian industry had competitive advantages that were lost, such as the increased cost of energy. Thus, the Brazilian industry lost production scale compared with other countries and failed to take advantage of the opportunities created through MERCOSUR.

As for the segment of vehicles for collective public transport, Brazil already has a well-structured, high-quality and internationally competitive equipment industry. It is technologically developed and provides supply capacity, being able to meet substantial internal and external demand, including the most restrictive environmental requirements. Brazil has a strong presence on the Latin American bus market, with the business community having a predilection for Brazilian bodyworks. Currently, however, the country is losing ground to manufacturers from other countries, especially suppliers from China. However, due to the strong consolidation of the bus industry, the specialists indicate that so far, there has been no risk of Brazilian manufacturers losing the country's domestic market to manufacturers from abroad.

The information gathered in this study indicates that it would be very difficult for the automotive industry in Brazil to make structural transformation decisions, because almost all of carmakers' capital comes from other countries. The investment decision-making process in these large automotive conglomerates is dictated by the companies' headquarters, with a limited level of autonomy for subsidiaries. The focus is on profitability and the return on investment, which are considered to be highly uncertain in Brazil, as there are variables such as the dollar price, taxation and market opening, making decisions difficult. For parent companies, this increases the viability of projects where foreign knowledge has a smaller role to play (e.g. projects involving with flex vehicles).

A key characteristic of the automotive industry is that the strategic R&D and decision-making centres are in the countries where the parent companies are based. According to a chapter in a BNDES publication (Daudt / Willcox 2018: 204f.), dealing with the agenda for the automotive industry in Brazil, if the current structure of the sector is maintained, carmakers "will seek to sell their new products to the large national/regional consumer market and further build up engineering competencies, but not necessarily develop the most strategic technologies locally". This text goes on (ibid.: 205):

This aspect will be restricted to foreign headquarters, as Brazil has no large carmakers with domestic capital. The technological development possible in Brazil tends to be limited, in spite of the substantial skills already accumulated in engineering and the broad base of companies in the country. Thus, Brazil is likely to remain a follower when it comes to the development of disruptive technologies.

It should be added that, from carmakers' point of view, a car factory cannot be easily turned into a factory for buses or other public transport equipment. The production and assembly line characteristics, as well as the specialisation of the labour force, are quite different. Conversion would be more feasible from a truck factory. Even the transformation of a diesel bus assembly line to electric buses would entail structural alterations. The eventual increase in demand for buses/underground or metro services/trains would at first be more readily met by an expansion of the manufacturing companies already prevailing in this segment in Brazil.

IMPACT ON JOBS

The statements collected in the interviews indicated that there is no expectation of substantial growth in the vehicle market in the years ahead and that the number of jobs at the carmakers might not necessarily go hand in hand with the growth in production, given the automation of assembly lines, as has been seen historically. The loss of jobs is a current reality, and remaining jobs are threatened even without major structural transformations for the carmakers. There was no indication that an industry aligned with inclusive, low-emission mobility would generate additional jobs. With regard to the production of electric vehicles, a global trend, the perceptions are that less labour is required than for the production of current vehicles with internal combustion engines. This is partly because fewer parts are needed to assemble an electric vehicle.

In addition, the acceleration of electrification in Brazil, uncoupled from the increase in Brazilian production capacity and backed up by electric vehicle imports, could lead to even more unemployment among the assemblers based in the country, and to jobs being moved to other countries. Part of this effect could be offset by the increase in jobs at the bus chassis and bodywork manufacturers, but numerically it is hard to envisage a scenario that covers all workers. It is estimated that for every worker in the bus industry four indirect jobs are generated and that the number of jobs in the manufacturing of electric buses is similar to that of these vehicles powered by diesel.

The technological change and the disruption of the automotive chain that are happening worldwide, which will be discussed further in the next section, calls for some reflection about employment. The perception is that the number of carmakers, parts suppliers, retailers and service shops will also normally decline in the inclusive, low-emission mobility scenario, leading to a reduction in the number

of conventional jobs. The adoption of transformative policies with a view to this new mobility can face resistance from workers, if there are fewer job vacancies caused by a reduction of automotive production and the prevalence of imported vehicles. One way out would be to prepare and relocate automotive industry workers to another branch of industry or supply chain for sustainable technologies, for example wind and solar energy, which would also help to ensure that jobs are distributed across other regions of the country, such as the Northeast.

DIGITAL TRANSFORMATION AND E-MOBILITY

A technological race is on in the automotive industry worldwide, and it is commonly believed that in the future, vehicles will be electrified, autonomous, shared and connected and will feature periodically updated software (PwC 2018). This has already led to the establishment of various partnerships and to a number of company acquisitions, bringing together the information technology and automotive industries, which will result in a vehicle production control being designed very differently and big changes in how people will move around compared with today. The recent establishment of the Stellantis Group, the alliance between Renault-Nissan and Mitsubishi (see Renault-Nissan-Mitsubishi n.d.) and the news about the partnership between Hyundai, Apple and Uber can be cited as examples of these new commercial arrangements. To illustrate this perspective, an analysis of the evolution of carmaker groups and mobile/tech & web/digital companies (KPMG 2020) shows that the top 15 technology companies, including those already active in urban mobility, are five times larger in terms of market capitalisation than the 50 most traditional carmakers (ibid.: 44).

Important changes are coming associated with business models, in which the offer of transport services deserves more attention vis-à-vis the sale of products (vehicles), demanding a close connection between the vehicle (hardware) and the use of information and communication systems (software) and the rental of vehicles or subscriptions for certain periods (Hofstätter et al. 2020). One of the main effects is the emergence of services that mainly affect public transport, known internationally as Mobility as a Service (MaaS). Thus, in the business model associated with individual transport vehicles, various scenarios for economic relations between carmakers and information technology and connectivity companies are envisaged, resulting in various potential market arrangements, having impacts on workers in the sector (Deloitte 2017). Carmakers are preparing for a new market, involving a substantial share of services such as rental, subscription and app-based transport. New business cores are being created to complement the

sale of vehicles, and there is competition for these services from big tech and transport network companies, which are travel management platforms. There is also the CaaS (Car as a Service) concept in which users do not buy a car but pays a monthly fee and is provided with a new car each year. In Brazil, this activity has recently started to count with the participation of CAOA, Fiat, Renault and Volkswagen. According to information from Renault, the size of the market is not yet known, but in some countries' capitals, such as Madrid and Paris, there are already profitable operations in this domain, accounting for 25 to 30 percent of the brand's sales (Silva 2021).

These technological changes will fundamentally change interactions in urban mobility systems, in terms of both passenger and cargo transport, new and different types of vehicles, reasons for travel, available services, relative costs and income levels, which will result in positive and negative externalities (Gomide / Morato 2011)[85], with different distributions across society. The conventional automotive

85 Externalities are costs or benefits that a given activity imposes on other economic agents without the valuation of these costs or benefits being properly incorporated into the price of the original activity.

industry, with cars powered by fuels (mainly fossil fuels), has become a risk for investors because, like the tobacco industry, it has started to be stigmatised by society. There is a global trend towards the simultaneous coexistence of several types of powertrains in the same country, along with the use of a common vehicle platform for different energy sources, across different carmakers and countries. The production of the new vehicles resulting from this technological race also has impacts on the automotive parts supply chain. It is likely that there will be a move away from parts suppliers that are going to become surplus to requirements due to technological development and the predominance of a given energy source, as well as the emergence of new manufacturers of vehicle parts and components.

It has been seen that overall, Brazil is still unable to decide on how it will manage to ensure future technological development. The country experienced its last major technological transformation with flex technology for cars and is now facing up to the onset of a disruptive change, namely the electrification of mobility which is starting to really take hold around the world. Without an industrial recalibration, Brazil runs the risk of becoming an importer country for these vehicles.

Reports and the relevant literature indicate that there is a tendency towards long-standing continuity in the production of internal combustion vehicles, given the country's socioeconomic situation and the absence of major shifts towards electrification in the domestic industry. One very likely scenario that has been mooted is the emergence of a Brazilian hybrid ethanol car and electrification of the luxury and premium segment through imports. In this sense, one criticism that is levelled at the industry is the importance of increasing the transparency of its subsidies for the industry, while another is that programmes such as Inovar-Auto and Rota 2030 have failed to invest more in technological development. In addition, any tax benefits for the purchase of electric cars will be enjoyed by the small higher-income segment of the population.

When it comes to buses, there is some demand for diesel substitution, but as yet no national strategy for its implementation has been forthcoming. It has been pointed out that Brazil could draw inspiration from the experience of Mexico, where there is such a strategy, including a focus on job creation, as the country tries to establish a market by providing attractive initial incentives before subsequently gradually phasing them out. China has also emerged as a success story. It has put in place a policy of developing its automotive and public transport industry by focusing on electrification (Mazzocco 2020). Subsidies have been introduced

for local production and consumption rather than for imports of electric vehicles, involving the central government, the provinces and the cities.

The analysis is that Brazil, by becoming an international authority in the technological development and production of buses, would be able to expand this market beyond its borders, unlike its automotive industry. It has been argued that the country should, therefore, have a policy like China, encouraging local development. It has been pointed out that close attention must be paid to international competitors because, while Brazil manufactured around 20,000 buses in all in 2020, China has companies that can produce 70,000 buses per year.

In Brazil, a dispute is still raging about what technological process should be adopted to replace diesel in buses, with various proposals coming from chassis manufacturers (batteries, biofuels, gas, hybrid). As the focus is on zero emissions, the prevailing view among the interviewees for this study seems to be that the electrification of the fleet with batteries should win out. However, some interviewees believe that the replacement of diesel by electric buses, with no major government incentives for this change, will fail because the diesel bus industry is very well established in Brazil. The energy transition is of no interest to manufacturers, given the risk of relying on a market that is not firmly established, and they think that there is no need for the various authorities and the federal government to adopt public policy instruments in the medium and long term. Brazilian chassis manufacturers are currently unable to cope with the pressure of demand for electric buses, which would result in imports of chassis from, most likely, Chinese suppliers who dominate this market worldwide. On the other hand, bodyworks factories are starting to prepare for electrification, already developing their own bodyworks for electric buses and entering into partnerships with foreign manufacturers of electric chassis. Today, in Brazil, various Chinese manufacturers are competing on the market (mainly via imports), but it has been pointed out that the supply capacity and the price of the electric chassis of the carmakers dominating the bus market in Brazil, such as Mercedes, Volkswagen, Scania and Volvo, are not yet known.

The need for regulatory change in public transport and in the energy sector to enable new players to enter the market and to generate jobs was highlighted. The public transport sector needs a new business model. The bus operator should not be worried about what to do with batteries at the end of their useful life. For Rio de Janeiro, there is a proposal to create a fund to guarantee bus companies the remuneration of their operational costs. Brazil still remunerates operations by

number of passengers or kilometres travelled, but there is a need for a change of framework given the exhaustion of the model involving financing of operational costs based on the payment of fares by users. There are international proposals to make payments, for example, on the basis of the number of seats offered per hour/direction. In this sense, Chile has been cited as an example to follow, as it has a new bus service contracting model that has been developed by making a separation between service operators, fleet owners/providers and electric power suppliers for the vehicles.

It has also been reiterated that the use of new energy sources can increase operational costs and drive people further away from public transport, exacerbating the existing crisis. The players involved in public transport would need to be aware of the technological changes and the requirement to replace the fleet so that there were no opportunistic price increases benefiting only suppliers' profits, especially at a time of crisis like the one the sector has been going through. It has been indicated that fare levels are already high and there is the risk that, as in other countries, using public transport will become more expensive than using a car, in addition to the advent and expansion of mobility using applications such as Uber.

Given the deepening of the economic crisis in the country, and also the potential decrease in the population's trips on public transport due to a change in habits following the lengthy COVID19 pandemic, public transport is facing an even more challenging period ahead. At a time when it needs increased subsidies, government revenues are down, posing the risk of loss of quality and demand, forming a vicious cycle. We are already seeing concessions (bus contracts) to operate public transport being surrendered in several cities, with these being described, for example, as a "wasteland" according one specialist interviewed for this report.

CONCLUSION

This chapter presents IEMA's observations about the subject that was investigated, based on the perspectives that were set out in the literature that was consulted and in the interviews conducted. We see, firstly, that transformations in urban mobility can take place through planning, predictability and coordinated evolution, with the state performing the functions of regulation and defence of the public interest, in the midst of a process of technological evolution; or as a result of a disastrous situation caused, mainly, by freely made arrangements and disputes between the political forces and economic interests involved.

The findings reinforce the perception that the future of the automotive industry and of public transport and its workers should not be treated completely separately, making it necessary to consider the relationships and transformations that will manifest themselves in various dimensions, by looking at the visions behind redesigning urban mobility, the structural conditions of the installed industrial fleet and the strong digital and technological transformations under way. A focus on electrification, automation and connectivity in the technological development of vehicles may contribute to the required reduction of pollutant emissions and greenhouse gases, but it has not yet been demonstrated to be a solution to address the unequal and unfair use of road space, to ensure accessibility and to promote the right to the city.

Therefore, there are multiple simultaneous changes under way, involving the use of technology, the emergence of new services, new players, new institutional relations, economic and market interests and social changes. We note that there is a trend towards businesses showing a strong interest in the improvement and expansion of individual transport, posing a major threat to an inclusive urban mobility, making solutions more complex. It does not seem that these changes, due to market forces, are moving in the direction of improving public transport, by increasing its share of trips while replacing its energy source. There is a risk of a certain "conservative modernisation", in which the injustices that weigh on urban mobility in Brazil will be maintained or deepened if only cleaner individual transport and associated services are adopted as the main economic and political alternative.

If the country continues to prioritise individual transport and new services based on information technology and banking services, which are not understood or used by much of society, there may be a radicalisation and deepening of the current gap between the highest and lowest income brackets, with the poorest facing even

worse accessibility. Investments in public transport should also be looked at in terms of their contribution to job creation and income generation in the transport vehicle industry, civil construction and the operation of systems, especially in a post-pandemic scenario. Structural improvements in cities are a matter of urgency, with a need to implement urban environmental policies in an integrated way, including the improvement of air quality and mitigation of greenhouse gases. This is all dependent on the country's development model and policy. Here the political principles associated with Mobility as a Right (MaaR) and the guarantee that public transport is a social and universal right should be defended, along with the principles of a just energy transition.

LIST OF INTERVIEWS CONDUCTED

ENTITIES

ABVE (Brazilian Association of Electric Vehicles): Adalberto Felício Maluf – President (BYD Marketing Director)

ANFAVEA (National Association of Automotive Vehicle Manufacturers): Henry Joseph, Jr – Director

C40 Cities Climate Leadership Group: Ilan Cuperstein – Deputy Regional Director for Latin America (ZEBRA (Zero Emission Bus Rapid-Deployment Accelerator) Project)

DIEESE (Inter-Union Department of Statistics and Socio-Economic Studies): Fausto Augusto, Jr – Technical Director

SIMEFRE (trade union for the railway and highway materials and equipment industry): Paschoal De Mario – Technical Director; Carlos Gomes – Corporate Affairs Manager; and Henrique Pedroso de Morais

SPECIALISTS

Alexandre Pelegi: Journalist specialising in articles on urban mobility for *Diário do Transporte*

Fernando Araldi: Project Management Coordination, Directorate of Mobility Projects and Urban Services at the Ministry of Regional Development

Fernando Sarti: Researcher at the Center for Industrial Economics and Technology at the University of Campinas (Unicamp)

Margarete Maria Gandini: General Coordinator for the Implementation and Inspection of Automotive Regimes at the Ministry of Economy

Marilane Oliveira Teixeira: PhD in Economic Development at the Institute of Economics at UNICAMP

Matias Cardomingo: Economist

Nazareno Stanislau Affonso: Former Secretary of Transport of Porto Alegre and the Federal District – National Director of the MDT Institute (institute of the National Movement for the Right to Quality Public Transport for All)

Rafael Ting Sun Guimarães: Product Engineer at Caio Induscar

Simão Saura Neto: São Paulo Transportes (SPTrans – city of São Paulo public transport operator)

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LIST OF ACRONYMS

BEV = battery-powered electric vehicle

CaaS = Car as a Service

EV = electric vehicle

FTS = first-tier supplier

HEV = hybrid electric vehicle

ICE = internal combustion engine

Mtoe = megatonnes of oil equivalent

OEM = original equipment manufacturer

R&D = research and development

TNC = transnational corporation

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70
70