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Mapping the impact of industrial decline on European regions

SINGLE MARKET ECONOMICS BRIEFS

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Single Market Economics Briefs

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The Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) is currently in the process of setting up a dedicated cell for collecting and generating 'Business Intelligence' (BI). BI should deliver insights on developments relating to economic security and competitiveness which justify policy intervention. This Economic Brief is a first product of the BI cell currently under construction.

Summary

The manufacturing sector is the backbone of the EU economy, directly accounting for 14% of employment and contributing 15% to GDP. In recent years, the sector has been exposed to a combination of structural headwinds and specific shocks, nurturing fears that Europe might have embarked on a path of de-industrialisation. Similarly, there have been growing concerns about the construction sector and its ability to prosper in an environment of high interest rates, spiralling input costs and chronic labour shortages.

This Brief zooms in on six major manufacturing sectors which are key to the Green Transition, as well as construction, and subjects them to a rigorous 'health check'. Starting from the diagnosis that the sectors are indeed showing worrying signs of 'ill health' and/or significant downside risks, our analysis provides evidence where exactly a continued geographic pattern of decline of the sectors in question would have the strongest repercussions in terms of employment. The study is conducted at the level of the 242 European NUTS-2 regions and thus allows, to our knowledge for the first time, a systematic and granular mapping of the potential impact of industrial decline across Europe.

Our results show that a continuation of recent trends would be strongest felt by a group of 73 regions (i.e. roughly 30% of all NUTS-2 areas). Construction aside (its decline seems mainly to affect Northern Europe), the bulk of the most affected regions are in the geographic centre of Europe. Germany, as well as Slovakia and Estonia stand out as having most to lose from industrial decline. In Germany, as many as 26 of 38 regions are strongly impacted, with twelve of them suffering from the decline of several sectors at once.

The sectors producing the largest number of affected regions are machinery and automotive by far. Energy-intensive sectors, whose decline in the aftermath of the energy shock has been well documented, only account for ten impacted regions.

1. Motivation

The manufacturing sector employs more than 30 million people in the EU and contributes 15% to GDP, making it the backbone of the European economy. Following a decade of recovery in the aftermath of the Global Financial Crisis, recent years have dealt unprecedented blows to the sector, both in the form of the COVID-19 pandemic and the energy crisis triggered by the Russian invasion of Ukraine. Coupled with a number of headwinds that already existed before, such as the Inflation Reduction Act potentially luring EU industries to the US, China developing a competitive edge in the production of certain key technologies for the Green Transition (e.g. batteries, electric vehicles (EVs), photovoltaic cells) and a growing shortage of labour and skills in Europe, concerns have emerged about a potential de-industrialisation of the continent. While overall manufacturing output in the EU declined by merely 0.9% from January 2019 to December 2024 and could thus best be described as 'stagnating', a number of sub-sectors are in outright decline. Automotive production, for instance, almost halved over the same period (-46%).

This Economic Brief zooms in on individual manufacturing sectors which are susceptible of being in a serious, structural decline and subjects them to a rigorous 'health check'. The selection is limited to sectors that are particularly important for the EU economy in terms of employment and value added, while, at the same time, key to ensuring a successful Green Transition, namely: automotive, basic metals, chemicals, fabricated metals, machinery and non-metallic minerals.[1] Given its high share in total employment and important role as an enabler of the Green Transition, the analysis also includes the construction sector[2].

Starting from the diagnosis of 'strained health' and/or significant downside risks in all examined sectors, the brief analyses where in Europe a protracted decline of the sectors in question would have the strongest repercussions on employment. The specific added value of the analysis is that it is conducted at regional, rather than only at Member State level, and thus particularly apt in the light of the strong regional concentration of manufacturing employment.[3] In the European chemicals sector, for instance, 8 of the 242 European NUTS-2 regions[4] account for more than one-quarter of the sector's total employment.

The relevance of a systematic mapping of the impact of industrial decline across regions can be corroborated when looking at the number of policy initiatives in support of specific regional industrial clusters. For the automotive sector alone, these include:

- An Automotive Regions Alliance bringing together 20 regions from seven EU countries, organising meetings, seminars and conferences, which has prepared a 10-point list of demands to the EU.[5]

[1] These sectors correspond to codes C20, C23, C24, C25, C28, C29 of the 'Statistical Classification of Economic Activities in the European Community' (NACE), Rev. 2.
[2] The sector corresponds to NACE code F (aggregating F41, F42 and F43).
[3] While there is a body of academic literature on the decline of industrial regions, especially in the 1970s and 1980s, as well as their adjustment strategies (see for instance, Boschma & Lambooy (1999), Finka et al. (2005), Rhodes (1986), Heim (1997), Blažek et al. (2019)), there has to our knowledge not yet been a systematic attempt at empirically estimating which regions are most vulnerable to the decline of key European industries.
[4] NUTS-2 regions are an official EU classification of regions, each having 800,000 to 3,000,000 inhabitants to the extent possible. This is the level at which inter alia cohesion funds are allocated. It corresponds for example to Provinces in Belgium, the former Régions in France or Länder in Austria. We use the 2021 rather than the 2024 definition due to data availability.
[5] https://cor.europa.eu/en/our-work/cooperations-and-networks/automotive-regions-alliance

- An initiative launched by 4 German mayors and supported by a further 11, which has sent a 7-point list of demands to President von der Leyen.[6]
- A 10-point plan by the German Bundesland (federal state) Baden-Württemberg.[7]
- An event called “Automotive regions: a just and sustainable transition to reinforce ecosystems and harness talent” organised on 10/10/2023 at the regional representation of Sachsen-Anhalt to the EU as part of the official programme of the 21st European Week of Regions and Cities.

The results presented in this brief could be useful elements to inform policy decisions on where to focus the allocation of EU funds. While the exact policy implications are beyond the scope of this analytical paper, one could for example envisage that some of the EU’s substantial structural funds are directed to regions that may suffer the most from industrial decline. In addition, it may make sense to direct clean-tech investments towards these regions, as they already have the infrastructure, know-how and skilled labour in place.

[6] See for example https://www.saarbruecken.de/media/download-67b6d711ebb49. The signatories are the mayors of the following 15 German cities: Augsburg, Dingolfing, Essen, Friedrichshafen, Ingolstadt, Lippstadt, Neckarsulm, Rastatt, Saarbrücken, Schwäbisch Gmünd, Schweinfurt, Sindelfingen, Stuttgart, Wolfsburg, Zwickau. Reassuringly, 13 of these 15 cities are located in one of the regions our analysis identifies as being exposed to the automotive industry. The regions hosting the other two cities, Essen and Lippstadt, while not exposed to the automotive industry directly according to our analysis, are exposed to (and among the regions most struggling to cope with the decline of) the fabricated metals and machinery industries, important suppliers to the automotive industry.

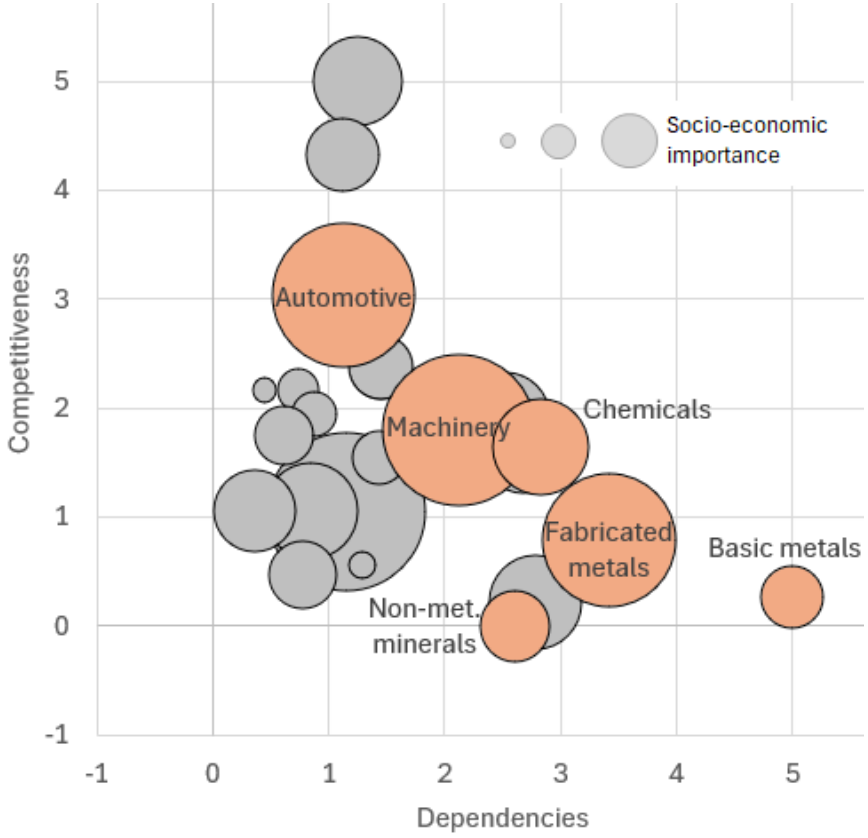
[7] https://www.baden-wuerttemberg.de/fileadmin/redaktion/dateien/PDF/Anlagen_PMs_2025/250204_Zehn-Punkte-Papier-Automobilwirtschaft.pdf

2. Importance of the sectors at EU level

Figure 1 illustrates the importance of the six manufacturing sectors for the EU economy along three criteria:

- *socio-economic* importance, as measured by the number of people employed by a sector, its value added and the demand it creates for upstream sectors;[8]
- international *competitiveness*, i.e. whether a sector achieves a higher share in the EU's export mix than in the exports of the rest of the world;[9]
- *dependencies*, that is the extent to which downstream sectors rely on inputs generated by the sector in question, as well as the degree to which the sector itself relies on inputs from third countries.[10]

Figure 1: The sectors' socio-economic importance, competitiveness and dependencies[11]



[8] The indicator is calculated as the average of all three components.
[9] The indicator furthermore takes into account recent changes in competitiveness. It is computed as the average of revealed comparative advantage (RCA) in 2022 and the change of RCA from 2019 to 2022. RCA measures a sector's importance in the EU's export mix relative to its importance in global trade.
[10] Dependencies measures the extent to which the EU could replace imports by reducing exports as well as the concentration of its import origin countries. Furthermore, it takes into account the number of downstream sectors that depend on the given sector's output. Specifically, it is computed as the geometric mean of downstream linkages and external dependencies, which in turn is computed as the geometric mean of imports over exports and the HHI of import origin countries. This latter part is thus equivalent to one of the two pillars of the EXVI; see Connell Garcia and Ho (2025) for the detailed methodology: https://single-market-economy.ec.europa.eu/publications/external-vulnerability-index-exvi_en
[11] For the detailed methodology behind this diagram, please refer to a forthcoming economic brief by Gentner Vavrova, Heikkonen, Listl and Pella, soon available at https://single-market-economy.ec.europa.eu/publications/single-market-economics-briefs_en

It clearly emerges that the six sectors analysed are particularly important in EU manufacturing, albeit for different reasons.

Automotive and machinery are among the sectors with the highest socio-economic importance (size of the bubble), only topped by food production. At the same time, they enjoy a comparatively high international competitiveness.

The other four sectors are fundamental since they produce inputs which are critical to a host of downstream sectors and/or the EU may try to maintain these industries in Europe to pre-empt an intensification of already existing, significant external dependencies. In the case of chemicals, a high dependency score is coupled with a comparatively high degree of international competitiveness, while fabricated metals ranks in the top-4 of all sectors on socio-economic importance.

For the construction sector, the analysis can only be approximated, as some of the data are not available and the competitiveness criterion does not apply (construction services are largely non-tradable, i.e. there are virtually no third-country players involved). However, based on its employment and value added well in excess of any of the manufacturing sectors, the socio-economic importance of construction is beyond doubt. Coupled with its relevance for the reduction of emissions from space heating, including construction in the analysis seems warranted.

Table 1 summarises the importance of all seven sectors for the EU in terms of employment and GDP.

Table 1: Importance of the sectors analysed

Sector	Employment	Employment share	GDP share
Automotive	2.45 million	1.13%	1.39%
Basic Metals	0.88 million	0.40%	0.56%
Chemicals	1.25 million	0.57%	1.03%
Fabricated Metals	3.70 million	1.70%	1.34%
Machinery	3.11 million	1.43%	1.63%
Non-met. minerals	1.18 million	0.54%	0.54%
Construction	14.1 million	6.49%	4.17%

3. Health of the sectors at EU level

To examine the 'health' of the seven sectors at EU-level, we combine a qualitative assessment of the challenges they face with an analysis of recent developments in headline figures on production, employment and firms' competitive position.

Indeed, our qualitative assessment shows that all sectors face a number of headwinds which have the potential to seriously transform them. Most of these headwinds concern several sectors at once:

- Increased ***energy costs*** since the Russian invasion of Ukraine: They have a negative impact on all manufacturing activities. The effect is most pronounced for energy-intensive industries (EIIs), i.e. chemicals, basic metals and non-metallic mineral products.
- Subdued demand from main customers due to a ***global industrial downturn***: This phenomenon is particularly relevant for the sectors in the upstream part of manufacturing (with high dependencies in Figure 1), namely chemicals, basic metals, fabricated metals and non-metallic mineral products, but it also applies to the automotive industry.
- Significant ***global overcapacity***, mainly due to the expansion of Chinese production capacity: The phenomenon is particularly acute for chemicals and basic metals.
- Growing ***competition from China for high-quality products***: This concerns especially complex products where EU manufacturers enjoyed high international competitiveness so far, namely automotive and machinery, and, to a lesser extent, fabricated metals.
- ***Dependencies*** revealed particularly by the COVID crisis.
- ***Shortages of labour***: A lack of staff is a general phenomenon in the EU economy and not confined to manufacturing. Importantly, it does not only concern high but also lower skilled workers and thus extends to the construction sector.

Beyond these "shared" headwinds, most sectors suffer from specific challenges. The car industry, for instance, is in the midst of a transformation from combustion to battery-electric vehicles (BEVs) and struggles to get on a par with Chinese producers and Tesla in respect of technology and production costs. The situation results in dwindling sales shares on the Chinese market and is compounded by a structurally smaller EU car market since the COVID-19 pandemic. Meanwhile, the EU construction sector suffers from high interest rates, costly energy efficiency measures and lengthy planning procedures, all of which raise doubts about the prosperity of the sector going forward.

To check whether and to what extent the above headwinds already took a toll on the analysed sectors, we focus on three variables: production, as measured by Eurostat's industrial production index, the number of people employed and firms' assessments of their competitive position on foreign markets outside the EU, as inquired by the Joint Harmonised EU Programme of Business and Consumer Surveys (EU BCS). For all variables, we consider the change over the last twelve months, as well as since the year preceding the energy shock (2021) and the outbreak of the COVID-19 pandemic (2019). The joint reading

of these growth rates, as well as recent employment and production expectations according to the EU BCS is summarised in Table 2.[12]

Table 2: Overview of sectors' health

Sector	Production	Employment	Compet. Position	Overall Health
Automotive	declining	declining	declining	**very strained**
Basic Metals	declining	stable but neg. expect.	declining	**strained**
Chemicals	declining	stable but neg. expect.	declining	**strained**
Fabricated Metals	declining	stable but neg. expect.	declining	**strained**
Machinery	declining	stable but neg. expect.	declining	**strained**
Non-met. minerals	declining	declining	declining	**very strained**
Construction	stable but downside risks	stable but downside risks	n/a	**stable with downside risks**

It clearly emerges that the headwinds mentioned above have translated into a tangible deterioration of the sectors' economic performance. All manufacturing sectors analysed saw significant declines in production. Focussing, for each sector, on the worst of its three growth rates over different time periods, production declines between -6% (for machinery and fabricated metals) and -14% to -18% (all other sectors) can be observed. Similarly, manufacturers' assessments of their competitive position deteriorated to levels well below the respective historical average. While employment declined only in two sectors (automotive, non-metallic minerals), it should be borne in mind that the adaptation of employment to reduced levels of output usually happens with a significant time-lag due to labour market rigidities. Indeed, the employment expectations in all manufacturing sectors are deeply in negative territory. Taken together, the indicators provide clear indications that the 'health' of all manufacturing sectors is strained and, in the case of automotive and non-metallic minerals, *very* strained.

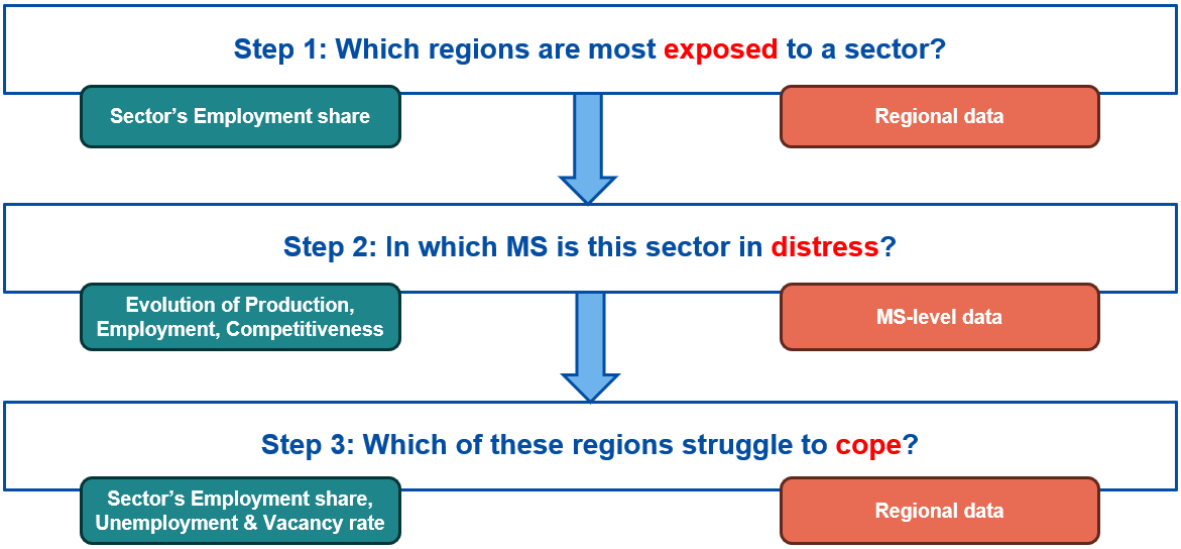
The construction sector stands out with a stable performance. However, in the light of the challenges described above, it appears adequate to describe its health as 'stable with downside risks'.

[12] See Annex 1 for an overview of the specific growth rates per sector, variable and period considered.

4. Overview of the methodology for the regional analysis

Starting from the diagnosis of 'strained health' and/or significant downside risks in all examined sectors, we analyse where in Europe a protracted decline of the activities in question would have the strongest repercussions on employment. We hereby follow a three-step approach as illustrated by Figure 2 below.

Figure 2: Methodology of the regional analysis for a sector



In **step 1**, we use regional employment data to identify the regions most **exposed** to a sector's decline. Specifically, we consider all regions in which a given sector accounts for more than 1% of employment as being exposed.[13] While the 1% threshold may seem moderate, it is effectively a lower bound for the actual significance of the sector, which tends to be much higher due to jobs indirectly depending on the economic activity in question. In addition, given the high concentration of industrial employment, the average sectoral employment of exposed regions is actually substantially larger than 1%. For example, the automotive sector accounts for 2.5% of total and 13.9% of industrial employment across the 85 regions in which it employs more than 1% of workers.

In **step 2**, we repeat the sectoral health checks performed in section 3 at *national* level to single out the specific Member States where a given sector is in decline. The step is warranted since strained health of a sector at aggregate EU level does not preclude that the sector might be doing well in particular countries. Given the very large number of country-sector combinations, the MS-level health check is simplified and purely data-driven.

In practice, we compute, for each sector and Member State, a composite index of distress,[14] using the following elements:

- production change (since 2019)
- employment change (since 2019)

[13] To be precise, we retain all regions in which the examined sector accounted for at least 1% of total employment in at least one year between 2019 and 2022 (latest year available), in order to also capture regions where the decline may already have started. This changes the results only very moderately compared to applying a 1% threshold in 2022.
[14] The calculation method, including the precise transformation of the data feeding into the indicator, is explained in more detail in part c) of Annex 2.

- current employment expectations according to surveys
- change in competitive position according to surveys (since 2019)

The Distress Indicator is calculated as the weighted average of the four components:

$$\boldsymbol{Distress} = 60\% * \Delta production + 20\% * \Delta employment + 10\% * empl.exp. + 10\% * compet.pos.$$

The chosen weights ensure that (i) higher importance is attached to statistical data which are more reliable than survey data (80% vs. 20%) and (ii) more weight is given to production as opposed to employment data (60% production vs. 30% employment, of which 10% expectations), which is warranted since employment tends to react much later to a crisis due to labour market rigidities. Unfortunately, these data are only available at MS, not regional, level.

Next, we define a threshold value for the distress indicator. All country-sector combinations faring worse than this threshold (i.e., having a lower composite index score) are considered distressed. The threshold value corresponds to the score which a hypothetical country with the following performance would get:

- Production and employment change: -7.5%
- Employment expectations and competitive position according to surveys: 1 standard deviation below historical average.[15]

Overlaying steps 1 and 2 we thus obtain per sector a list of regions that are both exposed to a given sector and, at the same time, located in a country where that sector is distressed.

In a **final step**, we further narrow down these lists according to which regions will have the hardest time to cope with industrial decline, from the perspective of employment security. To that end, we calculate the following index of coping ability per region-sector combination:

$$\boldsymbol{Coping\ Ability} = \left[\frac{1}{2} * unempl.rate + \left(\frac{sectoral\ empl.}{total\ empl.} - \frac{1}{2} * \frac{industrial\ vacancies}{total\ empl.}\right)\right] * (-1)$$

The indicator takes into account whether (i) the prevailing unemployment in a given region is already high, (ii) the ailing sector accounts for a particularly large share of employment (and thus has the potential to significantly drive up unemployment) and (iii) there are relatively few industrial vacancies which laid-off workers could apply for. In order to ensure that the indicator puts more emphasis on future than on existing/structural unemployment, the prevailing unemployment rate is multiplied by one-half. The same is done for industrial vacancies since the labour re-absorption they facilitate will be limited, as not every industrial vacancy is suitable for every industrial worker. The idea behind this step is that a job loss in southern Germany may not have the same impact, from the perspective of employment security, as a job loss in southern Italy.

Finally, the indicator is multiplied by minus one so that a *lower* index value implies a *lower* coping ability.

[15] The average replies to business surveys and the degree to which replies change in response to fluctuations of the business cycle differ significantly across sectors and Member States. Replies can thus only usefully be compared across sectors and Member States by expressing them relative to their sector and country specific historical average and characteristic amplitude (=standard deviation).

Of all exposed and distressed regions *across all seven sectors,*[16] we retain the 50% of regions with the lowest coping ability score. We can thus distil, for each examined sector, a set of regions which are most vulnerable to its decline, from an employment security perspective. A more detailed description of the data used and the technical details of the methodology is provided in Annex 2, sections b), c) and d).

[16] Technical note: We retain the bottom half of regions across all sectors, rather than per sector, because we do not want the question of whether a region is considered highly vulnerable to depend on the distribution of employment shares across regions for a given sector. For example, a region with a given unemployment and vacancy rate and 3% employment in automotive may not be in the bottom half of all regions with more than 1% automotive employment in terms of coping ability, given that automotive employment is highly concentrated, but with 3% employment in machinery it may be in the bottom half of all machinery sectors. We instead want it to be in the bottom half (or not) irrespective of the sector in which it has the 3% employment share.

5. Regional results per sector

Figure 3: Automotive Step 1: Exposure

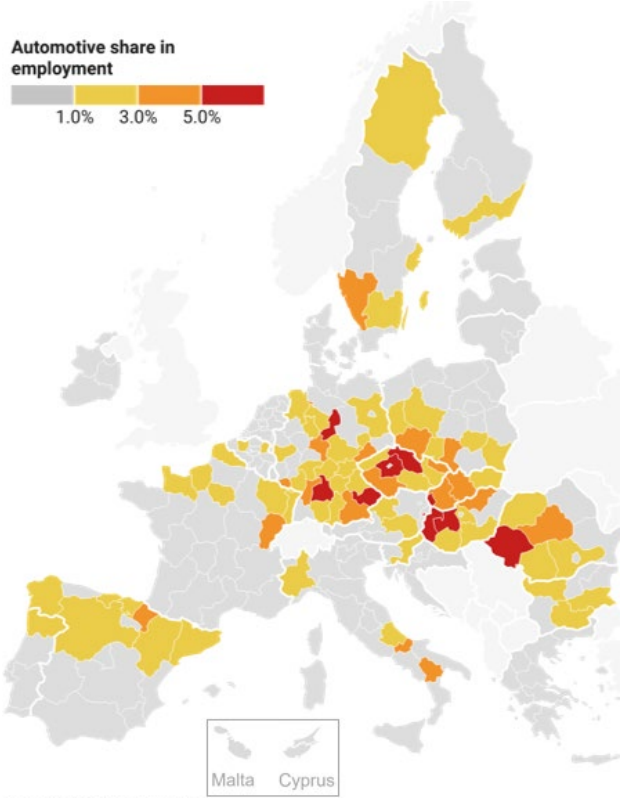
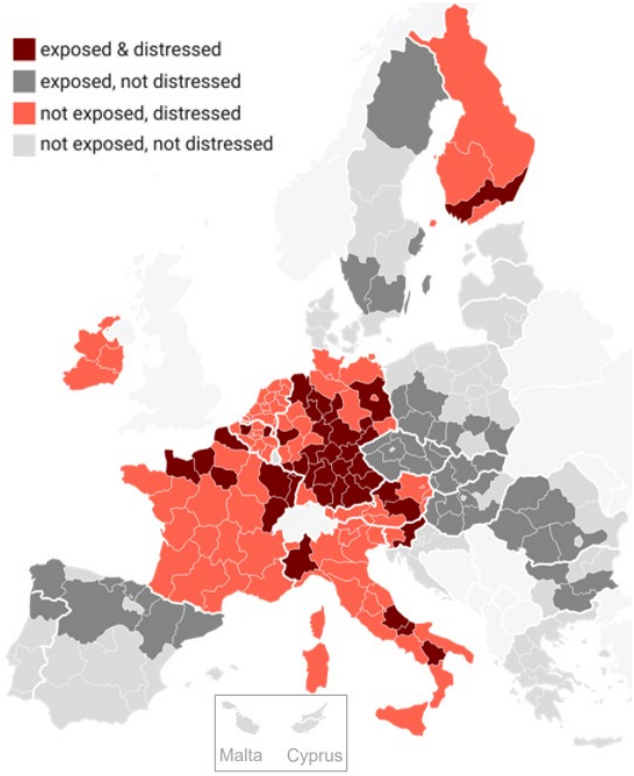


Figure 4: Automotive Steps 1 & 2: Exposure & Distress



This section presents the results of the regional analysis per sector. The first sub-section describes the results for the automotive sector in detail. The following sub-sections present the results for the other sectors in less detail, in the interest of space.

5.1 Automotive – results

Step 1: As shown in Figure 3, the regions most exposed to the automotive sector are distributed throughout Germany, central and eastern Europe (CEE), northeastern France, northern Spain, Italy, and southern Scandinavia. Germany, Czechia, Slovakia, Hungary and Romania stand out in so far as most or all regions are exposed and there is at least one region where the automotive sector accounts for more than 5% of regional employment.

Step 2: While the automotive sector is in decline in Europe overall, the distress is particularly acute in nine countries (highlighted in red in Figure 4), where the composite index of distress exceeds the threshold values defined above. These are Germany, France, Italy, Finland, Belgium, the Netherlands, Austria, Slovenia and Ireland. The finding is consistent with the results found by existing literature, which points to the fact that Spain and CEE have benefitted from substantial inward FDI in recent years, including from Chinese manufacturers.[17]

Of the 85 exposed regions identified in Step 1, 41 are located in distressed countries and hence retained for step 3 of our analysis (see dark red regions in Figure 4). The other exposed regions (dark grey in Figure 4) are discarded.

[17] See for example Garrone et al. (2025), which find that Germany, France and Italy are struggling, while Iberia and CEE are not.

Step 3: Of the 41 dark red regions in Figure 4, 23 turn out to be among the regions with the lowest coping ability, considering all exposed and distressed regions identified in the seven sectoral analyses. It is these 23 regions, shown in Figure 5, where a protracted decline of the automotive industry will have the most significant repercussions on employment:

Figure 5: Automotive Results

- **Austria:** Steiermark
- **Finland:** Etelä-Suomi
- **France:** Alsace, Basse-Normandie, Franche-Comté, Haute-Normandie, Ile-de-France, Lorraine, Nord-Pas de Calais
- **Germany:** Braunschweig, Bremen, Chemnitz, Karlsruhe, Kassel, Leipzig, Niederbayern, Oberbayern, Saarland, Stuttgart
- **Italy:** Abruzzo, Basilicata, Molise, Piemonte

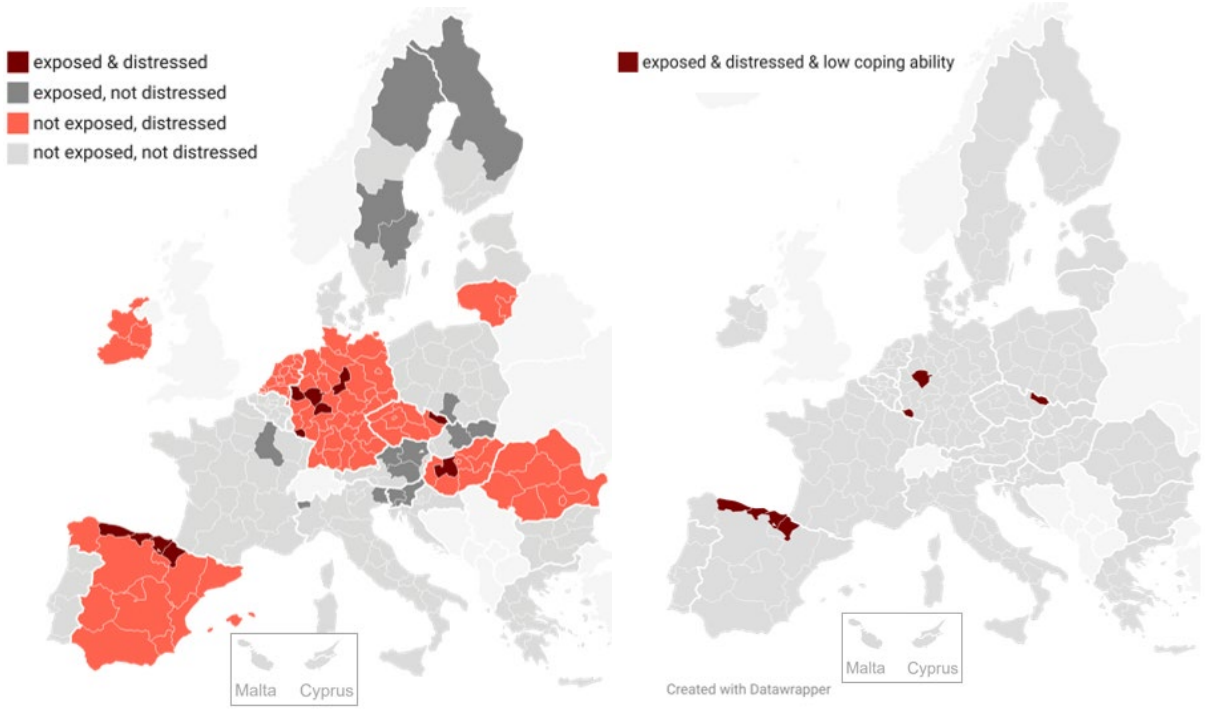
The results are intuitive in so far as all regions in Italy and France, where structural unemployment is comparatively high, are retained, while only some of the many German regions are.

All of the German regions are indeed major automotive hubs, hosting at least one[18] of the 25 German automotive assembly plants.[19] Similarly, three of the four Italian regions are home to a major assembly plant, with Abruzzo and Basilicata hosting the country's largest / third largest plant respectively. Finally, with the exception of Basse-Normandie, all French regions have at least one major assembly plant.[20]

[18] Oberbayern tops the list with three assembly plants and an output of 537,000 cars in 2024 (Source: S&P Global Mobility).
[19] Kassel does not have an assembly plant, but hosts Volkswagen's largest component plant in Germany.
[20] Nord-Pas-de-Calais hosts the largest number, namely four, with an output of 605,000 cars in 2024 (Source: S&P Global Mobility).

5.2 Basic metals – results

Figure 6: Basic metals. LHS: Exposure & Distress. RHS: Results



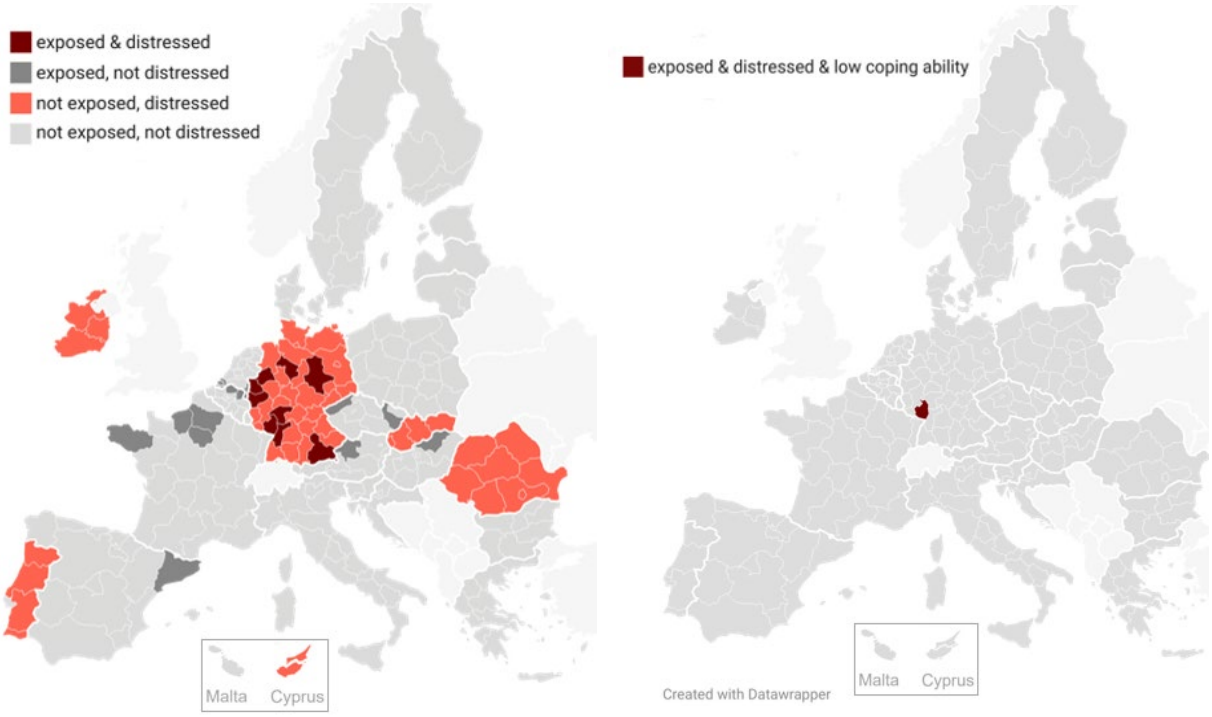
There are 26 regions that are exposed to the basic metals sector and 8 MS in which the basic metals sector is in distress; giving rise to 11 regions that are both exposed and distressed.

Of these 11 regions, the following 7 regions would particularly struggle to cope with the decline of the basic metals industry:

- **Czechia:** Moravskoslezsko
- **Germany:** Arnsberg, Saarland
- **Spain:** Cantabria, Comunidad Foral de Navarra, País Vasco, Principado de Asturias

5.3 Chemicals – results

Figure 7: Chemicals. LHS: Exposure & Distress. RHS: Results



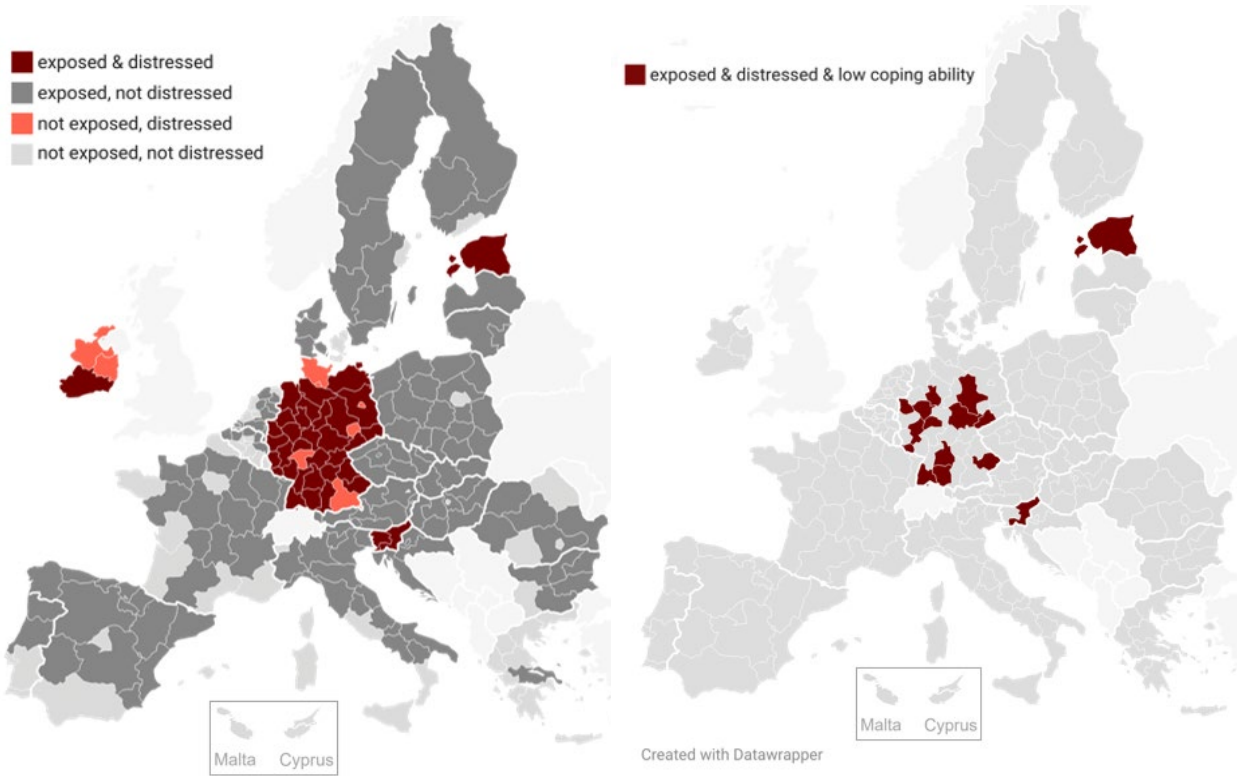
There are 22 regions that are exposed to the chemicals sector and 6 MS in which the chemicals sector is in distress; giving rise to 9 regions that are both exposed and distressed.

Of these 9 regions, only one region would particularly struggle to cope with the decline of the basic metals industry: **Rheinhessen-Pfalz in Germany**, hosting the BASF headquarters in Ludwigsburg.

The fact that only one of the nine exposed and distressed regions is among the regions with the lowest ability to cope can be explained by two factors. First, all of them are located in Germany (and within Germany, mostly in the south and west), which has relatively low regional unemployment rates. Second, the chemicals sector employs fewer workers than the automotive, machinery or fabricated metals sectors, which means the potential unemployment generated by its demise is smaller, leading to a higher coping ability score of chemical regions.

5.4 Fabricated metals – results

Figure 8: Fabricated Metals. LHS: Exposure & Distress. RHS: Results



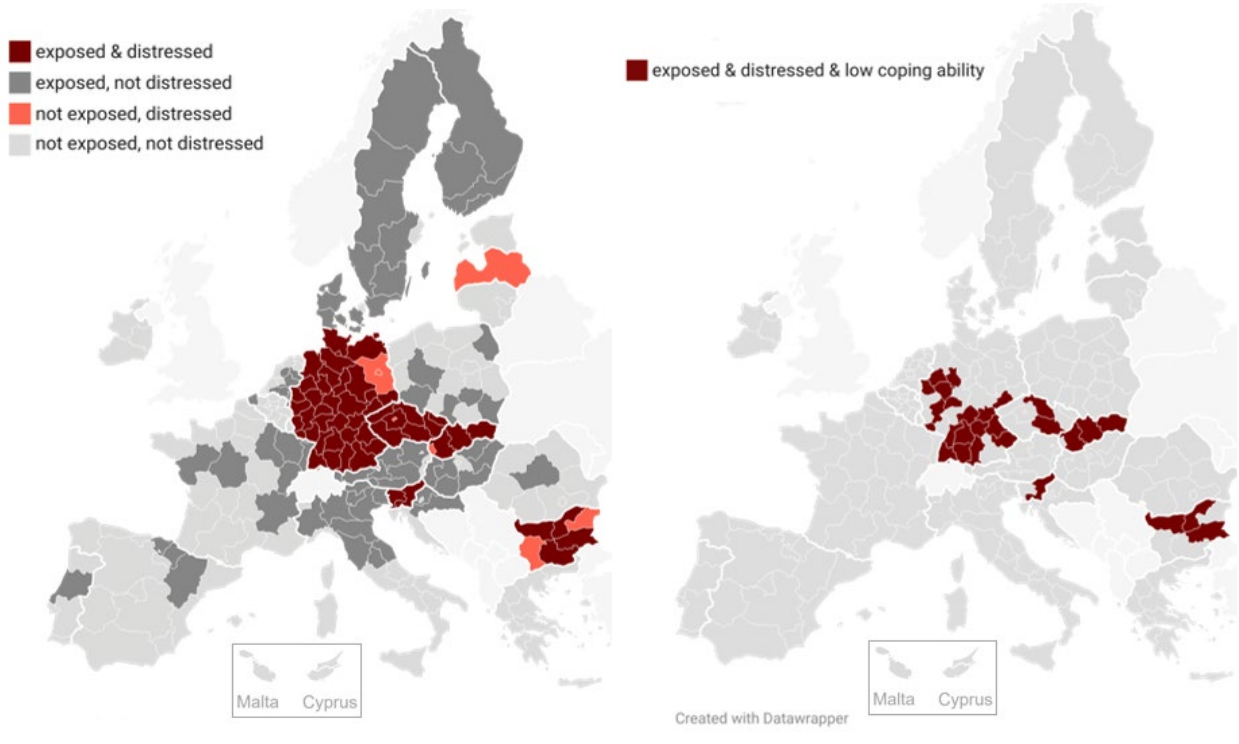
There are 168 regions exposed to the fabricated metals sector, making it the sector with the widest geographical dispersion of all manufacturing activities analysed. Distress is limited to 4 MS, resulting in 36 regions which are both exposed and distressed.

Of these 36 regions, the following 15 regions would particularly struggle to cope with the decline of the basic metals industry:

- **Estonia:** Eesti
- **Germany:** Arnsberg, Chemnitz, Detmold, Düsseldorf, Freiburg, Gießen, Koblenz, Niederbayern, Saarland, Sachsen-Anhalt, Stuttgart, Thüringen, Tübingen
- **Slovenia:** Vzhodna Slovenija.

5.5 Machinery – results

Figure 9: Machinery. LHS: Exposure & Distress. RHS: Results



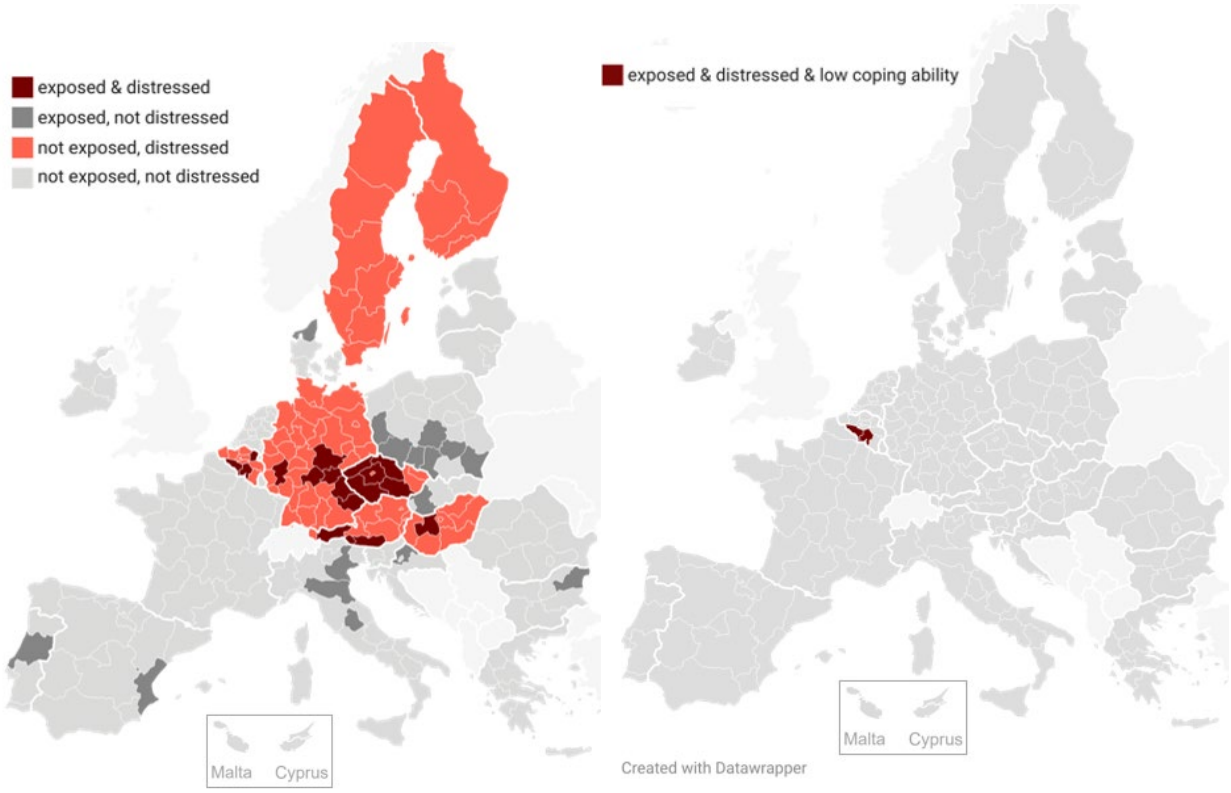
There are 116 regions that are exposed to the machinery sector and 6 MS in which the machinery sector is in distress; giving rise to 52 regions that are both exposed and distressed.

Of these 52 regions, the following 27 regions would particularly struggle to cope with the decline of the machinery industry:

- **Bulgaria:** Северен централен, Северозападен, Югоизточен
- **Czechia:** Jihovýchod, Severovýchod
- **Germany:** Arnsberg, Chemnitz, Detmold, Düsseldorf, Freiburg, Gießen, Karlsruhe, Koblenz, Mittelfranken, Münster, Niederbayern, Oberfranken, Oberpfalz, Saarland, Schwaben, Stuttgart, Tübingen, Unterfranken
- **Slovakia**: Stredné Slovensko, Východné Slovensko, Západné Slovensko
- **Slovenia**: Vzhodna Slovenija.

5.6 Non-metallic minerals – results

Figure 10: Non-metallic minerals. LHS: Exposure & Distress. RHS: Results

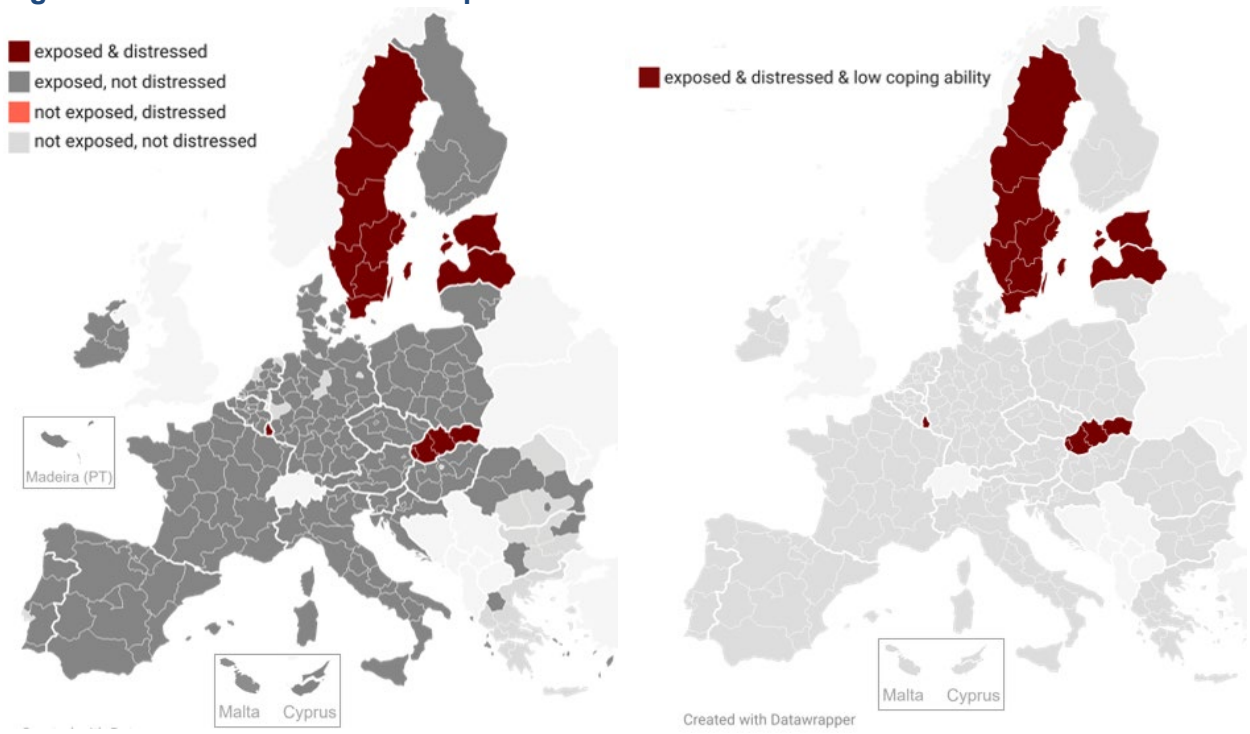


There are 33 regions that are exposed to the basic metals sector and 7 MS in which the basic metals sector is in distress; giving rise to 17 regions that are both exposed and distressed.

Of these 17 regions, the following 2 regions would particularly struggle to cope with the decline of the basic metals industry: **Hainaut and Namur in Belgium.**

5.7 Construction – results

Figure 11: Construction. LHS: Exposure & Distress. RHS: Results



There are 212 regions that are exposed to the construction sector and 5 MS in which the sector is in distress; giving rise to 15 regions that are both exposed and distressed.

All of them would particularly struggle to cope with the decline of the construction industry:

- **Estonia:** Eesti
- **Latvia:** Latvija
- **Luxembourg:** Luxembourg
- **Slovakia:** Bratislavský kraj, Stredné Slovensko, Východné Slov., Západné Slov.
- **Sweden:** Mellersta Norrland, Norra Mellansverige, Småland med öarna, Stockholm, Sydsverige, Västsverige, Östra Mellansverige, Övre Norrland

The large number of exposed regions is unsurprising, given that the construction sector employs far more people than the manufacturing sectors.[21] The fact that only 5 MS are distressed is in line with the robust performance of the public infrastructure and renovation sectors. Sweden being particularly affected can be explained by the large prevalence of variable-rate mortgages there. Through the financial sector, this may have spread to the Baltics, as many of the major banks there are Swedish. Finally, the fact that all exposed and distressed regions would struggle to cope can also be explained by the construction sector's large employment share.

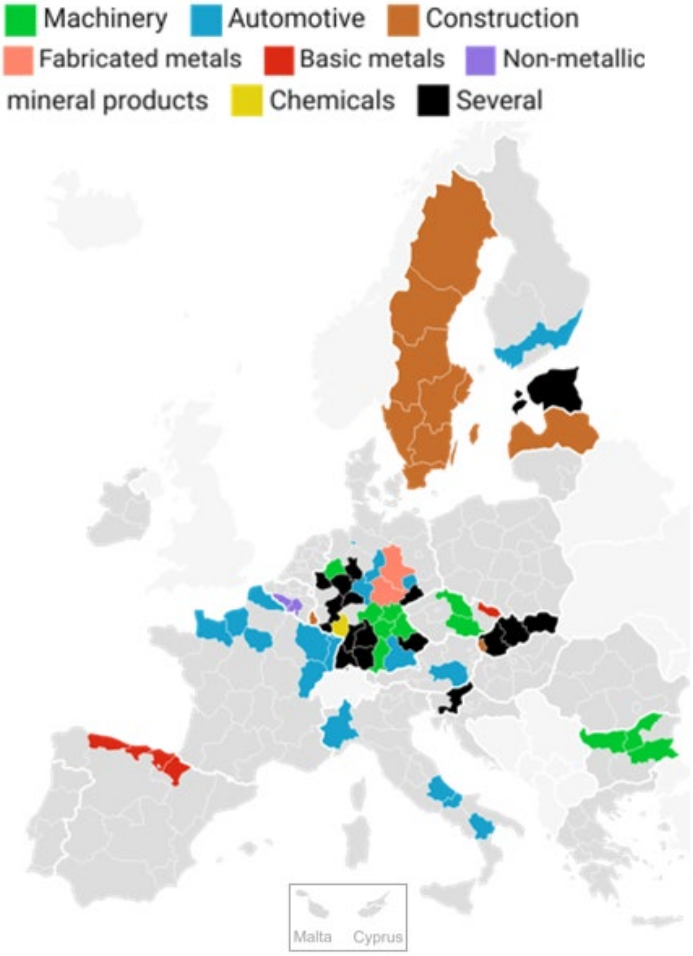
[21] In fact, to account for the fact that the construction sector employs more people than the manufacturing sectors (being also a one-digit NACE sector, one level above the individual two-digit NACE manufacturing sectors), we applied a 5% rather than a 1% threshold for exposure in the case of construction.

6. Overall results and conclusion

The manufacturing sector is the backbone of the EU economy, accounting for 14% of employment and contributing 15% to GDP. In recent years, the sector has been exposed to a mixture of structural headwinds and genuine shocks, nurturing fears that Europe might have embarked on a path of de-industrialisation. Similarly, there have been growing concerns about the construction sector and its ability to prosper in an environment of high interest rates, spiralling input costs and chronic labour shortages.

This Brief zooms in on six major manufacturing sectors which are key to the Green Transition, as well as construction, and subjects them to a rigorous 'health check'. Starting from the diagnosis that the sectors are indeed showing worrying signs of 'strained health' and/or significant downside risks, our analysis provides evidence where exactly a continued geographic pattern of decline of the sectors in question would have the strongest repercussions in terms of employment. The study is conducted at the level of the 242 European NUTS-2 regions and thus allows, to our knowledge for the first time, a systematic and granular mapping of the potential impact of industrial decline across Europe.

Figure 12: Regions most affected by industrial decline



Given a lack of data, the analysis could not be conducted for the following regions: Automotive: Hamburg (DE), Luxembourg (LU); Basic metals: Luxembourg (LU), Drenthe, Friesland, Noord-Holland, Zeeland and Zuid-Holland (all NL).

The results in Figure 12 show that a continuation of recent trends would not hit all regions alike, but would be felt strongest by a group of 73 regions (i.e. roughly 30% of all NUTS-2 areas). Construction aside, whose decline seems to mainly affect northern Europe (Sweden, Estonia, Latvia), the bulk of the regions is in the geographic centre of Europe.

Germany, Slovakia, and Estonia stand out as having most to lose from industrial decline: In Germany, fully 26 of 38 regions (68%) are strongly impacted, with twelve of them (32%) suffering from the decline of several sectors at once (black regions). The industrial demise culminates in the southwestern region Saarland which struggles with the impacts of an ailing automotive, machinery, basic and fabricated metals industry.

Also Slovakia and Estonia struggle with the simultaneous decline of sectors, namely construction in combination with machinery and fabricated metals, respectively.

As shown in Table 3, the sectors producing the largest number of affected regions are machinery and automotive by far. Worth highlighting, the energy-intensive sectors (chemicals, basic metals, non-metallic mineral products), whose decline in the aftermath of the energy shock has been well documented, only account for ten impacted regions together. The reason is that they employ relatively few people compared to construction and the other manufacturing sectors analysed.

Table 3: Overall Results

Sector	#	Regions
Machinery	**27**	BG: Северен централен, Северозападен, Югоизточен CZ: Jihovýchod, Severovýchod DE: Arnsberg, Chemnitz, Detmold, Düsseldorf, Freiburg, Gießen, Karlsruhe, Koblenz, Mittelfranken, Münster, Niederbayern, Oberfranken, Oberpfalz, Saarland, Schwaben, Stuttgart, Tübingen, Unterfranken SK: Stredné Slovensko, Východné Slovensko, Západné Slovensko SI: Vzhodna Slovenija
Automotive	**23**	AT: Steiermark FI: Etelä-Suomi FR: Alsace, Basse-Normandie, Franche-Comté, Haute-Normandie, Ile-de-France, Lorraine, Nord-Pas de Calais DE: Braunschweig, Bremen, Chemnitz, Karlsruhe, Kassel, Leipzig, Niederbayern, Oberbayern, Saarland, Stuttgart IT: Abruzzo, Basilicata, Molise, Piemonte
Fabricated metals	**15**	EE: Eesti DE: Arnsberg, Chemnitz, Detmold, Düsseldorf, Freiburg, Gießen, Koblenz, Niederbayern, Saarland, Sachsen-Anhalt, Stuttgart, Thüringen, Tübingen SI: Vzhodna Slovenija
Construction	**15**	EE: Eesti LV: Latvija LU: Luxembourg SK: Bratislavský kraj, Stredné Slovensko, Východné Slovensko, Západné Slov. SE: Mellersta Norrland, Norra Mellansverige, Småland med öarna, Stockholm, Sydsverige, Västsverige, Östra Mellansverige, Övre Norrland
Basic metals	**7**	CZ: Moravskoslezsko

		DE: Arnsberg, Saarland ES: Cantabria, Comunidad Foral de Navarra, País Vasco, Principado de Asturias
Non-met. minerals	**2**	BE: Prov. Hainaut, Prov. Namur
Chemicals	**1**	DE: Rheinhessen-Pfalz
(several sectors)	**17**	DE: Saarland (4x), Arnsberg (3x), Chemnitz (3x), Stuttgart (3x), Niederbayern (3x), Detmold (2x), Düsseldorf (2x), Freiburg (2x), Gießen (2x), Karlsruhe (2x), Koblenz (2x), Tübingen (2x) EE: Eesti (2x) SI: Vzhodna Slovenija (2x) SK: Stredné Slovensko (2x), Východné Slovensko (2x), Západné Slovensko (2x)

Annex 1: Data underlying EU level health checks (per sector)

Table 1.1 – Automotive industry

	Production	Employment	Competitive Position (survey*)
Change since pre-Covid (2019)	-14%	-6%	-1.8
Change since pre-energy crisis (2021)	7%	-3%	-2.0
Change over last 12 months	-8%	1%	-2.2
Expectations (at present; survey*)	-1.3	-1.1	n/a

Table 1.2 – Basic metals industry

	Production	Employment	Competitive Position (survey*)
Change since pre-Covid (2019)	-12%	-1%	-1.0
Change since pre-energy crisis (2021)	-11%	4%	-0.9
Change over last 12 months	-1%	1%	-2.4
Expectations (at present; survey*)	-1.2	-0.3	n/a

Table 1.3 – Chemical industry

	Production	Employment	Competitive Position (survey*)
Change since pre-Covid (2019)	-14%	9%	-1.5
Change since pre-energy crisis (2021)	-18%	11%	-1.7
Change over last 12 months	-3%	0%	-2.4
Expectations (at present; survey*)	-1.1	-0.4	n/a

Table 1.4 – Fabricated metals industry

	Production	Employment	Competitive Position (survey*)
Change since pre-Covid (2019)	-6%	5%	-1.2
Change since pre-energy crisis (2021)	-6%	5%	-1.2
Change over last 12 months	-3%	1%	-2.1
Expectations (at present; survey*)	-1.2	-0.7	n/a

Table 1.5 – Machinery industry

	Production	Employment	Competitive Position (survey*)
Change since pre-Covid (2019)	-3%	-4%	-0.8
Change since pre-energy crisis (2021)	-2%	0%	-0.7
Change over last 12 months	-6%	0%	-2.3
Expectations (at present; survey*)	-1.0	-0.7	n/a

Table 1.6 – Non-metallic mineral products industry

	Production	Employment	Competitive Position (survey*)
Change since pre-Covid (2019)	-11%	-9%	-0.3
Change since pre-energy crisis (2021)	-15%	-4%	-0.3
Change over last 12 months	0%	-2%	-1.3
Expectations (at present; survey*)	-0.8	-0.3	n/a

Table 1.7 – Construction sector

	Production	Employment	Competitive Position (survey*)
Change since pre-Covid (2019)	3%	6%	n/a
Change since pre-energy crisis (2021)	3%	8%	n/a
Change over last 12 months	-1%	1%	n/a
Expectations (at present; survey*)	n/a	0.8	n/a

For survey data, the tables show the number of standard deviations below the historical mean.

Annex 2: Methodology, data sources and avenues for further research

a) EU-level analysis

i. **Table 1, Importance:** Eurostat series SBS_SC_OVW. Value added: 2022. Employment: 2023. Total GDP and employment: Eurostat series nama_10_gdp and nama_10_a10_e.

ii. **Table 1, Health; and Annex 1:** Production: Eurostat series sts_inpr_m (manufacturing) and sts_copr_m (construction), seasonally and calendar adjusted. Percentage change from the 2019 average to the latest 3 months available (Oct.-Dec. 2024). Employment: Eurostat series lfsq_egan22d (manufacturing) and lfsq_egan2 (construction); aged 15 or over. Percentage change from the 2019 average to the latest quarter available (2024, Q3). Competitive Position: European commission business and consumer surveys (BCS); subsector data; industry; quarterly; seasonally and calendar adjusted. We standardise data per MS using historical mean and standard deviation between 2005 and 2019. Table shows the average since 2020, Q1, expressed as the number of historic standard deviations above its historic mean. Production and employment expectations: BCS; subsector data; industry; quarterly; seasonally and calendar adjusted. (Construction: each sub-sector weighted by its 2022 value added.) Standardise data per MS using historical mean and standard deviation 2005-19. Table shows the last three months (Oct.-Dec. 2024), expressed as the number of historic standard deviations above its historic mean.

b) Step 1: Exposure

i. Exposed if maximum employment share 2019-2022 exceeds 1% (5% for construction). Eurostat series sbs_r_nuts2021 (2021-22), sbs_r_nuts06 (2019-20) and nama_10r_3empers (totals).

c) Step 2: Distress

i. Production: Eurostat series sts_inpr_m (manufacturing) and sts_copr_m (construction), seasonally and calendar adjusted. Percentage change from the 2019 average to the latest 3 months available (Oct.-Dec. 2024). Values capped at +100% and -50%. Supplemented where missing by Eurostat series ds-056120 (production value), deflated by sts_inpp_a (sectoral producer price inflation) for MS with at least 1 million inhabitants: EL, FI, HR, LT, SE, SI.

ii. Employment: Eurostat series lfsq_egan22d (manufacturing) and lfsq_egan2 (construction); aged 15 or over. Percentage change from the 2019 average to the latest quarter available (2024, Q3). Values capped at +100% and -50%.

iii. Competitive Position: BCS; subsector data; industry; quarterly; seasonally and calendar adjusted. We standardise data per MS using historical mean and standard deviation between 2005 and 2019. Table shows the average since 2020, Q1, expressed as the number of historic standard deviations above its historic mean.

iv. Production and employment expectations: BCS; subsector data; industry; quarterly; seasonally and calendar adjusted. (Construction: each sub-sector weighted by its 2022 value added.) We standardise data per MS using historical mean and standard deviation between 2005 and 2019. Table shows the latest three months available (Oct.-Dec. 2024), expressed as the number of historic standard deviations above its historic mean.

v. Standardise across sectors and MS, then compute the composite index and synthetic threshold country.

d) Step 3: Coping

i. Employment share for 2022: Eurostat series sbs_r_nuts2021, using 2021 data if 2022 unavailable.
ii. Unemployment rate for 2022: Eurostat series Tgs00010. If missing, use latest available year, adjusted by the relative change in national unemployment rates since then (only applies to 4 regions; 2 in DE, 1 in FI, 1 in PL).
iii. Vacancy rate: Eurostat series jvs_q_nace2, seasonally and calendar adjusted, for 2024, Q3. Data are national. Estimate regional vacancy rate as national vacancy rate multiplied by regional employment shares (of the national total) for sectors C and F.
iv. Overall: Used NUTS2-2021 classification. Complemented with NUTS2-2024 where unavailable (Utrecht, Zuid-Holland).

e) Avenues for further research

This analysis could be expanded or enhanced along three dimensions.

First, the analysis could systematically be conducted for all sectors of the economy, or at least for all manufacturing sectors (given data availability). For example, the food manufacturing sector employs the largest number of people of all manufacturing sectors, but was not considered here as it appears to be less affected by recent crises and less critical to the green transition.

Second, the analysis could be summarised in a single composite index, instead of three separate steps for each of the seven sectors. For example, a hypothetical region in which 0.9% of the labour force work in each of the seven industrial sectors analysed may be more vulnerable to industrial decline than a region in which 1.1% of employment is in one of the seven sectors and none in any of the other six sectors. Similarly, a region that far exceeds two of the three thresholds but falls just short of one of them may in fact be more vulnerable to the decline of an industry than a region which just about passes all three thresholds. Such a composite analysis can relatively easily be conducted using the present framework as a starting point; we have instead decided to follow a more pedagogical three-step procedure for presentational clarity; and to conduct separate analyses per sector to produce more targeted, sector-specific results.

Third, the analysis could be refined by including additional data sources, for example on production expectations, the confidence index, or ad hoc or qualitative data available for some sectors, e.g. the number of vehicles produced for the automotive sector. We have instead opted to mostly use reliable hard data from official sources that is consistently available for all sectors.

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