

Kostarakos, Ilias; Marques Santos, Anabela

**Working Paper**

## An assessment of the economic performance of industrial ecosystems

JRC Working Papers on Territorial Modelling and Analysis, No. 07/2025

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JRC WORKING PAPER

# An Assessment of the Economic Performance of Industrial Ecosystems

JRC Working Papers on  
Territorial Modelling and Analysis

No 07/2025



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## **Abstract**

This report focuses on the assessment of the economic performance of selected industrial ecosystems. In particular, it offers an in-depth discussion of the developments across those ecosystems that exhibited the largest shares of total Gross Value Added in 2019, the year prior to the eruption of the pandemic-induced crisis. The analysis is conducted across three levels of aggregation, namely EU-wide, country-level and the NUTS2 regional level. Moreover, an analysis of the recent trends in labour productivity for the ecosystems is offered.

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## Executive summary

A recent JRC working paper<sup>1</sup> introduced an additional module to the Territorial Economic Data viewer<sup>2</sup> (TEDv), namely, the Industrial module. This new addition provides a breadth of data covering economic, institutional and policy dimensions at the country and the regional level, and via visualizations it allows the user to obtain insights into the state of the EU's (regional) economy.

The present report makes use of the datasets that make up the Industrial module and identifies the most important industrial ecosystems – based on the definition included in the 2021 Single Market report – in order to provide an in-depth analysis in terms of their contribution to output produced and total employment.

The choice of the industrial ecosystems as the unit of analysis is made based on their ability to capture the interdependencies across sectors and the linkages between the various blocks of economic activity. In this capacity, they are better suited for analysing a complex phenomenon like the industrial transition, which is bound to simultaneously affect a multitude of sectors and alter the current productive structure of the economy.

This report provides in-depth evidence of the importance of accounting for the heterogeneous developments in the performance of the industrial ecosystems across countries and regions. Indicatively, the report shows that while some ecosystems emerge as significant employers across countries and regions (e.g. the Retail ecosystem and the Agrifood ecosystem, especially in the so-called lagging regions), at the same time their production of Gross Value Added is relatively low. This large degree of heterogeneity is also made evident from the analysis of the developments in labour productivity. Lastly, the evidence presented suggest that the spatial patterns that emerge should be carefully analysed.

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<sup>1</sup> See Kostarakos and Marques Santos (2025).

<sup>2</sup> For more details about the Territorial Economic Data viewer see Marques Santos et al. (2023) or access the webtool here: <https://web.jrc.ec.europa.eu/dashboard/TEDV/index.html>

## 1. Introduction

The present report accompanies a recent JRC working paper (Kostarakos and Marques Santos, 2025) that introduced the Industrial module of the Territorial Economic Data viewer (TEDv). This module offers a wide range of data, covering economic, policy and institutional dimensions, allowing the user to swiftly assess the state of the EU's regional economies via visualizations.

This report uses the underlying datasets used for the construction of the Industrial module in order to provide a more in-depth analysis of the main industrial ecosystems (as defined in European Commission, 2021) in terms of their contribution to Gross Value Added (henceforth, GVA) and total employment. In particular, we calculate the average share of each ecosystem in total GVA and focus on the top-5. The resulting ecosystems are: Agrifood, Construction, Digital, Mobility-Transport-Automotive and Retail. We note here that our benchmark year of analysis is 2019, given that it is the last year prior to the eruption of the pandemic-induced crisis.

We opted for the analysis of the economic performance of industrial ecosystems rather than individual sectors based on the following consideration: industrial ecosystems, by design, are able to capture the interdependencies across sectors and the linkages between the various blocks of economic activity. As such, they emerge as the proper unit of analysis for a complex phenomenon like the industrial transition, which is bound to simultaneously affect a multitude of sectors and alter the current productive structure of the economy.

In what follows, we will also assess the evolution of the performance of each of these ecosystems over the course of the 2014-2020 programming period, analyse country- and region-wide patterns and examine the resilience of the ecosystems to the 2020 pandemic-induced shock.

The rest of the report is organized as follows: section 2 provides an overview of the developments in the economic performance of the selected ecosystems at the EU level, along with some descriptive evidence on the evolution of labour productivity. Section 3 offers a deep dive into the performance of the ecosystems, focusing on country- and region-specific developments. Lastly, section 4 offers some concluding remarks.



## 2. EU-wide developments

Prior to proceeding to the analysis of each ecosystem's performance over the 2014-2020 period, we provide some preliminary descriptive evidence. In particular, the following Tables present some summary statistics regarding the shares of GVA and employment for each of the five ecosystems, both for the EU27 as a whole and across countries and NUTS2 regions for 2019 (the benchmark year of our analysis), together with some preliminary evidence about their trajectory over time. Lastly, we focus briefly on the evolution of labour productivity –one of the main (macro)economic indicators- for the top-performing ecosystems at the aggregate, EU27 level.

As is evident from the following Tables, the common denominator of the analysis is the significant degree of heterogeneity observed across ecosystems, across countries and across regions. To be more specific, it can be gleaned from Table 1 that the growth performance across ecosystems was starkly different both in the period up until the pandemic-induced crisis and with respect to the 2020 shock. In particular, the Digital ecosystem clearly outperformed the rest of the ecosystems throughout the period, in terms of both GVA and employment growth; additionally, it exhibited remarkable resilience in 2020, along with the Agrifood ecosystem (the latter, in terms of GVA growth). On the other hand, the Mobility ecosystem suffered the largest toll in 2020, with its shares of GVA and employment exhibiting the largest in magnitude negative growth rates across all ecosystems.

As regards the state of the industrial ecosystems at the country level in 2019 (the benchmark year of our analysis), we observe from Table 2 that the Construction ecosystem attains the largest share of GVA produced, with the rest of the industrial ecosystems falling largely in the 5.6 to 6.3% range. It is worth noting that the largest share across ecosystems is found in the Digital ecosystem and, specifically, in Ireland. In the discussion for the Digital ecosystem we highlight the reasons why this value should be considered as an outlier, due to certain country-specific characteristics. Turning to the employment shares, the largest employer in 2019 was the Construction ecosystem, with an average share of 13.8%, followed by the Digital (9.8%) and the Agrifood (8.45%) ecosystems. It is worth noting here that the largest employment share across countries and ecosystems is located in Romania, in the Agrifood ecosystem and is equal to 25.3%.

**Table 1.** Summary statistics by ecosystem for the EU27 (in %)

| Ecosystem           | GVA           |                              |                      | Employment    |                              |                      |
|---------------------|---------------|------------------------------|----------------------|---------------|------------------------------|----------------------|
|                     | Level in 2019 | Average growth for 2014-2019 | Growth rate for 2020 | Level in 2019 | Average growth for 2014-2019 | Growth rate for 2020 |
| <b>Mobility</b>     | 6.06          | 0.29                         | -4.22                | 7.04          | 0.45                         | -0.75                |
| <b>Construction</b> | 11.03         | 0.82                         | 0.96                 | 13.82         | 0.58                         | 1.81                 |
| <b>Agrifood</b>     | 5.15          | -0.08                        | 1.94                 | 7.72          | -2.15                        | -0.22                |
| <b>Digital</b>      | 5.28          | 2.05                         | 6.7                  | 3.26          | 1.69                         | 3.64                 |
| <b>Retail</b>       | 6.32          | 0.08                         | -2.91                | 9.89          | -0.35                        | 0.43                 |

Source: Authors' calculations based on the data described in the main text.

**Table 2.** Summary statistics for GVA and employment shares across countries, 2019 (in %)

| Ecosystem           | GVA   |          |      |      | Employment |          |      |       |
|---------------------|-------|----------|------|------|------------|----------|------|-------|
|                     | Mean  | St. Dev. | Min  | Max  | Mean       | St. Dev. | Min  | Max   |
| <b>Mobility</b>     | 5.61  | 1.84     | 3.2  | 9.66 | 6.83       | 1.57     | 4.18 | 10.51 |
| <b>Construction</b> | 10.64 | 2.01     | 4.05 | 13.4 | 13.8       | 2.01     | 8.41 | 18.7  |
| <b>Agrifood</b>     | 5.64  | 1.95     | 1.25 | 10.4 | 8.45       | 5.15     | 2.95 | 25.3  |
| <b>Digital</b>      | 5.93  | 2.32     | 2.89 | 15.1 | 3.54       | 0.8      | 2.08 | 5.05  |
| <b>Retail</b>       | 6.31  | 0.82     | 4.19 | 7.9  | 9.78       | 0.86     | 8.3  | 11.52 |

Source: Authors' calculations based on the data described in the main text.

Table 3 presents the main summary statistics across the NUTS2 regions. The main conclusion that can be drawn from this table is the rather heterogeneous structure of economic activity that was not evident in higher levels of aggregation. In particular, we observe that in terms of GVA, even though the Construction ecosystem is the largest producer its contribution across the EU regions varies significantly. That is, the dispersion of the Construction GVA shares ranges from 3.29% in the Ionian islands region of Greece to 17% in the Trencin region of Slovakia. Even larger dispersion is evident in the Agrifood and Digital ecosystems. In particular, in the Agrifood ecosystem we observe that 25 regions produce less than 2.5% of regional GVA, with these regions being the more developed regions of countries like Belgium, France, Germany and Spain. In the Digital ecosystem, almost 10% of the regions exhibit a share of GVA less than 1.5%; these are mainly less developed regions located in Bulgaria, Greece, Portugal and Spain. Turning to employment, we observe that Construction and Retail attain the largest shares, with Agrifood being a close third. Moreover, both Agrifood and Digital again display the lowest shares across all the regions and ecosystems. Indicatively, in Agrifood, 29 regions exhibit a share of employment less than 2%, with the regions being located mainly in Germany, Spain and Sweden. As in the country-level case, the largest employment shares across regions and ecosystems are located in Romania. It is interesting to note here that almost all these regions are classified as more developed according to the cohesion criteria. In the Digital ecosystem, 25 regions in total exhibit an employment share less than or equal to 1%, being located mainly in Bulgaria, Greece, Portugal and Romania; almost all of these regions are classified as being less developed.

**Table 3.** Summary statistics for GVA and employment shares across regions, 2019 (in %)

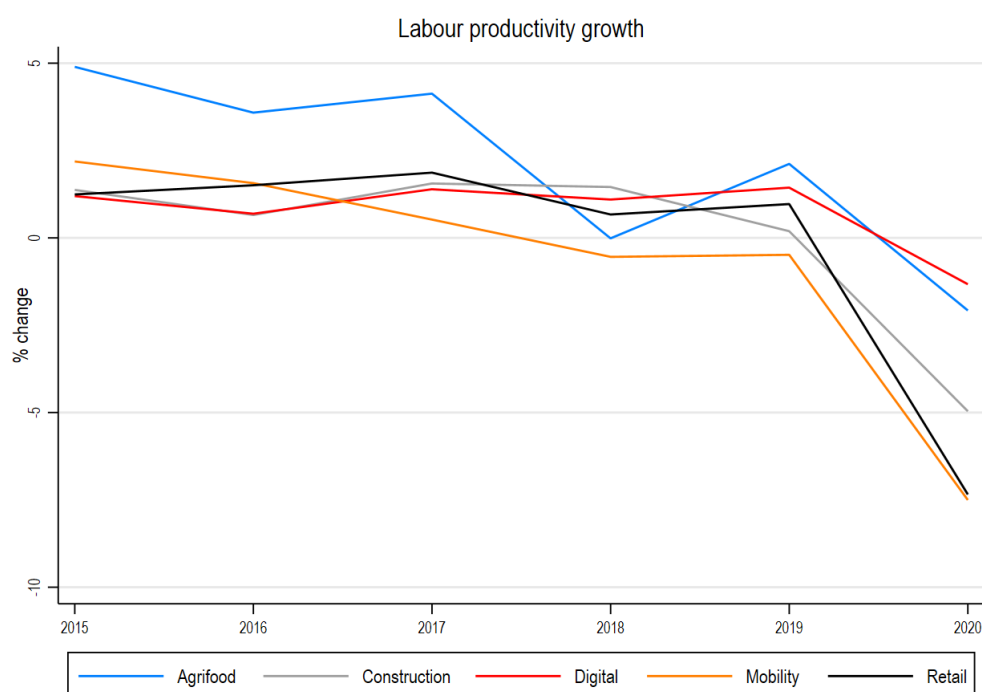
| Ecosystem           | GVA   |          |      |       | Employment |          |      |       |
|---------------------|-------|----------|------|-------|------------|----------|------|-------|
|                     | Mean  | St. Dev. | Min  | Max   | Mean       | St. Dev. | Min  | Max   |
| <b>Mobility</b>     | 5.86  | 3.29     | 1.81 | 28.08 | 6.87       | 2.36     | 3.11 | 18.48 |
| <b>Construction</b> | 10.81 | 2.49     | 3.29 | 17.02 | 13.51      | 2.21     | 6.37 | 18.72 |
| <b>Agrifood</b>     | 6.51  | 3.89     | 0.39 | 22.52 | 9.07       | 7.18     | 0.35 | 48.2  |
| <b>Digital</b>      | 3.83  | 2.83     | 0.37 | 24.29 | 2.64       | 1.58     | 0.55 | 8.18  |
| <b>Retail</b>       | 6.09  | 1.15     | 2.79 | 10.37 | 9.63       | 1.33     | 6.03 | 14.45 |

Source: Authors' calculations based on the data described in the main text.

Lastly, we turn our attention to the evolution of labour productivity across the ecosystems. Labour productivity is one of the most important economic indicators and is largely considered as being a key factor in ensuring a sustainable path of positive growth rates, leading to more prosperous economies and forwarding the process of cross-country/cross-region convergence. In recent years, there has been an ever-increasing interest amongst academics and policymakers regarding the trends in labour productivity growth, especially given the empirical findings that labour productivity growth in the EU appears to be slowing across countries and sectors. In this note, we only briefly touch upon this issue, as a means of providing an overview of the state of labour productivity across the main ecosystems. An important caveat is also the rather small-time dimension of our data; as such, the results should be considered as being indicative and describing short-run developments.

Figure 1 depicts the time path of annual labour productivity growth for each of the five ecosystems. As is evident from the Figure, annual labour productivity growth followed a rather heterogeneous trajectory across ecosystems. Specifically, the Agrifood and the Retail ecosystems exhibited the largest average labour productivity growth rates, with 2.9% and 1.16% respectively. It is worth noting here that Agrifood followed the most volatile path over time. The Mobility ecosystem exhibited a downward trajectory throughout the programming period, with the growth rate turning negative by 2018. Lastly, we observe that the 2020 pandemic shock exerted a large negative effect with the impact being rather heterogeneous. In particular, the Mobility and Retail ecosystems were the most affected (with a negative growth rate of 7.5% in magnitude) while Agrifood and Digital exhibited the smallest in magnitude decline.

**Figure 1.** Annual growth of labour productivity



Source: Authors' calculations

In Table 4, in an attempt to approximate a longer-term view, we provide the 6-year and 7-year average percentage changes in labour productivity, which correspond to the 2014-2019 period (i.e. prior to the eruption of the pandemic-induced crisis) and the 2014-2020 programming period, respectively. As is evident from the Table, prior to the pandemic shock, the ecosystems exhibited significant growth rates when compared to the beginning of the programming period. The Agrifood ecosystem emerges as the leader in terms of productivity gains, followed by the Digital and Retail ecosystems. It is worth mentioning that the rest of the ecosystems exhibited strong growth as well. However, when 2020 is considered as the final year of the calculations, we observe a rather different picture. In particular, the evidence suggests that the pandemic shock exerted a rather strong negative impact, affecting especially the Mobility and Retail ecosystems, while Agrifood and Construction managed to remain almost unaffected (that is, as they exhibited almost zero growth rates, they remained at the initial level of labour productivity after the impact of the shock). Only the Agrifood ecosystem exhibited strong resilience, recording a growth rate equal to 13.1%, somewhat lower compared to the growth rate of the 2014-2019 period. This resilience is explained by the overall strong growth performance of the ecosystem, which was sufficiently large during the period up to 2019 to ensure that the shock of 2020, despite its large magnitude,<sup>3</sup> would not counteract the overall positive rate.

**Table 4.** Labour productivity percentage changes for the industrial ecosystems

| <b>Ecosystems</b>   | <b>6-year<br/>percentage<br/>difference<br/>(2014-2019)</b> | <b>7-year<br/>percentage<br/>difference<br/>(2014-2020)</b> | <b>Annual<br/>average<br/>growth rate<br/>(2014-2019)</b> | <b>Annual<br/>average<br/>growth rate<br/>(2014-2020)</b> |
|---------------------|---|---|---|---|
| <b>Mobility</b>     | 3.27  | -4.48   | 1.02  | -0.16   |
| <b>Construction</b> | 5.34  | 0.11  | 1.01  | 0.16  |
| <b>Agrifood</b>     | 15.3  | 13.12   | 2.81  | 2.11  |
| <b>Digital</b>      | 5.95  | 4.55  | 0.93  | 0.60  |
| <b>Retail</b>       | 6.41  | -1.4  | 1.21  | -0.01   |

*Note: Authors' calculations based on the data described in the main body of the report. We note here that the formula for calculate the long-year changes in productivity is:  $\frac{z_t - z_{t-s}}{z_{t-s}}$ , where  $z$  denotes labour productivity and  $s$  is the year difference*

As a final proxy of the longer-term performance of the ecosystems in terms of productivity, the last two columns of Table 4 provides the annual average growth rates of labour productivity for the 2014-2019 and 2014-2020 periods, respectively. We observe that up to the pandemic year, all ecosystems experienced positive growth rates, with the Agrifood ecosystem emerging as the top performer. When the year 2020 is included in the analysis we observe that Agrifood remains the top performing ecosystem, followed by the Digital one. The Retail ecosystem was significantly impacted, exhibiting an almost zero average annual growth rate, while for Mobility the average turns negative.

<sup>3</sup> We note here that in 2020 the growth rate of labour productivity in the Agrifood ecosystem was equal to -7.5%, driven by the significant decline in employment.

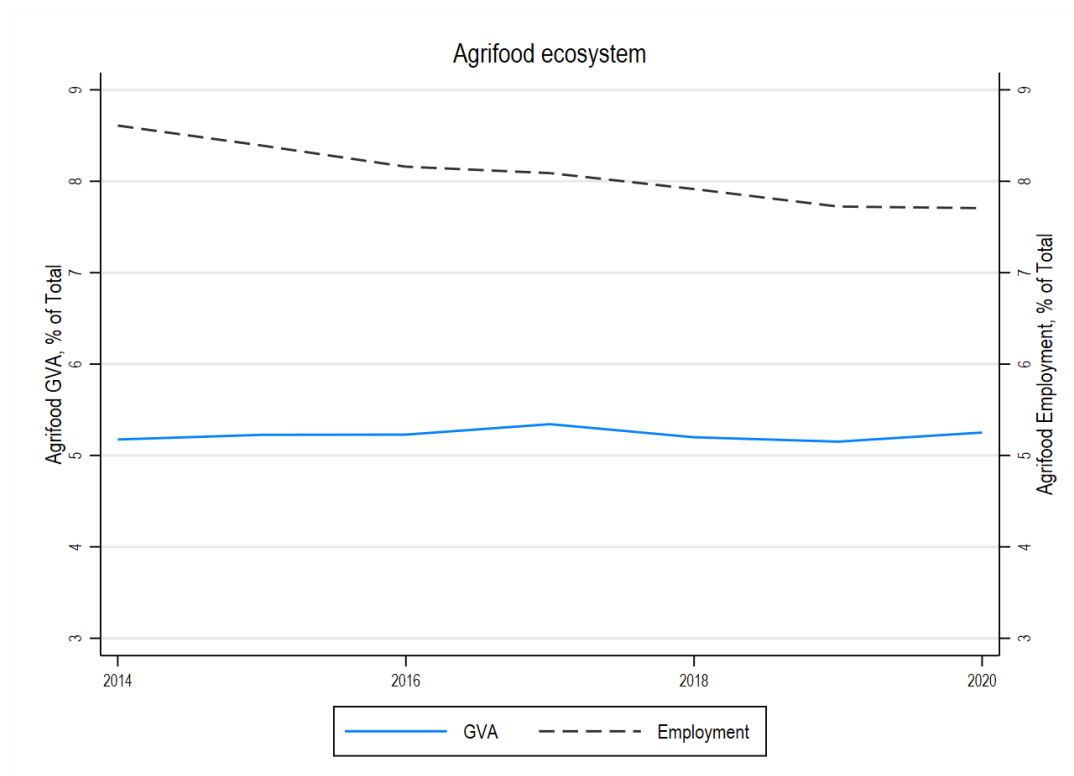
### 3. A deep-dive into the ecosystems

#### 3.1. Agrifood

The Agrifood ecosystem is one of the core ecosystems of the Union's economic structure, accounting for a significant share of output in employment across some Member States and regions. At the same time, it will likely face significant challenges as a result of the ongoing transition that requires a shift toward a more sustainable model of production, with significantly reduced emissions.

In 2019, almost 16.2 million persons were employed in the Agrifood ecosystem, which contributed a total of 611 billion euros of valued added. In terms of its relative position regarding the production of output and the rate of employment for the 2014-2020 programming period, as is evident from Figure 2, the Agrifood ecosystem did not exhibit a significant variation over time. In particular, the ecosystem's share of GVA remained stable at around 5.2%, with an average annual growth rate over the 2014-2019 period being only marginally negative and equal to -0.04%; a mildly downward path is evident for the rate of employment, which remained at around 8.1%. It is interesting to note that in 2020, the ecosystem exhibited significant resilience with the share of GVA attaining a growth rate equal to almost 2%, while the decline in terms of employment was very small (with a growth rate of -0.2%, or a decline equal to 270 thousand persons).

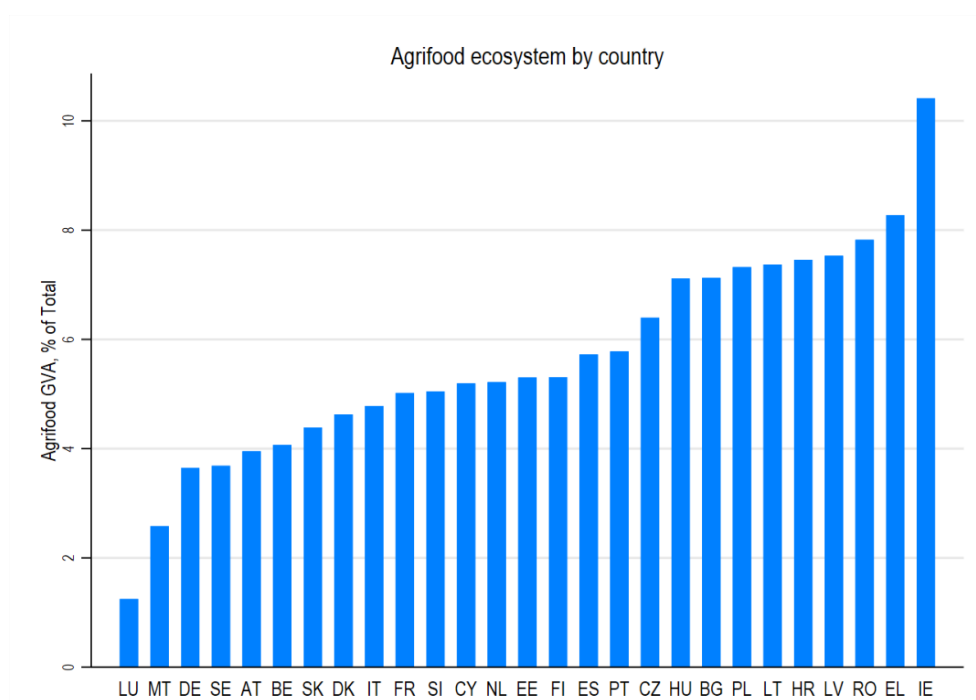
**Figure 2.** Evolution of the shares of GVA and Employment in Agrifood



*Source: Authors' calculations*

Turning to the country-level analysis of the GVA shares of the Agrifood ecosystem depicted in Figure 3, we observe that a rather heterogeneous pattern emerges. The largest Agrifood GVA production is located in Ireland (with a share equal to 10.5%), while Central and Eastern European Member States (namely Bulgaria, Croatia, Latvia, Lithuania, Poland and Romania) exhibited a strong performance, with an average share equal to 7.2%. On the contrary, the lowest contributions of the Agrifood ecosystem in total GVA are located in the northern periphery of the EU, in countries like Austria, Belgium, Germany, Luxembourg and Sweden with an average share of 3.3%, less than half compared to the top performers. A similar picture emerges when we examine the shares of employment across countries, with Bulgaria and Romania exhibiting by far the largest shares, exceeding the 20% threshold. A similar strong performance is evident in Latvia, Lithuania and also in Greece and Portugal, with an average share of 12%. The lowest shares of Agrifood employment are located in the aforementioned northern periphery countries, with an average share of 4.4%, less than one-third in magnitude compared to the top performers.

**Figure 3.** Agrifood GVA as share of total GVA by country, 2019

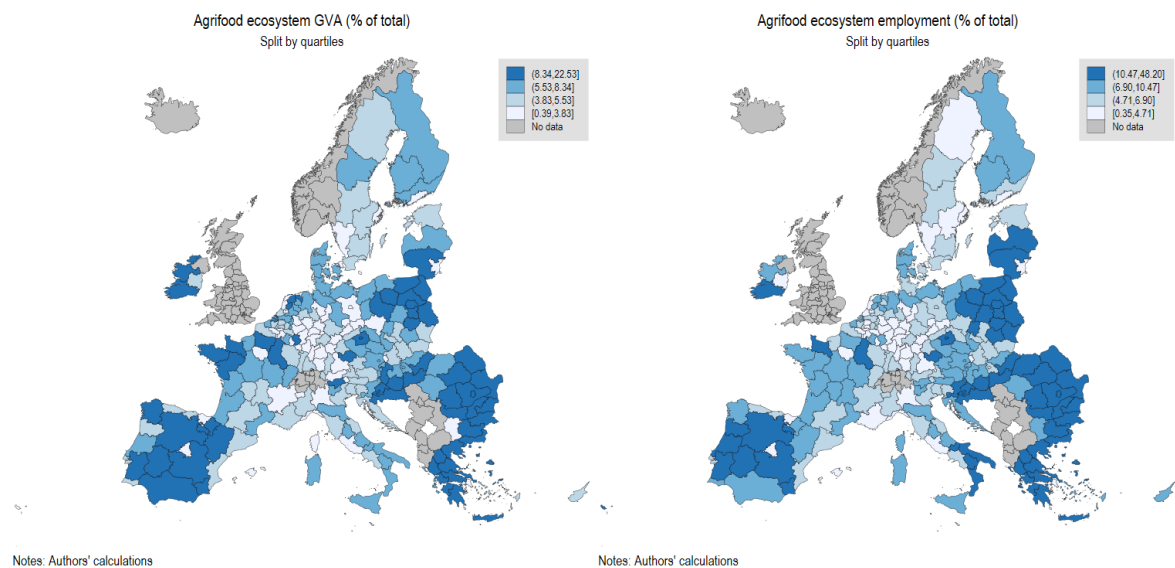


*Source: Authors' calculations*

Lastly, we turn our attention to the developments at the NUTS2 level. As is evident from the following Figure 4, there is a significant degree of heterogeneity in terms of the relative importance of the ecosystem as regards output production. In particular, the lowest contributions of the ecosystem are concentrated in the northern part of the Union, mainly in regions in Germany, Netherlands and Sweden, as well as in the north of Spain, and northwest and east Italy. In these regions, the average contribution of Agrifood in GVA production is 2.8%. Turning to the largest producers of the Agrifood ecosystem, these are located mainly in the southern periphery of the EU, in regions of Bulgaria, Greece, Poland and Romania, while regions in Ireland and Portugal also exhibit high shares. The average share of Agrifood GVA across these regions is almost 12%. In

terms of employment, we observe that the same spatial patterns emerge. In particular, for the regions located in the lowest-25% percent in terms of employment shares the average is equal to 3.3%, whereas in the top-performing regions (those in the top-25%, i.e. in the fourth quartile) the average employment share is equal to 19%. We note here that fifteen regions located in Bulgaria, Greece, Poland and Romania exhibit Agrifood employment shares larger than 25%.

**Figure 4.** Agrifood GVA and Employment as shares of total by NUTS2 regions, 2019



Source: Authors' calculations

As a means of obtaining further insights regarding the heterogeneous spatial patterns presented above, the following Table 5 summarizes the GVA and employment shares for the Agrifood ecosystem when regions are classified on the basis of the cohesion criteria, that is regions are categorized as belonging into either of the following three categories: less developed, in transition or more developed.<sup>4</sup> As is evident from the Table, Agrifood production is at its highest among the less developed regions, with an average share that is more than twice the share observed in the more developed ones (9 vs 4.4%, respectively). It is interesting to point out that an even larger dispersion is evident in the employment shares, with the difference between less and more developed regions being around ten percentage points on average (15.2 and 5%, respectively).

<sup>4</sup> According to the criteria set out for the 2021-2027 programming period, a region is classified as being less developed if its GDP per capita (in PPS) is less than 75% of the EU average, in transition if its GDP per capita lies between 75% and 100% of the EU average and more developed if its GDP per capita exceeds 100% of the EU average.

**Table 5.** GVA and employment shares in Agrifood by Cohesion classification (2019, in %)

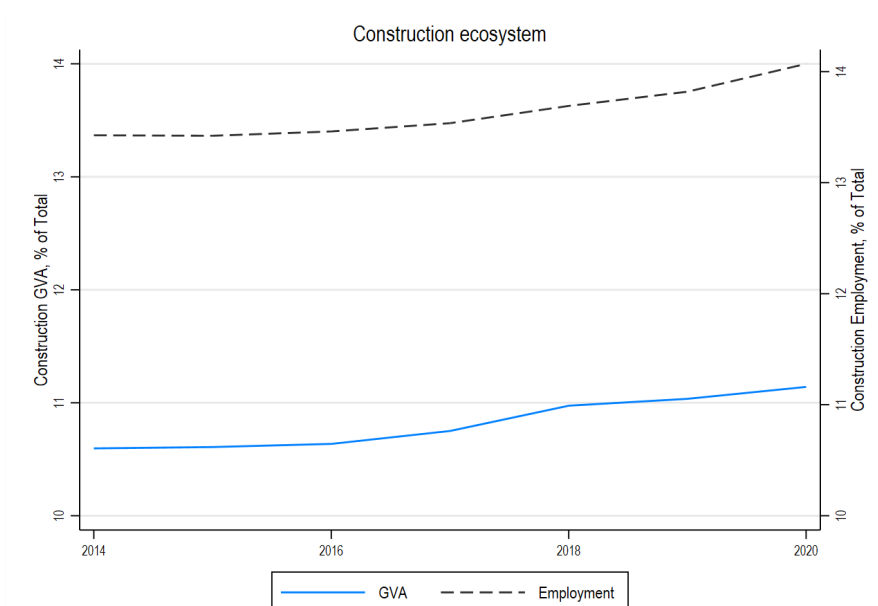
| Region category | GVA  | Employment |
|-----------------|------|------------|
| Less developed  | 9.05 | 15.27      |
| Transition      | 6.42 | 7.39       |
| More developed  | 4.43 | 5.03       |

Source: Authors' calculations.

### 3.2. Construction

The Construction ecosystem is the largest contributor, both in terms of GVA and employment, across the industrial ecosystems. In 2019, Construction employed a total of 28.9 million persons, while the ecosystem produced 1308 billion euro of value added, the largest in magnitude contribution across ecosystems. At the same time, it is one of the ecosystems that will potentially be the most affected by the ongoing industrial transition. Reason being that it is one of the most polluting ecosystems, thus requiring significant structural changes in order to meet the environmental targets prescribed. Additionally, being one of the ecosystems that represents a more traditional production mode, it is widely perceived as only slowly encompassing more digital technologies.

As is evident from Figure 5, the relative importance of construction has been steadily increasing over time. In particular, its GVA share rose from 10.6% in 2014 to 11% in 2019 (with an average annual rate of growth equal to 0.64%) while the employment share grew at an average rate of 0.33% (from 13.6% in 2014 to 13.8% in 2019). During 2020, the share of GVA managed to keep its upward trend, growing by almost 1%, while the rate of employment grew by almost 1.8%, reaching a level of 14%, the largest of the period under examination (in level terms, employment in Construction grew by almost one hundred thousand persons.)

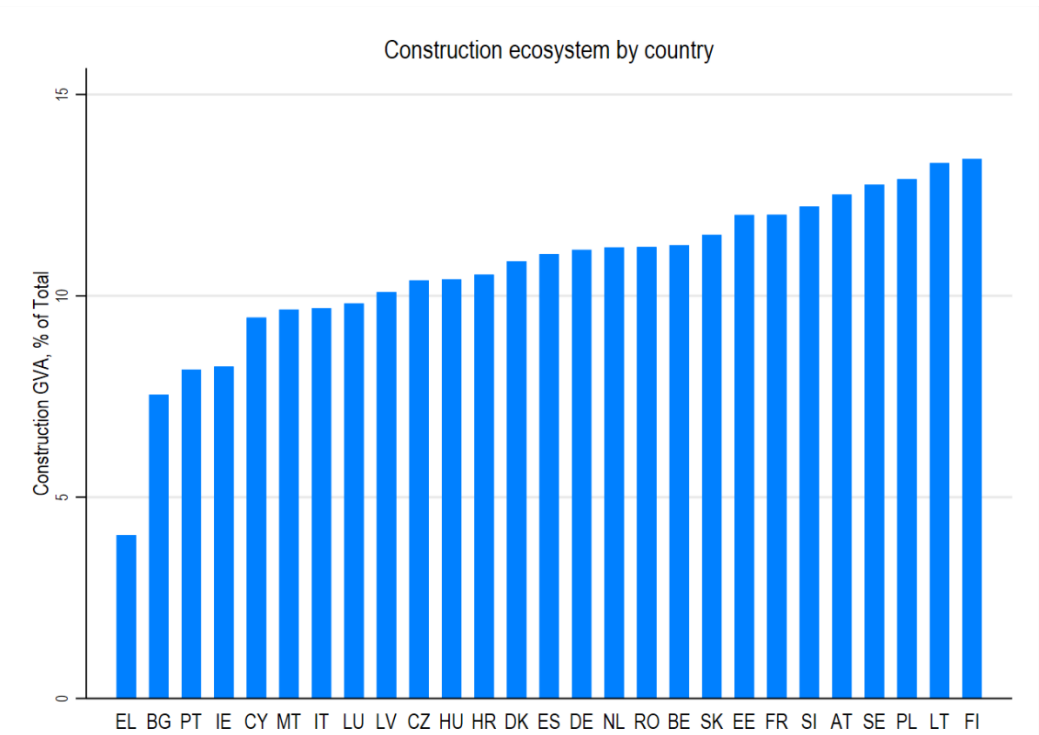
**Figure 5.** Evolution of the shares of GVA and Employment in Construction

Source: Authors' calculations



The country-specific analysis for the GVA contribution of the Construction ecosystem in 2019, depicted in Figure 6, shows that the ecosystem plays a rather important role across Member States, with the dispersion of the shares being small. In particular, excluding Greece and Bulgaria which exhibit the lowest shares, we observe that 20 Member States fall between the 10 to 13% range. A very similar picture emerges with respect to the employment shares of the ecosystem, with Greece and Bulgaria again being the smallest in magnitude employers (with shares equal to 8.4% and 9.7%, respectively), while 19 countries fall within the 13.5% to 18.7% range, for an average of almost 15%. These evidence enhance the previously documented result, namely, that Construction is the most important ecosystem in terms of GVA production and employment across Member States.

**Figure 6.** Evolution of the shares of GVA and Employment in Construction

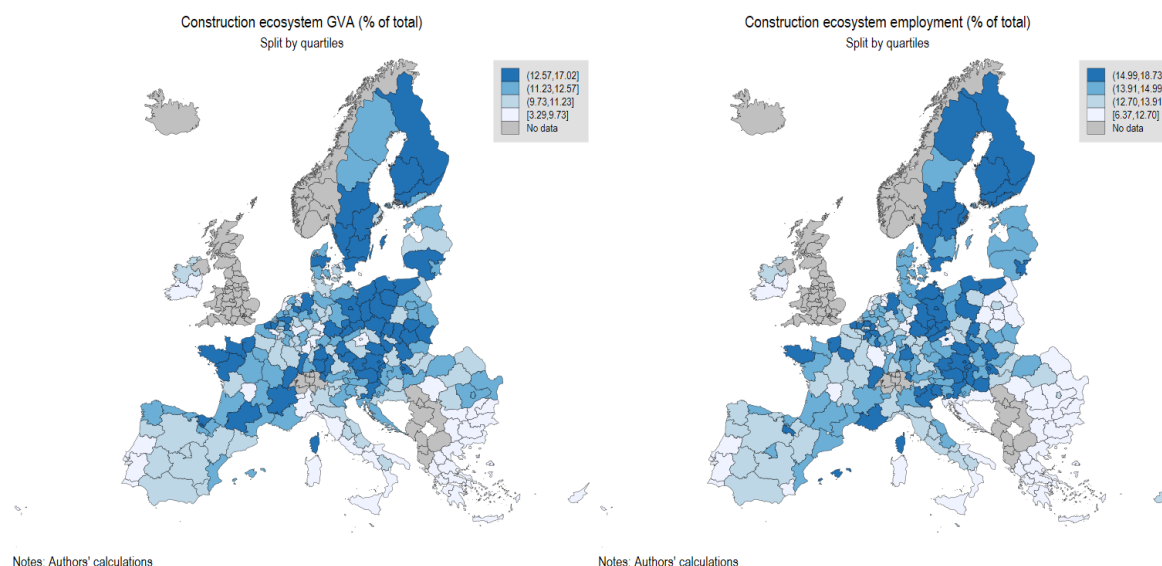


Source: Authors' calculations

Turning to the analysis of the spatial pattern depicted in Figure 7, we observe that the largest contributions of the Construction ecosystem’s GVA are located in Austria, Belgium, Germany, Finland, Netherlands and Poland. The average GVA share in these regions is equal to 13.35%. On the lower-end of the GVA shares we find regions located in Bulgaria, Greece and Italy and also in Ireland and Portugal, with an average share equal to 7.4%. Overall, even though a clear spatial divide in terms of GVA production is observed, with regions in the northern periphery being the top-performers and region is the South falling behind, it should be noted that the distribution of GVA is more concentrated compared to the Agrifood ecosystem case analysed before. A broadly similar picture emerges with respect to the shares of employment across regions, with the lowest shares being located predominantly in Greece, followed by Bulgaria, Portugal and Romania, with an

average share of 8.5%. The largest employers, with an average share of 15.8%, are located in Finland, Sweden and in regions of Belgium and Germany.

**Figure 7.** Construction GVA and Employment as shares of total by NUTS2 regions, 2019



Source: Authors' calculations

The relatively small dispersion observed in terms of GVA production and employment is made evident by the results presented in Table 6. In particular, we observe that when regions are split according to the cohesion criteria, the difference between the GVA shares of the less and more developed regions is around 1.3 pp whereas in terms of employment the difference is 2pp. This highlights the fact that, despite the spatial differences already analysed, Construction is –on average– an important ecosystem across the EU, playing a central role both in terms of GVA production and of employment.

**Table 6.** GVA and employment shares in Construction by Cohesion classification (2019, in %)

| Region category | GVA   | Employment |
|-----------------|-------|------------|
| Less developed  | 9.88  | 12.07      |
| Transition      | 11.04 | 14.21      |
| More developed  | 11.17 | 14.22      |

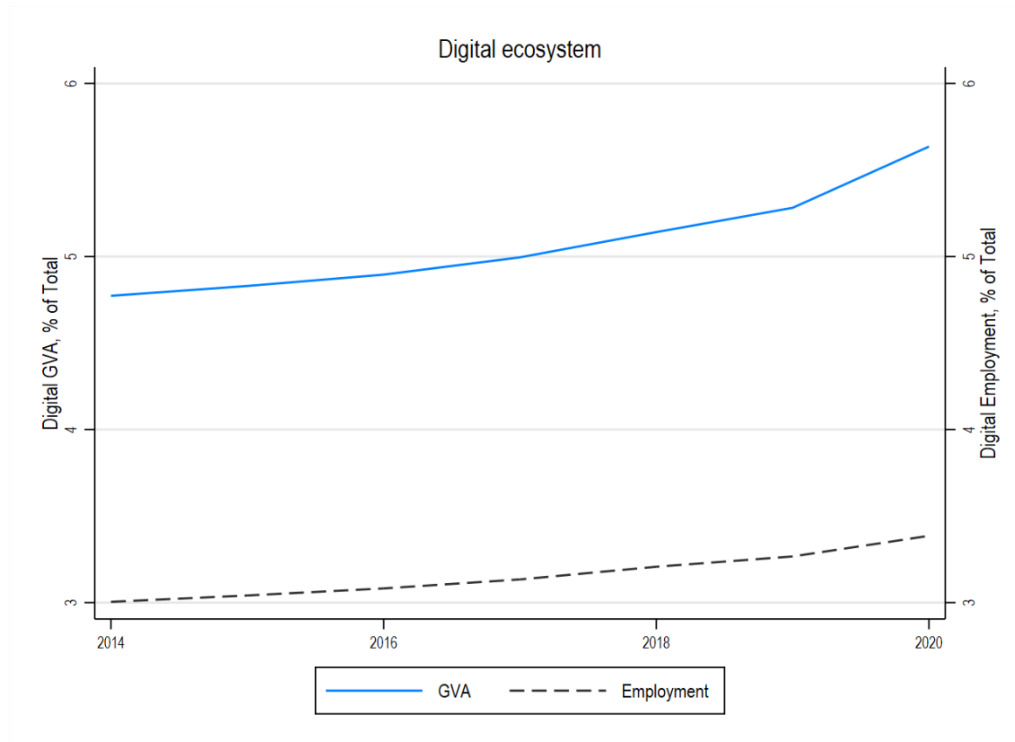
Source: Authors' calculations.

### 3.3. Digital

The Digital ecosystem is one the core ecosystems involved in the ongoing transition towards a more digitalized economy. Furthermore, it is also envisaged that it will play a crucial role in the transformation of the EU into a more environmentally sustainable economy, having itself to undergo such a transition given that some of its components (some sub-sectors of manufacturing) are requiring the use of a multitude of resources.

Overall, as is evident from Figure 8, for the 2014-2020 period the ecosystem exhibited a marked increase in its relative importance, especially in terms of output produced. More specifically, starting from a GVA share of 4.7% in 2014, by 2019 it accounted for 5.3% of total GVA produced in the EU, with the average annual growth rate being equal to 2.5%. In particular, in 2019 the Digital ecosystem produced a total of 626 billion euro of value added, while it employed 6.8 million persons. Moreover, in 2020, its GVA increased by 6.7% - the highest rate across the ecosystems under examination. In terms of employment, a similar trajectory is evident with an average annual growth rate of 1.6% up to 2019, with the corresponding growth for 2020 being equal to 3.6%.

**Figure 8.** Evolution of the shares of GVA and Employment in the Digital ecosystem

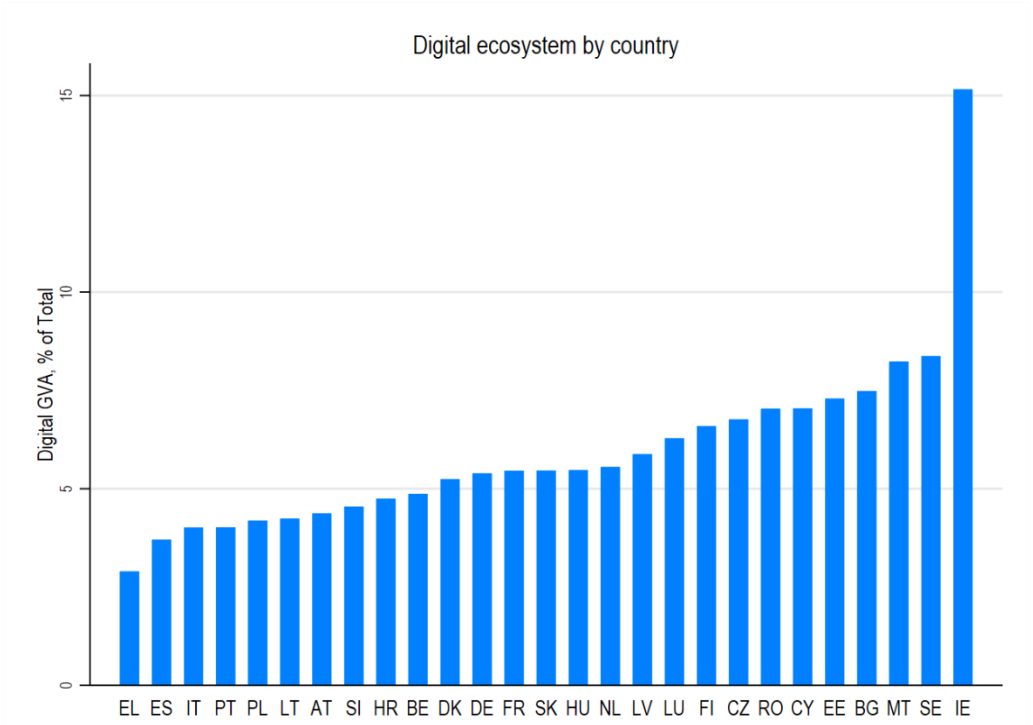


*Source: Authors' calculations*

Figure 9 presents the country-specific shares for 2019. It should be noted here that the significantly larger share observed in Ireland (almost three times larger than the EU average) is attributed to the operation of a small number of large multinational enterprises. The operations of such enterprises within the Republic of Ireland have been shown to significantly affect the Irish National Accounts and, as such, the relevant data need to be cautiously interpreted. Examining the distribution of the GVA shares across the rest of the countries, we observe that two tiers seem to

emerge. Firstly, a number of Member States in the northern periphery (Germany, Finland, France, Netherlands and Sweden) together with Bulgaria and Cyprus have a rather advanced Digital ecosystem, with an average share of GVA equal to 6.3%. We also highlight here that Estonia, Latvia and Romania also exhibited a rather strong performance. On the contrary, countries in the southern periphery of the EU –Greece, Italy, Portugal and Spain– exhibit the lowest shares, with an average of 3.6%. In terms of employment, it should be noted that the range of employment shares is rather small, with the lowest value of 2.1% being located in Greece and the maximum share of 5% being located in Estonia. This small range is indicative of the nature of the Digital ecosystem, which relies mainly on capital –both human and (in)tangible– as the main factor of production.

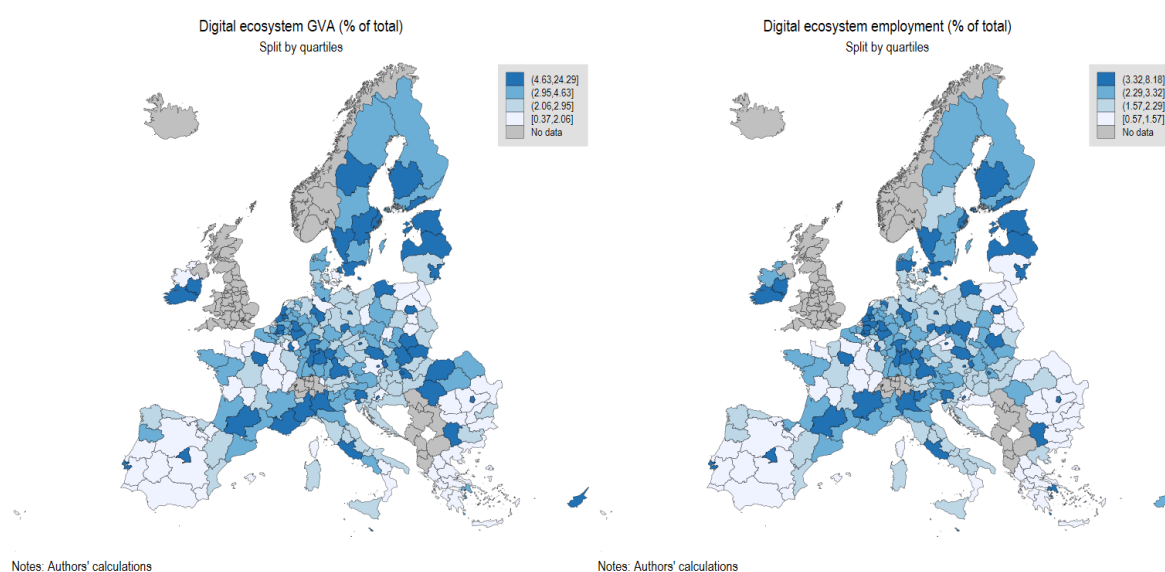
**Figure 9.** Evolution of the shares of GVA and Employment in the Digital ecosystem



*Source: Authors' calculations*

As can be gleaned from Figure 10, the Digital ecosystem’s contribution to the regional economies of the EU is characterized by a significant degree of heterogeneity, with some interesting spatial patterns emerging. In particular, starting with the GVA contributions, we observe that the lowest shares of GVA –with an average of 1.5%– are mainly located in regions in Greece, France, Spain and Portugal and also in southern Italy and Poland. On the contrary, the largest contributions –with an average of 7.7%– are located mainly in Ireland (for which, as already mentioned, the data are to be cautiously interpreted), Finland and Sweden and also in Germany, Netherlands and Romania. A rather similar picture emerges when examining the regional employment shares of the Digital ecosystem. Regions at the lower-end of the distribution exhibit a share equal to 1.1% whereas those in the upper-end (the top-25% of regions with respect to employment) exhibit a share equal to 4.9%.

**Figure 10.** Digital GVA and Employment as shares of total by NUTS2 regions, 2019



Source: Authors' calculations

Some additional insights are obtained when the regions are split according to the cohesion classification criteria. In particular, as is evident from Table 7, the less developed regions exhibit significantly smaller –almost half in magnitude– shares of both GVA and employment when compared to the more developed regions. This result can be considered as an indication that less developed regions are in need of further investment, in order to develop the Digital ecosystem and successfully complete the transition to a more digitalized economy.

**Table 7.** GVA and employment shares in the Digital ecosystem by Cohesion classification (2019, in %)

| Region category | GVA  | Employment |
|-----------------|------|------------|
| Less developed  | 2.58 | 1.72       |
| Transition      | 3.14 | 2.25       |
| More developed  | 5.37 | 3.71       |

Source: Authors' calculations.

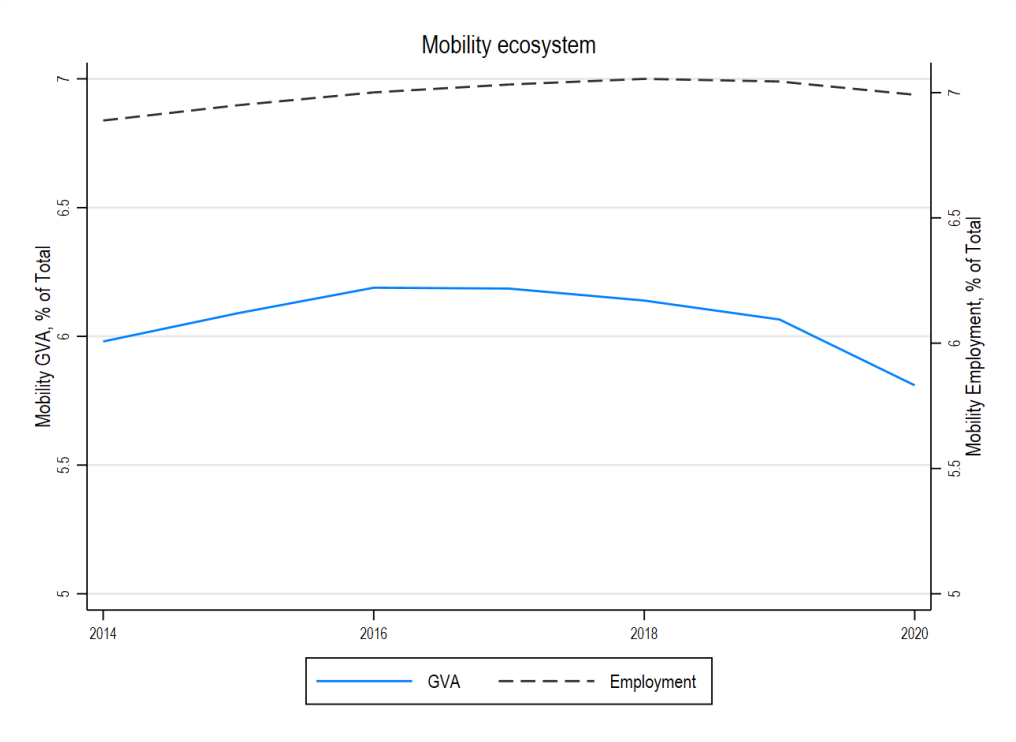
### 3.4. Mobility-Transport-Automotive

The Mobility ecosystem is currently facing significant, structural changes that will facilitate the necessary shift toward a greener production process with lower emissions. Given that, as of the 2014-2020 period, it is one of the largest employers across the EU, with an average rate of employment equal to 7%, it is important to examine and assess the evolution of the economic performance of this ecosystem.

As is evident from Figure 11, the contributions of the Mobility ecosystem –both in terms of GVA and employment– have remained essentially constant, with growth rates for both metrics that are only

marginally larger than zero up to 2019. Specifically, in 2019 almost 720 billion euro were produced by the Mobility ecosystem, which employed a total of 14.8 million persons. The pandemic-induced crisis exerted a significant toll on the ecosystem, leading to a negative GVA growth rate of 4.2%, while the decline of the employment rate was significantly smaller, being equal to -0.75%.

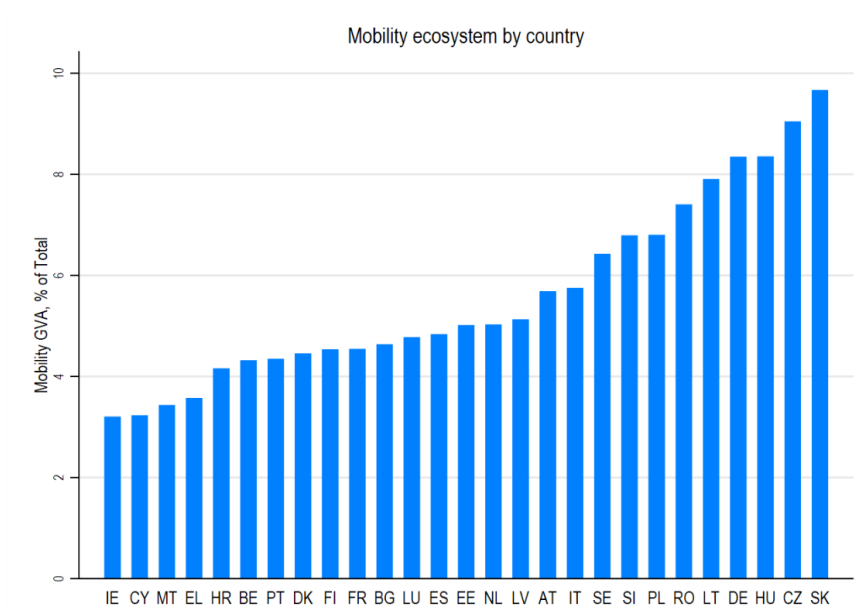
**Figure 11.** Evolution of the shares of GVA and Employment in Mobility



*Source: Authors' calculations*

The country-specific analysis of the Mobility ecosystem, depicted in Figure 12, reveals a spatial pattern that is rather distinct compared to the rest of the ecosystem included in this report. In particular, we observe that the largest shares of GVA production in this ecosystem (with an average of 7.8%) are located in the Central and Eastern European Member States (Czech Republic, Hungary, Poland, Romania Slovenia and Slovakia) and in Germany, whereas some of the largest EU economies (like France, Italy and the Netherlands) exhibit smaller shares, averaging 5.1%. A similar pictures emerges when the focus shifts toward the employment shares of the ecosystem, where the aforementioned Central and Eastern European Member States exhibit an average share of almost 9%, two percentage points higher compared to the EU-wide average of 6.8%.

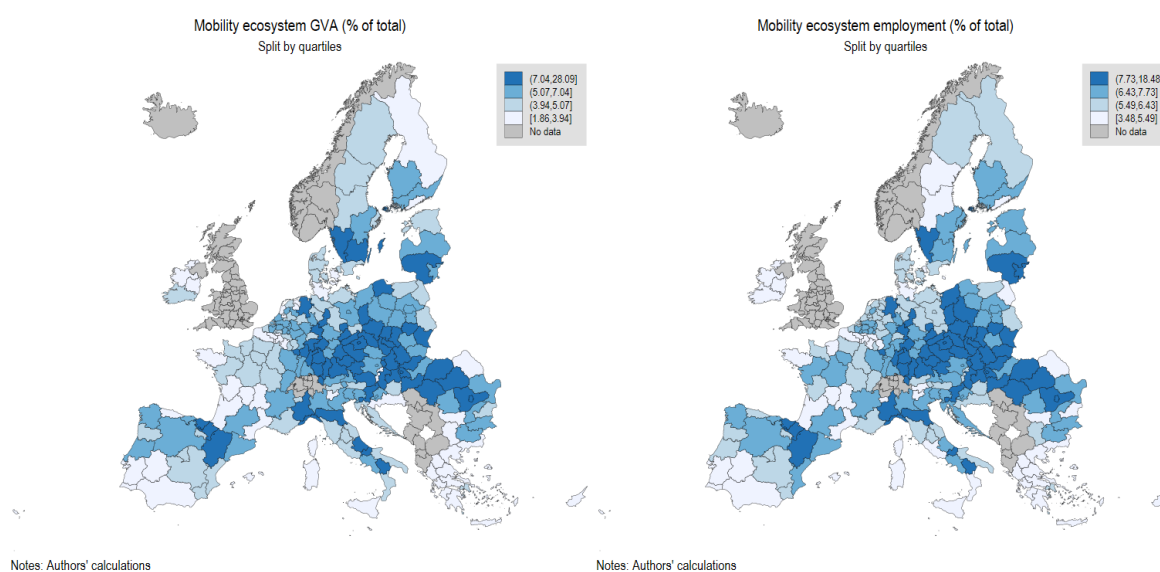
**Figure 12.** Evolution of the shares of GVA and Employment in Mobility (2019)



Source: Authors' calculations

The regional patterns of the Mobility ecosystem are presented in the following Figure 13. As is evident from the Figure, the lowest contributions in terms of output –with an average of 3%– are located mainly in Belgium, Greece, Ireland, the south of Spain and Portugal and in France. On the contrary, the largest contributions, averaging 10.2%, are located mainly in the Central and Eastern European regions, especially in the Czech Republic, Hungary, Poland, Romania and Slovakia. An almost identical picture emerges in terms of employment. The Central and Eastern European regions identified above emerge as the largest employers, with an average share of 10.1%, whereas the lowest employment rates are located in Greece, Ireland, France and Portugal.

**Figure 13.** Mobility GVA and Employment as shares of total by NUTS2 regions, 2019



Source: Authors' calculations

Table 8 offers some additional important insights by splitting the regions according to the cohesion classification criteria. In particular, we observe that in terms of GVA production and employment, the differences between the more and the less developed regions are rather small. This is an indication that the less developed regions managed to specialize to the needs of the Mobility ecosystem and emerged as rather significant contributors.

**Table 8.** GVA and employment shares in the Mobility ecosystem by Cohesion classification (2019, in %)

| <b>Region Category</b> | <b>GVA</b> | <b>Employment</b> |
|------------------------|------------|-------------------|
| <b>Less developed</b>  | 5.9        | 7.04              |
| <b>Transition</b>      | 4.88       | 6.22              |
| <b>More developed</b>  | 6.53       | 7.17              |

*Source: Authors' calculations.*

### 3.5. Retail

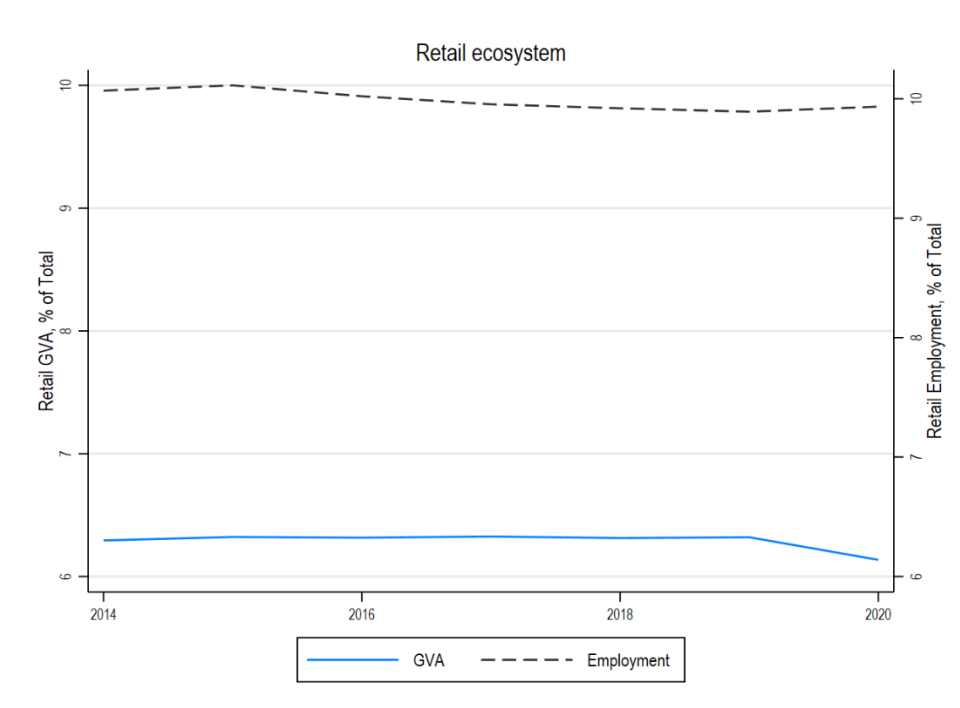
During the last programming period and, specifically, up to 2019 the Retail ecosystem exhibited a remarkable constancy in terms of its share in total GVA production, while in terms of employment it exhibited an average share of 6% in total employment (which translates to an average of 20 million employed persons). As a means of benchmarking the position of the ecosystem, we note that in 2019 a total of 20.7 million persons were employed in the ecosystem (the second largest in magnitude figure across ecosystems, behind Construction), while almost 750 billion euro of value added were produced (again, the second largest level across ecosystems).

As is evident from Figure 14, with an annual average growth rate of 0.08%, the ecosystem accounted for 6.3% of the EU's GVA over the 2014–2019 period. Nonetheless, the 2020 shock exerted a significant negative impact, which led to a negative growth rate equal to 2.9% in absolute terms. The rate of employment of the ecosystem exhibited a small, yet negative trend over time, declining from 10.1% in 2014 to 9.9% in 2019. However, in 2020, a reversal of the trend is observed, with employment growing by 0.43%.

The Retail ecosystem is another ecosystem whose relative importance with respect to the production of GVA, at the country level, is rather similar across Member States. In particular, we observe in Figure 15 that 20 Member States exhibit a share of GVA within the 6 to 8% range. The largest shares are located in Austria, Netherlands, Belgium, Lithuania and Poland, that is, countries Member States found across the whole range of the income distribution. A similar picture emerges with respect to employment, where the range of the shares of employment across Member States falls between the 8.3% of Luxembourg and the 11.5% exhibited by the Netherlands. Again, we observe that the importance of the Retail ecosystem is high across the income distribution, with the largest shares being located in Greece, Spain, Slovakia and –as already mentioned– the Netherlands.

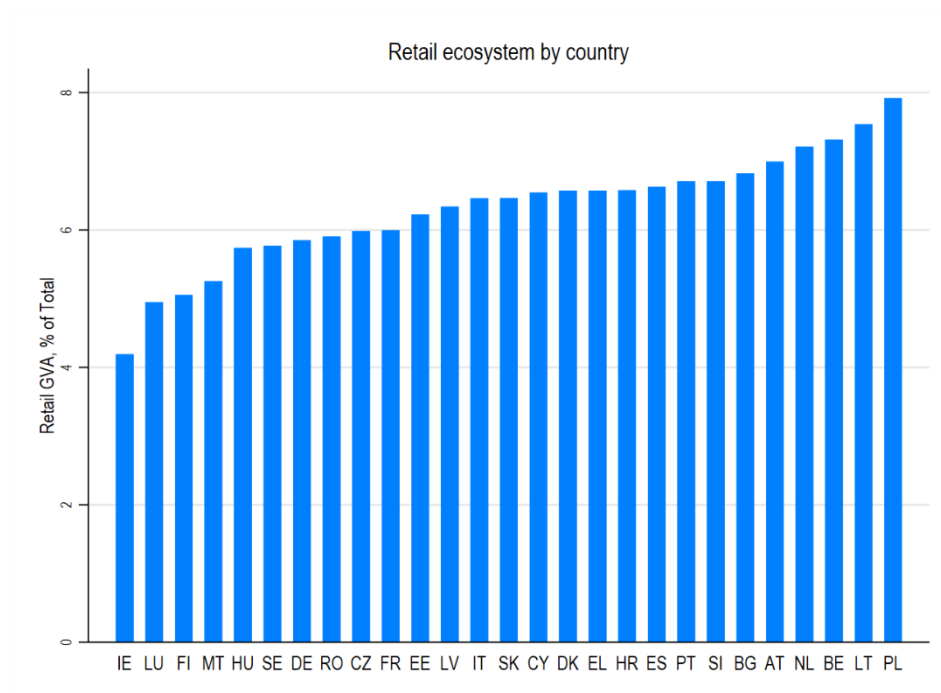


**Figure 14.** Evolution of the shares of GVA and Employment in Retail



Source: Authors' calculations

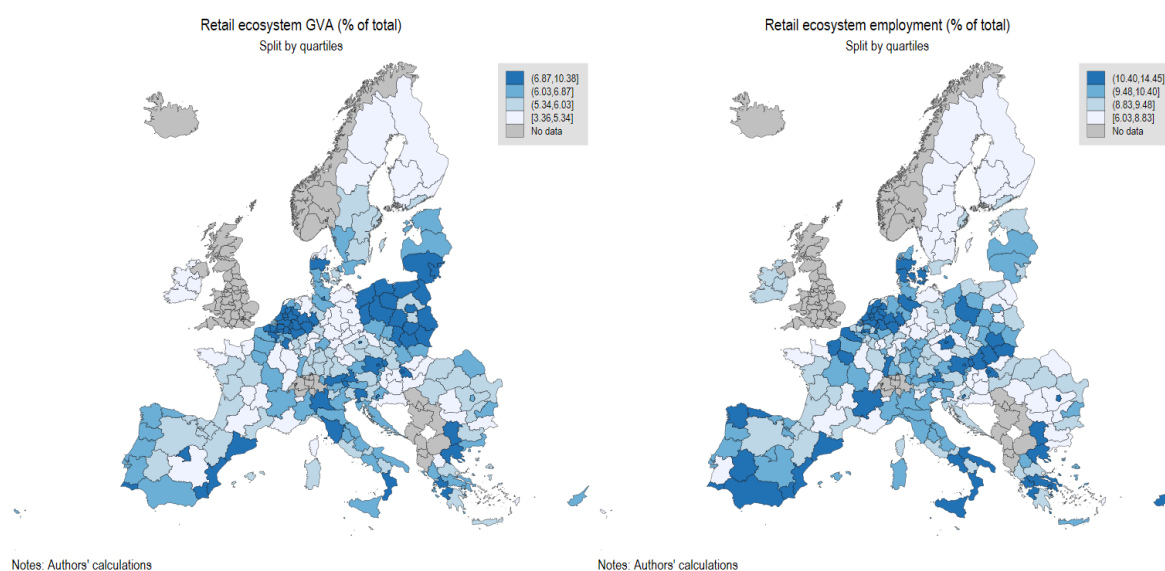
**Figure 15.** Evolution of the shares of GVA and Employment in Retail



Source: Authors' calculations

Turning to the regional level analysis depicted in Figure 16, we observe that some interesting spatial patterns emerge. Firstly, the GVA contribution of the regions that are located at the bottom 25% are quite lower compared to the top-performing regions (those in the fourth quartile, i.e. the top-25%); specifically, the average share of the former is 4.7% while the average share in the upper-end of the distribution is 7.6%. The lowest contributions are located mainly in France, Germany, Ireland and Hungary along with regions in Bulgaria and Romania, while the largest contributions are concentrated in Austria, Belgium, Netherlands and Poland. A somewhat different picture emerges in terms of employment. In particular, we observe that the highest employment shares, averaging 11.4%, are located in Portugal, the south of Spain and Italy and also in Hungary and Poland, whereas the lowest shares –with an average of 8.1%– are concentrated in the northern periphery and countries like Finland, Germany and Sweden.

**Figure 16.** Retail GVA and Employment as shares of total by NUTS2 regions, 2019



Source: Authors' calculations

Overall, we observe that the Retail ecosystem, despite the spatial patterns analysed, has a more concentrated presence across the Members States, in the sense that the observed spatial patterns and differences are not as pronounced as in the case of other ecosystems, especially in terms of employment.

This is further shown in Table 9, which presents the average shares of GVA production and employment in 2019 when the regions are split according to the cohesion criteria. We observe that, especially in the case of employment, the average shares across the three categories are virtually identical.

**Table 9.** GVA and employment shares in Retail by Cohesion classification (2019, in %)

| <b>Region category</b> | <b>GVA</b> | <b>Employment</b> |
|------------------------|------------|-------------------|
| <b>Less developed</b>  | 6.11       | 9.38              |
| <b>Transition</b>      | 5.86       | 9.71              |
| <b>More developed</b>  | 6.23       | 9.79              |

*Source: Authors' calculations.*

## **4. Conclusion**

The present report provided a detailed analysis of the state of the industrial ecosystems that emerge as the largest producers of Gross Value Added in the EU. Specifically, the report focused on the Agrifood, Construction, Digital, Mobility and Retail ecosystems.

The report assesses the economic performance of these ecosystems in terms of both GVA and employment across three levels of aggregation: EU-wide, country-level and the NUTS2 regional level.

The main result that emerges from our analysis is the large degree of heterogeneity in terms of performance across ecosystems, countries and regions which leads to the emergence of interesting spatial patterns. Indicatively, we document that some ecosystems emerge as significant employers across countries and regions (e.g. the Retail ecosystem and the Agrifood ecosystem, especially in the lagging regions) but, at the same time, their production of GVA is relatively low.

Lastly, the report provides some descriptive evidence for labour productivity developments across ecosystems and shows that again the main conclusion is that of a large degree of heterogeneity in terms of the ecosystems' performance.

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