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Methodology report for the European Panorama of Clusters and Industrial Change and European cluster database



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Visit: https://ec.europa.eu/growth/industry/policy/cluster/observatory_en

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1 Introduction

1.1 Purpose of the document

This report provides the definition of the indicators included in the European cluster database for which the data are accessible in the online Cluster mapping tool and that were used for the 2019 and 2020 versions of the European Panorama for Clusters and Industrial Change. The Cluster mapping tool is available at: <https://www.clustercollaboration.eu/cluster-mapping>

1.2 Structure of the document

Chapter 2 presents the changes to the methodology to identify cluster strengths by adding two new cluster star dimensions. This chapter also defines three new categories for different cluster strengths (high, medium, and basic-performing clusters).

Chapter 3 discusses the different indicators included in the European cluster database. Section 3.1 explains the calculation of the composite indicator for measuring industrial change. Section 3.2 shows the definitions for the standard indicators, which were already included in the European cluster database used by the previous European Cluster Observatory until 2016, which the European Observatory for Clusters and Industrial Change has continued afterwards.

Annex A provides the full definitions for the narrowly defined 51 Exporting (or Traded) industries, **Annex B** provides the full definitions for the 10 Emerging industries cutting across different sectors, **Annex C** provides the definition for the Cultural and creative sectors, and **Annex D** explains the regionalisation methodology applied for estimating regional innovation survey data.

2 Cluster stars and cluster strength

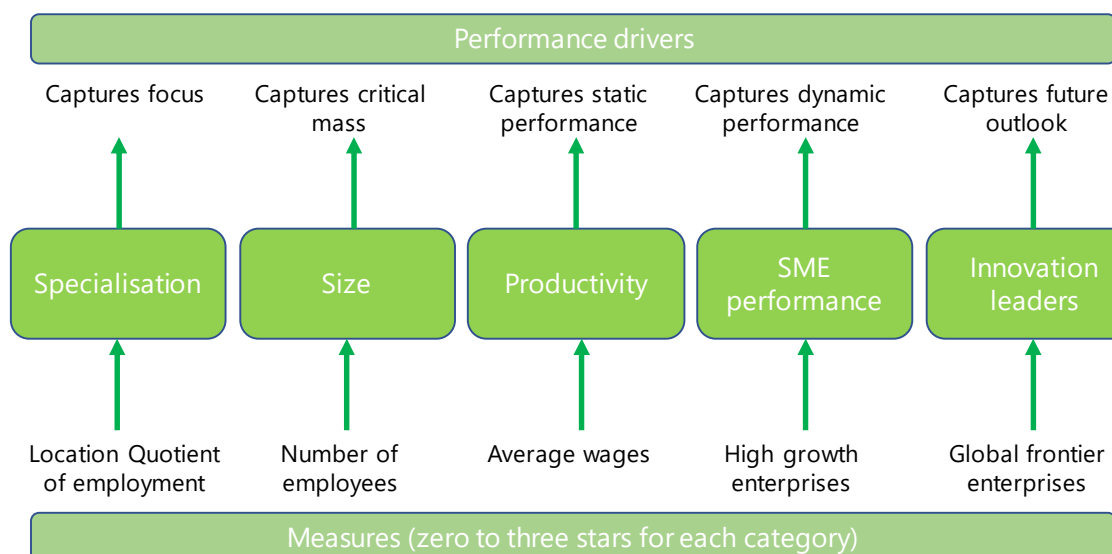
Cluster strength is measured using cluster stars introduced and defined by the previous European Cluster Observatory. The European Observatory for Clusters and Industrial Change extends this methodology by adding two new cluster star dimensions and by introducing a new classification for measuring cluster strengths.

Section 2.1 discusses the two new cluster star dimensions. Section 2.2 introduces the new classification for differentiating between high, medium and basic-performing clusters.

2.1 A revised cluster star methodology

Cluster strength has been calculated using the cluster mapping approach applied by the previous European Cluster Panorama for allocating so-called cluster stars, yet with an adapted approach. Cluster strength is based on the traditional measures of cluster size, specialisation, and employee productivity, and is complemented by **two new categories** of SME (high growth) performance and innovation leaders. The two newly added cluster star criteria aim to capture the dynamic part of cluster performance. By including the extent of presence of high-growth SMEs and the extent of presence of innovation leaders, including both large firms and SMEs, the new criteria aim to apply the right balance for better capturing the dynamic performance of clusters and the complementary role of firms of different sizes.

Figure 1 Measuring cluster performance



The extent to which regional clusters in exporting industries¹ or the more cross-sectoral defined emerging industries have achieved this specialised critical mass is shown by allocating them up to three cluster stars for each of the following five categories:

- **Size:** *total number of employees* in full time equivalent units in the industry for a given region. This indicator captures general employment performance;
- **Specialisation:** degree of specialisation measured by the *location quotient*. The location quotient is calculated as the ratio between the industry's share of total employment in a given region and the industry's share of total employment in all the countries considered in the analysis. Values above one (>1) imply high regional specialisation, with a location quotient of two corresponding to twice as many employees in an industry than would be expected if all employment was distributed evenly;
- **Productivity:** measured by the *average wage per employee* (in full time equivalent units) in the region as a proxy. Productivity levels vary across Europe and these differences are captured as part of the cluster strength measure;
- **SME performance:** measured by *number of high growth firms* (i.e. have annual growth rates of 20% for turnover or employment over 3 years while respecting minimum employment and turnover size thresholds). Research suggests that entrepreneurial activity drives economic growth and entrepreneurship policy in highly developed economies should focus on potentially fast-growing new firms;
- **Innovation leaders:** measured by the *number of global frontier firms* (i.e. top 5% of firms in terms of productivity (value added based, per employee), calculated by adding up factor incomes going to employees (wages) and to capital owners (profits) within any given emerging industry or exporting industry and year) as the relative strength of such firms probably reflects their capacity to innovate, rapidly diffuse and replicate cutting-edge ideas.

For the first three categories (size, specialisation and productivity), a star is assigned to regions that are in the top 20 per cent across all regions in Europe. These stars are then summed up for three years to arrive at the final star rating, with a maximum of three stars for each category. For the latter two categories, SME performance and innovation leaders, three stars are assigned each to regions that are in the top 20 per cent in Europe in a nine-year period, two stars for those in the top 20-40 per cent range and one in the top 40-60 per cent range. The number of cluster stars for an exporting industry in any region is thus between zero and 15. This new methodology has been applied in the *2019 Panorama report*, with a special focus on specialised industries, i.e. exporting or emerging industries (cf. Annexes A and B for full definitions). In the 2019 Panorama report, specialised clusters are defined as those exporting industries where the degree of specialisation, measured by the location quotient, is at least 1.5 and has more than 500 employees in the exporting industry.

¹ The European Cluster Observatory and the 2019 Panorama report refer to traded industries, the concept introduced originally in the US cluster mapping exercise. As firms in traded industries “sell products or services across regions and countries”, an intuitively more straightforward name is exporting industries. The term exporting industries is used in the 2020 Panorama report, whereas traded industries are used in the 2019 Panorama report, with both referring to the same industries.

2.2 A new classification for measuring cluster strength

The *2020 Panorama report* introduces a new classification for differentiating between cluster strength. Based on the number of cluster stars, the following clusters can be identified:

- **High-performing clusters** are those regional concentrations of exporting industries with:
 - High performance on size, specialisation and productivity, i.e. at least 3 stars for two of these and 2 stars for one of these, or at least 8 stars;
 - Medium to high performance on SME performance and innovation leaders, i.e. at least 3 stars for one of these and 2 stars for the other, or at least 5 stars;
 - Combined this gives **at least 13 stars**, and to make the calculations easier and more transparent, these 13 stars can be earned in any possible combination across the five cluster star dimensions.

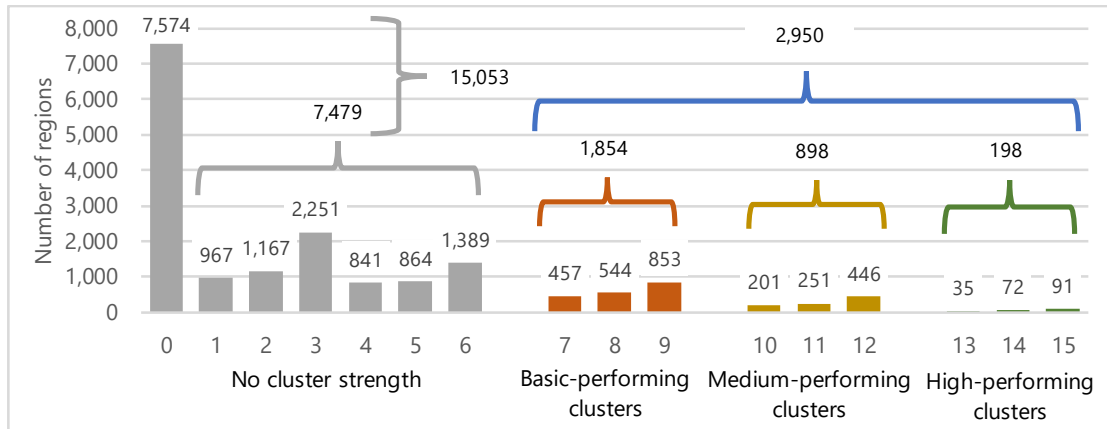
- **Medium-performing clusters** are those regional concentrations of exporting industries with:
 - Medium performance on size, specialisation and productivity, i.e. at least 3 stars for one of these and 2 stars for the other two, or at least 7 stars;
 - Medium performance on SME performance and innovation leaders, i.e. at least 3 stars for both combined;
 - Combined this gives **at least 10 stars**, and to make the calculations easier and more transparent, these 10 stars can be earned in any possible combination across the five cluster star dimensions.

- **Basic-performing clusters** are those regional concentrations of exporting industries with:
 - Low performance on size, specialisation and productivity, i.e. at least 4 stars combined;
 - Low performance on SME performance and innovation leaders, i.e. at least 3 stars for both combined;
 - Combined this gives **at least 7 stars**, and to make the calculations easier and more transparent, these 7 stars can be earned in any possible combination across the five cluster star dimensions.

The following Figure 2 illustrates the allocation of identified clusters according to the three newly introduced performance categories.

Following the above methodology using mostly 2017 data, a total of 2,950 clusters are identified from the European cluster database, including 198 high-performing clusters, 898 medium-performing clusters and 1,854 basic-performing clusters. There are 15,053 exporting industries without cluster strength, i.e. where the number of cluster stars is 6 or less.

Figure 2 Clusters defined



3 European cluster database

The European cluster database combines indicators from the previous European Cluster Observatory with new indicators developed in the European Observatory for Clusters and Industrial Change. The latter include among others two new cluster star dimensions (cf. Chapter 2) and a composite indicator for measuring industrial change.

Section 3.1 discusses the composite indicator for measuring industrial change. Section 3.2 shows the definitions for the standard indicators included in the European cluster database, i.e. those indicators which were also included in the cluster database of the European Cluster Observatory.

3.1 Industrial change and entrepreneurship

Industrial modernisation is understood as driving industrial competitiveness, generating growth and jobs. It involves the transition towards a more innovative, modern and sustainable economy. It is related to innovation, new technologies, production inputs and skills, in addition to the economic evolution as the base of competitiveness, wealth and income. Characterizing industrial modernisation is understood to rely on different dimensions, including:

- Evolution towards a more innovative regional economy
- New and emerging technologies
- Digitalisation
- Firm investments
- Entrepreneurship
- Internationalisation
- Creativity

For each dimension specific indicators have been selected and performance per dimension is calculated as the average performance for the selected indicators will be captured in a composite indicator. Performance across all dimensions is captured by the Composite Indicator of Industrial Change (CIIC), which allows comparative analyses for all or a selection of regions located in COSME countries.

Section 3.1.1 discusses the selected dimensions and indicators. Section 3.1.2 discusses the methodology for calculating the composite indicators for each dimension and the Composite Indicator of Industrial Change.

3.1.1 Composite Indicator of Industrial Change: dimensions and indicators

The Composite Indicator of Industrial Change (CIIC) builds on the work done by the 2011 European Commission Expert group on Measuring Innovation, notably the sub-group on Measuring Structural change, and the follow-up by the Joint Research Centre fine-tuning the indicators proposed by the Expert group². Malerba et al (2011)³ distinguish between three **types of indicators for measuring structural change**:

- *Enablers*. These indicators refer to the conditions in a country (or region) that support structural change. These indicators capture different aspects, among others how well the economic system supports the introduction and uptake of new products. It also captures attitudes of consumers and users towards new products and new technologies.
- *Compositional*. These indicators measure changes in the sectoral composition of the economy in terms of the composition of technologies, R&D, output and exports.
- *Schumpeterian*. These indicators refer to the firm level, primarily to the dynamics of innovation and entrepreneurship at the firm level, to changes in the type of firms (new innovative firms, reconfiguration of existing firms, change in the leading innovators), technologies and markets.

Malerba et al (2011) propose 5 indicators for the Enablers of structural change⁴, 12 Compositional indicators of structural change covering five different dimensions⁵, and 5 Schumpeterian indicators of structural change⁶. Vertesy et al (2012) develop a composite indicator of structural change towards a more knowledge-intensive economy starting from the indicators proposed by Malerba et al (2011). Of the three types of indicators, Vertesy et al

² Vertesy, D., D. Albrecht and S. Tarantola (2012), "Composite Indicators measuring structural change, to monitor the progress towards a more knowledge-intensive economy in Europe", EC: Joint Research Centre, March 2012.

³ Malerba, F., Salter, M., Saltelli, A. (2011), Expert Group on the Measurement of Innovation: Indicators for Structural Change. Brussels, 29 September 2011.

⁴ E1 Business environment; E2 Days to start a business; E3 Attitudes to Science and Technology; E4 Diffusion of ICT; E5 Risk capital.

⁵ *R&D*: C1 Change in the level of Government non-defence R&D expenditures; C2 Share of R&D services in the economy; *Skills*: C3 Changing skills and occupation; C4 Change in the share of employment in knowledge-intensive activities (KiAs); *Sectoral specialization*: C5 Change in countries' sectoral specialization; C6 Change in countries' international productive specialization in knowledge-intensive sectors; C7 Change in countries' international productive specialization in knowledge-intensive sectors (relative); C8 Input-output change; *International specialization*: C9 Change of countries' international technological specialization (RTA); C10 Change in export specialization in medium-high tech and high-tech products (RCA); C11 Change in international value chain; and *Internationalization*: C12 Increase in internationalization (change in FDI).

⁶ S1 Share of new firms in top 100 firms in each country; S2 New large R&D spenders; S3 Net entry rates in knowledge intensive sectors for both high-tech manufacturing and knowledge intensive services; S4 Share of young firms that innovate; S5 Share of population aspiring to high-growth entrepreneurship.

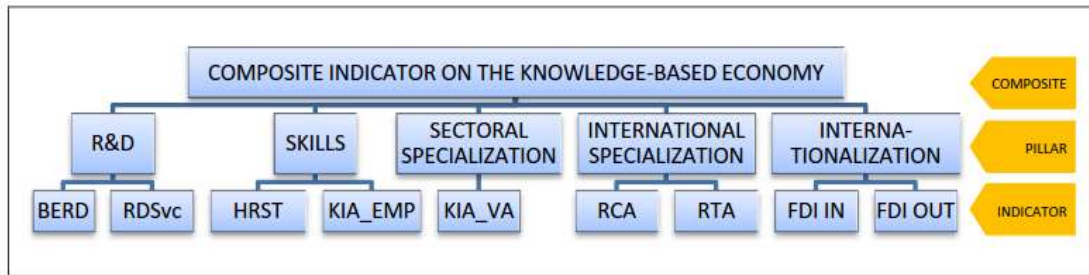
(2012) focus on the indicators of compositional structural change. The indicators measuring the Enablers were not used as these measure framework conditions for structural change rather than an objective quantification of structural change itself. Schumpeterian indicators were not used as the computation of these, requiring firm-level data, would be too time-consuming.

Vertesy et al (2012) identify nine compositional indicators organised into five pillars:

- Research & Development:
 - *BERD*: Total R&D expenditure as a share of GDP (%);
 - *RDSvc*: Share of R&D services in the economy (defined as the share of sector NACE Rev 1.1 code K73 in the total economy, in terms of value added).
- Skills:
 - *HRST*: Share of Human Resources in Science and Technology (HRST) as a share of active population (15-74) (%);
 - *KIA_EMP*: Share of employment in knowledge-intensive activities (KiAs) (defined as persons [15-74] employed in knowledge-intensive activities (KiAs) as a percentage of total employment (in sectors with at least 33% tertiary graduates)).
- Sectoral specialization:
 - *KIA_VA*: Share of value added in high-tech manufacturing and service sectors within the total value added in a country (R&D intensity-based definition; Relevant sectors for alternative definition applied: See Box 1 and ANNEX-III for further description (High-technology manufacturing (NACE Rev 1.1. DG24.4, DL30, DL32, DL33, DM35.3) and knowledge-intensive high-technology services (I64, K72 and K73)).
- International specialization:
 - *RTA*: Countries' international technological specialization (Revealed Technological Advantages - RTA) (defined as the share of selected technology classes in a country's patents (PCT));
 - *RCA*: Export specialization in medium-high tech and high-tech products (Revealed Competitive Advantages – RCA) (defined as exports of medium-high and high-technology products as a share of total exports over the world market share of high-tech exports).
- Internationalization:
 - *FDI_IN*: Cumulative inward FDI stock as a share of GDP;
 - *FDI_OUT*: Cumulative outward FDI stock as a share of GDP.

The structure of the composite indicator developed by Vertesy et al (2012) is shown in Figure 3. The relative size of the knowledge-based economy is measured by the level scores of the composite indicator. Change or progress towards a more knowledge-intensive economy is measured by level changes of the composite indicator.

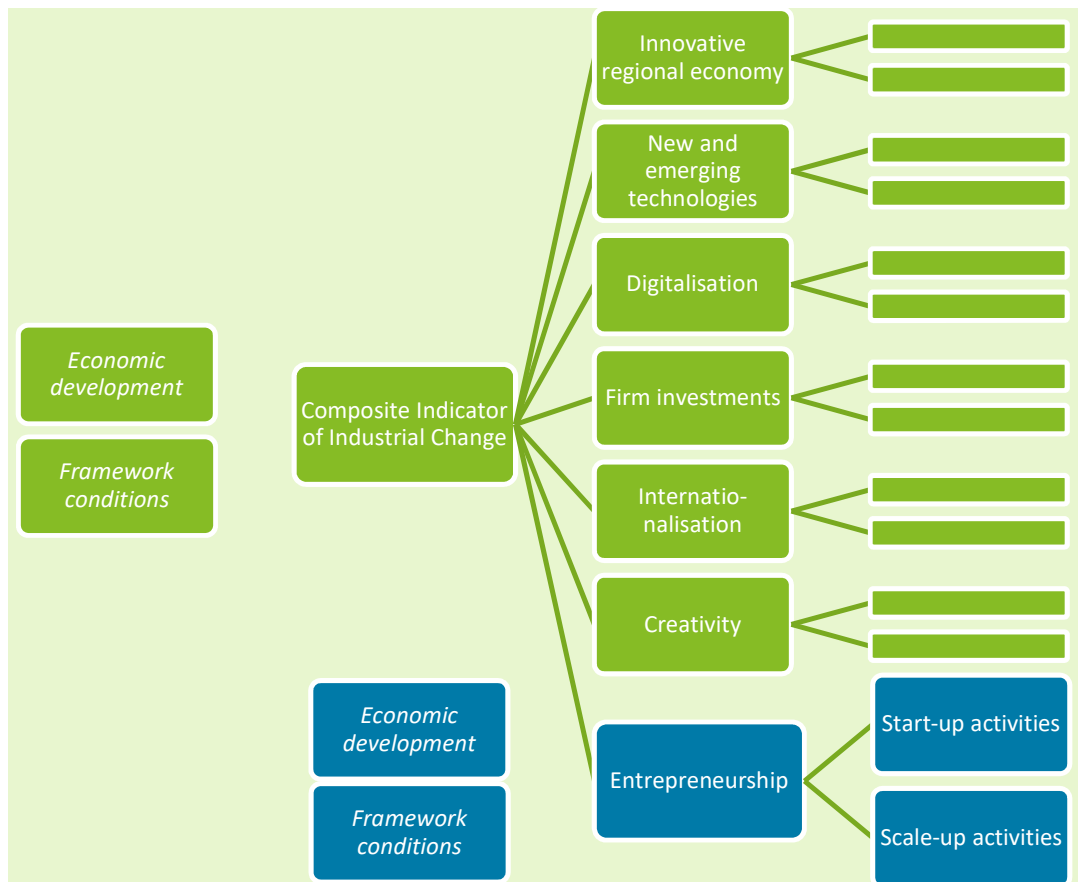
Figure 3 Composite indicator measuring the knowledge-based economy



Source: Vertesy et al (2012).

Composite Indicator of Industrial Change: dimensions and indicators

For the Composite Indicator of Industrial Change (CIIC) a similar structure has been adopted using **seven different dimensions** and for each dimension a small number of indicators. This structure is presented below, and the indicators included in each of the dimensions are discussed further below for each dimension.



Evolution towards a more innovative regional economy

This dimension refers to the capacity of a regional system to generate new solutions which are sold on the market, or which contribute to upgrading firms' processes and sales. Innovation not only refers to new products, but also to new services or new processes. For this dimension the following indicators have been used: Business R&D expenditures (BERD), Design applications, Trademark applications, Product and process innovators, Marketing and organisational innovators, and Employment in service innovation intensive industries.

Indicator	Coverage	Source
Design applications per billion GDP (in Purchasing Power Standards (PPS))	NUTS 2	Eurostat: reg_ipr_d
Employment in service innovation intensive industries (percentage share of total employment) <i>(Service intensive industries include the following NACE industries: C17 Manufacture of paper and paper products; J58 Publishing activities; J61 Telecommunications; J62 Computer programming, consultancy and related activities; J63 Information service activities; K64 Financial service activities, except insurance and pension funding; K65 Insurance, reinsurance and pension funding, except compulsory social security; M71-M73 Architectural and engineering activities; technical testing and analysis; scientific research and development; advertising and market research)</i>	NUTS 2	Own calculations using Eurostat data: SBS data by NUTS 2 regions and NACE Rev. 2 (from 2008 onwards) [sbs_r_nuts06_r2]
Innovative SMEs collaborating with others (percentage of SMEs)	NUTS 2 (NUTS 1 for some countries)	European Commission: Regional Innovation Scoreboard https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en
R&D expenditure in business (BERD) (percentage of GDP)	NUTS 2	Eurostat: rd_e_gdreg
SMEs that introduced a marketing or organisational innovation (percentage of SMEs)	NUTS 2 (NUTS 1 for some countries)	European Commission: Regional Innovation Scoreboard https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en
SMEs that introduced a product or process innovation (percentage of SMEs)	NUTS 2 (NUTS 1 for some countries)	European Commission: Regional Innovation Scoreboard https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en
Trademark applications per billion GDP (in Purchasing Power Standards (PPS))	NUTS 2	Eurostat: reg_ipr_t

New and emerging technologies

Industrial modernisation is usually the result of developing and applying new technologies (i.e. through updating the industrial process by integrating new technologies into the process of generating output). Implementing new technologies can boost innovation and growth, contribute to solving current challenges and thus open up new markets or increase the quality of applications in existing ones. The European Commission acknowledges this through supporting key enabling technologies (KETs)⁷. The indicator on the number of KETs patents is taken from the KETs Observatory⁸. Another indicator measures employment in high-technology industries, where higher employment shares are a proxy for a larger use of these technologies in a region.

Indicator	Coverage	Source
Aggregate number of patents in KETs per billion GDP (in Purchasing Power Standards (PPS))	NUTS 2	KETs Observatory https://ec.europa.eu/growth/tools-databases/kets-tools/regional-distribution-kets-patents
Employment in high-tech sectors (share of total employment) <i>(High-tech sectors include the following NACE industries NACE 21, 26, 59, 60, 61, 62, 63, 72)</i>	NUTS 2	Eurostat, SBS statistics: Employment in technology and knowledge-intensive sectors by NUTS 2 regions and sex (from 2008 onwards, NACE Rev. 2) [htec_emp_reg2]

Digitalisation

Digitalisation is an important current trend that massively changes economic sectors and existing production modes. Digitalisation may enforce disruptive changes in individual businesses, sectors and value chains, and across sectors (e.g. ICT and mechanical engineering). It can lead to the creation of new businesses, entrepreneurship efforts and new cooperation structures within and across sectors. The digitalisation of production processes for goods and services has the potential to increase efficiency and vertical integration of value chains.

When measuring digitalisation penetration on the level of regions, challenges with respect to data availability become apparent. Both Eurostat and DG Connect provide data for businesses on the national level, but it seems difficult so far to integrate data on a sub-national aggregation level⁹. Regional data are available for only one indicator: Employment in IT. Therefore, country-level data are used for the other indicators.

⁷ KETs include the following technologies: Advanced Materials; Nanotechnology; Micro- and Nano-electronics; Industrial Biotechnology; Photonics; and Advanced Manufacturing Technology.

⁸ <https://ec.europa.eu/growth/tools-databases/kets-tools/kets-observatory>

⁹ Eurostat provides regional data on birth rates for ICT, share of 3-year old enterprises in ICT, and employment in new ICT enterprises, but regional data are not available for too many Member States (among others Belgium, Germany, Netherlands, Poland, United Kingdom) and are therefore not included.

Indicator	Coverage	Source
Digital engagement (frequency of internet access) (percentage of individuals)	NUTS 2	Eurostat, Regional digital Economy and Society: [isoc_r_iuse_i]
E-commerce (share of turnover)	Country	Eurostat, Digital economy and society: isoc_ec_evaln2
Employment in IT (share of total employment) <i>(Employment in IT is defined as employment in the following NACE industries: C26 Manufacture of computer, electronic and optical products, J61 Telecommunications, J62 Computer programming, consultancy and related activities, J63 Information service activities)</i>	NUTS 2	Own calculations using Eurostat data: SBS data by NUTS 2 regions and NACE Rev. 2 (from 2008 onwards) [sbs_r_nuts06_r2]
Enterprises who have ERP software package to share information between different functional area (share of all enterprises)	Country	Eurostat, Digital economy and society: isoc_eb_iip
Individuals' purchases of goods or service over the internet (percentage of individuals)	NUTS 2	EU; Eurostat, Regional digital Economy and Society: isoc_r_blt12_i

Firm investments

The replacement of production facilities has an immediate effect on the modernisation of production in individual businesses, sectors and value chains. Firms and sectors that rely on outdated machines and facilities for their production have difficulties in coping with requirements of supra-regional value chains and competitors. In this respect, investments in production inputs can deliver important information on the current state of the production facilities within a region. Indicators in this dimension include Gross fixed capital formation and Total innovation expenditures. The latter have been estimated from national level CIS data using the regionalisation method developed for the European Service Innovation Scoreboard. For estimating regional data, the assumption is that national values on the industry level can be applied to the regional level. The variation of an indicator across regions results from the variation of the indicator used as best proxy for regionalisation, e.g. the structure of industries or employment. Hence, total innovation expenditures in regions have been calculated by transforming the national value with the help of regional industry characteristics on the regional level.

Indicator	Coverage	Source
Gross fixed capital formation (percentage of GDP)	NUTS 2	Eurostat: nama_10r_2gfcf
Innovation expenditures	NUTS 2	Own estimates (cf. Annex D for more details about estimating regional CIS data)

Internationalisation

Enterprises competing in the international market face intense external competition. Competitiveness will be sustained or improved by offering new products (product innovation) or lower prices (process innovations). Exports are a good proxy for the internationalisation of a region's business economy. Export data is not available from Eurostat, but export data has been estimated for 2000-2011 at the NUTS 2 level and a collection of NACE 2 digit industries¹⁰ in a 2015 study for DG GROW¹¹. These data have been used to construct an indicator on the share of medium-high and high-tech product exports in the 2016 Regional Innovation Scoreboard. In addition, regional data on incoming FDI flows have been added as a measure for the attractiveness and openness of regions for foreign investments.

Indicator	Coverage	Source
Incoming Foreign Direct Investment (FDI) flows	NUTS 2	© ESPON Origin of data: ESPON EGTC
Medium-high and high-tech product exports (share of product exports)	NUTS 2	European Commission: Regional Innovation Scoreboard https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en

Creativity

Three different 'types' of creativity can be distinguished: technological creativity (invention), economic creativity (entrepreneurship) and artistic/cultural creativity. These three dimensions of creativity are interrelated and share a common process of thinking and reinforcing each other. Thus, the creative economy is the result of the interrelations among technology, arts and businesses. As there are only a few indirect indicators for measuring the generation of new ideas, the creative sector is used as a proxy to measure creativity: the creative sector not only covers activities with an artistic component but also activities with creative output involving intellectual property, activities using creative input to add value, as in the service sector and user-created activities and networks¹². The existence of a vibrant creative sector is an indication of an underlying creativity activity permeating the whole economy.

¹⁰ Export data are available for most NUTS 2 regions of the 28 EU Member states for the following NACE Rev 1.1 industries: 15-16, 17-18, 19, 20, 21-22, 23, 24, 25, 26, 27-28, 29, 30-33, 34-35, 36-37, 50, 51, 52, 60, 61, 62, 63, 64, 70, 71-74.

¹¹ Cordes, A., B. Gehrke, R. Römisch, C. Rammer, P. Schliessler, and P. Wassman (2015), "Identifying revealed comparative advantages in an EU regional context", Study by NIW, WIW and ZEW within the Framework Service Contract "Studies in the Area of European Competitiveness" for DG GROW.

¹² Hollanders, H. and A. van Cruysen, "Design, Creativity and Innovation: a scoreboard approach", in: E. Villalba (ed.), "Measuring Creativity", Proceedings from the conference, 'Can creativity be measured?', Luxembourg: Publications Office of the European Union, ISBN 978-92-79-12862-2, 2009.

In a study for the German Federal Ministry for Economic Affairs and Energy¹³, Fraunhofer ISI and ZEW defined 12 subsectors in the creative and cultural sector at the NACE 4-digit and 5-digit level (See Annex C for the full definition). Using data from the Orbis database for all regions these definitions have been used to construct an indicator for employment the creative and cultural sector.

Two more indicators are used for measuring creativity. The Global Creativity Index¹⁴ distinguishes between 3 dimensions for measuring creativity: Technology, Talent and Tolerance. Technology captures R&D expenditures and patent applications, Talent captures employment in creative occupations and educational attainment. Tolerance uses data from Gallup’s World Poll¹⁵ to capture attitudes toward ethnic and racial minorities and tolerance toward gay and lesbian people. For the CIIC, patent applications and educational attainment will also be used to measure creativity. For educational attainment the same indicator is used as in the Regional Innovation Scoreboard focusing “on a narrow share of the population aged 30 to 34” as this narrow age range “will relatively quickly reflect changes in educational policies leading to more tertiary graduates”. R&D expenditures is already included in the Innovation dimension and, as explained above, an indicator is already included measuring employment in creative and cultural sectors.

Indicator	Coverage	Source
Employment in creative and cultural sectors (percentage of total employment)	NUTS 2	Own estimates using Orbis data
EPO patent applications (per million population)	NUTS 2	Own calculations using patent data from REGPAT and population data from Eurostat
Population aged 30-34 having completed tertiary education (percentage of respective age group)	NUTS 2	Eurostat: edat_ifse_12

Entrepreneurship

An actively evolving economy offers opportunities for start-up activities in innovative and/ or emerging fields. New firms stimulate the economic structure and are also an indication for business opportunities based on new ideas. They create employment and new markets or market niches. Entrepreneurship is an important dimension of industrial change.

¹³ ZEW and Fraunhofer ISI (2016), Monitoring zu ausgewählten wirtschaftlichen Eckdaten der Kultur- und Kreativwirtschaft 2014, Bericht im Rahmen des Projekts „Stand und Perspektiven der deutschen Kultur- und Kreativwirtschaft 2013-2015, im Auftrag des Bundesministeriums für Wirtschaft und Energie (BMWi).

¹⁴ <http://martinprosperity.org/content/the-global-creativity-index-2015/>

¹⁵ <https://www.gallup.com/analytics/232838/world-poll.aspx>

Eurostat provides regional data on business demography, including data on entrepreneurship (e.g. number of enterprise births, but also on variables such as the share of three-year-old enterprises in business populations and survival rates, employment in young enterprises and also data on high-growth enterprises. Unfortunately, regional data are missing in some countries (e.g. Germany, Sweden, United Kingdom) and therefore country level results have been used for all regions in these countries. For the CIIC, the following indicators are included:

- *Birth rate*: number of enterprise births in the reference period (t) divided by the number of enterprises active in t – percentage;
- *Survival rate of 3-year-old enterprises*: number of enterprises in the reference period (t) newly born in t-3 having survived to t, divided by number of enterprise births in t-3;
- *Employment share of enterprise births*: number of persons employed in the reference period (t) among enterprises newly born in t, divided by the number of persons employed in t among the stock of enterprises active in t;
- *Employment share of 3-year-old enterprises*: number of persons employed in enterprises newly born in t-3 having survived to t, divided by the number of persons employed in t among the stock of enterprises active in t.

In addition, firm level data from the Orbis database have been used to estimate the following two indicators measuring the share of start-ups and scale-ups. The Methodology report gives the following definitions for start-ups and scale-ups:

- *Start-ups* "are measured by the share of enterprises of a certain age in the total population."
- *Scale-ups* "are measured by the share of high-growth enterprises (at least a 20 per cent average annual growth over a three-year period)."

For identifying start-ups, Orbis provides information on the "date of incorporation". Start-ups have been identified as those enterprises with a date of incorporation three years before the reference data, e.g. for 2017, this would be the share of enterprises with a date of incorporation in 2014. Start-up rates are defined as the percentage share of start-ups out of all enterprises.

For scale-ups, the OECD definition on high-growth enterprises has been used, i.e. an enterprise must have experienced both a 20% average annual employment growth over a three-year period and the number of employees has to be at least ten in the first year of this three-year period. Scale-up rates are defined as the percentage share of scale-ups out of all enterprises.

Orbis data have been extracted for all enterprises with at least 5 employees for at least one year in the last ten years. This lower limit of 5 employees has been used to significantly reduce the amount of online data extractions. The amount of information lost is perceived to be relatively small as for many enterprises Orbis data are missing or incomplete, notably for smaller enterprises.

Indicator	Coverage	Source
Birth rate of enterprises	NUTS 2	Eurostat: Business demography and high growth enterprise by NACE Rev. 2 and NUTS 3 regions [bd_hgnace2_r3] - V97020
Employment share of enterprise births	NUTS 2	Eurostat: Business demography and high growth enterprise by NACE Rev. 2 and NUTS 3 regions [bd_hgnace2_r3] - V97120
Employment share of 3-year-old enterprises	NUTS 2	Eurostat: Business demography and high growth enterprise by NACE Rev. 2 and NUTS 3 regions [bd_hgnace2_r3] - V97153
Scale-ups (percentage share)	NUTS 2	Own estimates using Orbis data
Start-ups (percentage share)	NUTS 2	Own estimates using Orbis data
Survival rate of 3-year-old enterprises	NUTS 2	Eurostat: Business demography and high growth enterprise by NACE Rev. 2 and NUTS 3 regions [bd_hgnace2_r3] - V97043

3.1.2 Methodology for calculating the Composite Indicator of Industrial Change

This section provides an overview of the methodology for data computations for the Composite Indicator of Industrial Change (CIIC).

Normalisation of data

As the indicators to be used are referring to data that is available on different scales, normalisation is necessary to adjust the data scores to a common scale - an important precondition for further data processing procedures. Data normalisation refers to a rescaling procedure. The normalisation of data is conducted using the following data transformation:

$$\text{(Raw indicator - minimum of all regions and years) / (Maximum of observed scores for all regions in the entire period - minimum of observed scores for all regions in the entire period)}$$

This approach results in indicators between 0 and 1 and produces the basic precondition for comparing variables with different distributions.

CICC composite indicators

Composite indicators have been calculated for each of the dimensions using the methodology developed by the previous European Cluster Observatory by taking the unweighted average of all the indicators captured in the respective dimension. The CIIC has been calculated as a weighted average of the composite index scores for all seven dimensions, where these index scores have all be recalculated to the same zero-to-one range to ensure that each dimension has a comparable impact on the CIIC score. Weights for the different dimensions reflect their perceived relevance contributing to the CIIC and are as follows:

Dimension	Weight
Innovative regional economy	25%
New and emerging technologies	10%
Digitalisation	15%
Firm investments	10%
Internationalisation	10%
Creativity	10%
Entrepreneurship	20%

The composite scores of the CIIC structural change can be interpreted in two different ways, the *level scores* reflect the degree of modernisation of a region's industry, the *level changes* reflect industrial change.

Indicator	Coverage
Degree of industrial modernization	CIIC scores (levels)
Industrial change	Level changes in CIIC scores

Data availability

For EU Member States, Norway and Switzerland data are available for almost all indicators, except for some Entrepreneurship indicators for several countries. For other countries the CIIC has not been calculated due to too many missing data. Table 1 on the next page highlights the indicators for which data are not available.

Table 1 Data availability for the indicators included in the CIIC

	B	B	C	D	D	E	E	E	F	H	I	T	C	L	L	L	H	M	N	A	P	P	R	S	S	F	S	U	C	N	A	B	I	S	K	M	M	R	T	U	I	L														
	E	G	Z	K	E	E	L	S	R	R	Y	V	T	U	T	L	T	O	K	E	K	H	O	L	A	V	K	E	S	R	A																									
Innovative regional economy																																																								
Business R&D																																																								
Designs																																																								
Trademarks																																																								
PP innovators																																																								
MO innovators																																																								
SI industries																																																								
New and emerging technologies																																																								
KETs patents																																																								
High-tech sectors																																																								
Digitalisation																																																								
ERP software																																																								
IT employment																																																								
E-commerce																																																								
Digital engagement																																																								
Purchases internet																																																								
Firm investments																																																								
Investment (GFCF)																																																								
Innovation																																																								
Internationalisation																																																								
MHT exports																																																								
FDI inflows																																																								
Creativity																																																								
Employment CC																																																								
Patents																																																								
Tertiary education																																																								
Entrepreneurship																																																								
Birth-rate																																																								
Survival rate																																																								
Employment births																																																								
Employment 3-year old enterprises																																																								
Start-ups																																																								
Scale-ups																																																								

3.2 Standard indicators

This section provides definitions for the indicators already included in the European cluster database used by the European Cluster Observatory until 2016.

Apparent labour productivity

- Definition: Ratio of output (GDP in PPS) per employed person
- Unit of measurement: Thousand Euros in Purchasing Power Standards (PPS)
- Rationale: Indicator captures efficiency in the production process
- Source: Eurostat (Employment by sex, age and NUTS 2 regions [lfst_r_lfe2emp] / Gross domestic product (GDP) at current market prices by NUTS 2 regions [nama_10r_2gdp])

Cluster star – (Employment) Size

- Definition: Total number of employees in full time equivalent units in the industry for a given region
- Cluster star: An industry gets 1 star for being in the top 20 per cent across all regions in a particular year
- Source: see Employment

Cluster star – Productivity

- Definition: Measured by the average wage per employee (in full time equivalent units) in the region as a proxy. Productivity levels vary across Europe and these differences are captured as part of the cluster strength measure
- Cluster star: An industry gets 1 star for being in the top 20 per cent across all regions in a particular year
- Source: see Productivity

Cluster star – Specialisation

- Definition: Degree of specialisation measured by a location quotient. The location quotient is calculated as the ratio between the industry's share of total employment in a given region and the industry's share of total employment in all the regions considered in the analysis. Values above unity imply high regional specialisation, with a location quotient of two corresponding to twice as many employees in an industry than would be expected if all employment was distributed evenly
- Cluster star: An industry gets 1 star for being in the top 20 per cent across all regions in a particular year
- Source: see Employment

Employment

- Definition: Total number of employees in full time equivalent units in the industry for a given region
- Unit of measurement: Number of employees
- Rationale: Indicator captures general employment performance
- Source: Data from national sources updated with aggregate Orbis firm-level data
- Source: Calculated using Eurostat data updated with aggregate Orbis firm-level data

Employment growth

- Definition: Growth of total number of employees in full time equivalent units. Employment growth is calculated as the compound annual growth rate since the period at t-3 or the latest year before that
- Unit of measurement: per cent
- Source: Data from national sources updated with aggregate Orbis firm-level data

Hotspots - Emerging Industries

- Definition: Total number of stars in a region where stars are defined for the ten Emerging Industries. The indicator captures overall cluster strength in Emerging industries
- Source: Sum of cluster stars across all five dimensions

Hotspots – Exporting Industries

- Definition: Total number of stars in a region where stars are defined for the 51 Exporting industries. The indicator captures the overall cluster strength in Exporting industries
- Source: Sum of cluster stars across all five dimensions

Labour cost per employee

- Definition: Compensation of employees over total number of employees
- Unit of measurement: Thousand Euros
- Source: Eurostat (Compensation of employees by NUTS 2 regions [nama_10r_2coe] / Employment (thousand persons) by NUTS 3 regions [nama_10r_3empers])

Labour cost per employee in manufacturing

- Definition: Compensation of employees in manufactures over the total number of employees in manufacturing sectors
- Unit of measurement: Thousand Euros
- Source: Eurostat (Compensation of employees by NUTS 2 regions [nama_10r_2coe] / Employment (thousand persons) by NUTS 3 regions [nama_10r_3empers])

Labour force participation rate

- Definition: Active population (15 years or older) over total population in same age group
- Unit of measurement: per cent
- Source: Eurostat (Economically active population by sex, age and NUTS 2 regions [lfst_r_lfp2act])

Long term unemployment rate

- Definition: Long-term unemployed (12 months or longer) as a percentage of active population
- Unit of measurement: per cent
- Source: Eurostat (Long-term unemployment (12 months and more) by NUTS 2 regions [fst_r_lfu2ltu])

PCT Patents filed per million inhabitants

- Definition: PCT patent applications (fragment count) by priority year at the regional level over millions of inhabitants
- Source: OECD (<https://stats.oecd.org/>)

Population at risk of poverty

- Definition: Population at risk of poverty (net income less than 60% national median) as a percentage of total population
- Unit of measurement: per cent
- Source: Eurostat (At-risk-of-poverty rate by NUTS 2 regions [ilc_li41])

Productivity

- Definition: Measured by the average wage per employee (in full time equivalent units) in the region as a proxy. Productivity levels vary across Europe and these differences are captured as part of the cluster strength measure
- Unit of measurement: Thousand Euros
- Source: Data from national sources updated with aggregate Orbis firm-level data

Sale of new to market and new to firm innovations (innovative sales)

- Definition: Turnover of new or significantly improved products (i.e. product innovations) as a percentage of total turnover (for SMEs only)
- Unit of measurement: Normalised values between 0 and 1
- Source: European Commission - Regional Innovation Scoreboard ¹⁶

SMEs introducing market or organisational innovations

- Definition: SMEs who introduced a new marketing innovation and/or organisational innovation to one of their markets as a percentage of all SMEs
- Unit of measurement: Normalised values between 0 and 1
- Source: European Commission - Regional Innovation Scoreboard ¹⁶

SMEs introducing product or process innovations

- Definition: SMEs who introduced a new product or a new process to one of their markets as a percentage of all SMEs
- Unit of measurement: Normalised values between 0 and 1
- Source: European Commission - Regional Innovation Scoreboard ¹⁶

¹⁶ https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en

Specialisation

- Definition: Degree of specialisation measured by a location quotient. The location quotient is calculated as the ratio between the industry's share of total employment in a given region and the industry's share of total employment in all the regions considered in the analysis. Values above unity imply high regional specialisation, with a location quotient of two corresponding to twice as many employees in an industry than would be expected if all employment was distributed evenly
- Source: Data from national sources updated with aggregate Orbis firm-level data

Specialised cluster

- Definition: An exporting industry that has a specialisation rate of over 1.5 – measured by the location quotient – and has more than 500 employees
- Source: see Specialisation

Unemployment rate

- Definition: Unemployed people (15 years or older) as a percentage of active population in the same age group
- Unit of measurement: per cent
- Source: Eurostat (Unemployment rates by sex, age and NUTS 2 regions (%)) [lfst_r_lfu3rt]

Youth labour force participation rate

- Active population aged 15 to 24 over total population in the same age group
- Unit of measurement: per cent
- Source: Eurostat (Economic activity rates by sex, age and NUTS 2 regions (%)) [lfst_r_lfp2actrt]

Youth unemployment rate

- Definition: Unemployed people (aged 15 to 24) as a percentage of active population in the same age group
- Unit of measurement: per cent
- Source: Eurostat (Unemployment rates by sex, age and NUTS 2 regions (%)) [lfst_r_lfu3rt]

Annex A - Exporting industries definitions

Cluster	NACE	Industry Name
Aerospace vehicles and defence	30.30	Manufacture of air and spacecraft and related machinery
Agricultural inputs and services	01.61	Support activities for crop production
	01.62	Support activities for animal production
	01.63	Post-harvest crop activities
	01.64	Seed processing for propagation
	20.15	Manufacture of fertilisers and nitrogen compounds
Apparel	14.11	Manufacture of leather clothes
	14.12	Manufacture of workwear
	14.13	Manufacture of other outerwear
	14.14	Manufacture of underwear
	14.19	Manufacture of other wearing apparel and accessories
	14.20	Manufacture of articles of fur
Appliances	27.51	Manufacture of electric domestic appliances
	27.52	Manufacture of non-electric domestic appliances
Automotive	24.53	Casting of light metals
	24.54	Casting of other non-ferrous metals
	28.13	Manufacture of other pumps and compressors
	29.10	Manufacture of motor vehicles
	29.20	Manufacture of bodies (coachwork) for motor vehicles, manufacture of trailers and semi-trailers
	29.31	Manufacture of electrical and electronic equipment for motor vehicles
	29.32	Manufacture of other parts and accessories for motor vehicles
	30.40	Manufacture of military fighting vehicles
	Biopharmaceuticals	21.10
21.20		Manufacture of pharmaceutical preparations
Business services	49.32	Taxi operation
	62.01	Computer programming activities
	62.02	Computer consultancy activities
	62.03	Computer facilities management activities
	62.09	Other information technology and computer service activities
	63.11	Data processing, hosting and related activities
	64.20	Activities of holding companies
	70.10	Activities of head offices
	70.22	Business and other management consultancy activities
	71.11	Architectural activities
	71.12	Engineering activities and related technical consultancy
	71.20	Technical testing and analysis
	74.30	Translation and interpretation activities
	74.90	Other professional, scientific and technical activities n.e.c.
	77.12	Renting and leasing of trucks
	77.40	Leasing of intellectual property and similar products, except copyrighted works
	78.10	Activities of employment placement agencies
	78.30	Other human resources provision
	81.10	Combined facilities support activities
	82.20	Activities of call centres

	82.30	Organisation of conventions and trade shows
Coal mining	05.10	Mining of hard coal
	05.20	Mining of lignite
	09.90	Support activities for other mining and quarrying
	26.30	Manufacture of communication equipment
Communications equipment and services	61.20	Wireless telecommunications activities
	61.30	Satellite telecommunications activities
	61.90	Other telecommunications activities
Construction products and services	23.14	Manufacture of glass fibres
	23.51	Manufacture of cement
	23.52	Manufacture of lime and plaster
	23.61	Manufacture of concrete products poses
	23.62	Manufacture of plaster products for construction purposes
	23.64	Manufacture of mortars
	23.65	Manufacture of fibre cement
	23.70	Cutting, shaping and finishing of stone
	23.99	Manufacture of other non-metallic mineral products n.e.c.
	24.20	Manufacture of tubes, pipes, hollow profiles fittings, of steel
	25.30	Manufacture of steam generators, except central heating hot water boilers
	35.30	Steam and air conditioning supply
	42.12	Construction of railways and underground railways
	42.22	Construction of utility projects for electricity and telecommunications
	42.91	Construction of water projects
	Distribution and electronic commerce	46.11
46.12		Agents involved in the sale of fuels, ores, metals and industrial chemicals
46.13		Agents involved in the sale of timber and building materials
46.14		Agents involved in the sale of machinery, industrial equipment, ships and aircraft
46.15		Agents involved in the sale of furniture, household goods, hardware and ironmongery
46.16		Agents involved in the sale of textiles, clothing, fur, footwear and leather goods
46.17		Agents involved in the sale of food, beverages and tobacco
46.18		Agents specialised in the sale of other particular products
46.19		Agents involved in the sale of a variety of goods
46.21		Wholesale of grain, unmanufactured tobacco, seeds and animal feeds
46.22		Wholesale of flowers and plants
46.23		Wholesale of live animals
46.24		Wholesale of hides, skins and leather
46.31		Wholesale of fruit and vegetables
46.32		Wholesale of meat and meat products
46.34		Wholesale of beverages
46.35		Wholesale of tobacco products
46.38		Wholesale of other food, including fish, crustaceans and molluscs
46.41		Wholesale of textiles
46.42		Wholesale of clothing and footwear
46.43		Wholesale of electrical household appliances
46.44		Wholesale of china and glassware and cleaning materials
46.45		Wholesale of perfume and cosmetics
46.46		Wholesale of pharmaceutical goods
46.47		Wholesale of furniture, carpets and lighting equipment
46.48		Wholesale of watches and jewellery
46.49	Wholesale of other household goods	
46.51	Wholesale of computers, computer peripheral equipment and software	
46.52	Wholesale of electronic and telecommunications equipment and parts	
46.61	Wholesale of agricultural machinery, equipment and supplies	

	46.62	Wholesale of machine tools
	46.63	Wholesale of mining, construction and civil engineering machinery
	46.64	Wholesale of machinery for the textile industry and of sewing and knitting machines
	46.65	Wholesale of office furniture
	46.66	Wholesale of other office machinery and equipment
	46.69	Wholesale of other machinery and equipment
	46.71	Wholesale of solid, liquid and gaseous fuels and related products
	46.72	Wholesale of metals and metal ores
	46.76	Wholesale of other intermediate products
	47.91	Retail sale via mail order houses or via Internet
	52.10	Warehousing and storage
	77.31	Renting and leasing of agricultural machinery and equipment
	77.32	Renting and leasing of construction and civil engineering machinery and equipment
	77.33	Renting and leasing (including computers)
	77.34	Renting and leasing of water transport equipment
	77.35	Renting and leasing of air transport equipment
	77.39	Renting and leasing of other machinery, equipment and tangible goods n.e.c.
	82.92	Packaging activities
Downstream chemical products	20.12	Manufacture of dyes and pigments
	20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
	20.41	Manufacture of soap and detergents, cleaning and polishing preparations
	20.42	Manufacture of perfumes and toilet preparations
	20.51	Manufacture of explosives
	20.52	Manufacture of glues
	20.53	Manufacture of essential oils
	20.59	Manufacture of other chemical products n.e.c.
Downstream metal products	25.29	Manufacture of other tanks, reservoirs and containers of metal
	25.40	Manufacture of weapons and ammunition
	25.71	Manufacture of cutlery
	25.72	Manufacture of locks and hinges
	25.91	Manufacture of steel drums and similar containers
	25.92	Manufacture of light metal packaging
	25.99	Manufacture of other fabricated metal products n.e.c.
Education and knowledge creation	72.11	Research and experimental development on biotechnology
	72.19	Other research and experimental development on natural sciences and engineering
	72.20	Research and experimental development on social sciences and humanities
	85.41	Post-secondary non-tertiary education
	85.42	Tertiary education
	85.52	Cultural education
	85.59	Other education n.e.c.
	85.60	Educational support activities
	94.12	Activities of professional membership organisations
Electric power generation and transmission	35.11	Production of electricity
	35.12	Transmission of electricity
Environmental services	36.00	Water collection, treatment and supply
	38.12	Collection of hazardous waste
	38.22	Treatment and disposal of hazardous waste
	38.32	Recovery of sorted materials
Financial services	64.11	Central banking
	64.30	Trusts, funds and similar financial entities
	64.91	Financial leasing
	64.92	Other credit granting

	64.99	Other financial service activities, except insurance and pension funding n.e.c.
	66.11	Administration of financial markets
	66.12	Security and commodity contracts brokerage
	66.19	Other activities auxiliary to financial services, except insurance and pension funding
	66.30	Fund management activities
Fishing and fishing products	03.11	Marine fishing
	03.12	Freshwater fishing
	10.20	Processing and preserving of fish, crustaceans and molluscs
Food processing and manufacturing	10.31	Processing and preserving of potatoes
	10.32	Manufacture of fruit and vegetable juice
	10.39	Other processing and preserving of fruit and vegetables
	10.41	Manufacture of oils and fats
	10.42	Manufacture of margarine and similar edible fats
	10.51	Operation of dairies and cheese making
	10.52	Manufacture of ice cream
	10.61	Manufacture of grain mill products
	10.62	Manufacture of starches and starch products
	10.72	Manufacture of rusks and biscuits manufacture of preserved pastry goods and cakes
	10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products
	10.81	Manufacture of sugar
	10.82	Manufacture of cocoa, chocolate and sugar confectionery
	10.83	Processing of tea and coffee
	10.84	Manufacture of condiments and seasonings
	10.85	Manufacture of prepared meals and dishes
	10.86	Manufacture of homogenised food preparations and dietetic food
	10.89	Manufacture of other food products n.e.c.
	10.91	Manufacture of prepared feeds for farm animals
	10.92	Manufacture of prepared pet foods
	11.01	Distilling, rectifying and blending of spirits
	11.02	Manufacture of wine from grape
	11.03	Manufacture of cider and other fruit wines
	11.04	Manufacture of other non-distilled fermented beverages
	11.05	Manufacture of beer
	11.06	Manufacture of malt
	11.07	Manufacture of soft drinks production of mineral waters and other bottled waters
Footwear	15.11	Tanning and dressing of leather dressing and dyeing of fur
	15.20	Manufacture of footwear
Forestry	02.10	Silviculture and other forestry activities
	02.20	Logging
	02.30	Gathering of wild growing non-wood products
	02.40	Support services to forestry
Furniture	31.01	Manufacture of office and shop furniture
	31.02	Manufacture of kitchen furniture
	31.03	Manufacture of mattresses
	31.09	Manufacture of other furniture
Hospitality and tourism	01.70	Hunting, trapping and related service activities
	55.10	Hotels and similar accommodation
	55.20	Holiday and other short-stay accommodation
	55.30	Camping grounds, recreational parks
	55.90	Other accommodation
	77.21	Renting and leasing of recreational and sports goods
	79.11	Travel agency activities
	79.12	Tour operator activities
	79.90	Other reservation service and related activities

	91.02	Museums activities
	91.03	Operation of historical sites and buildings and similar visitor attractions
	91.04	Botanical and zoological gardens and nature reserves activities
	92.00	Gambling and betting activities
	93.11	Operation of sports facilities
	93.12	Activities of sport clubs
	93.19	Other sports activities
	93.21	Activities of amusement parks and theme parks
	93.29	Other amusement and recreation activities
Information technology and analytical instruments	26.11	Manufacture of electronic components
	26.12	Manufacture of loaded electronic boards
	26.20	Manufacture of computers and peripheral equipment
	26.40	Manufacture of consumer electronics
	26.51	Manufacture of instruments and appliances for measuring, testing and navigation
	26.52	Manufacture of watches and clocks
	26.70	Manufacture of optical instruments equipment
	26.80	Manufacture of magnetic and optical media
	58.21	Publishing of computer games
58.29	Other software publishing	
Insurance services	65.11	Life insurance
	65.12	Non-life insurance
	65.20	Reinsurance
	66.21	Risk and damage evaluation
	66.29	Other activities auxiliary to insurance and pension funding
Jewellery and precious metals	32.11	Striking of coins
	32.12	Manufacture of jewellery and related articles
	32.13	Manufacture of imitation jewellery and related articles
Leather and related products	15.12	Manufacture of luggage, handbags and the like, saddlery and harness
Lighting and electrical equipment	27.11	Manufacture of electric motors, generators and transformers
	27.12	Manufacture of electricity distribution and control apparatus
	27.20	Manufacture of batteries and accumulators
	27.31	Manufacture of fibre optic cables
	27.32	Manufacture of other electronic and electric wires and cables
	27.33	Manufacture of wiring devices
	27.40	Manufacture of electric lighting equipment
	27.90	Manufacture of other electrical equipment
Livestock processing	10.11	Processing and preserving of meat
	10.12	Processing and preserving of poultry meat
	10.13	Production of meat and poultry meat products
Marketing, design, and publishing	58.11	Book publishing
	58.12	Publishing of directories and mailing lists
	58.14	Publishing of journals and periodicals
	58.19	Other publishing activities
	63.12	Web portals
	63.91	News agency activities
	63.99	Other information service activities n.e.c.
	70.21	Public relations and communication activities
	73.11	Advertising agencies
	73.12	Media representation
	73.20	Market research and public opinion polling
	74.10	Specialised design activities
	91.01	Library and archives activities
Medical devices	26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment
	32.50	Manufacture of medical and dental instruments and supplies
Metal mining	07.10	Mining of iron ores

	07.21	Mining of uranium and thorium ores
	07.29	Mining of other non-ferrous metal ores
Metalworking technology	23.91	Production of abrasive products
	25.11	Manufacture of metal structures and parts of structures
	25.12	Manufacture of doors and windows of metal
	25.61	Treatment and coating of metals
	25.62	Machining
	25.73	Manufacture of tools
	25.94	Manufacture of fasteners and screw machine products
	28.41	Manufacture of metal forming machinery
	28.91	Manufacture of machinery for metallurgy
Music and sound recording	59.20	Sound recording and music publishing activities
Non-metal mining	08.11	Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate
	08.12	Operation of gravel and sand pits mining of clays and kaolin
	08.91	Mining of chemical and fertiliser minerals
	08.92	Extraction of peat
	08.93	Extraction of salt
	08.99	Other mining and quarrying n.e.c.
Oil and gas production and transportation	06.10	Extraction of crude petroleum
	06.20	Extraction of natural gas
	09.10	Support activities for petroleum and natural gas extraction
	19.10	Manufacture of coke oven products
	19.20	Manufacture of refined petroleum products
	49.50	Transport via pipeline
Paper and packaging	17.11	Manufacture of pulp
	17.12	Manufacture of paper and paperboard
	17.21	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard
	17.22	Manufacture of household and sanitary goods and of toilet requisites
	17.23	Manufacture of paper stationery
	17.24	Manufacture of wallpaper
	17.29	Manufacture of other articles of paper and paperboard
Performing arts	90.01	Performing arts
	90.02	Support activities to performing arts
	90.03	Artistic creation
	90.04	Operation of arts facilities
Plastics	20.16	Manufacture of plastics in primary forms
	22.21	Manufacture of plastic plates, sheets, tubes and profiles
	22.22	Manufacture of plastic packing goods
	22.23	Manufacture of builders' ware of plastic
	22.29	Manufacture of other plastic products
	28.96	Manufacture of plastics and rubber machinery
Printing services	18.11	Printing of newspapers
	18.12	Other printing
	18.13	Pre-press and pre-media services
	18.14	Binding and related services
Production technology and heavy machinery	25.21	Manufacture of central heating radiators and boilers
	28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
	28.12	Manufacture of fluid power equipment
	28.14	Manufacture of other taps and valves
	28.15	Manufacture of bearings, gears, gearing and driving elements
	28.21	Manufacture of ovens, furnaces and furnace burners
	28.22	Manufacture of lifting and handling equipment
	28.24	Manufacture of power-driven hand tools
28.25	Manufacture of non-domestic cooling and ventilation equipment	

	28.29	Manufacture of other general-purpose machinery n.e.c.
	28.30	Manufacture of agricultural and forestry machinery
	28.49	Manufacture of other machine tools
	28.92	Manufacture of machinery for mining, quarrying and construction
	28.93	Manufacture of machinery for food, beverage and tobacco processing
	28.94	Manufacture of machinery for textile, apparel and leather production
	28.95	Manufacture of machinery for paper and paperboard production
	28.99	Manufacture of other special-purpose machinery n.e.c.
	30.20	Manufacture of railway locomotives and rolling stock
	30.99	Manufacture of other transport equipment n.e.c.
Recreational and small electric goods	28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)
	30.91	Manufacture of motorcycles
	30.92	Manufacture of bicycles and invalid carriages
	32.20	Manufacture of musical instruments
	32.30	Manufacture of sports goods
	32.40	Manufacture of games and toys
	32.91	Manufacture of brooms and brushes
	32.99	Other manufacturing n.e.c.
Textile manufacturing	13.10	Preparation and spinning of textile fibres
	13.20	Weaving of textiles
	13.30	Finishing of textiles
	13.91	Manufacture of knitted and crocheted fabrics
	13.92	Manufacture of made-up textile articles, except apparel
	13.93	Manufacture of carpets and rugs
	13.94	Manufacture of cordage, rope, twine and netting
	13.95	Manufacture of non-wovens and articles made from non-wovens, except apparel
	13.96	Manufacture of other technical and industrial textiles
	13.99	Manufacture of other textiles n.e.c.
	14.31	Manufacture of knitted and crocheted hosiery
	14.39	Manufacture of other knitted and crocheted apparel
	20.60	Manufacture of man-made fibres
Tobacco	12.00	Manufacture of tobacco products
Transportation and logistics	33.16	Repair and maintenance of aircraft and spacecraft
	49.39	Other passenger land transport n.e.c.
	49.41	Freight transport by road
	51.10	Passenger air transport
	51.21	Freight air transport
	51.22	Space transport
	52.21	Service activities incidental to land transportation
	52.23	Service activities incidental to air transportation
	52.24	Cargo handling
	52.29	Other transportation support activities
Upstream chemical products	20.11	Manufacture of industrial gases
	20.13	Manufacture of other inorganic basic chemicals
	20.14	Manufacture of other organic basic chemicals
	20.17	Manufacture of synthetic rubber in primary forms
	20.20	Manufacture of pesticides and other agrochemical products
Upstream metal manufacturing	24.10	Manufacture of basic iron and steel and of ferro-alloys
	24.31	Cold drawing of bars
	24.32	Cold rolling of narrow strip
	24.33	Cold forming or folding
	24.34	Cold drawing of wire
	24.41	Precious metals production
	24.42	Aluminium production
	24.43	Lead, zinc and tin production

	24.44	Copper production
	24.45	Other non-ferrous metal production
	24.46	Processing of nuclear fuel
	24.51	Casting of iron
	24.52	Casting of steel
	25.50	Forging, pressing, stamping and roll-forming of metal powder metallurgy
	25.93	Manufacture of wire products, chain and springs
Video production and distribution	18.20	Reproduction of recorded media
	59.11	Motion picture, video and television programme production activities
	59.12	Motion picture, video and television programme postproduction activities
	59.13	Motion picture, video and television programme distribution activities
Vulcanized and fired materials	22.11	Manufacture of rubber tyres and tubes retreading and rebuilding of rubber tyres
	22.19	Manufacture of other rubber products
	23.11	Manufacture of flat glass
	23.12	Shaping and processing of flat glass
	23.13	Manufacture of hollow glass
	23.19	Manufacture and processing of other glass, including technical glassware
	23.20	Manufacture of refractory products
	23.31	Manufacture of ceramic tiles and flags
	23.32	Manufacture of bricks, tiles and construction products, in baked clay
	23.41	Manufacture of ceramic household and ornamental articles
	23.43	Manufacture of ceramic insulators and insulating fittings
	23.44	Manufacture of other technical ceramic products
Water Transportation	23.49	Manufacture of other ceramic products
	30.11	Building of ships and floating structures
	30.12	Building of pleasure and sporting boats
	33.15	Repair and maintenance of ships and boats
	38.31	Dismantling of wrecks
	50.10	Sea and coastal passenger water transport
	50.20	Sea and coastal freight water transport
	50.30	Inland passenger water transport
	50.40	Inland freight water transport
52.22	Service activities incidental to water transportation	
Wood products	16.10	Sawmilling and planing of wood
	16.21	Manufacture of veneer sheets and wood-based panels
	16.22	Manufacture of assembled parquet floors
	16.23	Manufacture of other builders' carpentry and joinery
	16.24	Manufacture of wooden containers
	16.29	Manufacture of other products of wood manufacture articles of cork, straw and plaiting materials

Annex B - Emerging industries definitions

Emerging Industry	NACE	NACE Name
Advanced packaging	17.11	Manufacture of pulp
	17.12	Manufacture of paper and paperboard
	17.21	Manufacture of corrugated paper and paperboard and of containers of paper and paperboarded
	17.22	Manufacture of household and sanitary goods and of toilet requisites
	17.23	Manufacture of paper stationery
	17.24	Manufacture of wallpaper
	17.29	Manufacture of other articles of paper and paperboard
	22.21	Manufacture of plastic plates, sheets, tubes and profiles
	22.22	Manufacture of plastic packing goods
	22.29	Manufacture of other plastic products
	24.20	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel
	25.61	Treatment and coating of metals
	25.73	Manufacture of tools
	25.99	Manufacture of other fabricated metal products n.e.c.
	28.99	Manufacture of other special-purpose machinery n.e.c.
	29.32	Manufacture of other parts and accessories for motor vehicles
	31.01	Manufacture of office and shop furniture
46.76	Wholesale of other intermediate products	
Biopharmaceuticals	11.01	Distilling, rectifying and blending of spirits
	17.22	Manufacture of household and sanitary goods and of toilet requisites
	20.13	Manufacture of other inorganic basic chemicals
	20.14	Manufacture of other organic basic chemicals
	20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
	20.41	Manufacture of soap and detergents, cleaning and polishing preparations
	20.59	Manufacture of other chemical products n.e.c.
	21.10	Manufacture of basic pharmaceutical products
	21.20	Manufacture of pharmaceutical preparations
	46.46	Wholesale of pharmaceutical goods
72.11	Research and experimental development on biotechnology	
72.19	Other research and experimental development on natural sciences and engineering	
Blue growth industries	03.11	Marine fishing
	03.12	Freshwater fishing
	09.10	Support activities for petroleum and natural gas extraction
	10.20	Processing and preserving of fish, crustaceans and molluscs
	22.19	Manufacture of other rubber products
	25.99	Manufacture of other fabricated metal products n.e.c.
	28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
	28.22	Manufacture of lifting and handling equipment
	30.11	Building of ships and floating structures
	30.12	Building of pleasure and sporting boats
	33.15	Repair and maintenance of ships and boats
	35.11	Production of electricity
	35.12	Transmission of electricity
36.00	Water collection, treatment and supply	

Emerging Industry	NACE	NACE Name
	42.91	Construction of water projects
	46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft
	49.41	Freight transport by road
	50.10	Sea and coastal passenger water transport
	50.20	Sea and coastal freight water transport
	50.30	Inland passenger water transport
	50.40	Inland freight water transport
	52.10	Warehousing and storage
	52.22	Service activities incidental to water transportation
	52.23	Service activities incidental to air transportation
	52.24	Cargo handling
	52.29	Other transportation support activities
	71.12	Engineering activities and related technical consultancy
	71.20	Technical testing and analysis
	72.19	Other research and experimental development on natural sciences and engineering
	73.11	Advertising agencies
	77.32	Renting and leasing of construction and civil engineering machinery and equipment
	77.34	Renting and leasing of water transport equipment
	79.11	Travel agency activities
	Creative industries	18.20
49.32		Taxi operation
58.11		Book publishing
58.12		Publishing of directories and mailing lists
58.14		Publishing of journals and periodicals
58.19		Other publishing activities
59.11		Motion picture, video and television programme production activities
59.12		Motion picture, video and television programme post-production activities
59.13		Motion picture, video and television programme distribution activities
59.20		Sound recording and music publishing activities
62.01		Computer programming activities
62.02		Computer consultancy activities
62.03		Computer facilities management activities
62.09		Other information technology and computer service activities
63.11		Data processing, hosting and related activities
63.12		Web portals
63.91		News agency activities
63.99		Other information service activities n.e.c.
64.20		Activities of holding companies
70.10		Activities of head offices
70.21		Public relations and communication activities
70.22		Business and other management consultancy activities
71.11		Architectural activities
71.12		Engineering activities and related technical consultancy
71.20		Technical testing and analysis
73.11		Advertising agencies
73.12		Media representation
73.20		Market research and public opinion polling
74.10		Specialised design activities
74.30		Translation and interpretation activities
74.90		Other professional, scientific and technical activities n.e.c.
77.12		Renting and leasing of trucks
77.40	Leasing of intellectual property and similar products, except copyrighted works	

Emerging Industry	NACE	NACE Name
	78.10	Activities of employment placement agencies
	78.30	Other human resources provision
	81.10	Combined facilities support activities
	82.20	Activities of call centres
	82.30	Organisation of conventions and trade shows
	91.01	Library and archives activities
Digital industries	22.29	Manufacture of other plastic products
	25.61	Treatment and coating of metals
	25.73	Manufacture of tools
	26.11	Manufacture of electronic components
	26.12	Manufacture of loaded electronic boards
	26.20	Manufacture of computers and peripheral equipment
	26.30	Manufacture of communication equipment
	26.40	Manufacture of consumer electronics
	26.51	Manufacture of instruments and appliances for measuring, testing and navigation
	26.52	Manufacture of watches and clocks
	26.70	Manufacture of optical instruments and photographic equipment
	26.80	Manufacture of magnetic and optical media
	27.12	Manufacture of electricity distribution and control apparatus
	27.90	Manufacture of other electrical equipment
	28.24	Manufacture of power-driven hand tools
	28.29	Manufacture of other general-purpose machinery n.e.c.
	28.99	Manufacture of other special-purpose machinery n.e.c.
	32.50	Manufacture of medical and dental instruments and supplies
	46.43	Wholesale of electrical household appliances
	46.51	Wholesale of computers, computer peripheral equipment and software
	46.52	Wholesale of electronic and telecommunications equipment and parts
	46.66	Wholesale of other office machinery and equipment
	46.69	Wholesale of other machinery and equipment
	58.11	Book publishing
	58.21	Publishing of computer games
	58.29	Other software publishing
	61.20	Wireless telecommunications activities
	61.30	Satellite telecommunications activities
	61.90	Other telecommunications activities
62.01	Computer programming activities	
62.02	Computer consultancy activities	
62.09	Other information technology and computer service activities	
70.21	Public relations and communication activities	
73.20	Market research and public opinion polling	
Environmental industries	06.20	Extraction of natural gas
	09.10	Support activities for petroleum and natural gas extraction
	16.21	Manufacture of veneer sheets and wood-based panels
	16.29	Manufacture of other products of wood manufacture of articles of cork, straw and plaiting materials
	17.22	Manufacture of household and sanitary goods and of toilet requisites
	20.14	Manufacture of other organic basic chemicals
	20.15	Manufacture of fertilisers and nitrogen compounds
	20.16	Manufacture of plastics in primary forms
	20.59	Manufacture of other chemical products n.e.c.
	22.29	Manufacture of other plastic products
	23.49	Manufacture of other ceramic products
23.51	Manufacture of cement	
24.10	Manufacture of basic iron and steel and of ferro-alloys	

Emerging Industry	NACE	NACE Name
	25.21	Manufacture of central heating radiators and boilers
	25.30	Manufacture of steam generators, except central heating hot water boilers
	25.99	Manufacture of other fabricated metal products n.e.c.
	26.51	Manufacture of instruments and appliances for measuring, testing and navigation
	28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
	28.29	Manufacture of other general-purpose machinery n.e.c.
	28.99	Manufacture of other special-purpose machinery n.e.c.
	35.11	Production of electricity
	35.12	Transmission of electricity
	36.00	Water collection, treatment and supply
	38.12	Collection of hazardous waste
	38.22	Treatment and disposal of hazardous waste
	38.31	Dismantling of wrecks
	38.32	Recovery of sorted materials
	46.21	Wholesale of grain, unmanufactured tobacco, seeds and animal feeds
	46.22	Wholesale of flowers and plants
	49.50	Transport via pipeline
	52.22	Service activities incidental to water transportation
	52.29	Other transportation support activities
	71.12	Engineering activities and related technical consultancy
	72.11	Research and experimental development on biotechnology
72.19	Other research and experimental development on natural sciences and engineering	
Experience industries	01.70	Hunting, trapping and related service activities
	46.18	Agents specialised in the sale of other particular products
	46.42	Wholesale of clothing and footwear
	46.49	Wholesale of other household goods
	47.91	Retail sale via mail order houses or via Internet
	49.39	Other passenger land transport n.e.c.
	50.30	Inland passenger water transport
	50.40	Inland freight water transport
	52.22	Service activities incidental to water transportation
	52.23	Service activities incidental to air transportation
	55.10	Hotels and similar accommodation
	55.20	Holiday and other short-stay accommodation
	55.30	Camping grounds, recreational vehicle parks and trailer parks
	55.90	Other accommodation
	58.29	Other software publishing
	62.01	Computer programming activities
	62.09	Other information technology and computer service activities
	63.12	Web portals
	70.21	Public relations and communication activities
	70.22	Business and other management consultancy activities
	77.21	Renting and leasing of recreational and sports goods
	79.11	Travel agency activities
	79.12	Tour operator activities
	79.90	Other reservation service and related activities
	82.30	Organisation of conventions and trade shows
	90.01	Performing arts
	90.02	Support activities to performing arts
90.03	Artistic creation	
90.04	Operation of arts facilities	
91.02	Museums activities	
91.03	Operation of historical sites and buildings and similar visitor attractions	

Emerging Industry	NACE	NACE Name
	91.04	Botanical and zoological gardens and nature reserves activities
	92.00	Gambling and betting activities
	93.11	Operation of sports facilities
	93.12	Activities of sport clubs
	93.19	Other sports activities
	93.21	Activities of amusement parks and theme parks
	93.29	Other amusement and recreation activities
Logistical services	33.16	Repair and maintenance of aircraft and spacecraft
	49.32	Taxi operation
	49.39	Other passenger land transport n.e.c.
	49.41	Freight transport by road
	51.10	Passenger air transport
	51.21	Freight air transport
	51.22	Space transport
	52.21	Service activities incidental to land transportation
	52.23	Service activities incidental to air transportation
	52.24	Cargo handling
Medical devices	52.29	Other transportation support activities
	61.30	Satellite telecommunications activities
	23.32	Manufacture of bricks, tiles and construction clay
	25.40	Manufacture of weapons and ammunition
	25.73	Manufacture of tools
	26.11	Manufacture of electronic components
	26.12	Manufacture of loaded electronic boards
	26.40	Manufacture of consumer electronics
	26.51	Manufacture of instruments and appliances for measuring, testing and navigation
	26.52	Manufacture of watches and clocks
	26.60	Manufacture of irradiation, electromedical equipment
	26.70	Manufacture of optical instruments and photographic equipment
	27.12	Manufacture of electricity distribution and control apparatus
	27.31	Manufacture of fibre optic cables
	27.32	Manufacture of other electronic and electric wires and cables
	27.33	Manufacture of wiring devices
	27.51	Manufacture of electric domestic appliances
	27.90	Manufacture of other electrical equipment
	28.12	Manufacture of fluid power equipment
	28.13	Manufacture of other pumps and compressors
	28.25	Manufacture of non-domestic cooling and ventilation equipment
	28.29	Manufacture of other general-purpose machinery n.e.c.
	28.95	Manufacture of machinery for paper and paperboard production
	28.99	Manufacture of other special-purpose machinery n.e.c.
	32.50	Manufacture of medical and dental instruments and supplies
	46.46	Wholesale of pharmaceutical goods
	62.03	Computer facilities management activities
Mobility technologies	22.21	Manufacture of plastic plates, sheets, tubes and profiles
	22.29	Manufacture of other plastic products
	24.10	Manufacture of basic iron and steel and of ferro-alloys
	24.53	Casting of light metals
	24.54	Casting of other non-ferrous metals
	25.30	Manufacture of steam generators, except central heating hot water boilers
	25.50	Forging, pressing, stamping and roll-forming of metal powder metallurgy
	25.61	Treatment and coating of metals
	25.62	Machining
25.73	Manufacture of tools	

Emerging Industry	NACE	NACE Name
	25.94	Manufacture of fasteners and screw machine products
	25.99	Manufacture of other fabricated metal products n.e.c.
	26.11	Manufacture of electronic components
	27.11	Manufacture of electric motors, generators and transformers
	27.12	Manufacture of electricity distribution and control apparatus
	27.32	Manufacture of other electronic and electric wires and cables
	27.33	Manufacture of wiring devices
	27.51	Manufacture of electric domestic appliances
	27.90	Manufacture of other electrical equipment
	28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
	28.12	Manufacture of fluid power equipment
	28.13	Manufacture of other pumps and compressors
	28.15	Manufacture of bearings, gears, gearing and driving elements
	28.22	Manufacture of lifting and handling equipment
	28.24	Manufacture of power-driven hand tools
	28.25	Manufacture of non-domestic cooling and ventilation equipment
	28.29	Manufacture of other general-purpose machinery n.e.c.
	28.30	Manufacture of agricultural and forestry machinery
	28.41	Manufacture of metal forming machinery
	28.49	Manufacture of other machine tools
	28.92	Manufacture of machinery for mining, quarrying and construction
	28.94	Manufacture of machinery for textile, apparel and leather production
	28.95	Manufacture of machinery for paper and paperboard production
	28.96	Manufacture of plastics and rubber machinery
	28.99	Manufacture of other special-purpose machinery n.e.c.
	29.10	Manufacture of motor vehicles
	29.20	Manufacture of bodies (coachwork) for motor vehicle,s manufacture of trailers and semi-trailers
	29.31	Manufacture of electrical and electronic equipment for motor vehicles
	29.32	Manufacture of other parts and accessories for motor vehicles
	30.20	Manufacture of railway locomotives and rolling stock
	30.30	Manufacture of air and spacecraft and related machinery
	30.40	Manufacture of military fighting vehicles
	30.92	Manufacture of bicycles and invalid carriages
	46.69	Wholesale of other machinery and equipment

Annex C - Cultural and creative sectors

Based on the more detailed table below showing NACE 5-digit codes, the following list of NACE 4-digit codes has been derived for measuring activities in cultural and creative sectors.

NACE	Industry
18.14	Binding and related services
32.11	Striking of coins
32.12	Manufacture of jewellery and related articles
32.13	Manufacture of imitation jewellery and related articles
32.20	Manufacture of musical instruments
47.61	Retail sale in of books in specialised stores
47.62	Retail sale of newspapers and stationary in specialised stores
47.63	Retail sale of music and video recordings in specialised stores
47.78	Other retail sale of new goods in specialised stores
47.79	Retail sale of second-hand goods in stores
58.11	Book publishing
58.12	Publishing of directories and mailing lists
58.13	Publishing of newspapers
58.14	Publishing of journals and periodicals
58.19	Other publishing activities
58.21	Publishing of computer games
58.29	Other software publishing
59.11	Motion picture, video and television programme production activities
59.12	Motion picture, video and television programme post-production activities
59.13	Motion picture, video and television programme distribution activities
59.14	Motion picture projection activities
59.20	Sound recording and music publishing activities
60.10	Radio broadcasting
60.20	Television programming and broadcasting activities
62.01	Computer programming activities
63.12	Web portals
63.91	News agency activities
71.11	Architectural activities
73.11	Advertising agencies
73.12	Media representation
74.10	Specialised design activities
74.20	Photographic activities
74.30	Translation and interpretation activities
77.22	Renting of video tapes and disks
85.52	Cultural education
90.01	Performing arts
90.02	Support activities to performing arts
90.03	Artistic creation
90.04	Operation of arts facilities
91.01	Library and archives activities
91.02	Museums activities
91.03	Operation of historical sites and buildings and similar visitor attraction
91.04	Botanical and zoological gardens and nature reserve activities

Definition of 12 subsectors in cultural and creative sectors using NACE 5-digit codes

Subsector / NACE	Industry
1. Musikwirtschaft	
32.20	Herstellung von Musikinstrumenten
47.59.3	Einzelhandel mit Musikinstrumenten etc.
47.63	Einzelhandel mit bespielten Tonträgern etc.
59.20.1	Tonstudios etc.
59.20.2	Tonträgerverlage
59.20.3	Musikverlage
90.01.2	Musik-/Tanzensembles
90.02	Erbringung von Dienstleistungen für die darstellende Kunst
90.03.1	Selbständige Musiker/-innen etc.
90.04.1	Theater-/Konzertveranstalter
90.04.2	Private Musical-/Theaterhäuser, Konzerthäuser etc
2. Buchmarkt	
18.14	Buchbinderei etc.
47.61	Einzelhandel mit Büchern
47.79.2	Antiquariate
58.11	Buchverlage
74.30.1	Selbständige Übersetzer/-innen
90.03.2	Selbständige Schriftsteller/-innen
3. Kunstmarkt	
47.78.3	Einzelhandel mit Kunstgegenständen etc.
47.79.1	Einzelhandel mit Antiquitäten
90.03.3	Selbständige bildende Künstler/-innen
91.02	Museumsshops etc.
4. Filmwirtschaft	
47.63	Einzelhandel mit bespielten Tonträgern etc
59.11	Film-/TV-Produktion
59.12	Nachbearbeitung/sonstige Filmtechnik
59.13	Filmverleih und -vertrieb
59.14	Kinos
77.22	Videotheken
90.01.4	Selbständige Bühnen-, Film-, TV-Künstler/-innen
5. Rundfunkwirtschaft	
60.10	Hörfunkveranstalter
60.20	Fernsehveranstalter
90.03.5	Selbständige Journalisten/-innen und Pressefotografen/-innen
6. Markt für darstellende Künste	
85.52	Kulturunterricht/Tanzschulen
90.01.1	Theaterensembles
90.01.3	Selbständige Artisten/-innen, Zirkusbetriebe
90.01.4	Selbständige Bühnen-, Film-, TV-Künstler/-innen
90.02	Erbringung von Dienstleistungen für die darstellende Kunst
90.04.1	Theater- und Konzertveranstalter
90.04.2	Private Musical-/Theaterhäuser, Konzerthäuser etc.
90.04.3	Varietés und Kleinkunstbühnen

Subsector / NACE	Industry
7. Designwirtschaft	
32.12	Herstellung von Schmuck, Gold-, Silberschmiedewaren
71.11.2	Büros für Innenarchitektur
73.11	Werbegestaltung
74.10.1	Industrie-, Produkt- und Mode-Design
74.10.2	Grafik- und Kommunikationsdesign
74.10.3	Interior Design und Raumgestaltung
74.20.1	Selbständige Fotografen/-innen
8. Architekturmarkt	
71.11.1	Architekturbüros für Hochbau
71.11.2	Büros für Innenarchitektur
71.11.3	Architekturbüros für Orts-, Regional- und Landesplanung
71.11.4	Architekturbüros für Garten- und Landschaftsgestaltung
90.03.4	Selbständige Restauratoren/-innen
9. Pressemarkt	
47.62	Einzelhandel mit Zeitschriften und Zeitungen
58.12	Verlegen von Adressbüchern etc.
58.13	Verlegen von Zeitungen
58.14	Verlegen von Zeitschriften
58.19	Sonstiges Verlagswesen (ohne Software)
63.91	Korrespondenz- und Nachrichtenbüros
90.03.5	Selbständige Journalisten/-innen und Pressefotografen/-innen
10. Werbemarkt	
73.11	Werbeagenturen/Werbegestaltung
73.12	Vermarktung und Vermittlung von Werbezeiten/-flächen
11. Software- und Games-Industrie	
58.21	Verlegen von Computerspielen
58.29	Verlegen von sonstiger Software
62.01.1	Entwicklung und Programmierung von Internetpräsentationen
62.01.9	Sonstige Softwareentwicklung
63.12	Webportale
32.11	Herstellung von Münzen
12. Sonstige	
32.13	Herstellung Fantasieschmuck
74.20.2	Fotolabors
74.30.2	Selbständige Dolmetscher/-innen
91.01	Bibliotheken und Archive
91.03	Betrieb von historischen Stätten und Gebäuden und ähnlichen Attraktionen
91.04	Botanische und zoologische Gärten sowie Naturparks

Source: ZEW and Fraunhofer ISI (2016), Monitoring zu ausgewählten wirtschaftlichen Eckdaten der Kultur- und Kreativwirtschaft 2014, Bericht im Rahmen des Projekts „Stand und Perspektiven der deutschen Kultur- und Kreativwirtschaft 2013-2015, im Auftrag des Bundesministeriums für Wirtschaft und Energie (BMWi).

Annex D - Estimating regional CIS data

The Community Innovation Survey (CIS) is a survey about innovation activities in enterprises. The survey is designed to provide information on the innovativeness of sectors by type of enterprises, on the different types of innovation and on various aspects of the development of an innovation, such as objectives, sources of information, public funding or expenditures. National level data are available from Eurostat¹⁷. The CIS provides statistics broken down by countries, types of innovators, economic activities and size classes. The survey is currently carried out every two years across the European Union, EFTA countries and EU candidate countries.

Several of the indicators in the European cluster database use regional CIS data from the Regional Innovation Scoreboard (RIS)¹⁸. For innovation expenditures regional CIS data are not available from the RIS. These data are estimated using the 'regionalisation methodology' from the European Service Innovation Scoreboard.

Regional estimates can be produced by combining national level CIS data by industry with regional industry level data on employment and number of enterprises. A key assumption is that national 'intensities' or 'shares' observed at industry level also apply at regional level.

The methodology for regionalising CIS data is explained by using the share of firms with product innovations as an example:

- Step 1: Calculate for each country Y the share of firms with product innovations for each industry I, using CIS country level data: $PI_{Y,I}$ (for those countries for which $PI_{Y,I}$ is not available the corresponding value for the EU is used);
- Step 2a: Identify the employment share of industry I for region R: $EMPL_{R,I}$;
- Step 3a: Calculate the estimate for the share of firms with product innovations by multiplying $EMPL_{R,I}$ with $PI_{Y,I}$: $PI_{EMPL_{R,I}}$;
- Step 2b: Identify the share of local units (enterprises) of industry I for region R: $ENTR_{R,I}$;
- Step 3b: Calculate the estimate for the share of firms with product innovations by multiplying $ENTR_{R,I}$ by $PI_{Y,I}$: $PI_{ENTR_{R,I}}$;
- Step 4: Calculate the average of $PI_{EMPL_{R,I}}$ and $PI_{ENTR_{R,I}}$ as the estimate for the regional share of product innovators: $PI_{R,I}$.

The same method can be applied to calculate innovation expenditures. The example in the table below explains the 'regionalisation methodology'.

¹⁷ <https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>

¹⁸ https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en

Country				Region					
Industry	Product innovat ors	Frequen cy	Contri- bution	Industry	Frequen cy Employ- ment	Contri- bution	Frequen cy Number of firms	Contri- bution	
A	10.0%	16.67%	1.67%	A	10.0%	1.0%	15.0%	1.5%	
B	20.0%	16.67%	3.33%	B	20.0%	4.0%	5.0%	1.0%	
C	30.0%	16.67%	5.00%	C	20.0%	6.0%	30.0%	9.0%	
D	50.0%	16.67%	8.33%	D	20.0%	10.0%	20.0%	10.0%	
E	20.0%	16.67%	3.33%	E	20.0%	4.0%	20.0%	4.0%	
F	40.0%	16.67%	6.67%	F	10.0%	4.0%	10.0%	4.0%	
A to F		100.0%	28.33%	A to F	100.0%	PI_EMPL _R_I 29.0%	100.0%	PI_ENTR _R_I 29.5%	PI_R_I 29.25%

European Observatory for Clusters and Industrial Change

The European Observatory for Clusters and Industrial Change (#EOCIC) is an initiative of the European Commission's Internal Market, Industry, Entrepreneurship and SMEs Directorate-General. The Observatory provides a single access point for statistical information, analysis and mapping of clusters and cluster policy in Europe, aimed at European, national, regional and local policy-makers, as well as cluster managers and representatives of SME intermediaries.



The aim of the Observatory is to help Europe's regions and countries design better and more evidence-based cluster policies and initiatives that help countries participating in the COSME programme to:

- develop world-class clusters with competitive industrial value chains that cut across sectors;
- support Industrial modernisation;
- foster Entrepreneurship in emerging industries with growth potential;
- improve SMEs' access to clusters and internationalisation activities; and
- enable more strategic inter-regional collaboration and investments in the implementation of smart specialisation strategies.

In order to address these goals, the Observatory provides an Europe-wide comparative cluster mapping with sectoral and cross-sectoral statistical analysis of the geographical concentration of economic activities and performance, made available on the website of the European Cluster Collaboration Platform¹⁹. The Observatory provides the following services:

- **Bi-annual "European Panorama of Clusters and Industrial Change"** that analyses cluster strengths and development trends across 51 cluster sectors and 10 emerging industries, and investigates the linkages between clusters and industrial change, entrepreneurship, growth, innovation, internationalisation and economic development;
- **"Cluster and Industrial Transformation Trends Report"** which investigates the transformation of clusters, new specialisation patterns and emerging industries;
- **Cluster policy mapping** in European countries and regions as well as in selected non-European countries;
- **"Regional Eco-system Scoreboard for Clusters and Industrial Change"** that identifies and captures favourable framework conditions for industrial change, innovation, entrepreneurship and cluster development;

¹⁹ <https://www.clustercollaboration.eu/>

- **"European Stress Test for Cluster Policy"**, including a self-assessment tool targeted at cross-sectoral collaboration, innovation and entrepreneurship with a view to boosting industrial change;
- **Customised advisory support services** to twelve selected model demonstrator regions, including expert analysis, regional survey and benchmarking report, peer-review meeting, and policy briefings in support of industrial modernisation;
- **Advisory support service to European Strategic Cluster Partnerships**, in order to support networking between the partnerships and to support exchanges of successful practices for cross-regional collaborations and joint innovation investments;
- **Smart Guides** for cluster policy monitoring and evaluation, and for entrepreneurship support through clusters that provide guidance for policy-makers; and
- **Brings together Europe's cluster policy-makers and stakeholders** at four European Cluster Policy Forum events, the EU Cluster Weeks, and at the European Cluster Conference In order to facilitate high-level cluster policy dialogues, exchanges with experts and mutual cluster policy learning. Four European Cluster Policy Forums took place in February, April, November 2018 and March 2019 in Brussels, which discussions have been followed up by the European Commission Expert Group on Clusters. The European Cluster Conference took place from 14 to 16 May 2019 in Bucharest (Romania) with support of the Romanian Presidency to the EU.
- Online presentations and publications, discussion papers, newsletters, videos and further promotional material accompany and support information exchanges and policy learning on cluster development, cluster policies and industrial change.

More information about the European Observatory for Clusters and Industrial Change is available at: <https://www.clustercollaboration.eu/eu-initiatives/european-cluster-observatory>



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