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The Business Demography of the ICT Sector in Europe

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Abstract

This report explores the latest available statistics up to 2014 for the business demography of the Information and Communication Technologies (ICT) economic sector in Europe. It combines relevant databases which provide insights into the Member States' ICT performance. The first four sections of this report take into account information, primarily from Eurostat, on ICT business demography. In the fifth section, radar charts are employed to combine Eurostat figures with information from the project on Prospective Insights in ICT R&D – phase 3 (PREDICT) in order to gain further insights into the association of relevant ICT variables across European countries. Selected economic indicators from Eurostat are also included in the final section in order to reveal patterns of associations between ICT and the economy.

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Foreword

PREDICT: Prospective Insights on R&D in ICT

PREDICT produces statistics and analyses on ICT industries and their R&D in Europe since 2006. The project covers major world competitors including 40 advanced and emerging countries – the EU28 plus Norway, Russia and Switzerland in Europe, Canada, the United States and Brazil in the Americas, China, India, Japan, Korea and Taiwan in Asia, and Australia – as well as a growing array of indicators related to the ICT content of economic activities.

Rationale

ICTs determine competitive power in the knowledge economy. The ICT sector alone originates almost one fourth of total Business expenditure in R&D (BERD) for the aggregate of the 40 economies under scrutiny in the project. It also has a huge enabling role for innovation in other technological domains, let aside the impact of ICT uptake in the organisation of businesses. This is reflected at the EU policy level, where the Digital Agenda for Europe in 2010 was identified as one of the seven pillars of the Europe 2020 Strategy for growth in the Union and the achievement of a Digital Single Market (DSM) is one of the 10 political priorities set by the Commission since 2015.

Statistics and indicators

PREDICT provides indicators in a wide variety of topics, including value added, employment, labour productivity and BERD, distinguishing fine grain economic activities in ICT and media and content industries (up to 22 individual activities, 14 of which at the class level, i.e. at 4 digits in the ISIC classification) and at a higher level of aggregation for all the other industries in the economy. It also produces data on Government financing of R&D in ICTs, and total R&D expenditure at the country level. Now-casting of more relevant data in these domains is also performed, while time series go back to 1995.

Team

PREDICT is a collaboration between the JRC and the European Commission Communications Networks, Content and Technology (CNECT) Directorate General.

Since 2013 data collection and analysis has been carried out jointly by JRC and the Valencian Institute of Economic Research (Instituto Valenciano de Investigaciones Económicas - Ivie).

Executive summary

The annual business demography indicators from Eurostat provide a snapshot of the active population of ICT enterprises and also show how this population has changed as a result of births and deaths of firms. How the ICT business population changes reveals how ICT enterprises are distributed across Europe, and which ICT sectors are more successful. Time series on the employment resulting from business dynamics are also documented by Eurostat, and these statistics are relevant to the employment objectives of the European Commission's current growth strategy (EU2020). One of the main priorities of EU2020 is to provide "An agenda for new skills and jobs: to give fresh momentum to labour market reforms to help people gain the right skills for future jobs, to create new jobs and overhaul EU employment legislation". The empirical exercise described in this report offers a tool to appraise the most recent statistics on ICT business demography across Europe. At the same time, it aims to stimulate in-depth empirical analyses on the most relevant findings.

This report presents the most recent Eurostat statistics on the business demography of the Information and Communication Technologies (ICT) sector in Europe. **Key demographic data** on the **ICT sector** as a whole and also on **ICT manufacturing**, **ICT services**, and **ICT wholesale** are observed. In addition, relevant ICT sectors at the NACE 2-digit level are also discussed. Finally, Eurostat's ICT demographic statistics are combined with selected data from the project 'Perspective Insights in ICT R&D' (PREDICT) on the Member States' ICT performance, and with key macro-economic indicators (also from Eurostat).

The **key figures** about the ICT sector in the EU in 2014 are:

1. **ICT services** enterprises made up **97.2%** of the entire ICT sector;
2. **Germany, France**, and the **United Kingdom** together accounted for around **40%** of the entire ICT business population;
3. **Eastern economies** exhibit **remarkable net business population growth** in the ICT sector (e.g., Czech Republic 43%, Lithuania 31%, the Slovak Republic 18%);
4. **Computer programming, consultancy and related activities** accounted for **732,000 companies**. This amounts to **67% of the European ICT companies** with an actual **growth of 33% with respect to 2009**.

The empirical exercise described in this report confirms the relative strength of ICT services with respect to ICT manufacturing. **ICT services enterprises made up 96.3% of the entire ICT sector in the EU in 2009 and 97.2% in 2014**. Moreover, the figures show that **Germany** (which has **10% of the EU's ICT enterprises**), together with **France (13%)** and the **United Kingdom (17%)** stand out. Together, they accounted together for around 40% of the entire ICT business population of the EU in 2014. Even though Europe's biggest economies continue to be the top players in terms of ICT stock, statistics also reveal that **Eastern economies are undergoing rapid growth**. In 2014, the highest rates of net business population growth in the ICT sector were attained by the **Czech Republic (43%)**, **Lithuania (31%)**, and the **Slovak Republic (18%)**.

In ICT services, the **Computer programming, consultancy and related activities sector** (i.e. J62) **is thriving**. This has powerful implications for innovation, growth and employment of skilled labour. In the EU as a whole, there were just over **550,000 companies** in this particular sector **in 2009**. **By 2014**, this figure had increased to roughly **732,000**, an actual growth of 33%. In the EU, there were roughly 843 thousand ICT enterprises in 2009 and 1,100 thousand in 2014. Therefore sector J62 represented about **67% of the European ICT companies in 2014**.

1 Business demographics of the ICT sector at European level

1.1 Introduction

Monitoring business demographics is important for policy makers as it allows them to observe the transformations brought about by the entries and exits of firms. Business statistics¹ on the ICT sector are even more crucial, given the importance that policy assigns to it in encouraging innovation and spread it in every socio-economic domain. Nowadays ICTs are pervasive in society and abundantly present in many businesses not traditionally included in the ICT sector. In 2014 in Europe, ICT contributed some 4% of GDP and around 3% of employment, while ICT services alone contributed around 3% of GDP and 70% of ICT employment as a whole (PREDICT, Europe's Digital Progress Report 2017). Much has been written about the relationship between the adoption of ICTs and firms' productivity or aggregate economic performance, and how ICTs affect organizational change or human behaviour (Alexandru and Kagitci, 2014). Since ICTs interplay with many spheres of business and society (Seri and Zanfei, 2013), monitoring ICT business statistics is useful to detect the current dynamics in this fundamentally important sector.

This report follows up on a recent attempt to explore the Eurostat information on Business Demography is the JRC report "Birth, Survival, Growth and Death of ICT Companies" (Gabison, 2015). The present work contributes to the topic by showing longer time series and more up-to-date statistics. Data presented here span 5 years (i.e. from 2009 to 2014) for the EU and 6 years (i.e. from 2008 to 2014) for the Member States, while Gabison (2015) mostly provides figures for precise years. Furthermore, the information of this report is up to 2014, while the former report is up to 2011. The present work presents statistics about the EU, the Member States, and key sectors of the ICT services. In particular, the information revolves around four series with the best coverage of time, country, and sectors: 1. The population of active enterprises; 2. The number of births of enterprises; 3. The number of deaths of enterprises; 4. The number of employees in the population of active enterprises.

Statistics about the creation and disruption of ICT firms tell policy makers about entrepreneurial dynamics in the economic system. Policy making within the context of the Europe 2020 strategy is committed to boosting innovation and employment (Lachenmaier and Rottmann, 2011) as two of the top drivers of EU growth (European Commission, 2010). ICT industries regularly engage in research and development activities to pursue innovations of their products and processes, either by means of internal efforts or of networks (Golonka, 2015). In the course of these activities, ICT firms create and disrupt jobs directly (Evangelista and Savona, 2003). At the same time ICT enterprises can promote or destroy entire employment domains (Heeks, 2002). Consequently, demographic business data is an important tool that helps European policy makers appraise and anticipate the vitality and competitiveness of European ICT industries. Indicators of the active population of ICT enterprises, along with measures of net creation of ICT businesses (i.e. ICT births, deaths, and churn) and of the resulting employment, give a sense of ICT entrepreneurial dynamism that – once injected into the economic system – promotes the performance of sectors and countries.

The goal of this report is to lay the groundwork for the effective use of business statistics for policy making. The information provided by demographic data enables policy makers to be more aware of the forces at work inside the ICT sectors, which subsequently affect the rest of the economy. Moreover, the exploration of the indicators currently provided

¹ COMMISSION IMPLEMENTING REGULATION (EU) No 439/2014 of 29 April 2014 amending Regulation (EC) No 250/2009 implementing Regulation (EC) No 295/2008 of the European Parliament and of the Council concerning structural business statistics, as regards the definitions of characteristics and the technical format for the transmission of data (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:JOL_2014_128_R_0013&from=EN).

by Eurostat stimulates reflection on viable new metrics (e.g., composite indicators, multivariate models) that could be developed in the future for meaningful analyses and comparisons across Member States. Meanwhile, the empirical exercise on ICT business demography described in this report offers evidence that can support policies which aim to enhance innovation, employment, and smart growth.

This report is structured as follows: Section 1, Section 2, and Section 3 present and elaborate on the Eurostat data from the section "Business demography by legal form (from 2004 onwards, NACE Rev. 2) (bd_9ac_l_form_r2)"². Table 2 lists the indicators considered in these three sections. Section 4 discusses information on high-growth firms provided by Eurostat in the sections "High-growth enterprises (growth by 10% or more) and related employment by NACE Rev. 2 (bd_9pm_r2)"³ and "Indicators with growth by 20% or more (from 2008 onwards, NACE Rev. 2) (bd_9n_r2)"⁴. Section 5 considers together standardised indicators from: 1. Business demography by legal form; 2. PREDICT; and 3. the general economy. This latter exercise aims to show the relative performance of countries, and to gain a sense of the association among these different variables. Finally, the main conclusions are stated at the end of the report.

1.2 The Eurostat database of business demography

The elaborations and figures in this report are based on the data in the Business Demography (BD) database collected by Eurostat. This database can be found in the Structural Business Statistics in the breakdown of "Industry, trade and services"⁵. It targets the private sector economy, and contains information from the business registers of the participating countries. Though the BD database documents the population of enterprises⁶ in EU Member States⁷ from 2004 to 2014 across different aggregates and sectors of activity, this study explicitly focuses on the business demography of the ICT sectors.

This exercise considers the four ICT aggregates provided in Eurostat (Table 1):

1. Information and Communication Technology – Total (ICT), which includes the NACE activities from C261 to C264, C268, G465, J582, J61, J62, J631 and S951.
2. ICT manufacturing (C ICT) which includes NACE activities from C261 to C264 and C268.
3. ICT services (G-U ICT) which includes NACE activities G465, J582, J61, J62, J631 and S951.

² http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=bd_9ac_l_form_r2&lang=en

³ http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=bd_9pm_r2&lang=en

⁴ http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=bd_9n_r2&lang=en

⁵ <http://ec.europa.eu/eurostat/web/structural-business-statistics/data/database>
http://ec.europa.eu/eurostat/web/structural-business-statistics/entrepreneurship/business-demography?p_p_id=NavTreeportletprod_WAR_NavTreeportletprod_INSTANCE_98P2XZ2YW9tR&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-2&p_p_col_pos=1&p_p_col_count=2

⁶ The [EUROSTAT - OECD \(2007\) Manual on Business Demography Statistics](#) on page 12 "recommends that the statistical unit to be used for business demography data collections is the enterprise. At the European level, this unit is defined as follows in the statistical units Regulation (Council Regulation (EEC) No 696/93 of 15 March 1993 on the statistical units for the observation and analysis of the production system in the Community), and is consistent with definitions uses in the 1993 System of National Accounts and International Standard of Industrial Classifications: *"The enterprise is the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit."*

⁷ Data coverage varies from country to country and across years. [Country specific notes](#) are provided by Eurostat about all Member States. Information about Greece is not in the Eurostat Database of Business Demography.

4. ICT wholesale (G46_ICT) - this is a subset of ICT services and accounts for sector G465 only.

Business statistics aim to track the major demographic events related to the population of firms⁸, and their impact on employment levels (Schrör, 2008 and 2009). Furthermore, Business Demography information allows us to compare the numbers of new businesses in different sectors. Therefore, Business demographic statistics are valid tools for both the European growth strategy and the joint OECD-Eurostat "Entrepreneurship Indicators Programme", as they allow the collection of internationally-comparable indicators (EUROSTAT – OECD, 2007).

Depending on the availability of information for countries and years, this report focuses on specific Eurostat series and sectors. Table 2 lists the Eurostat indicators and the derived variables employed to picture the salient demographic traits of ICT sectors in Europe as a whole and across the Member States.

Table 1: ICT aggregates and corresponding NACE sectors

ICT aggregates (Eurostat)		Corresponding ICT sectors (NACE Rev. 2)	
ICT total (ICT)	ICT Manufacturing (C_ICT)	26.1 [3-digit sector; Manufacture of electronic components and boards]	
		26.2 [3-digit sector; Manufacture of computers and peripheral equipment]	
		26.3 [3-digit sector; Manufacture of communication equipment]	
		26.4 [3-digit sector; Manufacture of consumer electronics]	
		26.8 [3-digit sector; Manufacture of magnetic and optical media]	
	ICT services (G-U_ICT)	ICT wholesale (G46_ICT)	46.5 [3-digit sector; ICT trade industries]
			58.2 [3-digit sector; Software publishing]
			61 [2-digit sector; Telecommunications]
			62 [2-digit sector; Computer programming, consultancy and related activities]
			63.1 [3-digit sector; Data processing, hosting and related activities; web portals]
	95.1 [3-digit sector; Repair of computers and communication equipment]		

⁸ Please note that the word enterprise is used interchangeably with its synonyms (e.g., firm, company) in reference to the same concept.

Table 2: Selected Eurostat indicators and derived variables

In bold are the indicators from Eurostat presented in this report without any further elaboration. For the remaining indicators, the second column specifies how they were calculated.

Indicator	Calculations on Eurostat indicators	Referring figures
V11910 - Population of active enterprises in t		Figure 1; Figure 4; Figure 5 ; Figure 12; Figure 14
V11920 - Number of births of enterprises in t		Figure 2; Figure 6; Figure 12
V11930 - Number of deaths of enterprises in t		Figure 2; Figure 6; Figure 12
V16911 - Number of employees in the population of active enterprises in t		Figure 1; Figure 15; Figure 17
Share of ICT manufacturing	$[V11910(\text{ICT manufacturing}) / V11910(\text{ICT total})]*100$	Figure 3; Figure 8
Share of ICT services	$[V11910(\text{ICT services}) / V11910(\text{ICT total})]*100$	Figure 3; Figure 8
Share of ICT wholesale	$[V11910(\text{ICT wholesale}) / V11910(\text{ICT services})]*100$	Figure 3; Figure 9
V11910 - Population of active enterprises (EU28-share, 2014)	$[V11910(\text{country}) / V11910(\text{EU28})]*100$	Figure 7 ; Figure 11
V11920 - Number of births of enterprises (EU28-share, 2014)	$[V11920(\text{country}) / V11920(\text{EU28})]*100$	Figure 7
V11930 - Number of deaths of enterprises (EU28-share, 2014)	$[V11930(\text{country}) / V11930(\text{EU28})]*100$	Figure 7
V16911 - Number of employees in the population of active enterprises (EU28-share, 2014)	$[V11911(\text{country}) / V11911(\text{EU28})]*100$	Figure 7
V97010 - Net business population growth		Figure 7
ICT services except wholesale (EU28-share, 2014)	$\{[V11910(\text{ICT services}) - V11910(\text{ICT wholesale})] / [V11910(\text{ICT services}) - V11910(\text{ICT wholesale})]_{\text{EU28}}\} * 100$	Figure 10
ICT wholesale (EU28-share, 2014)	$[V11910(\text{ICT wholesale})] / V11910(\text{ICT wholesale})_{\text{EU28}} * 100$	Figure 10

Table 2: Selected Eurostat indicators and derived variables (continued)

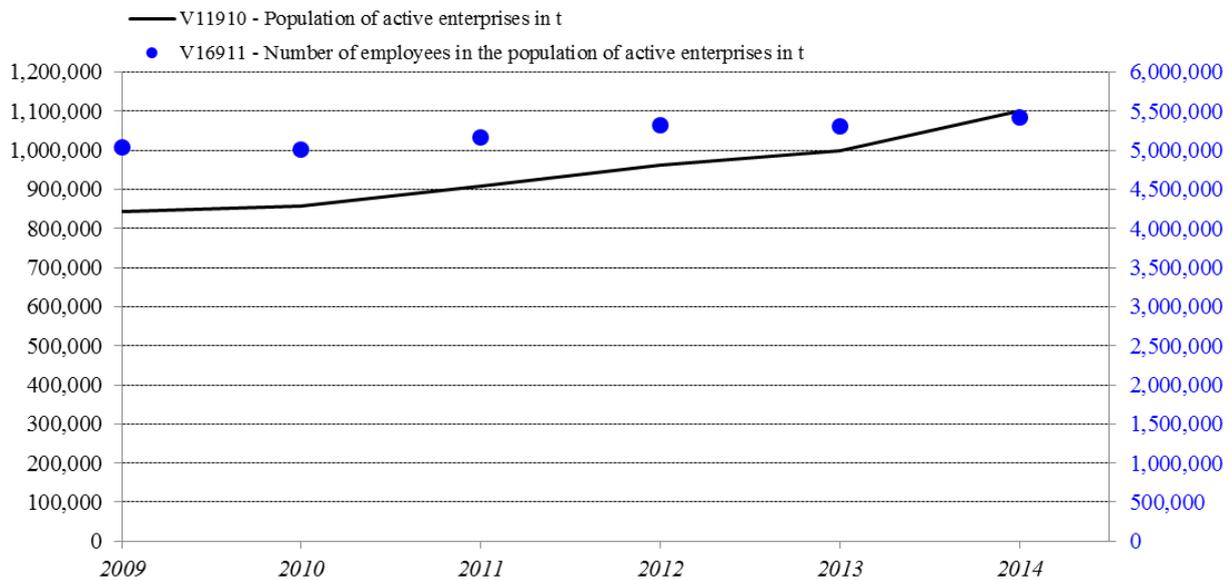
Indicator	Calculations on Eurostat indicators	Referring figure
V97015 - Business churn: birth rate + death rate		Figure 13
V97020 - Birth rate: number of enterprise births in the reference period (t) divided by the number of enterprises active in t		Figure 13
V97030 - Death rate: number of enterprise deaths in the reference period (t) divided by the number of enterprises active in t		Figure 13
Share of employees in the ICT services	$[V16911(\text{ICT services}) / V16911 (\text{ICT total})]*100$	Figure 16
Share of employees in the ICT manufacturing	$[V16911(\text{ICT manufacturing}) / V16911 (\text{ICT total})]*100$	Figure 16
Share of employees in sector J61 on ICT services	$[V16911(\text{J61}) / V16911 (\text{ICT total})]*100$	Figure 18
Share of employees in sector J62 on ICT services	$[V16911(\text{J62}) / V16911 (\text{ICT total})]*100$	Figure 18

Source: Eurostat, and own elaborations on Eurostat data

1.3 The ICT business population and its employees in Europe

This section presents the evolution⁹ of the ICT business population and of the employment it creates in the European Union (i.e. EU28)¹⁰. The snapshot in Figure 1¹¹ shows the ICT business population quite steady until 2010 and growing immediately afterwards. There were approximately 843 thousand in 2009 and 1100 thousand in 2014. Since 2011, also ICT employees have risen more. Births and deaths of ICT firms (Figure 2) fluctuate at about the same levels from 2009 to 2012, and start to rise from 2012 on¹². The increase in both births and deaths conveys the impression of entrepreneurial revival mirrored by a high churn rate (i.e. birth rate plus death rate).

Figure 1: Evolution of the number of active enterprises and employees in the Information and Communication Technology sector - Total (ICT) in the EU from 2009 to 2014



Source: Eurostat, Business demography by legal form (from 2004 onwards, NACE Rev. 2) [bd_9ac_l_form_r2]

The *Population of active enterprises* is represented on the left y-axis.

The *Number of employees in the population of active enterprises* is represented on the right y-axis.

⁹ Data presented in this section are from the Eurostat updated of the 25/10/16.

¹⁰ EU-28 (from 1 July 2013): EU-27 + Croatia (HR)
http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:EU_enlargements

¹¹ For both series displayed in Figure 1 the aggregate for EU28 is available for years 2012, 2013, and 2014.

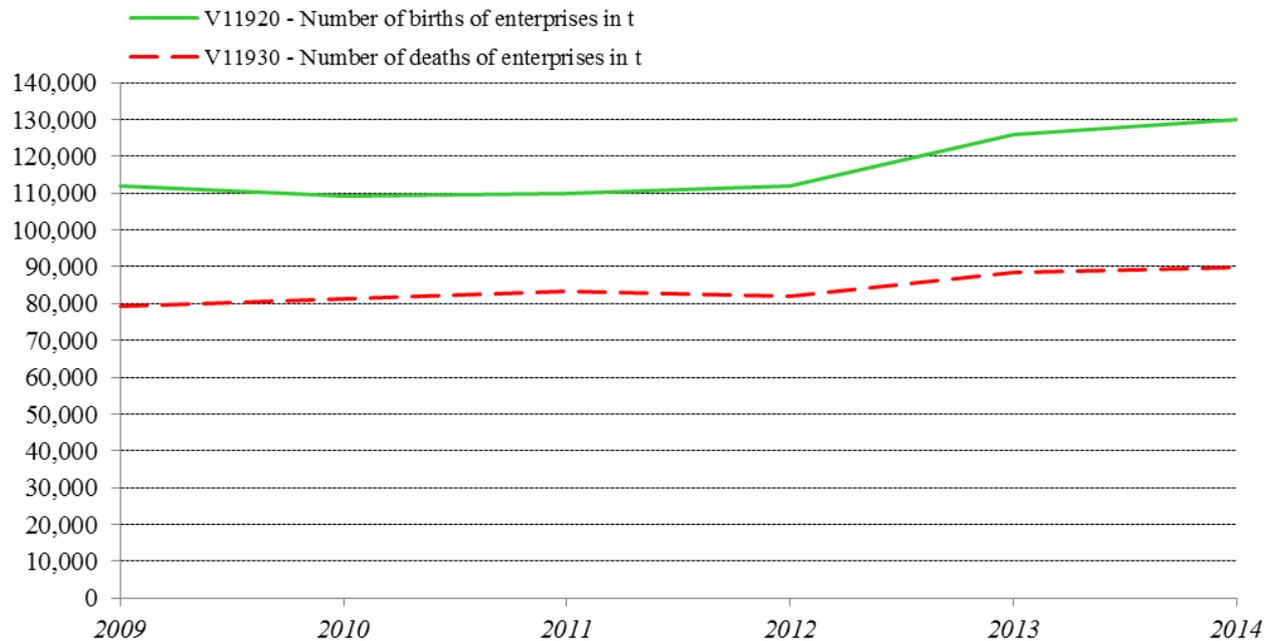
Values for EU28 in 2009, 2010, and 2011 are imputed by employing Eurostat statistics about the EU27, as follows:

1. $\overline{EU27} = EU28-HR$ (for 2012, 2013, and 2014);
2. $ratio_i = \overline{EU27} / EU28$ (for $i =$ for 2012, 2013, and 2014);
3. $avg_ratio = average(ratio_i)$ (for 2012, 2013, and 2014);
4. $EU28 = EU27 / avg_ratio$ (for 2009, 2010, 2011).

¹² The series V11920 (i.e. *Number of births of enterprises*, Figure 2) is reported for 2012, 2013, and 2014. Therefore, 2009, 2010, and 2011 of this series are imputed by means of the procedure described footnote 10. Note that for 2011 (for which neither EU28 nor EU27 is available in Eurostat), the aggregate EU27 is set to its own average between 2010 and 2011 in order to proceed with the calculation of EU28.

The series V11930 (i.e. *Number of deaths of enterprises*) is reported for 2010, 2011, 2012, 2013, and 2014. Therefore, the value for 2009 is obtained by applying the average growth rate year-over-year of the available values.

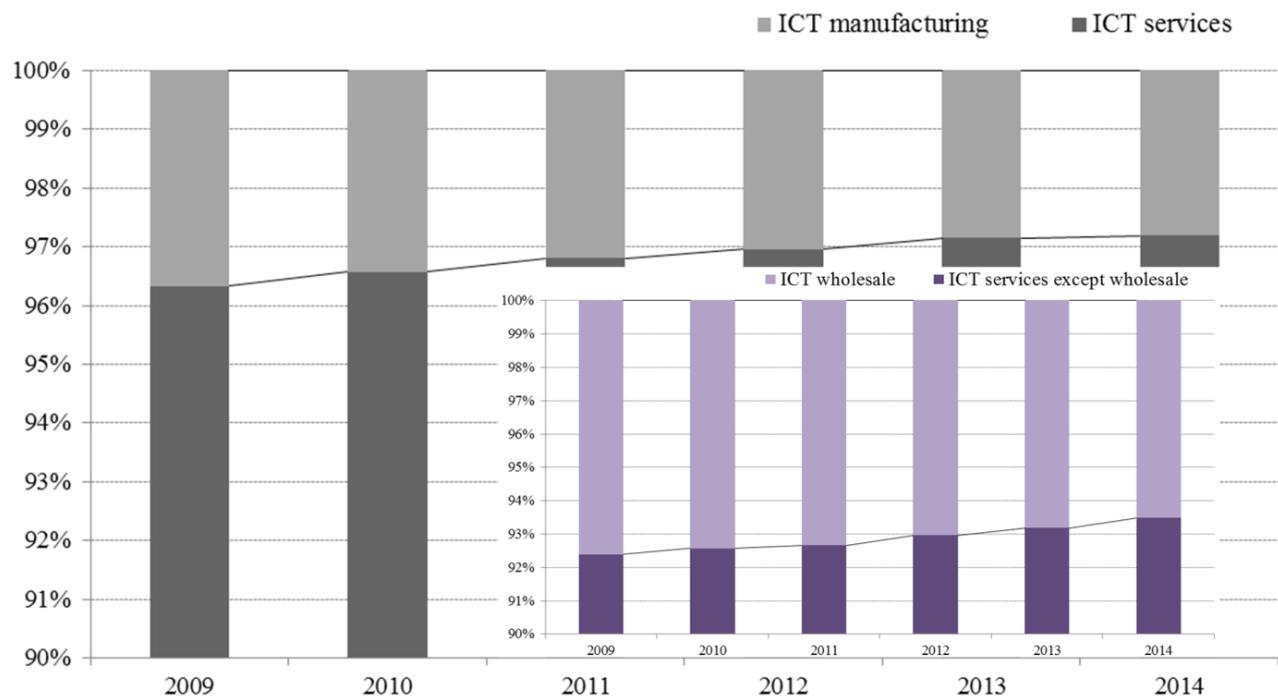
Figure 2: Evolution of the number of births and deaths in the ICT sector in the EU from 2009 to 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2]

Figure 3 charts the shifts in the composition of the ICT entrepreneurial population as a whole from 2009 to 2014. ICT services made up the largest share of this population, which grew from 96.3% in 2009 to 97.2% in 2014. In the same period, the share of active ICT wholesale firms in the ICT services aggregate shrank. In 2009, active wholesale enterprises made up 7.6% of the businesses in ICT services, but in 2014 this share fell to 6.5%.

Figure 3: Evolution of the share of ICT services in the EU from 2009 to 2014



Source: Eurostat, Business demography by legal form [V11910 - bd_9ac_l_form_r2]

Figure 4 presents more detailed statistics of active enterprises in both ICT manufacturing and ICT services. ICT manufacturing encompasses sectors 261, 262, 263, 264, and 268 of NACE Rev. 2 classification, but the Eurostat Business Demography database provides information for sectors 26 and 27 together (i.e. aggregate C26_C27)¹³. Therefore, this broad aggregate is plotted in black in Figure 4 as a wider representative of the ICT manufacturing aggregate. The number of firms belonging to this manufacturing aggregate dropped by almost 4% in 2010. They declined every year from 2009 but recovered by almost 3% in 2014.

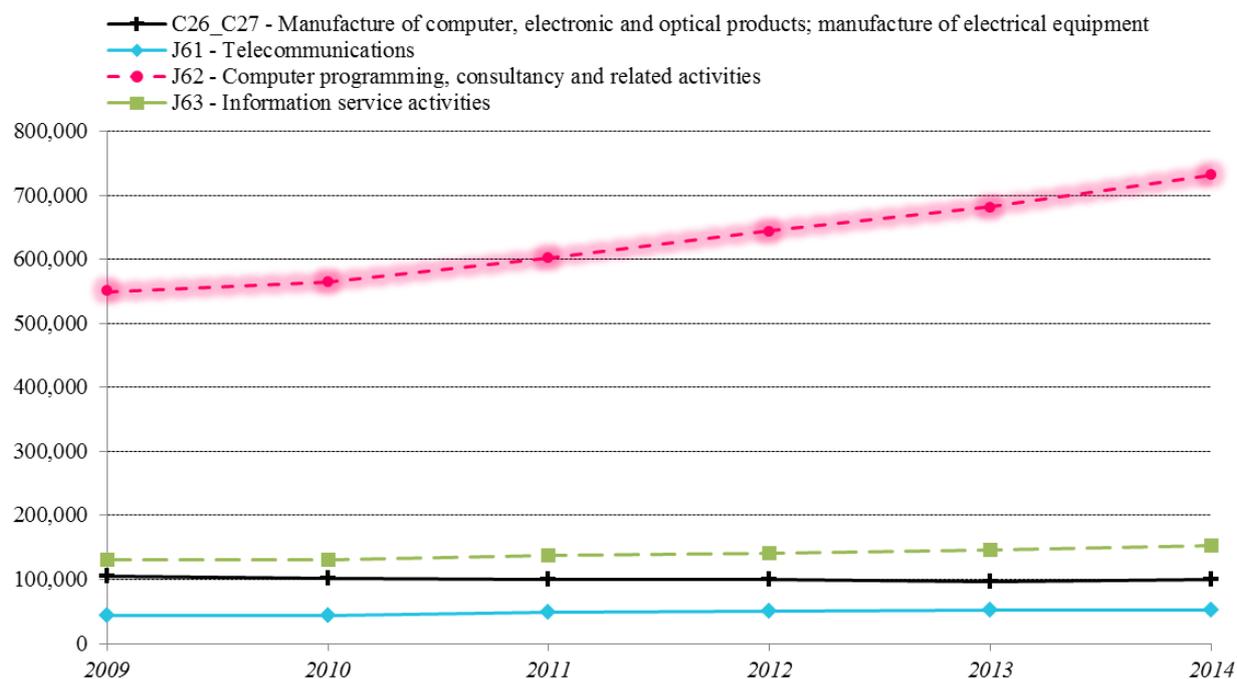
Regarding ICT services, two of its most booming sectors (i.e. J61 and J62) are reported in Eurostat and plotted in the figure. The number of companies operating in the Telecommunications sector (i.e. J61) experienced a jump of approximately 9% in 2011, and then stabilised at around 52,200 units. The "Computer programming, consultancy, and related activities" sector (i.e. J62) has both the largest and the fastest-growing population (Figure 4). Firms active in sector J62 increased by 3% approximately in 2010, and then expanded by around 6% - 7% per year. For sector J62, Eurostat provides data at 4-digit level. From the more detailed information, it emerges that the most thriving sub-sectors in J62 are "Computer programming activities" (i.e. J6201) and "Computer facilities management activities" (i.e. J6203)¹⁴ whose firms increased every year between 11% and 12%. Likewise, from 2010 the number of active firms in the "Information service activities sector" (i.e. J63)¹⁵ grew each year between 3% and 5%.

¹³ The aggregate C26_C27 is defined as "Manufacture of computer, electronic and optical products; manufacture of electrical equipment".

¹⁴ The 4-digit sectors of J62 which are encompassed in the definition of ICT services -and detailed also by Eurostat Business Demography- are: 1. "Computer programming activities" (i.e. 6201); 2. "Computer consultancy activities" (i.e. 6202); 3. "Computer facilities management activities" (i.e. 6203); 4. "Other information technology and computer service activities" (i.e. 6209).

¹⁵ Only the 3-digit sector J631 belongs to the aggregate of ICT services. The wider sector J63 is considered in this document because J631 is not reported by the Eurostat Business Demography.

Figure 4: Evolution of the number of active enterprises in selected ICT sectors (NACE Rev. 2) in the EU from 2009 to 2014



Source: Eurostat, Business demography by legal form [V11910 - bd_9ac_l_form_r2]

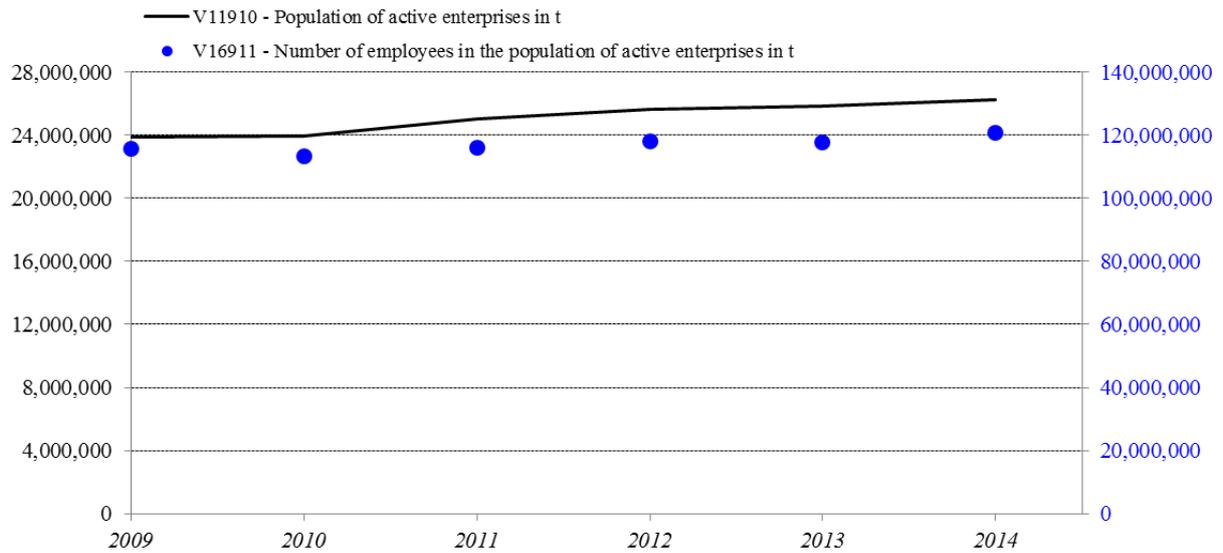
1.4 Comparing the ICT sector to the business economy

Even though the ICT sector is the main objective of this exercise, it is interesting to see how it compares with another relevant benchmark. Hence, Figure 5 and Figure 6 about the business economy¹⁶ draw parallels with Figure 1 and Figure 2 about the ICT sector. The demographics of the business economy and of its employment display patterns which are similar to those of the ICT sector. The numbers of active enterprises in the business economy were less than 24 thousands in 2009 and increased only slightly up until 2010 in the aftermath of the economic downturn. Like the ICT sector, though the number of firms in the business economy began to grow from 2009, this growth became steeper from 2010. The number employees of active firms decreased in 2010 and in 2013 in both the business economy and the ICT sector, with more pronounced growth in both cases from 2011. Growth in the numbers of births and deaths (Figure 6) of enterprises was stronger in the business economy than it was in the ICT sector. The number of births in both aggregates increased from 2012 to 2014.

Altogether, these figures (on both the ICT sector and the business economy for the available years) give mild signals of a new entrepreneurial upturn, with corresponding increases in employment, in 2010. Adequate policies can identify the characteristics of the new job demand and transmit it to the education systems in charge of training for new professional roles. Furthermore, once new employees are trained, appropriate policies help the contact between the demand for and the offer of specific competences.

¹⁶ The Eurostat aggregate of "Business economy except activities of holding companies" (i.e. B-N_X_K642, this aggregate includes all NACE activities except sections A, K642, O P, Q, R, S, T and U) is considered here. The same imputation procedure described for Figure 1 and Figure 2 is followed to reconstruct the values represented in Figure 4 and Figure 5 for 2009, 2010, and 2011. For the series V11920 (i.e. *Number of births of enterprises in t*) the procedure is on this occasion exactly the same followed for V11910, and for V16911, since EU27 is provided by Eurostat for 2009, 2010, and 2011.

Figure 5: Evolution of the number of active enterprises and employees in the business economy (except activities of holding companies) in EU from 2009 to 2014

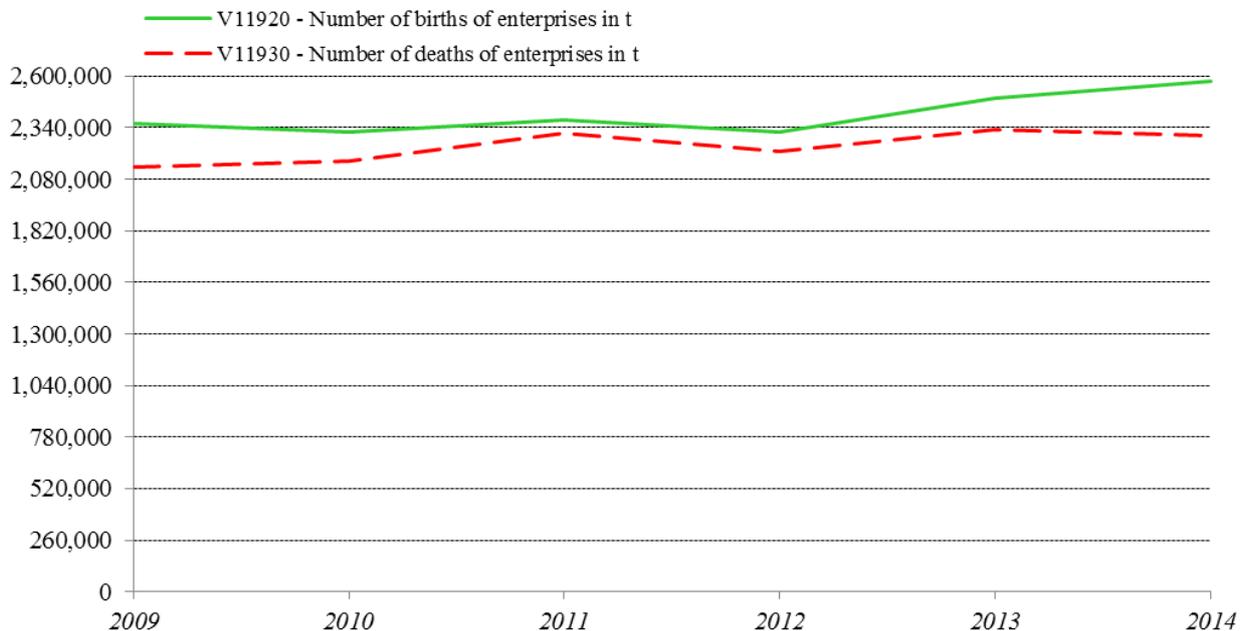


Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2]

The *Population of active enterprises* is represented on the left y-axis.

The *Number of employees in the population of active enterprises* is represented on the right y-axis.

Figure 6: Evolution of the number of births and deaths in the business economy (except activities of holding companies) in the EU from 2009 to 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2].

2 ICT demographic trends across the EU Member States

After a preliminary exploration of ICT sector business demographics in the EU, this section analyses the performance of the individual Member States during the most recent years of statistical reporting. A question naturally arises as to whether some countries lead the European trends as regards ICT business demographics - and if so, which ones. This section proposes a set of denominators to scale and assess the ICT demographics of Member States. First, Figure 7 displays some key figures on how the numbers of ICT firms in individual Member States compared with the EU28 aggregate in 2014. Figure 8, Figure 9, and Figure 10 show how the ICT business population is distributed between manufacturing and services -and the share of wholesale within the ICT services- in each Member State in 2014. The section concludes with evidence in Figure 11 on the share of firms in relevant ICT sectors.

2.1 The ICT business population across the Member States

Figure 7 sorts the Member States¹⁷ according to their share of *active ICT enterprises* (i.e. series V11910 whose EU28 aggregate levels are in Figure 1). This graph shows what each country contributes to the European population of ICT active enterprises, along with shares of births, deaths and employees of ICT companies¹⁸. Countries are ranked from the Member State with the highest share of the ICT population in EU (i.e. United Kingdom) to the country with the lowest share (i.e. Cyprus). In addition, Figure 7 also displays official information from Eurostat about the *ICT Net business population growth* (i.e. V97010). By means of example, the UK had 17% of EU active ICT enterprises, almost 23% of EU ICT births, 21% of EU ICT deaths, and 19% of EU employees working in firms in 2014. Moreover, in the same year in the UK, the net growth of the active ICT enterprises was almost 7%.

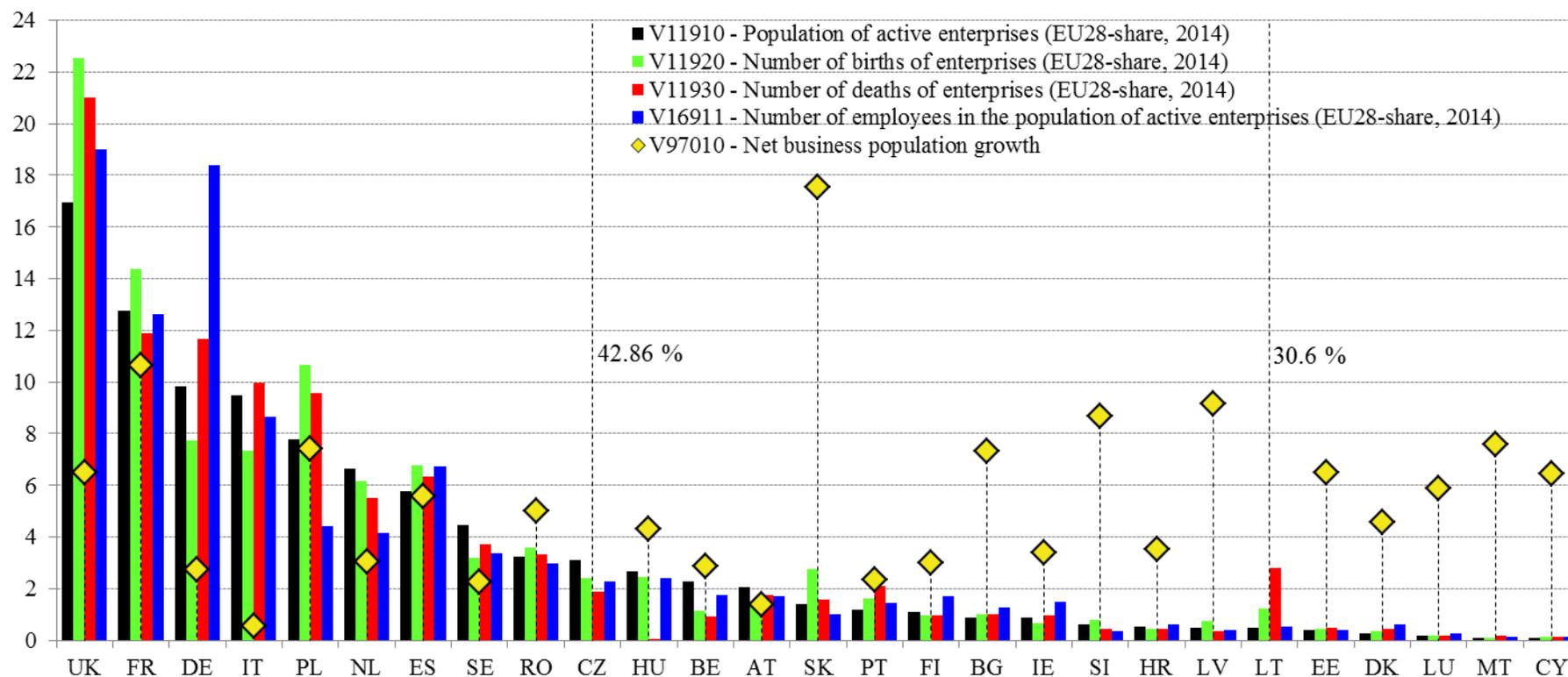
A correspondence can be established between Figure 7 and PREDICT figures presented in the Europe's Digital Progress Report (2017) on "The EU ICT sector and its R&D performance". The five largest European economies were the biggest contributors to the value added and employment of the whole ICT sector in 2014. In 2014, the top contributors to the European ICT population of firms were the United Kingdom, France, Germany, Italy, Poland, and the Netherlands. Spain (i.e. the 5th country for value added and the employment in the ICT sector in 2013) followed immediately after.

Across countries, it is interesting to observe how the stock of ICT businesses pairs with very heterogeneous dynamics of the annual changes in the ICT population itself. The UK and France are among the Member States with the highest shares of ICT firms in Europe, and they also display quite lively growth rates - 6.5% and 10.66% respectively - in the ICT population itself. The net growth of the number of ICT enterprises in the third and fourth countries, namely Germany (2.74%) and Italy (0.55%) is considerably lower than that of the top two countries. However, very high net growth in the numbers of ICT firms has been achieved by the Czech Republic (42.86%), Slovakia (17.55%), and Latvia (i.e. 30.6%) which signals the existence of dynamism in the ICT sectors of these economies and the eastern economies in general. Admittedly the ICT population of eastern economies is smaller even so its variations are still significant. On the other hand, not all the countries with smaller ICT population achieved net growths which are comparable to the eastern economies. It is worthwhile noticing that the net growth of the ICT enterprises was positive in all the Member States in 2014.

¹⁷ Information about Greece is not reported by the Eurostat database.

¹⁸ Eurostat data of ICT business population, of ICT births, of ICT deaths, and of the employees are divided by the respective EU28 aggregates presented in Figure 1 and Figure 2.

Figure 7: Member States by their shares (%) of the EU's active ICT enterprises in 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2]. Series V97010 is updated on 25/10/2016.

The last available years are considered when data for 2014 are not available in Eurostat. For the following countries, the years considered are in brackets for respective series:

1. Ireland: V11910 (2013), V11920 (2013), V11930 (2011), V16911 (2013), V97010 (2013);
2. Luxemburg V16911 (2010);
3. Malta V11920 (2013), V11930 (2013);
4. Poland V11930 (2013).

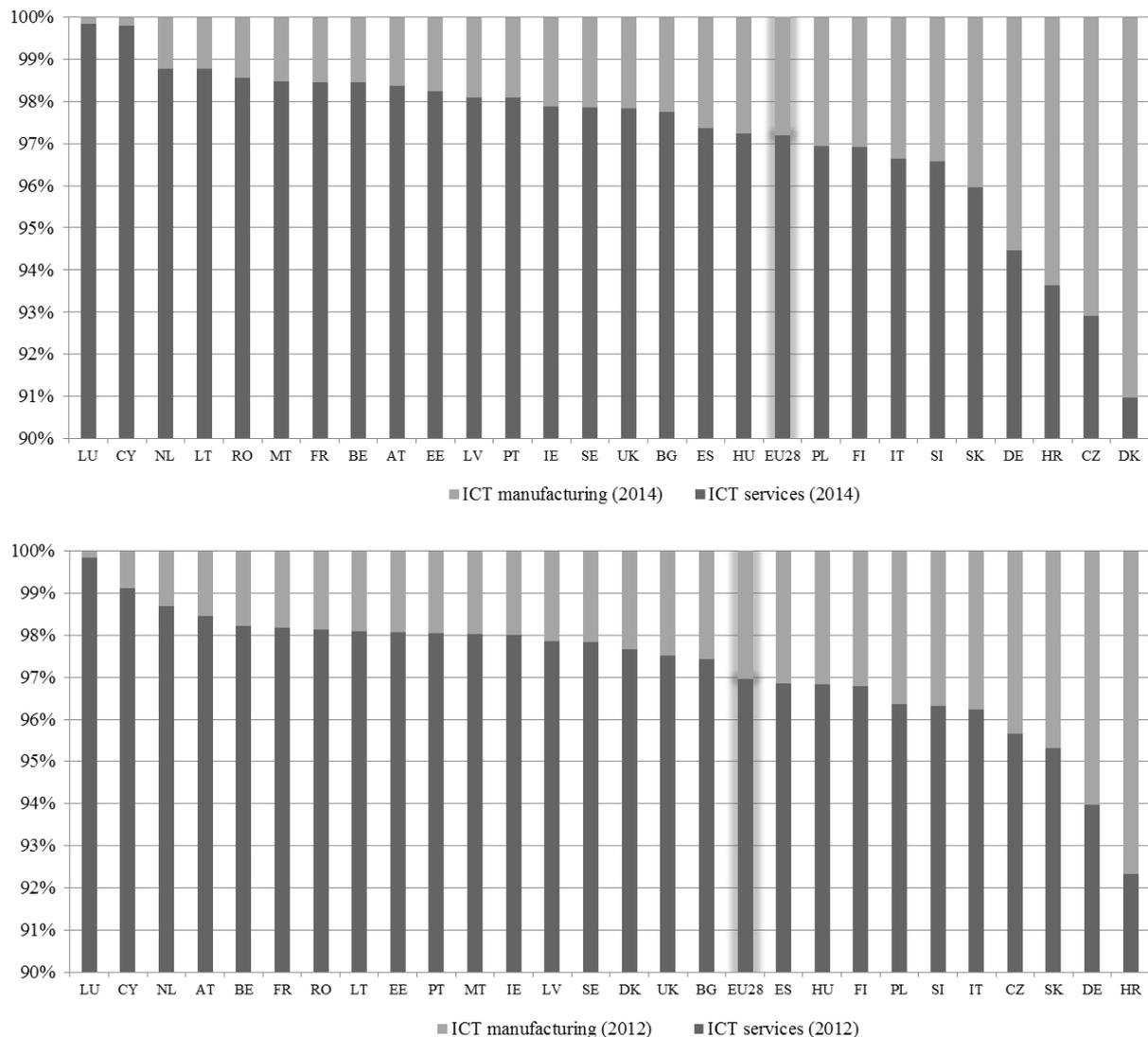
2.2 Manufacturing and services in the ICT sectors of the EU Member States

This section aims to gain insights into how the ICT business population splits between manufacturing and services in the Member States. Definitely, ICT services firms represent the biggest share of the ICT business population. However, evidence shows that "a country's ability to develop a competitive service economy depends on the structure of its manufacturing sector as some manufacturing industries are more intensive users of these services" (Guerrieri and Meliciani, 2005).

Figure 8 shows how the population of active ICT sector enterprises is split between services and manufacturing in the Member States and for the aggregate of EU28. Two snapshots were taken in 2014 (i.e. the last available data reported in Eurostat) and 2012 in order to appraise how ICT sector composition has evolved in the short term across Europe. In both years, countries are in descending order according to their share of active ICT services firms, over their total active ICT sector enterprises. The comparison of these two pictures shows that the population of ICT services firms increased in most European Member States.

From 2012 to 2014 the share of ICT service firms in the active population of ICT enterprises grew almost everywhere in Europe. On the other hand, Denmark and Czech Republic constitute two examples of the inverse trend. The European economies in which the number of ICT manufacturing firms exceeds 3% of their domestic ICT business population are: Denmark (i.e. about 9%), Czech Republic (i.e. around 7%), Croatia and Germany (i.e. approximately 6%), Slovakia (i.e. 4%), and finally Slovenia, Italy, Finland, and Poland (i.e. about 3%). In these countries the share of ICT manufacturing firms is also higher than the EU28 aggregate (2.81%).

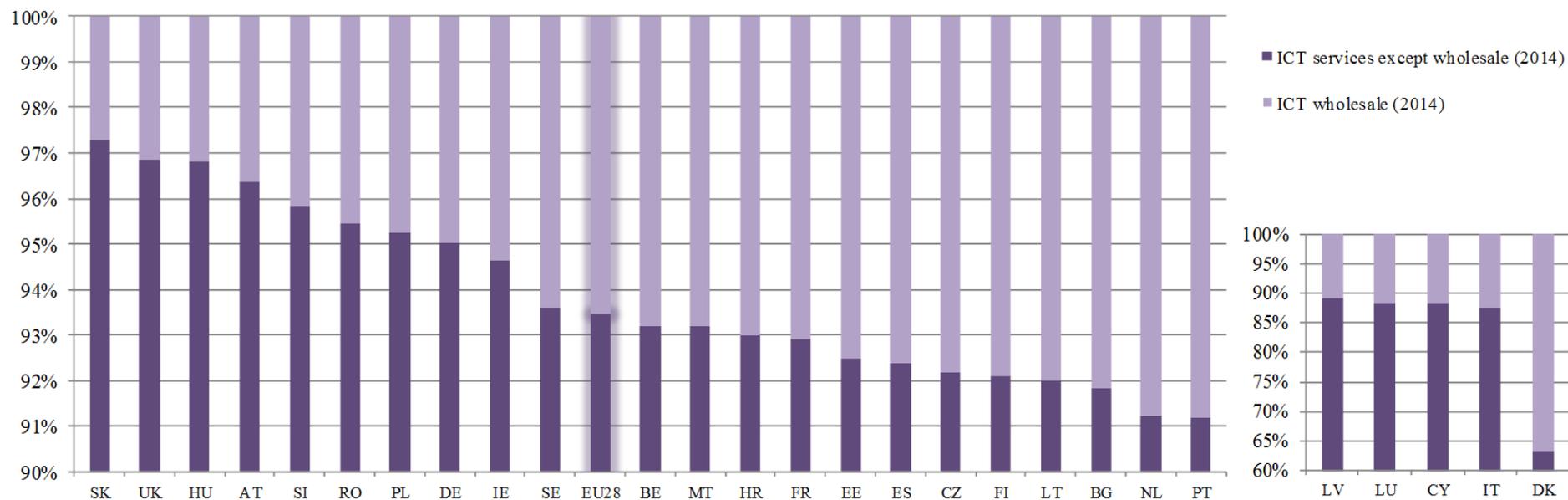
Figure 8: Member States by their internal share (%) of ICT services vs. manufacturing, in 2014 and 2012



Source: Eurostat Business demography by legal form [bd_9ac_l_form_r2].
 In the upper graph, the ICT last available data for Ireland and Malta are from 2013.

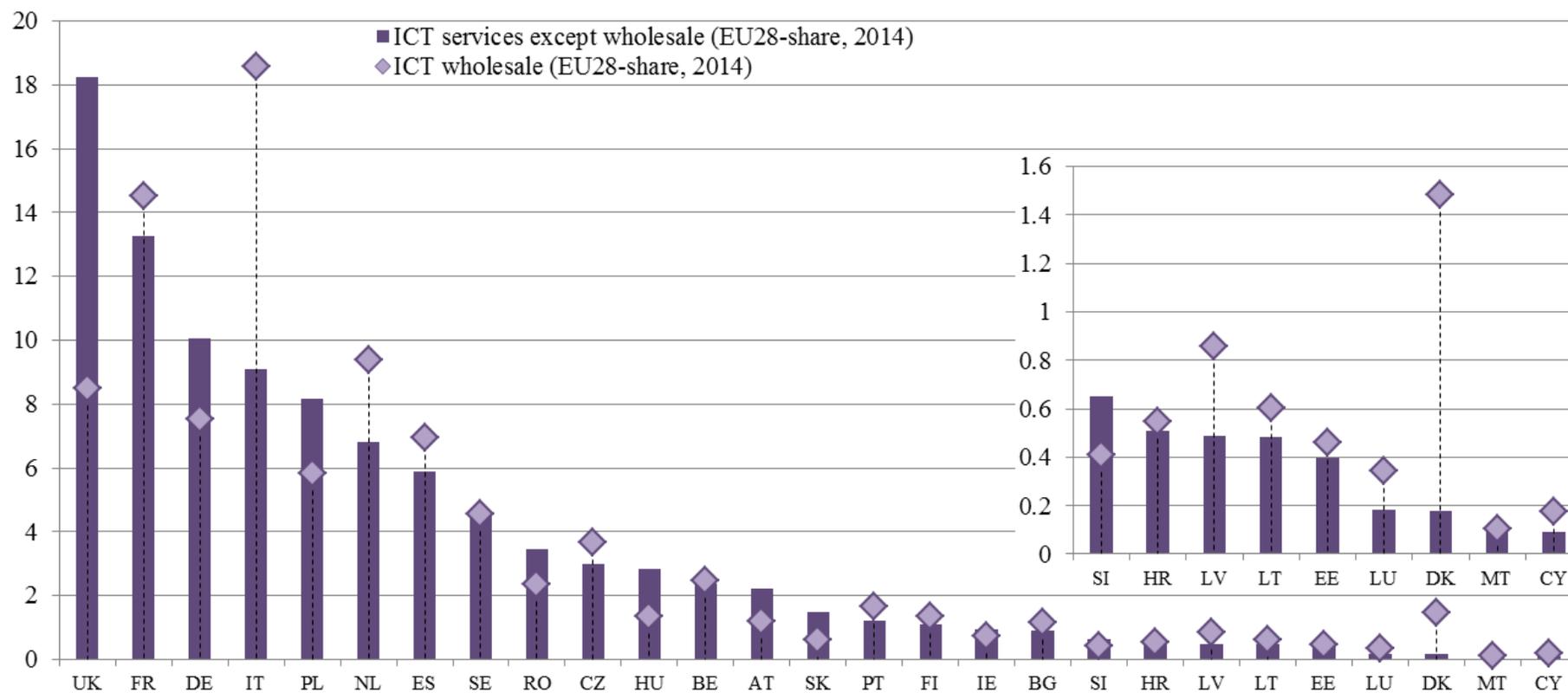
Figure 9 orders the Member States according to their internal shares of "ICT services except wholesale" and wholesale. This figure breaks down the components of ICT services to depict a sharper portrait of the ICT specialty of Member States. Luxembourg is 1st for its ratio between the number of its ICT services firms and its internal ICT business population (Figure 8). However, it comes fourth from last as regards the number of enterprises in ICT services considered without wholesales over the entire population of ICT services enterprises (Figure 9). Finally, Figure 10 sorts Member States according to their shares of EU enterprises in "ICT services except wholesale", and shows together also the EU-share that each Member State has in "ICT wholesales". The three biggest European economies retain the top positions, while Luxembourg remains the fourth from last.

Figure 9: Member States by their internal share (%) of active enterprises in "ICT services except wholesale" in 2014



Source: Eurostat Business demography by legal form [bd_9ac_l_form_r2]

Figure 10: Member States by their share (%) of EU active enterprises in "ICT services except wholesale" in 2014



Source: Eurostat Business demography by legal form [bd_9ac_l_form_r2]

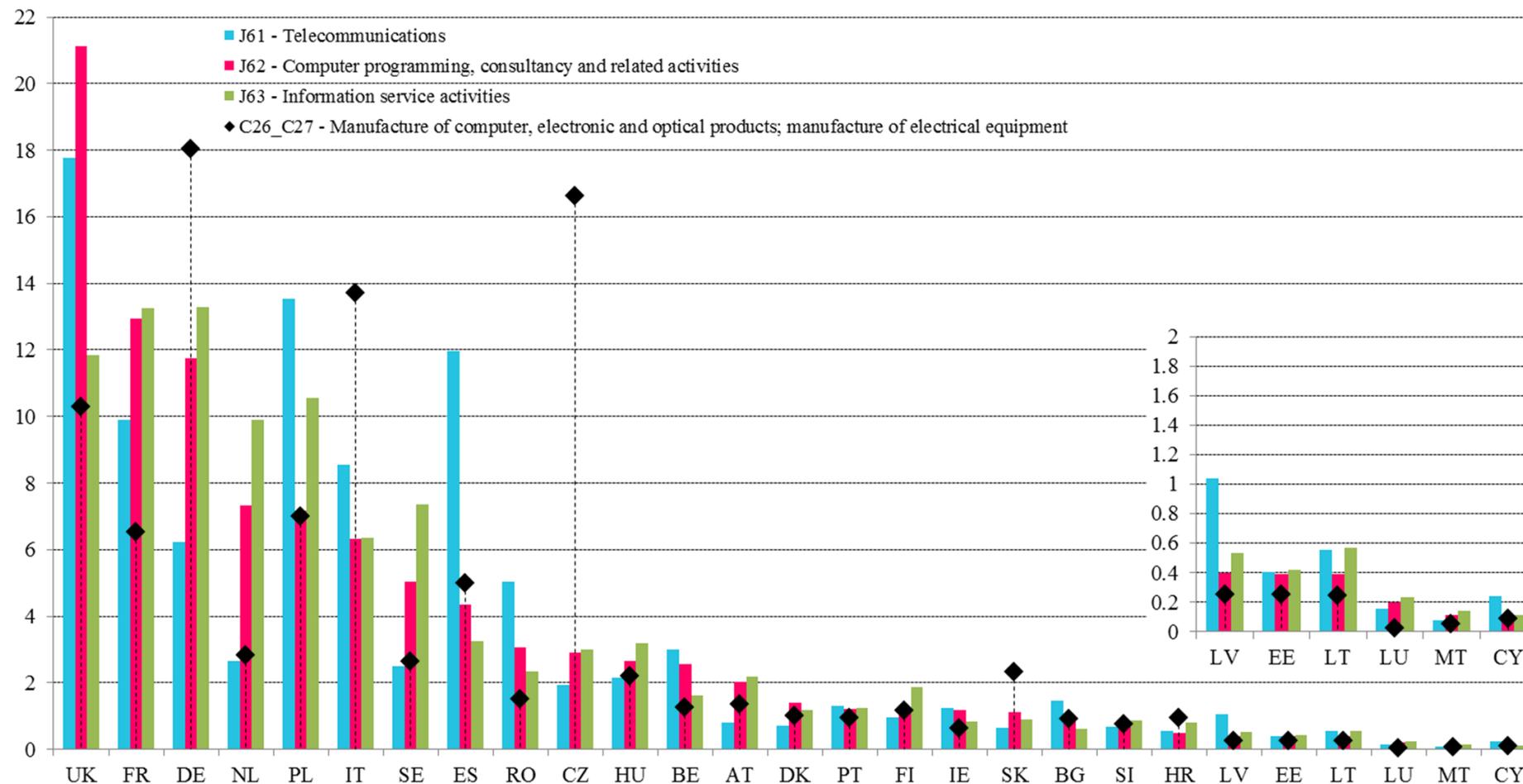
2.3 The share of selected ICT services and manufacturing sectors in the Member States

In 2014, ICT services enterprises made up 97.2% (Figure 3) of the total ICT sector. Sectors J61, J62, and J63 formed a big portion of this percentage. Therefore, to complete the picture of the EU Member States, this section presents statistics about selected ICT sectors across the EU. Figure 11 sorts countries according to their share of Computer programming, consultancy and related activities (i.e. sector J62). This particular sector was chosen as a yardstick for the figure because its lively growth at EU level (i.e. Figure 4) triggers a keener look at country level. Together with the EU28-share of active firms in sector J62, Figure 11 also shows each Member State's share in sectors J61, J63, and in the Eurostat aggregate C26_C27 (i.e. Manufacture of computers, electronic and optical products; Manufacture of electrical equipment).

Figure 11 increases the impression of specialisation across European Member States. Certain countries have larger business shares in J61, J62, J63, or in C26_C27 than others. The United Kingdom, France, and Germany outclass other EU Member States – together, they have almost 46% of the EU's "Computer programming, consultancy and related activities" (i.e. J62). The same countries also have the largest shares of enterprises active in "Information service activities" (i.e. J63). In this case Germany leads, and the three Member States together contribute 38% of the EU's share of active firms in sector J63. Regarding the "Telecommunications" sector (i.e. J61), the prominent Member States are the United Kingdom, Poland, and Spain, which together host 43% of total EU enterprises in J61. Finally, the figures reveal that Germany, the Czech Republic, and Italy have higher numbers of active firms in the manufacturing of computers, electronic, optical products, and of electrical equipment (i.e. C26_C27). Their active firms in C26_C27 make up 48% of the total EU.

The ICT sectors and its sub components of services and manufacturing sectors are as per Table 1. As mentioned on page 12, the ICT manufacturing encompasses sectors 261, 262, 263, 264, and 268 of NACE Rev. 2 classification, but the broad aggregate C26_C27 was considered since Eurostat Business Demography database provides information for sectors 26 and 27 together. Similarly, the sector J63 was the closest available representative of sector 631 of the ICT services.

Figure 11: The Member States' shares (%) of EU ICT enterprises in selected ICT manufacturing and services sectors (NACE Rev. 2) in 2014



Source: Eurostat Business demography by legal form [bd_9ac_l_form_r2].
 Last available data for J61 and C26_C27 for Malta relate to 2013 instead of 2014. Last update: 25.10.16

3 More ICT demographic evidence from the top 3 countries

The exploration of EU Member States in the previous section particularly highlighted three countries –Germany, France, and the United Kingdom. These countries came top in some of the figures proposed in Section 2, and were also positioned fairly well in the others. In 2014, these three countries accounted for about 40% of the ICT firms in the EU, approximately 45% of the births and deaths of ICT firms, and for half of the overall employment produced by active ICT businesses (Figure 7). This section also analyses country-level figures for additional business demographic indicators about the ICT business population in order to glean further insights.

Figure 12 shows how the active population (i.e. series V11910) in the ICT sector as a whole evolved, together with the number of births (i.e. series V11920) and deaths (i.e. V11930) of ICT enterprises during the 7 years from 2008 to 2014 in Germany¹⁹, France, and the United Kingdom. The active population of ICT businesses grew in all three countries, although quite different dynamics affected the numbers of new and declining firms in these Member States.

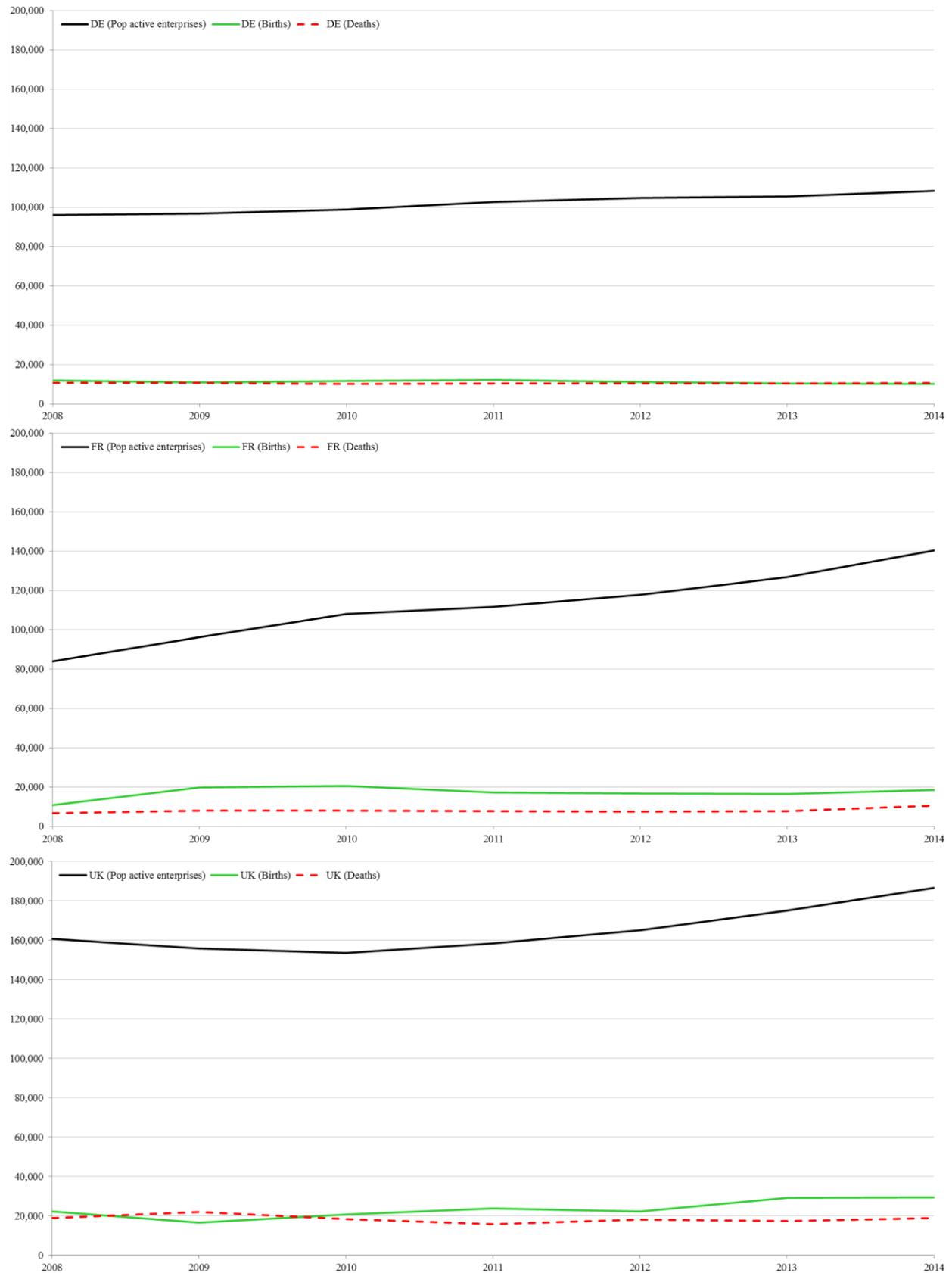
In Germany, the number of ICT companies overall grew quite steadily. The highest growth rates were registered in 2011 (i.e. 3.92%) and 2014 (i.e. 2.74%). On the other hand, the number of births of enterprises dropped in 2012 and has kept on declining since then. Similarly, the number of enterprise deaths fell in 2010, and then fluctuated at around 10300 in the following years.

In France, the overall ICT population also increased from 2008 to 2014, with some impressive yearly growth rates: 14.44% in 2009, 12.44% in 2010, 3.18% in 2011, 5.56% in 2012, 7.63% in 2013, and 10.66% in 2014. The number of births rose sharply between 2008 and 2010, while the number of deaths has been quite steady.

Finally, in the United Kingdom –where the ICT business population is the largest of Europe- the number of ICT companies did not always increase as it did in Germany and France over the same period. It dropped by 3.09% in 2009 and by 1.44% in 2010, but increased from 2011 onwards (i.e. by 3.14% in 2011, 4.14% in 2012, 6.18% in 2013, and by 6.5% in 2014). In this country, the population of ICT firms displays a slight U-shape trend which appears to be particularly influenced by ICT births since they both – the population and the new births- have experienced a joint rise over the last few years. However, the number of deaths looks rather stable. It peaked in 2009 and then made a fluctuating recovery towards pre-existing levels.

¹⁹ The data for Germany in 2008 is estimated by employing the average growth rate of the available years on the value of 2009.

Figure 12: Trends in the number of active enterprises, births, and deaths in the ICT sector in Germany, France, and the United Kingdom from 2008 to 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2].

3.1 ICT churn, birth and death rates in Germany, France and the United Kingdom

The business churn (i.e. birth plus death rates) is traditionally considered to be the thermometer of the business sector's ability to evolve and adjust its production structure to meet new needs on the demand side, and to redirect resources from declining firms to vibrant ones. High rates of churn do not necessarily imply enhanced levels of productivity from the outset, and of growth afterwards. Therefore, higher birth rates and churn are better for growth and jobs creation when they are coupled with improved productivity and more innovation (Ahmad, 2006). However, caution is advised when dealing with concepts such as business churn and turnover in order to avoid the "naive view that well-functioning economies are characterised by high turnover rates and sclerotic economies by low rates" (Bartelsman, 2013). The argument of "improper churn" (Caballero and Hammour, 1998) warns that turnover per se is not necessarily associated with appropriate policies. Policies may create inefficient entry-barriers or inefficient survival-barriers which let churn drop or rise independently of any positive entrepreneurial dynamism (Cabral, 2014).

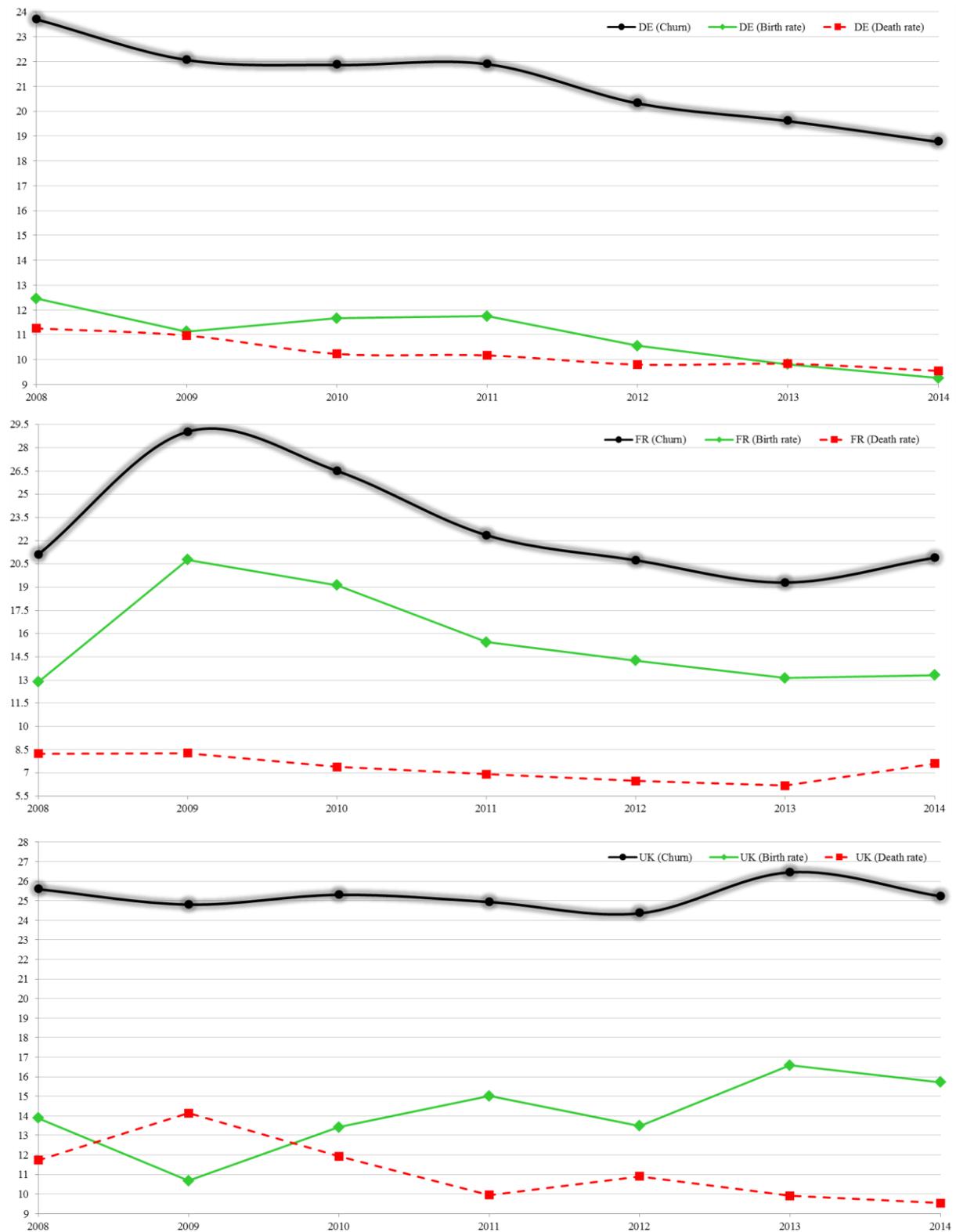
Certainly, the churn rate –with its components of birth and death rates - gives a first sense of the entrepreneurial movements which could ideally achieve the reallocation of resources to the most productive firms. There is empirical evidence to show that sometimes low levels of churn and productivity coexist in Europe. This frequently occurs when less productive firms have better access to finance, better government or supplier contacts, managers who care more about empire-building than improving performance, or when a speculative bubble distorts the allocation process (Bravo-Biosca, 2011). In order to eventually establish the prerequisites for a sustainable growth, European policies aiming to stimulate new expansive paths should grant adequate support to firms that are the real engines of progress.

Figure 13 plots the time paths of the churn, birth and death rates of Germany, France, and the United Kingdom²⁰. In the most recent periods, ICT churn declined in Germany and France, but remained fairly stable in the United Kingdom. For all three countries, the ICT sector churn rate appears to be driven by the birth rate, whose shape is clearly reflected in the churn. Moreover, the series of birth and death rates in

Figure 13 clearly mirrors the trends in the numbers of births and deaths in Figure 12.

²⁰ The values of France's death rates in 2012, 2013, and 2014 were recalculated by employing the same Eurostat formula on the respective available values of churn and birth rate. The values of Germany's death rates in 2008 and 2014, and the United Kingdom's in 2014 were estimated by applying the average yearly difference of the available observations, and they were subsequently used to calculate the business churn –according to the Eurostat formula- for the same years and countries.

Figure 13: Trends in business churn, birth, and death rates (%) in the ICT sector in Germany, France, and the United Kingdom from 2008 to 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2].

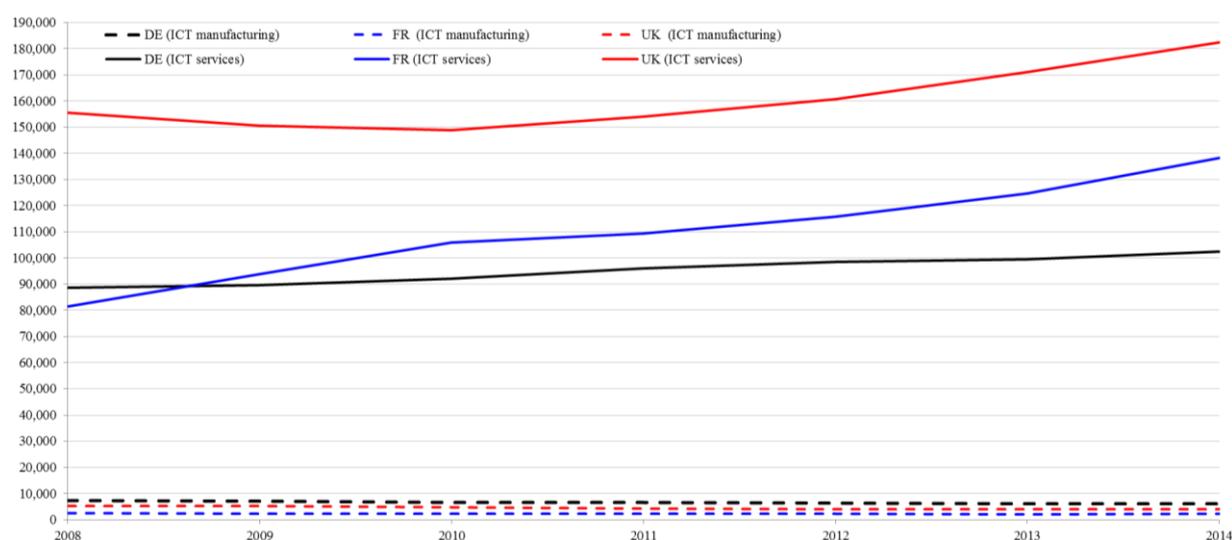
3.2 ICT services and manufacturing in Germany, France and the United Kingdom

At this stage it is interesting to appraise the dimension of the ICT services sector with respect to the overall ICT aggregate, and to observe the patterns followed by ICT services and ICT manufacturing firms (Figure 14).

The population of ICT services enterprises has recently increased in all three Member States, reaching occasionally rates of 20 and 30%. During the same period, the number of ICT manufacturing firms contracted by between 7 and 1% in Germany, between 3 and 5% in France, and up to 12% but with some recovery in the United Kingdom.

By comparing the populations of ICT services and ICT manufacturing firms in Figure 14, the prevalence of ICT service enterprises is evident in all three Member States. In Germany active companies in ICT services increased their share of the total ICT sector, going from 92% in 2008 to almost 95% in 2014. Similarly, in France and the United Kingdom, ICT services enterprises made up about 97% of the whole sector in 2008, and reached 99% in 2014. An interesting feature of the graph relates to the similarity in the growth paths of ICT services in France and the United Kingdom from 2010 onwards (i.e. very similar trends followed by the blue and the red lines in Figure 14).

Figure 14: Trends of the number of active enterprises in ICT services and manufacturing in Germany, France and the United Kingdom from 2008 to 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2].

3.3 The employment brought about by ICT services and manufacturing in Germany, France and the United Kingdom

Supporting employment is a key objective of the current European growth strategy. It is therefore crucial to spotlight relevant figures (Mas et al., 2017) and find out what level of employment has been produced by different business activities in the ICT sector.

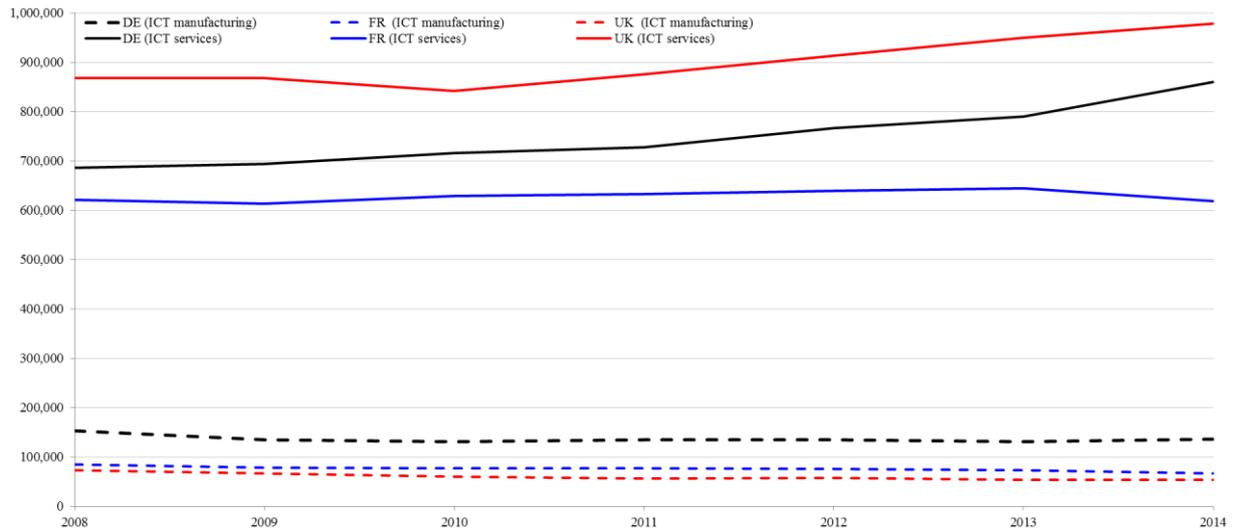
Figure 15 plots the number of people employed by active enterprises (i.e. series V16911) separately for ICT services (i.e. solid line) and ICT manufacturing (i.e. dotted line) from 2008 to 2014 in the three Member States. Starting in 2010, the employment in ICT services in the United Kingdom and Germany increased, while in France employment in both ICT services and ICT manufacturing remained stable or declined.

The United Kingdom has the highest records in terms of employees in ICT services. In 2008 there were almost 870 thousand employees in UK ICT services, and the number

grew to almost 980 thousand in 2014. The corresponding figures on ICT manufacturing in UK are some 73 thousand in 2008, and 53 thousand in 2014.

In particular, in 2012 there were 5.39% more individuals working in German ICT services than in 2011. Numbers increased by 3.12% in 2013, and by 8.89% in 2014. In the United Kingdom the number of employees in ICT services has also grown by approximately 4% every year since 2012.

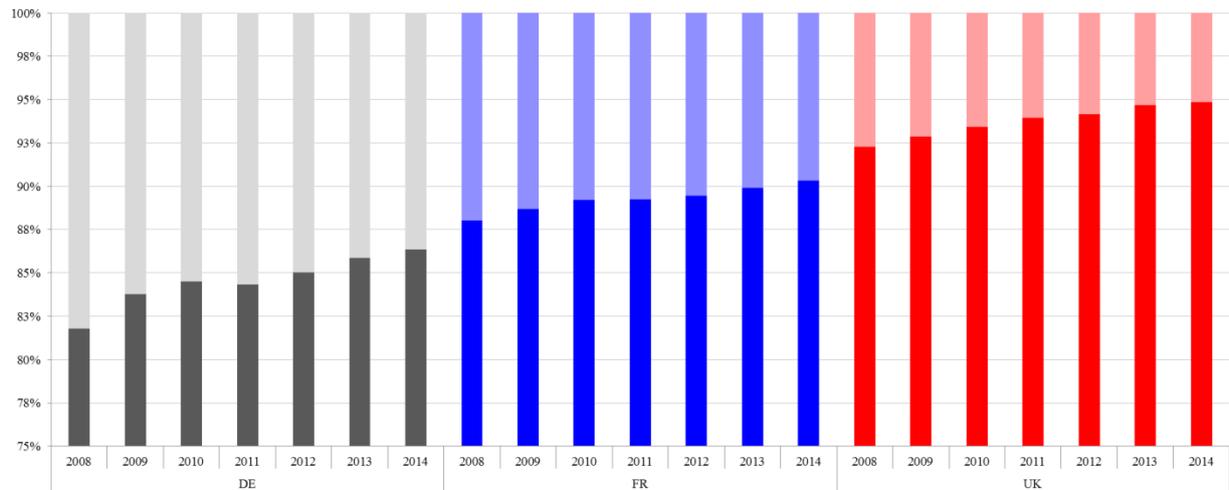
Figure 15: Trends in the number of employees in active enterprises in ICT services and manufacturing in Germany, France, and the United Kingdom from 2008 to 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2].

Following up on employment, Figure 16 shows the proportion of employees in ICT services or manufacturing firms from the three Member States between 2008 and 2014. In all three countries, the number of ICT services employees increased during this period. In the United Kingdom, this increase was particularly evident.

Figure 16: The evolution of the share of employees in ICT services and manufacturing in Germany, France, and the United Kingdom from 2008 to 2014

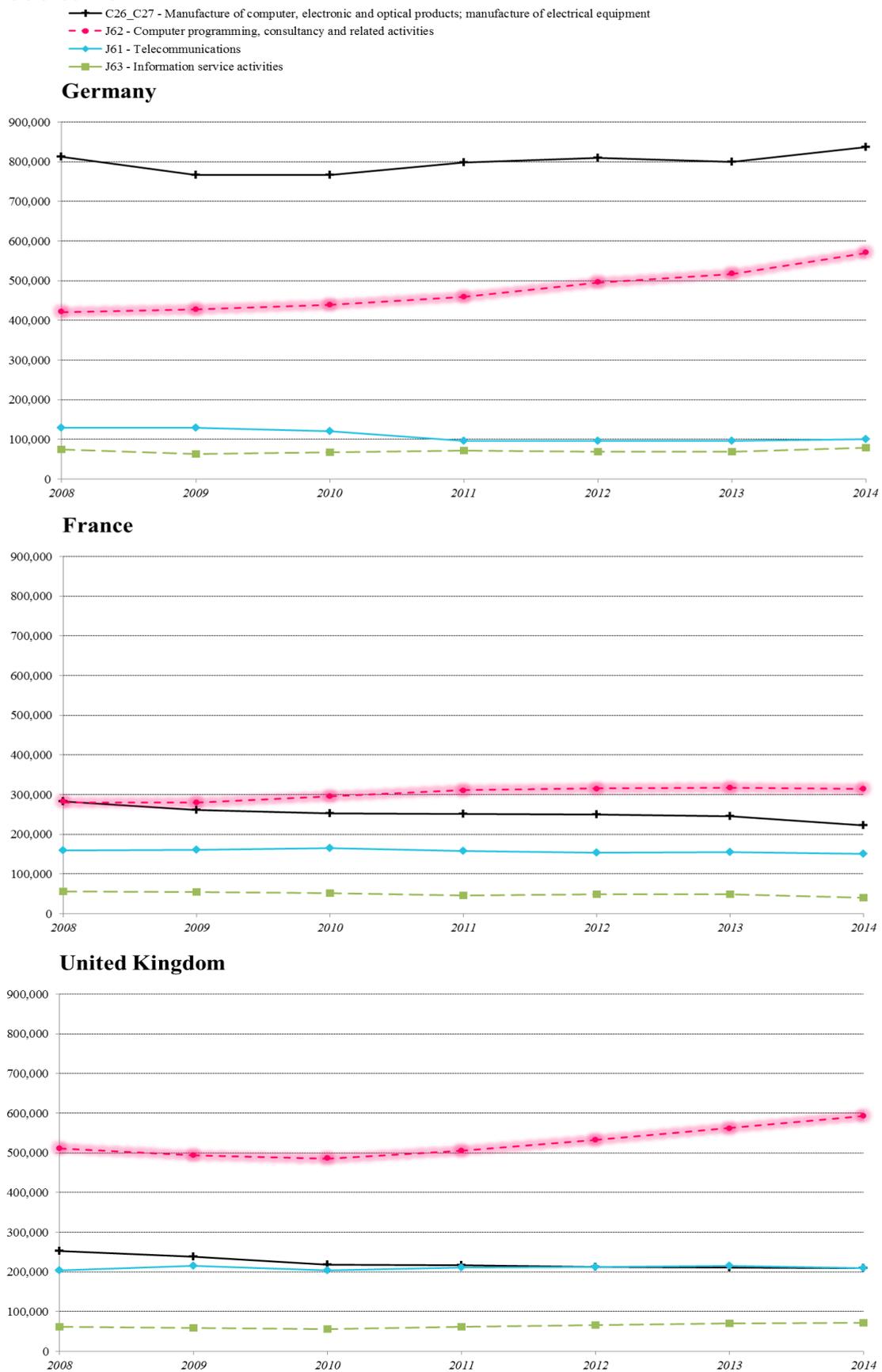


Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2].
 The Number of employees in the population of active enterprises in ICT services is the lower darker bar.
 The Number of employees in the population of active enterprises in ICT manufacturing is the higher lighter bar.

Finally, as in previous sections, insights can be gained from looking at particular sectors within the overall ICT aggregate. Figure 17 further extends the information from Figure 4 (the NACE Rev. 2 sectors presented at EU level) and from Figure 11 (the NACE Rev. 2 sectors across the Member States), and shows the number of employees from 2008 to 2014 in Germany, France, and the United Kingdom.

From another perspective, Figure 17 corroborates the evidence that in Germany ICT manufacturing is still quite active and making a positive contribution to both business and employment. However, in France the "Manufacture of computer, electronic and optical products; manufacture of electrical equipment" sector (i.e. C26_C27) experienced a marked decline which was almost symmetrical to the rise of the "Computer programming, consultancy and related activities" sector (i.e. J62). This could be due to employees from sectors C26_C27 migrating to the sectors in J62. Clearly, a dedicated research on the interplays between C26_C27 and J62 could better explain this statistical fact. The J62 sectors appear to be expanding considerably in all three economies and in the EU as a whole. This calls for policies to support this type of business, and also for strategies to channel the necessary human resources towards firms which need appropriate skills (Holtgrewe, 2014). Moreover, adequate policies should be tailored to facilitate the transition of resources from shrinking sectors to growing ones.

Figure 17: Trends in the number of employees in active enterprises in selected ICT sectors (NACE Rev. 2) in Germany, France, and the United Kingdom from 2008 to 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2].

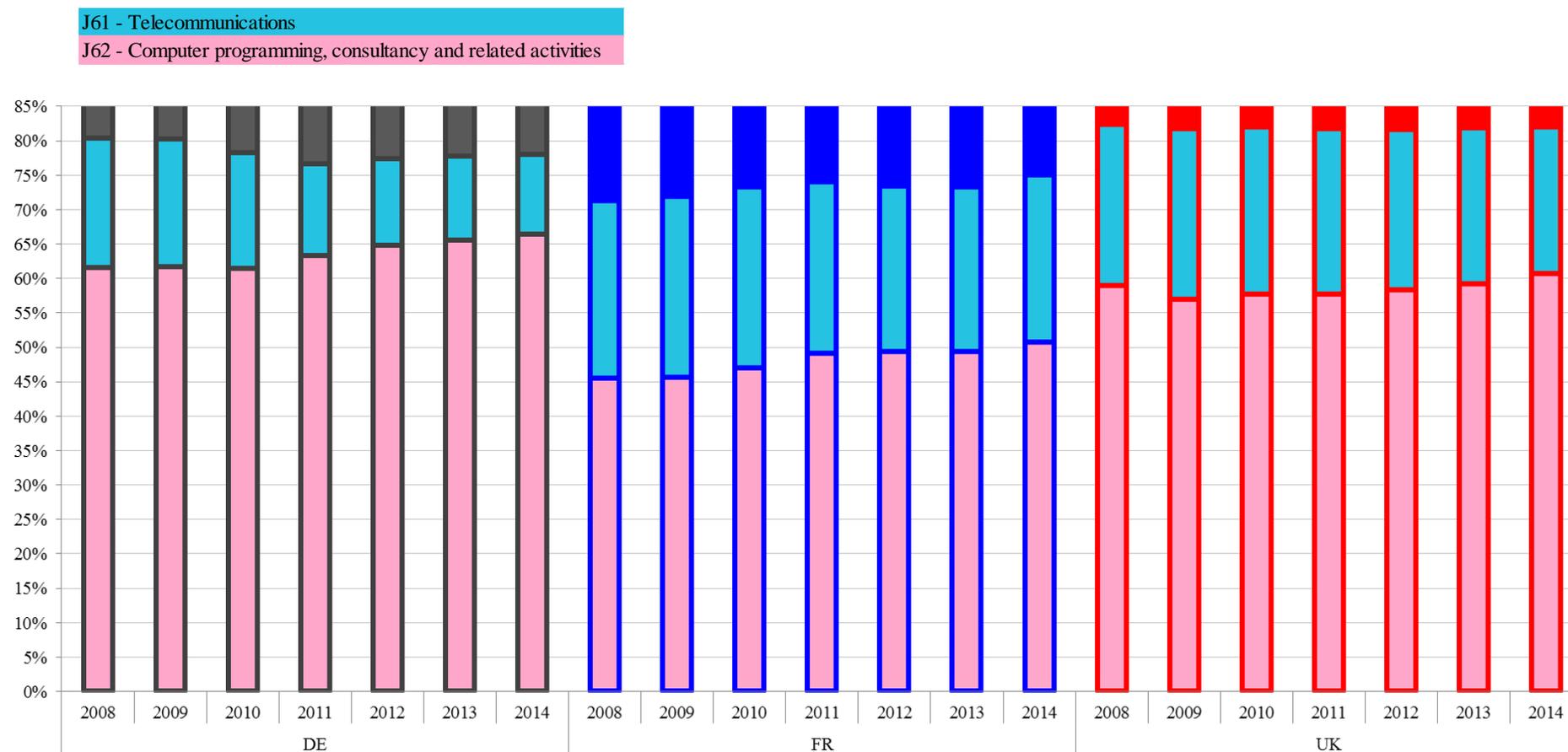
Figure 18 presents the share of employees in sectors J61 and J62²¹ with respect to the ICT services sector as a whole in Germany, France and the UK. Figure 18 actually shows the growing predominance of sector J62 within ICT services.

In Germany from 2008 to 2014, the "Computer programming, consultancy and related activities" (i.e. sector J62) employed from 62% to 67% of the total number of employees in ICT services. In France, this percentage grew from 46% to 51% over seven years, and in the UK, it fluctuated between 57% and 61%. The share of employees in Telecommunications (i.e. J61) shrank more markedly in Germany than it did in France and the United Kingdom over the same period.

These figures on the ICT sector, and more specifically on the rapid advancement of ICT services (Galbraith and McAdam, 2013) and "Computer programming, consultancy and related activities" (J62), stimulate reflections about the socio-economic transformations involved. The European Commission has already put in place relevant measures to fund the best projects (e.g., EU Framework Programme for Research and Innovation), and to channel funds (e.g., the Public Procurement of R&D, ICT and ICT related R&D; the European Venture Capital Funds) towards firms that are innovative (as ICT firms often are - Salmelin, 2013). Similarly, the European Commission is trying to create the right conditions (e.g., Digital Skills and Jobs Coalition) to engender the digital skills, which ICT companies often cannot find. In this respect, the up-to-date figures in this document offer a reading of ICT business demography which spotlights those sectors which could drive innovation, employment, and growth.

²¹ Sector J63 is dropped from the figure since only a little part of it (i.e. 631) is included in the taxonomy of ICT services (i.e. 465, 582, 61, 62, 631, 951), and Eurostat database of business demography by legal form does not encompass the three-digit level for J63.

Figure 18: Shares (%) of employees in selected ICT services sectors over the total ICT services employees in Germany, France, and the United Kingdom from 2008 to 2014



Source: Eurostat, Business demography by legal form [bd_9ac_l_form_r2]. Last update: 07/12/16

4 High-growth firms in the ICT sector

A vital part of the ICT sector consists of high-growth companies which represent a key engine of economic activity and of innovation. The Eurostat database on high-growth companies gathers statistics on:

1. High growth enterprises (growth by 10% or more) and related employment by NACE Rev. 2 (bd_9pm_r2);
2. Indicators with growth by 20% or more (from 2008 onwards, NACE Rev. 2) (bd_9n_r2).

The former group of statistics includes information from 2012 to 2014 about specific sectors, but not about ICT aggregates (i.e. ICT total, ICT manufacturing, ICT services, ICT wholesale). The latter contains information from 2007 to 2013 for only some EU Member States and does not have the EU28 total. It includes information on the ICT major aggregates, classifying enterprises according to the number of employees (i.e. "From 5 to 9 employees", "5 employees or more", and "10 employees or more").

The statistical evidence has so far highlighted specific sectors and Member States. Thus, as well as focusing on the EU28, France, Germany, and the United Kingdom as far as data availability allows, this section also aims to match both ICT sectors and aggregates of relevance. Section 4.1 introduces figures at sector level from the first Eurostat database (i.e. bd_9pm_r2) about the EU28, France, Germany, and the United Kingdom. Section 4.2 presents information at aggregate (i.e. ICT, ICT manufacturing, ICT services) level from the second Eurostat database (i.e. bd_9n_r2) about France and the United Kingdom (statistics are not available for Germany).

4.1 High-growth enterprises (growth by 10% or more)

The most populated indicators from the Eurostat tables of high-growth enterprises "by 10% or more" -therefore selected for this section- are:

1. V11960 - Number of high-growth enterprises measured in employment (growth by 10% or more);
2. V16961 - Number of employees in high-growth enterprises measured in employment (growth by 10% or more).

These indicators are shown for individual ICT sectors, namely:

1. ICT manufacturing:
 - a) C261 - Manufacture of electronic components and boards
 - b) C262 - Manufacture of computers and peripheral equipment
 - c) C263 - Manufacture of communication equipment
 - d) C264 - Manufacture of consumer electronics
 - e) C268 - Manufacture of magnetic and optical media
2. ICT services:
 - a) G465 - Wholesale of information and communication equipment
 - b) J582 - Software publishing
 - c) J61 - Telecommunications
 - d) J62 - Computer programming, consultancy and related activities
 - e) J631 - Data processing, hosting and related activities; web portals
 - f) S951 - Repair of computers and communication equipment.

The upper part of Figure 19 shows the available statistics²² about the numbers of high-growth enterprises (in black, with values on the left axis) and of their employees (i.e. in blue, with values on the right axis) for the individual sectors of ICT manufacturing and services in EU in 2014. In ICT manufacturing, the "Manufacture of electronic components and boards" sector (i.e. C261) has the most fast-growing enterprises, and the highest employment. Among ICT services, the "Computer programming, consultancy and related activities" sector (i.e. J62) stands out once again for high-growth companies and the numbers of people they employ. These observations about the EU are also valid for Germany, France, and the United Kingdom (i.e. second and third graphs). A time trend for these countries is also displayed. According to statistics of high growth in the second graph of Figure 19, the fall in ICT manufacturing is particularly observable in all three Member States for sector C261 which is the most flourishing sector inside ICT manufacturing in Europe in 2014 (i.e. the first graph of Figure 19). The third graph of Figure 19 shows opposite trends about J62 –the most thriving sector among ICT services - which appears to be in full expansion, therefore in considerable need of funding and skilled workers.

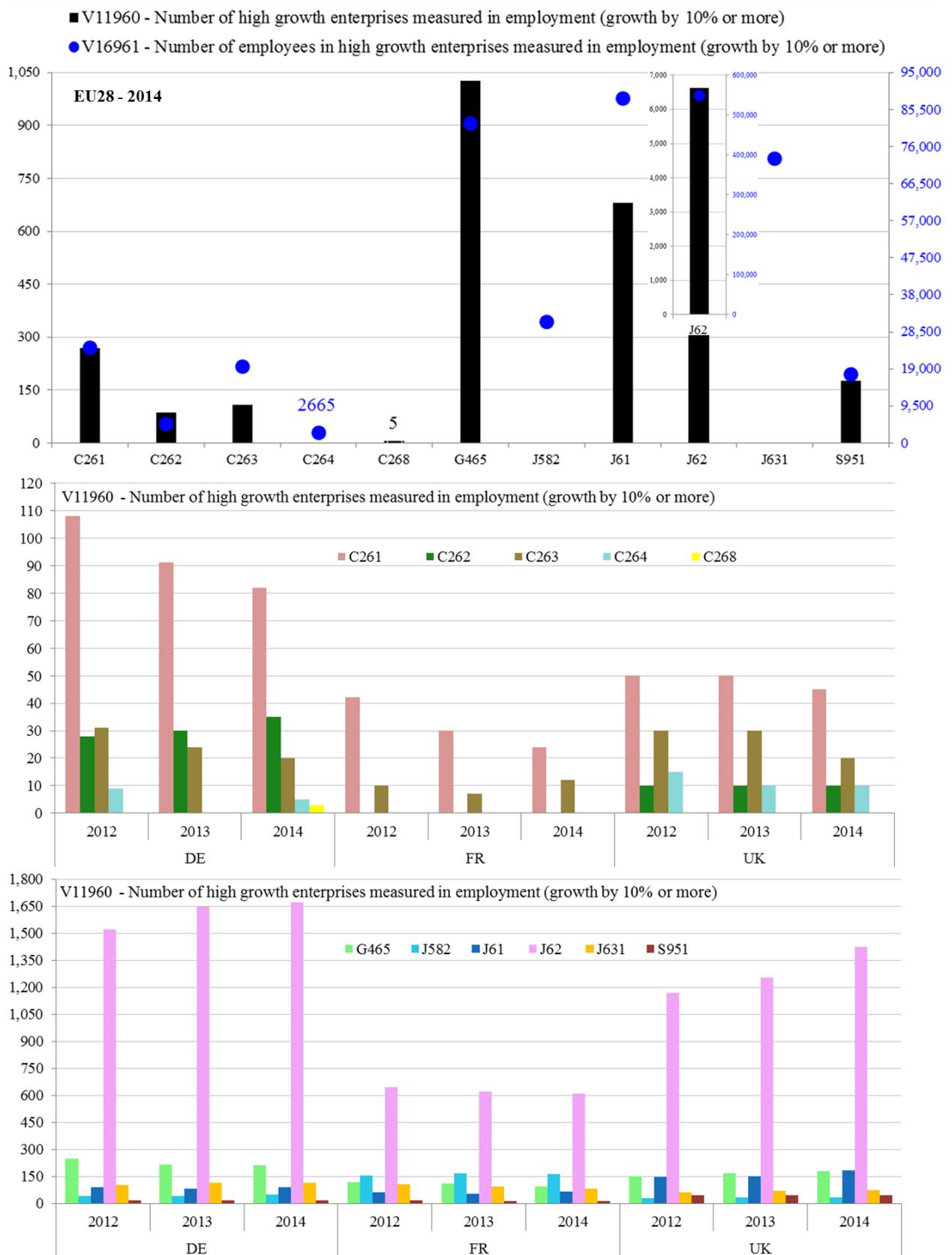
Figure 20 details the employment carried out by each ICT manufacturing and ICT services sector in Germany, France, and the United Kingdom. For each country, the values of ICT manufacturing sectors and sectors are represented by bars and measured by the left axis, while those of the ICT services sectors and sectors are drawn as lines on the right vertical axis. Not surprisingly the statistics on employment mirror the demographics of the business sector. Sectors 261 and 62 are the most prosperous in ICT manufacturing and ICT services respectively and they employ more workers than the other sectors, though the number of employees in sector 261 is declining in all three Member States (Figure 20), as is the number of enterprises (Figure 19, the second graph). In Germany and the United Kingdom, however, the ICT services sector 261 is emerging in terms of numbers of both firms and employees. In France, the numbers of firms and employees in the ICT manufacturing sector 261 and the ICT services sector 62 shrank between 2012 and 2014.

²² As for EU28, indicators V11960 and V16961 are reported for 2014 only. V11960 is not available at EU28 level for C264, J582, and J631, while V16961 is not available at EU28 for sector C268.

At country level, the indicator V11960 is not available for: 1. Germany: C264 (2013), and C268 (2012, 2013); 2. France: C262 (2012, 2013, 2014), and C264 (2012, 2013, 2014). While zero-values are reported in the table of V11960 for sector C268 for either France (2012, 2013, 2014) or United Kingdom (2012, 2013, 2014).

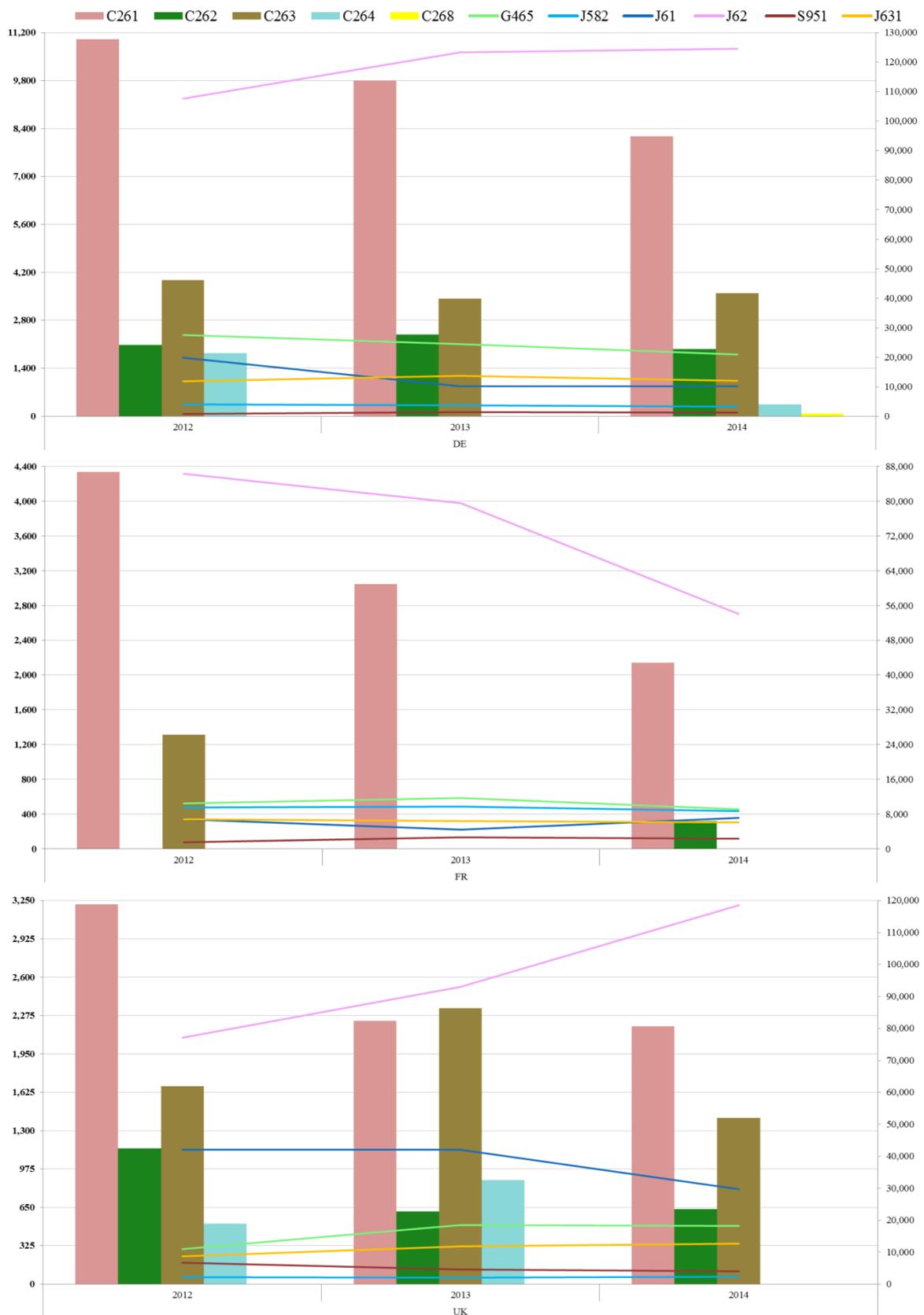
Eventually, at country level the indicator V16961 is not available for: 1. Germany: C264 (2013), C268 (2012, 2013); 2. France: C262 (2012, 2013), C263 (2013, 2014), C264 (2012, 2013, 2014); 3. United Kingdom: C264 (2014). Similarly to the indicator V11960, also for V16961 zero-values are reported in the table of sector C268 for either France (2012, 2013, 2014) or United Kingdom (2012, 2013, 2014).

Figure 19: Number of high-growth enterprises and of their employees



Source: Eurostat, High-growth enterprises (growth by 10% or more) and related employment by NACE Rev. 2 [bd_9pm_r2].

Figure 20: Number of employees by country and sectors



Source: Eurostat, High-growth enterprises (growth by 10% or more) and related employment by NACE Rev. 2 [bd_9pm_r2].

4.2 Indicators with growth by 20% or more

The Eurostat database "bd_9n_r2" groups firms by their size (i.e. From 5 to 9 employees, 5 employees or more, 10 employees or more). It collects information about enterprises which have achieved growth of 20% or more in particular countries from 2007 to 2013²³. Specifically, this section presents four indicators –in terms of numbers and of shares.

The indicators expressed as numbers are:

1. V11950 - Number of high-growth enterprises measured in employment;
2. V11951 - Number of high-growth enterprises measured in turnover;
3. V11952 - Number of young high-growth enterprises (gazelles) measured in employment;
4. V11953 - Number of young high-growth enterprises (gazelles) measured in turnover.

Indicators expressed as shares are:

1. V97450 - Share of high-growth enterprises in the population of active enterprises, measured in employment;
2. V97451 - Share of high-growth enterprises in the population of active enterprises, measured in turnover;
3. V97452 - Share of young high-growth enterprises (gazelles) in the population of active enterprises, measured in employment;
4. V97453 - Share of young high-growth enterprises (gazelles) in the population of active enterprises, measured in turnover.

The Eurostat tables on these indicators are unevenly populated with information. For this reason, this section presents tables instead of charts. Table 3, Table 4, and "n.a.": not available.

Table 5 show the year (in brackets by the countries) in which information is more abundant for each specific Member State. Each table reports on the above listed indicators about ICT total, ICT manufacturing, and ICT services for different size classes. Overall, these tables confirm the statistical evidence observed throughout this report that ICT services make up the biggest part of the ICT sector in almost every country. Besides stimulating reflections on the figures themselves, and their coverage in this case, these tables also provoke considerations on which criteria should be used to classify high-growth firms. As regards indicators for firms growing 20% or more, small companies particularly (i.e. "From 5 to 9 employees", "5 employees or more", and "10 employees or more") feed the tables of official statistics. On the other hand, IT companies with high market capitalisation make up most of the industry and are not captured entirely by the current size clusters, or by the criteria of employment and turnover alone. It would therefore be useful - at some stage in the future - to gather statistical information about the demographic dynamics brought about by highly capitalised high-growth firms (Simon, 2016).

²³ These indicators are collected on a voluntary basis ([Eurostat](#)). The data presented were last updated on 19/05/2016.

Table 3: Indicators with growth by 20% or more - From 5 to 9 employees

	ICT total V11950	ICT total V11951	ICT total V11952	ICT total V11953	ICT total V97450	ICT total V97451	ICT total V97452	ICT total V97453
BG (2012)	8	7	3	2	1.23	1.07	0.46	0.31
CZ (2012)	120	119	20	24	11.46	11.37	1.91	2.29
DK (2011)	66	115	21	35	8.17	14.23	2.60	4.33
EE (2012)	9	30	4	7	5.06	16.85	2.25	3.93
ES (2012)	191	n.a.	50	n.a.	6.25	n.a.	1.64	n.a.
FR (2012)	32	n.a.	5	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	261	428	35	63	3.83	6.28	0.51	0.92
CY (2010)	520	n.a.	0	n.a.	559.14	n.a.	0.00	n.a.
LV (2013)	0	20	0	1	0.00	8.40	0.00	0.42
LT (2013)	n.a.	0	0	0	n.a.	0.00	0.00	0.00
LU (2011)	10	23	5	8	7.35	16.91	3.68	5.88
HU (2013)	61	94	16	22	5.59	8.62	1.47	2.02
NL (2012)	16	117	1	27	0.66	4.83	0.04	1.11
PT (2012)	47	76	22	30	6.20	10.03	2.90	3.96
RO (2013)	32	43	22	13	2.00	2.69	1.38	0.81
SI (2011)	6	16	1	2	2.14	5.69	0.36	0.71
SK (2013)	7	10	2	2	1.56	2.23	0.45	0.45
SE (2013)	n.a.							
UK (2012)	855	1,080	n.a.	n.a.	9.88	12.48	n.a.	n.a.

	ICT manufacturing V11950	ICT manufacturing V11951	ICT manufacturing V11952	ICT manufacturing V11953	ICT manufacturing V97450	ICT manufacturing V97451	ICT manufacturing V97452	ICT manufacturing V97453
BG (2012)	0	0	0	0	0.00	0.00	0.00	0.00
CZ (2012)	11	9	1	1	11.70	9.57	1.06	1.06
DK (2011)	2	2	0	1	6.90	6.90	0.00	3.45
EE (2012)	0	1	0	0	0.00	20.00	0.00	0.00
ES (2012)	6	n.a.	n.a.	n.a.	4.55	n.a.	n.a.	n.a.
FR (2012)	n.a.	n.a.	0	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	24	58	3	9	4.71	11.37	0.59	1.76
CY (2010)	0	n.a.	0	n.a.	0.00	n.a.	0.00	n.a.
LV (2013)	0	1	0	0	0.00	11.11	0.00	0.00
LT (2013)	n.a.	0	0	0	n.a.	0.00	0.00	0.00
LU (2011)	0	0	0	0	n.a.	n.a.	n.a.	n.a.
HU (2013)	3	4	1	0	4.76	6.35	1.59	0.00
NL (2012)	1	5	0	0	1.33	6.67	0.00	0.00
PT (2012)	1	1	1	1	5.56	5.56	5.56	5.56
RO (2013)	1	0	0	0	1.52	0.00	0.00	0.00
SI (2011)	0	0	0	0	0.00	0.00	0.00	0.00
SK (2013)	0	1	0	0	0.00	5.00	0.00	0.00
SE (2013)	n.a.							
UK (2012)	30	40	n.a.	n.a.	5.88	7.84	n.a.	n.a.

	ICT services V11950	ICT services V11951	ICT services V11952	ICT services V11953	ICT services V97450	ICT services V97451	ICT services V97452	ICT services V97453
BG (2012)	8	7	3	2	1.28	1.12	0.48	0.32
CZ (2012)	109	110	19	23	11.44	11.54	1.99	2.41
DK (2011)	64	113	21	34	8.22	14.51	2.70	4.36
EE (2012)	9	29	4	7	5.20	16.76	2.31	4.05
ES (2012)	185	n.a.	n.a.	n.a.	6.33	n.a.	n.a.	n.a.
FR (2012)	n.a.	n.a.	5	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	237	370	32	54	3.76	5.87	0.51	0.86
CY (2010)	520	n.a.	0	n.a.	565.22	n.a.	0.00	n.a.
LV (2013)	0	19	0	1	0.00	8.30	0.00	0.44
LT (2013)	n.a.	0	0	0	n.a.	0.00	0.00	0.00
LU (2011)	10	23	5	8	7.35	16.91	3.68	5.88
HU (2013)	58	90	15	22	5.64	8.75	1.46	2.14
NL (2012)	15	112	1	27	0.64	4.77	0.04	1.15
PT (2012)	46	75	21	29	6.22	10.14	2.84	3.92
RO (2013)	31	43	22	13	2.02	2.80	1.43	0.85
SI (2011)	6	16	1	2	2.30	6.13	0.38	0.77
SK (2013)	7	9	2	2	1.64	2.10	0.47	0.47
SE (2013)	n.a.							
UK (2012)	825	1,040	n.a.	n.a.	10.13	12.77	n.a.	n.a.

Source: Eurostat, Indicators with growth by 20% or more (from 2008 onwards, NACE Rev. 2) [bd_9n_r2].
"n.a.": not available.

Table 4: Indicators with growth by 20% or more - 5 employees or more

	ICT total V11950	ICT total V11951	ICT total V11952	ICT total V11953	ICT total V97450	ICT total V97451	ICT total V97452	ICT total V97453
BG (2012)	98	69	39	32	6.64	4.67	2.64	2.17
CZ (2012)	227	299	42	52	8.40	11.06	1.55	1.92
DK (2011)	126	245	28	46	6.75	13.12	1.50	2.46
EE (2012)	24	62	5	12	6.06	15.66	1.26	3.03
ES (2012)	405	n.a.	74	n.a.	6.10	n.a.	1.12	n.a.
FR (2012)	819	n.a.	177	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	475	813	53	89	3.68	6.30	0.41	0.69
CY (2010)	1,046	n.a.	0	n.a.	597.71	n.a.	0.00	n.a.
LV (2013)	40	64	8	4	8.08	12.93	1.62	0.81
LT (2013)	n.a.	126	16	n.a.	n.a.	13.38	1.70	n.a.
LU (2011)	20	46	9	13	5.33	12.27	2.40	3.47
HU (2013)	120	207	23	37	5.55	9.58	1.06	1.71
NL (2012)	439	664	122	138	7.38	11.16	2.05	2.32
PT (2012)	97	144	26	41	5.82	8.64	1.56	2.46
RO (2013)	70	118	52	25	2.10	3.55	1.56	0.75
SI (2011)	11	31	2	2	1.92	5.41	0.35	0.35
SK (2013)	117	65	18	11	11.88	6.60	1.83	1.12
SE (2008)	238	389	24	30	6.43	10.51	0.65	0.81
UK (2012)	1,630	2,330	n.a.	n.a.	8.88	12.70	n.a.	n.a.

	ICT manufacturing V11950	ICT manufacturing V11951	ICT manufacturing V11952	ICT manufacturing V11953	ICT manufacturing V97450	ICT manufacturing V97451	ICT manufacturing V97452	ICT manufacturing V97453
BG (2012)	7	6	1	1	7.53	6.45	1.08	1.08
CZ (2012)	19	42	4	7	6.19	13.68	1.30	2.28
DK (2011)	2	4	0	2	2.11	4.21	0.00	2.11
EE (2012)	0	8	0	0	0.00	22.86	0.00	0.00
ES (2012)	12	n.a.	n.a.	n.a.	3.23	n.a.	n.a.	n.a.
FR (2012)	n.a.	n.a.	7	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	41	136	6	10	2.94	9.76	0.43	0.72
CY (2010)	1	n.a.	0	n.a.	50.00	n.a.	0.00	n.a.
LV (2013)	1	3	0	0	4.00	12.00	0.00	0.00
LT (2013)	n.a.	10	0	n.a.	n.a.	26.32	0.00	n.a.
LU (2011)	0	0	0	0	0.00	0.00	0.00	0.00
HU (2013)	9	23	1	2	4.84	12.37	0.54	1.08
NL (2012)	11	28	3	5	5.16	13.15	1.41	2.35
PT (2012)	1	4	1	1	1.72	6.90	1.72	1.72
RO (2013)	3	5	2	3	1.70	2.84	1.14	1.70
SI (2011)	2	2	1	0	2.94	2.94	1.47	0.00
SK (2013)	12	10	2	1	11.65	9.71	1.94	0.97
SE (2008)	7	34	0	3	2.73	13.28	0.00	1.17
UK (2012)	60	130	n.a.	n.a.	4.71	10.20	n.a.	n.a.

	ICT services V11950	ICT services V11951	ICT services V11952	ICT services V11953	ICT services V97450	ICT services V97451	ICT services V97452	ICT services V97453
BG (2012)	91	63	38	31	6.58	4.55	2.75	2.24
CZ (2012)	208	257	38	45	8.68	10.73	1.59	1.88
DK (2011)	124	241	28	44	7.00	13.60	1.58	2.48
EE (2012)	24	54	5	12	6.65	14.96	1.39	3.32
ES (2012)	393	n.a.	n.a.	n.a.	6.27	n.a.	n.a.	n.a.
FR (2012)	n.a.	n.a.	170	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	434	677	47	79	3.77	5.88	0.41	0.69
CY (2010)	1,045	n.a.	0	n.a.	604.05	n.a.	0.00	n.a.
LV (2013)	39	61	8	4	8.30	12.98	1.70	0.85
LT (2013)	n.a.	116	16	15	n.a.	12.83	1.77	1.66
LU (2011)	20	46	9	13	5.35	12.30	2.41	3.48
HU (2013)	111	184	22	35	5.62	9.32	1.11	1.77
NL (2012)	428	636	119	133	7.46	11.09	2.07	2.32
PT (2012)	96	140	25	40	5.97	8.71	1.55	2.49
RO (2013)	67	113	50	22	2.13	3.59	1.59	0.70
SI (2011)	9	29	1	2	1.78	5.74	0.20	0.40
SK (2013)	105	55	16	10	11.90	6.24	1.81	1.13
SE (2008)	231	355	24	27	6.71	10.30	0.70	0.78
UK (2012)	1,570	2,200	n.a.	n.a.	9.19	12.88	n.a.	n.a.

Source: Eurostat, Indicators with growth by 20% or more (from 2008 onwards, NACE Rev. 2) [bd_9n_r2].
"n.a.": not available.

Table 5: Indicators with growth by 20% or more - 10 employees or more

	ICT total V11950	ICT total V11951	ICT total V11952	ICT total V11953	ICT total V97450	ICT total V97451	ICT total V97452	ICT total V97453
BG (2012)	90	62	36	30	10.92	7.52	4.37	3.64
CZ (2012)	107	180	22	28	6.46	10.87	1.33	1.69
DK (2011)	60	130	7	11	5.67	12.28	0.66	1.04
EE (2012)	15	32	1	5	6.88	14.68	0.46	2.29
ES (2012)	214	n.a.	24	n.a.	5.98	n.a.	0.67	n.a.
FR (2012)	787	n.a.	172	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	214	385	18	26	3.51	6.32	0.30	0.43
CY (2010)	526	n.a.	0	n.a.	641.46	n.a.	0.00	n.a.
LV (2013)	40	44	8	3	15.56	17.12	3.11	1.17
LT (2013)	n.a.	126	16	n.a.	n.a.	27.69	3.52	n.a.
LU (2011)	10	23	4	5	4.18	9.62	1.67	2.09
HU (2013)	59	113	7	15	5.51	10.56	0.65	1.40
NL (2012)	423	524	121	105	12.00	14.86	3.43	2.98
PT (2012)	50	68	4	11	5.51	7.49	0.44	1.21
RO (2013)	38	75	30	12	2.20	4.35	1.74	0.70
SI (2011)	5	15	1	0	1.71	5.14	0.34	0.00
SK (2013)	110	55	16	9	20.48	10.24	2.98	1.68
SE (2008)	238	389	24	30	11.03	18.03	1.11	1.39
UK (2012)	775	1,250	n.a.	n.a.	7.99	12.89	n.a.	n.a.

	ICT manufacturing V11950	ICT manufacturing V11951	ICT manufacturing V11952	ICT manufacturing V11953	ICT manufacturing V97450	ICT manufacturing V97451	ICT manufacturing V97452	ICT manufacturing V97453
BG (2012)	7	6	1	1	10.61	9.09	1.52	1.52
CZ (2012)	8	33	3	6	3.76	15.49	1.41	2.82
DK (2011)	0	2	0	1	0.00	3.03	0.00	1.52
EE (2012)	0	7	0	0	0.00	23.33	0.00	0.00
ES (2012)	6	n.a.	n.a.	n.a.	2.50	n.a.	n.a.	n.a.
FR (2012)	16	n.a.	7	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	17	78	3	1	1.93	8.83	0.34	0.11
CY (2010)	1	n.a.	0	n.a.	100.00	n.a.	0.00	n.a.
LV (2013)	1	2	0	0	6.25	12.50	0.00	0.00
LT (2013)	n.a.	10	0	n.a.	n.a.	34.48	0.00	n.a.
LU (2011)	0	0	0	0	0.00	0.00	0.00	0.00
HU (2013)	6	19	0	2	4.88	15.45	0.00	1.63
NL (2012)	10	23	3	5	7.25	16.67	2.17	3.62
PT (2012)	0	3	0	0	0.00	7.50	0.00	0.00
RO (2013)	2	5	2	3	1.82	4.55	1.82	2.73
SI (2011)	2	2	1	0	4.17	4.17	2.08	0.00
SK (2013)	12	9	2	1	14.46	10.84	2.41	1.20
SE (2008)	7	34	0	3	4.29	20.86	0.00	1.84
UK (2012)	30	90	n.a.	n.a.	3.92	11.76	n.a.	n.a.

	ICT services V11950	ICT services V11951	ICT services V11952	ICT services V11953	ICT services V97450	ICT services V97451	ICT services V97452	ICT services V97453
BG (2012)	83	56	35	29	10.95	7.39	4.62	3.83
CZ (2012)	99	147	19	22	6.86	10.19	1.32	1.52
DK (2011)	60	128	7	10	6.04	12.89	0.70	1.01
EE (2012)	15	25	1	5	7.98	13.30	0.53	2.66
ES (2012)	208	n.a.	n.a.	n.a.	6.23	n.a.	n.a.	n.a.
FR (2012)	771	n.a.	165	n.a.	n.a.	n.a.	n.a.	n.a.
IT (2012)	197	307	15	25	3.78	5.89	0.29	0.48
CY (2010)	525	n.a.	0	n.a.	648.15	n.a.	0.00	n.a.
LV (2013)	39	42	8	3	16.18	17.43	3.32	1.24
LT (2013)	n.a.	116	16	15	n.a.	27.23	3.76	3.52
LU (2011)	10	23	4	5	4.20	9.66	1.68	2.10
HU (2013)	53	94	7	13	5.60	9.93	0.74	1.37
NL (2012)	413	501	118	100	12.19	14.79	3.48	2.95
PT (2012)	50	65	4	11	5.76	7.49	0.46	1.27
RO (2013)	36	70	28	9	2.23	4.33	1.73	0.56
SI (2011)	3	13	0	0	1.23	5.33	0.00	0.00
SK (2013)	98	46	14	8	21.59	10.13	3.08	1.76
SE (2008)	231	355	24	27	11.58	17.80	1.20	1.35
UK (2012)	745	1,160	n.a.	n.a.	8.34	12.99	n.a.	n.a.

Source: Eurostat, Indicators with growth by 20% or more (from 2008 onwards, NACE Rev. 2) [bd_9n_r2].
"n.a.": not available.

5 ICT business demographics as regards selected indicators across the European Member States

This section assesses how ICT business demographics perform with respect to other ICT variables and economic indicators in each Member State and compares Member States with each other. The additional ICT variables included in this exercise belong to the dataset of Perspective Insights in ICT R&D (i.e. PREDICT), and the additional economic indicators come from Eurostat. The indicators are standardised by the min-max transformation so they vary homogeneously between 0 (i.e. for the lowest value) and 1 (i.e. for the highest value). Because the range of all the indicators is between 0 and 1, the two extreme values immediately identify laggards and leaders for all the variables. Thus, it is possible to observe the relative performance of countries in relation to the same variable, to compare diverse indicators among themselves, and to also have a sense of the correlation between different variables in each Member State. Radar charts are presented to visualise indicators' standardised values for 2013²⁴. Table 6 lists the indicators presented in the radar charts that make up Figure 21.

Table 6: Indicators included in the radar charts

Indicator	Source	Name in the chart
Population of active enterprises in t (V11910)	Eurostat	ICT Business pop
Number of employees in the population of active enterprises in t (V16911)	Eurostat	Employees in ICT business pop
Business churn: birth rate + death rate (V97015)	Eurostat	ICT churn
Birth rate: number of enterprise births in the reference period (t) divided by the number of enterprises active in t (V97020)	Eurostat	ICT birth rate
Death rate: number of enterprise deaths in the reference period (t) divided by the number of enterprises active in t (V97030)	Eurostat	ICT death rate
Business R&D Expenditure and Gross R&D Expenditure	PREDICT	ICT BERD
ICT employment	PREDICT	ICT EMPL
ICT Gross Value Added	PREDICT	ICT Gross VA
ICT R&D Personnel	PREDICT	ICT PERD
ICT Labour productivity	PREDICT	ICT Productivity
ICT R&D Researchers	PREDICT	ICT RERD
Gross domestic product at market prices (B1GQ)	Eurostat	GDP
Gross capital formation (P5G)	Eurostat	Gross capital formation
Exports of goods and services (P6)	Eurostat	Exports of goods and services
Imports of goods and services (P7)	Eurostat	Imports of goods and services
Taxes on production and imports less subsidies (D2X3)	Eurostat	Taxes on production and imports less subsidies

Sources:

Eurostat;

PREDICT 2016: https://ec.europa.eu/jrc/sites/jrcsh/files/methodological_notes_january_2016.pdf

Of the three European top players (i.e. Germany, France, and the United Kingdom) identified in previous sections, Germany and France have together the highest values in all the PREDICT ICT indicators. In particular, Germany scores the highest in terms of Business R&D Expenditure and Gross R&D Expenditure, ICT employment, and ICT Gross

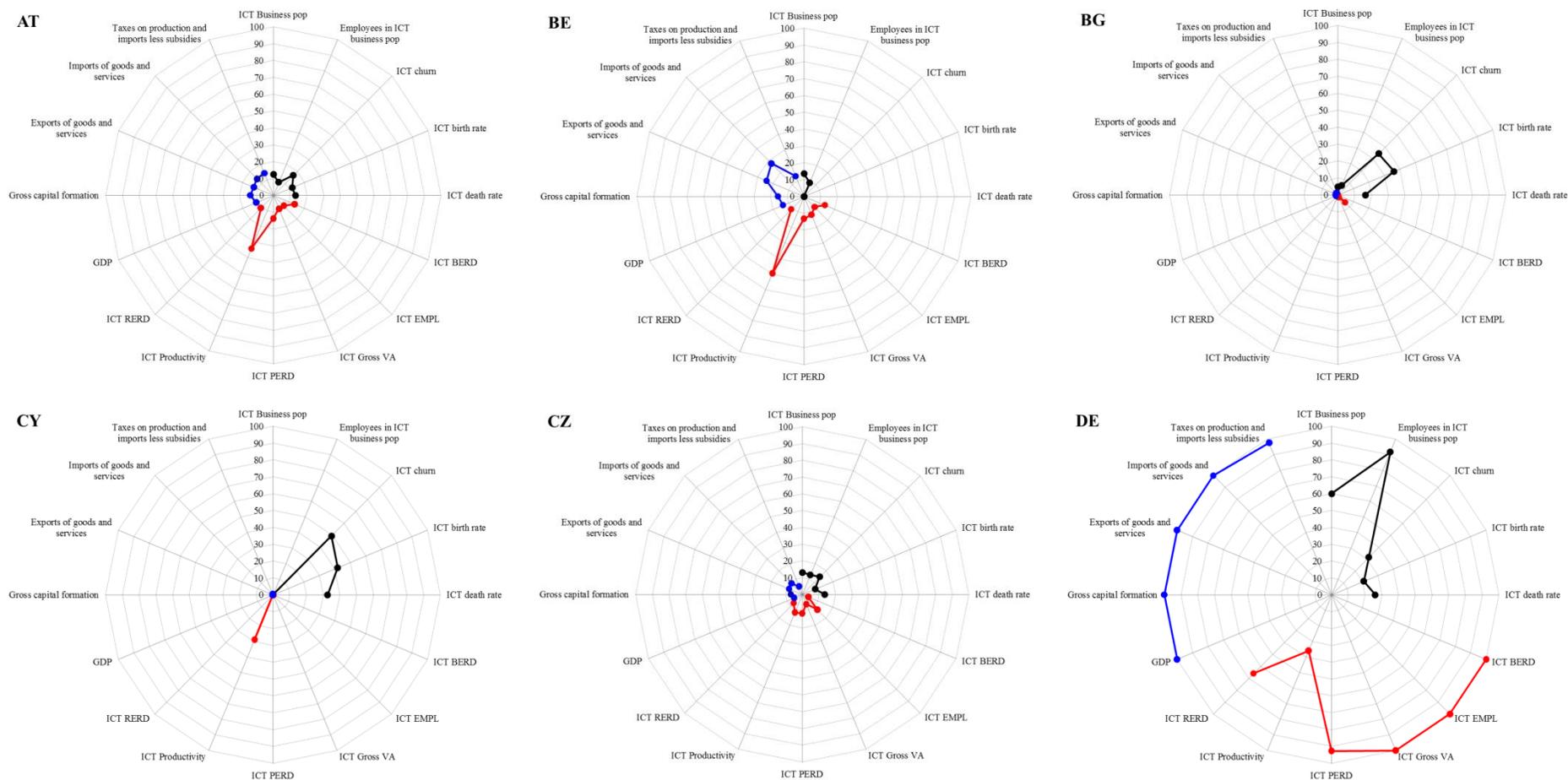
²⁴ The year 2013 was selected in order to have contemporaneous indicators with PREDICT currently available data. As for the indicator V16911 the last available years for Luxembourg and Portugal are 2010, and 2012 respectively. Regarding the indicator V97015, the last available year for Ireland is 2011. Eventually about the indicator V97030, the last available data is 2011 for Ireland, France and Romania.

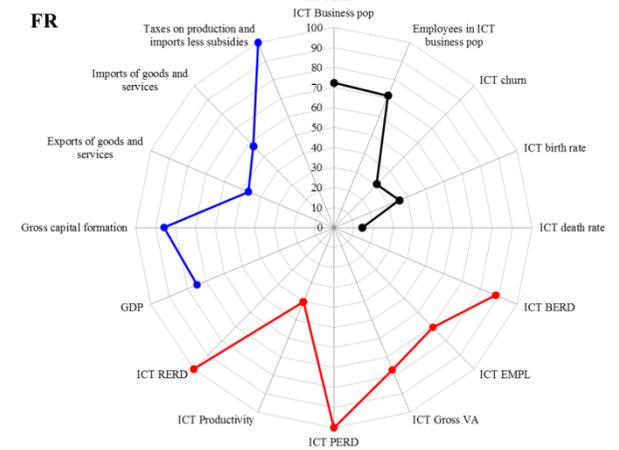
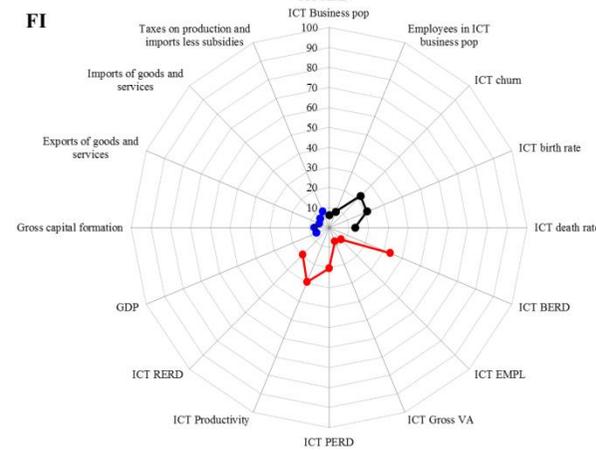
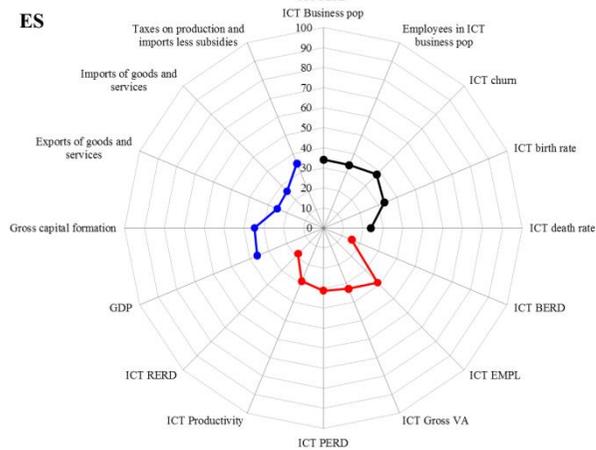
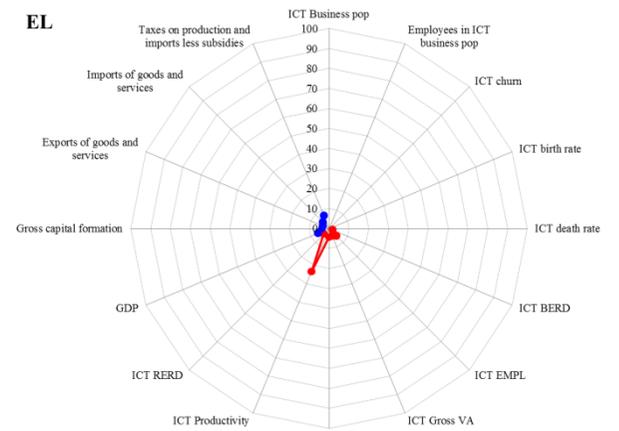
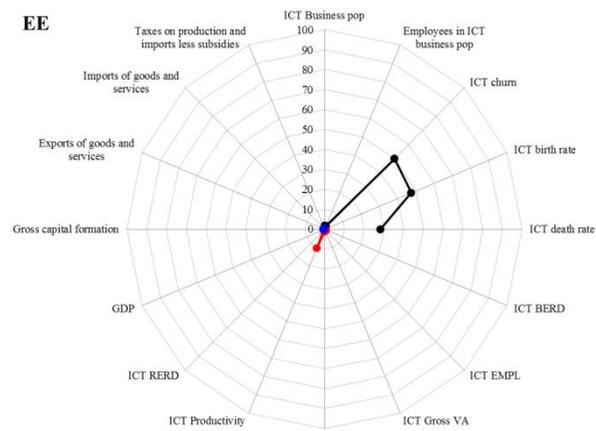
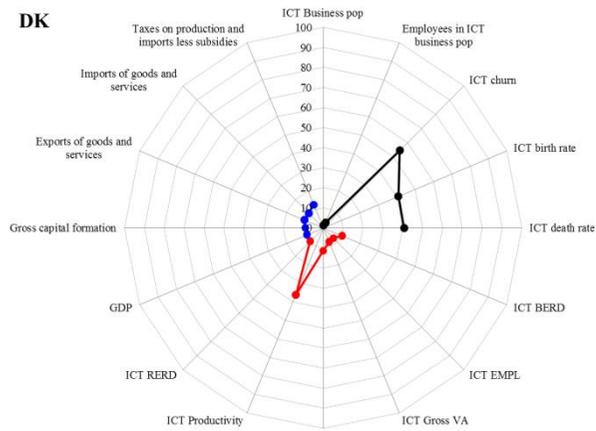
Value Added. On the other hand, France outperforms the other Member States in ICT R&D Personnel and in ICT R&D Researchers. The United Kingdom has the highest numbers of ICT firms and ICT employees.

Romania comes first in terms of ICT churn, birth rate, and death rate. Indeed, many Eastern economies show similar patterns for indicators of entrepreneurial activity in the ICT sector, though they may not have large stocks of existing ICT firms and employees nor very high scores in the economic indicators plotted in the radar charts. Lithuania and Latvia are particularly interesting in this respect as the churn rate in both countries consists mainly of birth rate. This is also true – albeit to a lesser extent – in Bulgaria, Estonia, Croatia, Slovenia, Poland, and Slovakia.

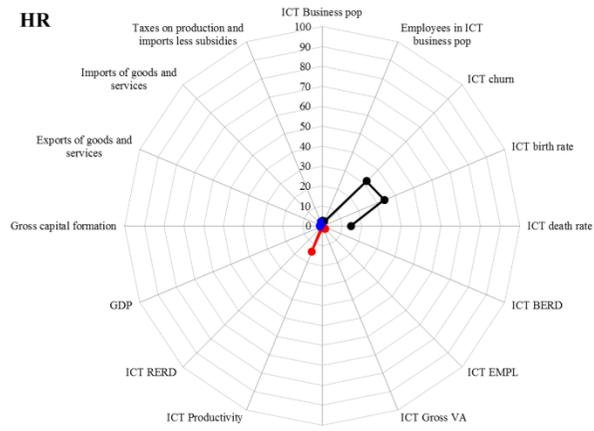
This exercise aims to stimulate reflections on how to read business demography together with additional aspects specific to the ICT sector and to the economy in general. Future multivariate analyses could reveal complementary information on how specific indicators associate together in boosting or impairing the ICT entrepreneurial fabric across heterogeneous clusters of Member States.

Figure 21: Radar charts: Joint performance of indicators across Member States

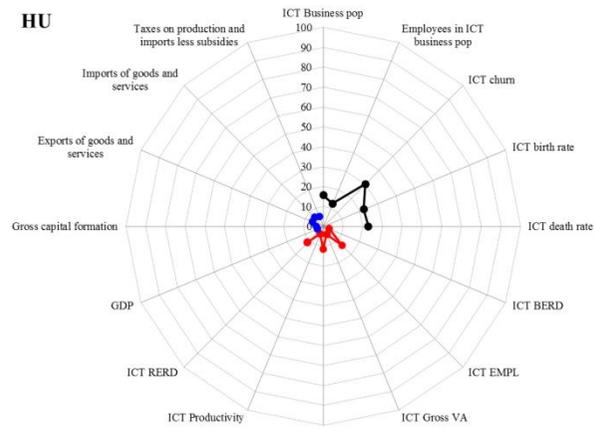




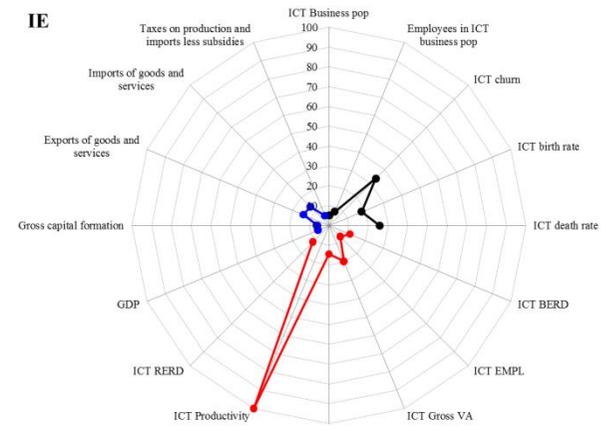
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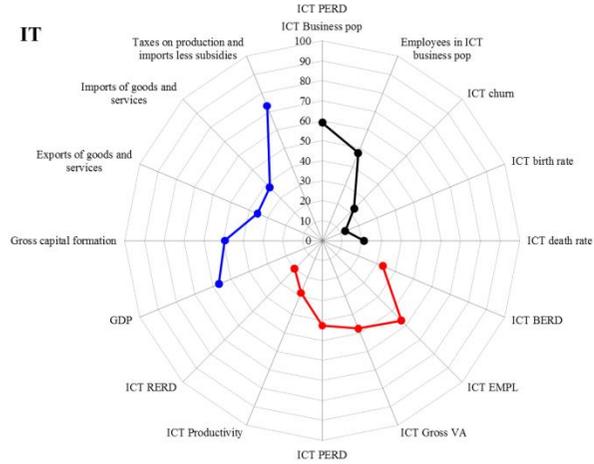
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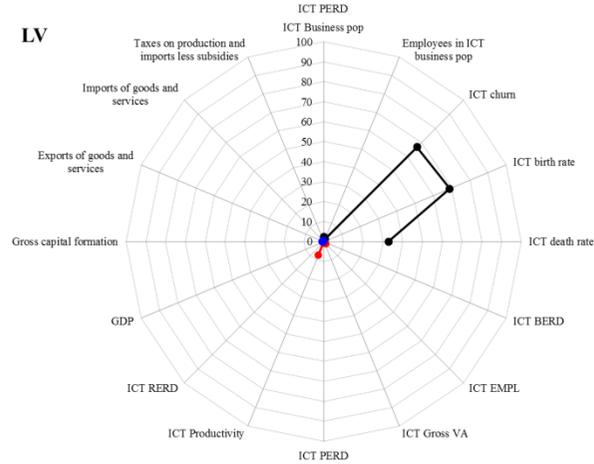
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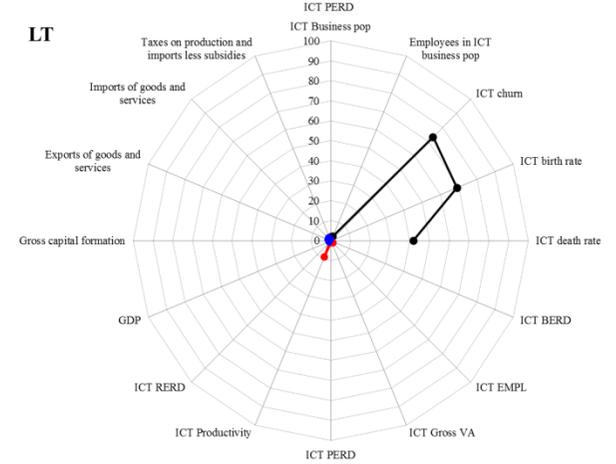
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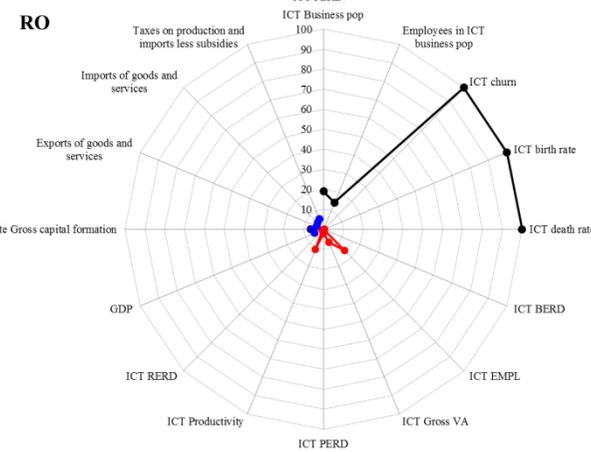
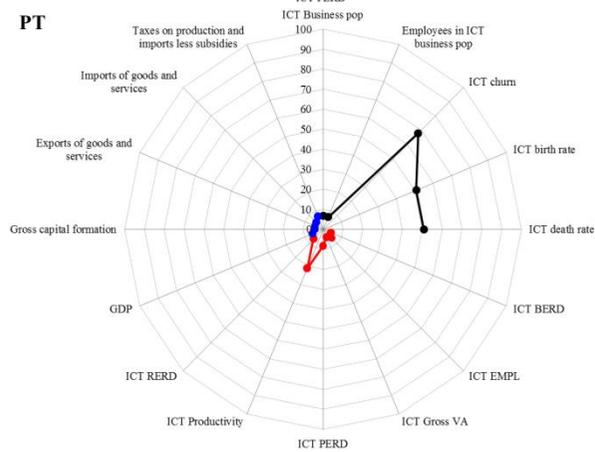
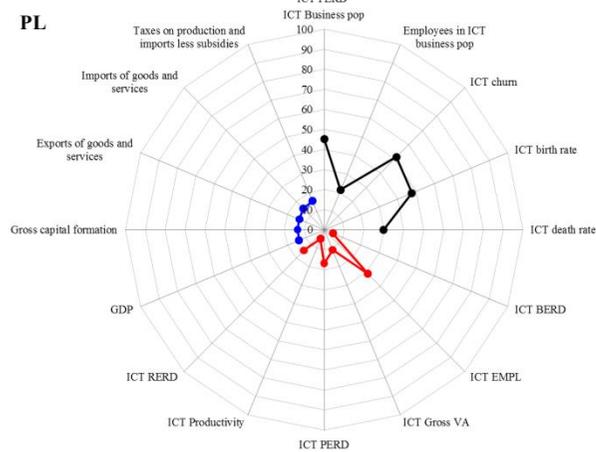
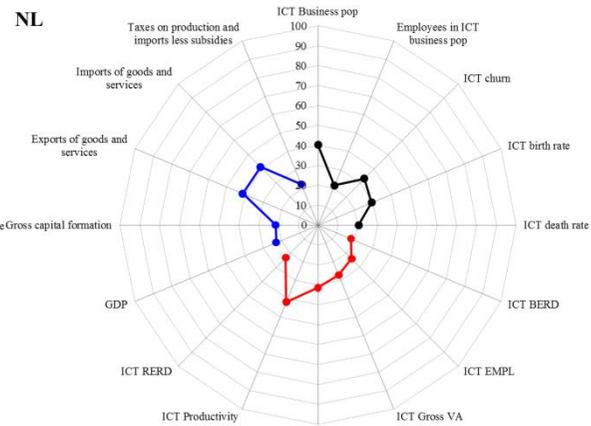
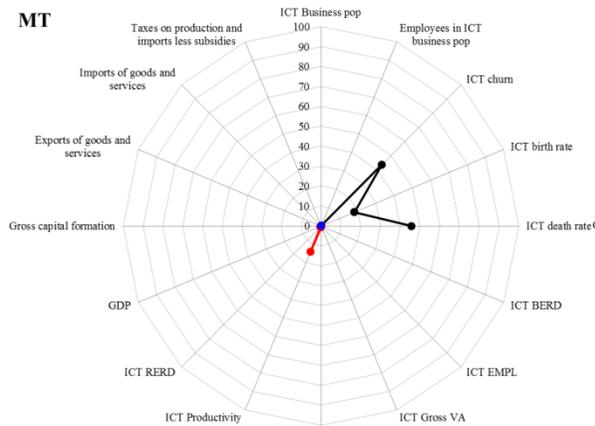
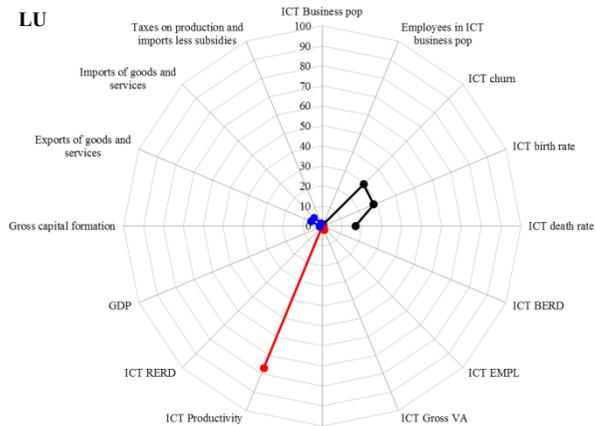


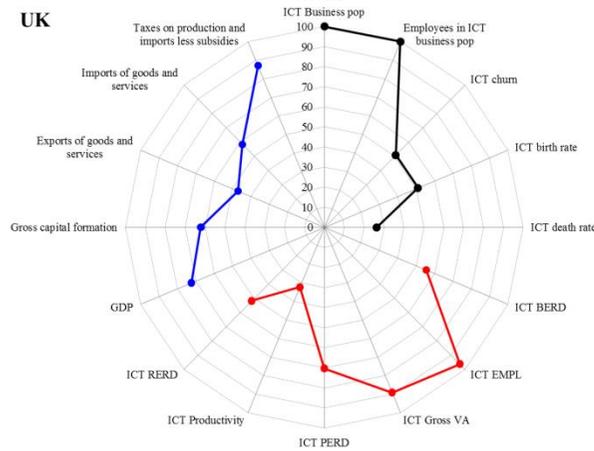
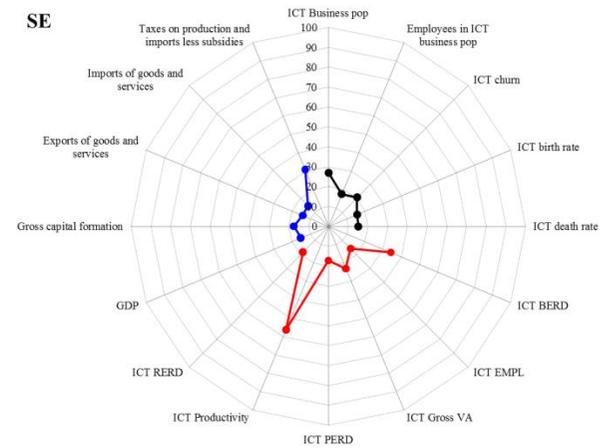
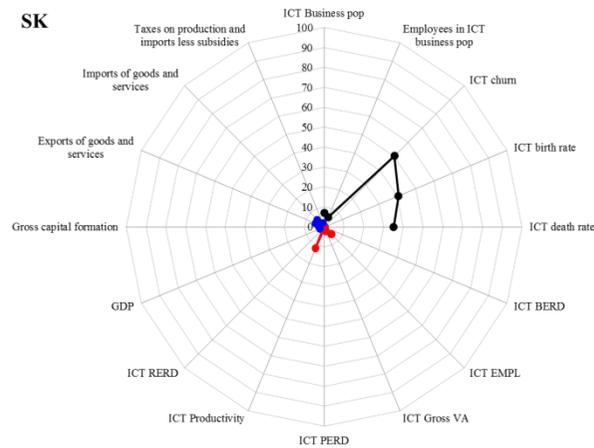
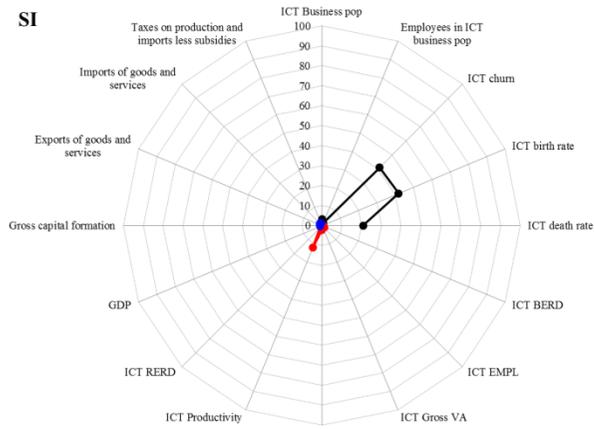
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LT







Source: Eurostat, PREDICT 2016 (https://ec.europa.eu/jrc/sites/jrcsh/files/methodological_notes_january_2016.pdf)

Indicators of business demography are in black, PREDICT variables are in red, and Eurostat economic indicators are in blue.

Raw data are standardised by means of the min-max transformation to set the range of variability between 0 and 1 for all the indicators.

Conclusions and way forward

The statistics presented in this report provide useful figures to monitor the ICT sector's business demographics. The report includes data on high-growth enterprises which probably act as catalysts for much of the current digital transformation. Furthermore, it draws attention to issues of availability of official statistics for Europe, and stimulates ideas on how to further exploit business statistics in the context of the PREDICT project.

Specifically, this report interprets the most recent statistics on ICT business demographics in order to detect those Member States and sectors from which new waves of innovation, employment, and growth may come in the future. The investigation draws three main conclusions:

1. Europe's biggest economies –namely **Germany, France, and the United Kingdom**- continue to be the **top players** in terms of **ICT stock**.
2. However, **Eastern European economies are experiencing rapid and impressive growth** in their ICT business populations.
3. **The "Computer programming, consultancy and related activities" sector is growing fast**. This will have implications for innovation, growth and employment of skilled labour.

Challenges and policy recommendations:

The statistics highlight the need to support – with financial and human resources – the development of those ICT sectors in which Europe and the Members States are advancing.

The up-to-date figures in this document spotlight **specific ICT sectors** that **drive entrepreneurial growth and employment**. These sectors are the most likely to generate innovation and growth in the short term. For example, the fast growing **"Computer programming, consultancy and related activities"** sector **needs funding and skilled workers**. Furthermore, rapid growth in this sector unveils, from the perspective of business demography, the **ongoing digital transformation**.

In order to meet the challenges of this transformation and reap its benefits, adequate policies can **identify** what types of **jobs** will be **in high-demand** and **transmit this information to the education systems** in charge of training for new professional roles. Furthermore, once new employees are trained, appropriate policies can **help match the demand with the offer of specific competences**.

Though ICT services sectors are booming, **ICT manufacturing sectors are shrinking**. It is important that policy helps to **reallocate skilled workers from old professional roles to new ones**. This would enable inclusive growth and profitable use of European human capital.

Research avenues for the future

This report focuses on the ICT business population and employees. Precise sectors are spotlighted, especially those in the ICT services aggregate.

The next step inside the PREDICT project would be to take advantage of the data it has generated to **explore the employment levels of specific ICT sectors** (i.e. at 4-digit level).

Furthermore, **thorough analyses of Eastern Economies and of the "Computer programming, consultancy and related activities" sector across countries** can be carried out with the wealth of additional information that PREDICT offers on R&D in the ICT sectors.

References

- Ahmad, N., & Hoffmann, A. (2008). A framework for addressing and measuring entrepreneurship. OECD STD/DOC(2008)2.
- Ahmad, N., & Vale, S. (2005, November). Moving Towards Comparable Business Demography Statistics ". OECD Structural Business Statistics Expert Meeting, Paris.
- Ahmad, N. (2006), "A Proposed Framework For business Demography Statistics", *OECD Statistics Working Papers*, 2006/03, OECD Publishing. <http://dx.doi.org/10.1787/145777872685> (Also published as a book chapter: Ahmad, N. (2008). A proposed framework for business demography statistics. In *Measuring Entrepreneurship* (pp. 113-174). Springer US.)
- Alexandru, F., & Kagitci, M. I. (2014). Corporate Social Responsibility: Unity and Diversity in Approach from the Perspective of Citizens. *Journal of Empirical Economics*, 2(3), 129-140.
- Bartelsman, E. J. (2013). ICT, reallocation and productivity. *Economic papers - European Commission Directorate-General for Economic and Financial Affairs*, (486), 1-44.
- Brandt, N. (2004), "Business Dynamics in Europe", *OECD Science, Technology and Industry Working Papers*, 2004/01, OECD Publishing. <http://dx.doi.org/10.1787/250652270238>
- Bravo-Biosca, A. (2011, October). A look at business growth and contraction in Europe. In [3rd European Conference on Corporate R&D and Innovation CONCORD-2011](#).
- Bravo-Biosca, A., C. Criscuolo and C. Menon (2013), "What Drives the Dynamics of Business Growth?", *OECD Science, Technology and Industry Policy Papers*, No. 1, OECD Publishing. <http://dx.doi.org/10.1787/5k486qtttq46-en>
- Caballero, R. J., & Hammour, M. L. (1998). Improper churn: Social costs and macroeconomic consequences (No. w6717). *National bureau of economic research*.
- Cabral, L. (2014). Good turnover and bad turnover: Barriers to business and productivity. *Economics Letters*, 125(2), 179-181.
- [European Commission \(2010\)](#). *Communication from the Commission, Europe 2020, A strategy for smart, sustainable and inclusive growth*. COM(2010) 2020 final, Brussels.
- European Commission (2017). [The Europe's Digital Progress Report 2017](#).
- EUROSTAT - OECD (2007) Manual on Business Demography Statistics, OECD ISBN 978-92-64-04187-5.
- Evangelista, R., & Savona, M. (2003). Innovation, employment and skills in services. Firm and sectoral evidence. *Structural Change and Economic Dynamics*, 14(4), 449-474.
- Gabison, G. A. (2015). *Birth, Survival, Growth, and Death of ICT Companies* (No. JRC94807). Institute for Prospective and Technological Studies, Joint Research Centre.
- Galbraith, B., & McAdam, R. (2013). The convergence of ICT, policy, intermediaries and society for technology transfer: evidence from European innovation projects. *Technology Analysis & Strategic Management*, 25(3), 249-252.
- Golonka, M. (2015). Proactive cooperation with strangers: Enhancing complexity of the ICT firms' alliance portfolio and their innovativeness. *European Management Journal*, 33(3), 168-178.

- Guerrieri, P., & Meliciani, V. (2005). Technology and international competitiveness: the interdependence between manufacturing and producer services. *Structural Change and Economic Dynamics*, 16(4), 489-502.
- Heeks, R. (2002). i-development not e-development: Special issue on ICTs and development. *Journal of International Development*, 14(1), 1-11.
- Holtgrewe, U. (2014). New new technologies: the future and the present of work in information and communication technology. *New technology, work and employment*, 29(1), 9-24.
- Lachenmaier, S., & Rottmann, H. (2011). Effects of innovation on employment: A dynamic panel analysis. *International journal of industrial organization*, 29(2), 210-220.
- Mas M., Fernández de Guevara J., Robledo J.C., López-Cobo M., [The 2017 PREDICT Key Facts Report. An Analysis of ICT R&D in the EU and Beyond](#), EUR 28594 EN, doi:10.2760/397817.
- PREDICT-3 Administrative Agreement 34163-2015-12.
- Rhodes, C. (2013). Business statistics. *Economic policy and statistics*.
- Schrör, H. (2008), Entrepreneurship Indicators: 'Employer Business Demography' and High-Growth Enterprises in Europe. [Eurostat](#). Presented at the: *21st Meeting of the Wiesbaden Group on Business Registers - International Round Table on Business Survey Frames, Paris (24-27 November, 2008), Session 6A: "Entrepreneurship indicators, Business Demography and SMEs"*.
- Schrör, H. (2008). Business demography in Europe: employers and job creation. [Statistics in Focus](#), 100.
- Schrör, H. (2009). Business Demography: employment and survival. [Statistics in Focus](#), 70.
- Hempell, T., Leeuwen, G. V., & Wiel, H. V. D. (2004). ICT, innovation and business performance in services: evidence for Germany and The Netherlands. *ZEW-Centre for European Economic Research Discussion Paper*, (04-006).
- Salmelin, B. (2013). The Horizon 2020 framework and Open Innovation Ecosystems. *Journal of Innovation Management*, 1(2), 4-9.
- Seri, P., & Zanfei, A. (2013). The Co-evolution of ICT, Skills and Organization in Public Administrations: Evidence from new European country-level data. *Structural change and economic dynamics*, 27, 160-176.
- Simon, J. P. (2016). *How to Catch a Unicorn: An exploration of the universe of tech companies with high market capitalisation* (No. JRC100719). Institute for Prospective Technological Studies, Joint Research Centre.

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