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Ready for the digital economy? The usage of innovative digital tools by enterprises in EU countries

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ENTRENOVA, Zagreb, Croatia, 2021

Motivation for the research

- Digital transformation also requires significant changes in their business models (Bouwman, 2019).
- The global digitalisation trend puts pressure on business in the EU. Companies in the EU already significantly lagging behind other main global players like China and the US in sales related to information and communication technologies (Schweer and Sahl, 2016).
- The current state of a digital economy is also significantly different among EU countries (Milošević, 2018; Kinnunen et al. 2019).

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Previous research and our approach

- The problem of digital transformation of business in the EU have been examined by several recent studies such for example Kinnunen et al. (2019); Borowiecki et al. (2020); Ragnedda et al. (2020), Tomicic Furjan et al. (2020) or Bouwman (2019).
- Most of them are focus either on the managerial problems related to digitalisation, accumulation of digital capital or level of overall digitalisation in the country.
- Our paper is based on this previous research but pays significantly more attention to indicators related to the digital readiness of enterprises.
- It classifies and rank EU countries according to more complex indicator capturing the digital readiness of companies.

Aim of the paper

The main goal is to identify key similarities and differences in digital readiness among EU countries and point out the strength and weaknesses of these countries.

To meet this goal 3 research questions have been stated:

1. How important are e-Commerce activities and selected innovative digital tools for enterprises in EU countries?
What are the key differences among countries?
2. What is the classification of EU countries into groups based on their similarities in digital readiness?
3. Which EU countries are leaders in digital readiness and what is the ranking of EU countries according to their overall digital readiness.

Methodology and data - variables

- We are focused on selected digital tools and other variables related to readiness for the digital economy.
- Research sample contains 27 EU countries plus UK.
- Cross-sectional data valid for the year 2019 (some of them for the year 2018).
- Compare the usage of e-commerce as well as usage of social networks and websites by enterprises in EU countries.
- Cluster analysis based on cross-sectional macro-level data from the Eurostat database – European commission (2021).
- Factor analysis - allows us to reduce the dimensions (only one single factor has been identified).

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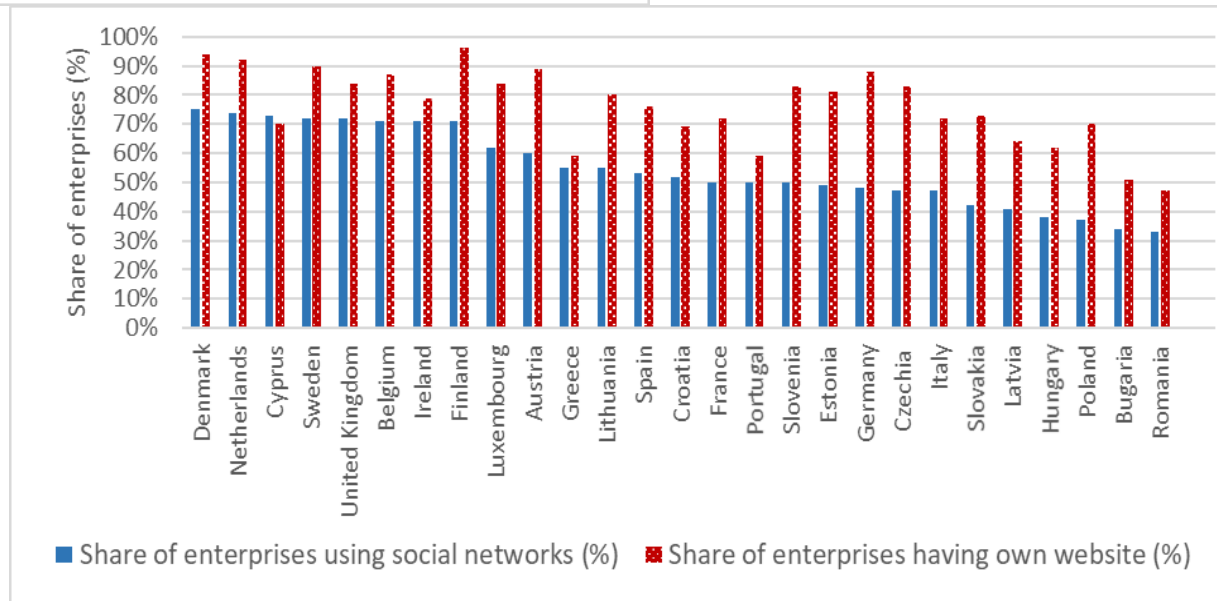
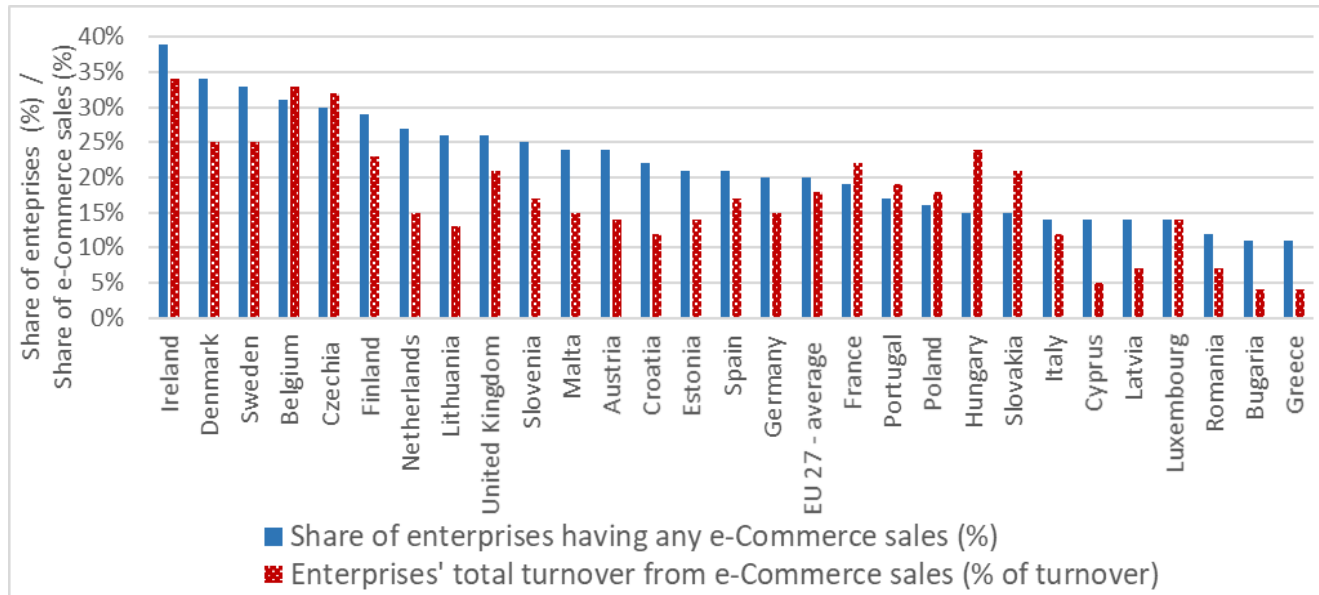
Methodology and data - variables

	Variable	Description	Code
A	Enterprises with e-commerce sales (%)	Enterprises having any e-commerce sales (% of enterprises with 10 or more employees in economy without financial sector)	isoc_ec_eseIn2
B	Enterprises' total turnover from e-commerce sales (%)	Value of e-commerce sales: Enterprises' total turnover from e-commerce sales (% of total turnover of enterprises with 10 or more employees without financial sector)	isoc_ec_evaln2
C	Enterprises with internet access (%)	Enterprises having internet access (% of enterprises with 10 or more employees in economy without fin. sector)	isoc_ci_in_en2
D	Enterprises providing portable devices for connection (%)	Enterprises providing portable devices for mobile connection to the internet for their employees (% of enterprises with 10 or more employees in economy without fin. sector)	isoc_cimobe_dev
E	Enterprises with a website (%)	Enterprises having own website (% of enterprises with 10 or more employees in economy without fin. sector)	isoc_ciweb
F	Enterprises using any social networks(%)	Enterprises using any social network (% of enterprises with 10 or more employees in economy without fin. sec)	isoc_cismt
G	Enterprises employing ICT specialists (%)	Enterprises that employ ICT specialists (% of enterprises with 10 or more employees in economy without fin. sec)	isoc_ske_itspen2
H	Enterprises buying cloud computing services (%)	Enterprises buying cloud computing services used over the internet (% of enterprises with 10 or more employees in economy without fin. sec)	isoc_cicce_use
I	Enterprises analysing big data (%)	Enterprises analysing big data from any data source (% of enterprises with 10 or more employees in economy without fin. sec)	isoc_eb_bd
J	Enterprises having insurance against ICT security incidents (%)	Enterprises having insurance against ICT security incidents (% of enterprises with 10 or more employees in economy without fin. sec)	isoc_cisce_

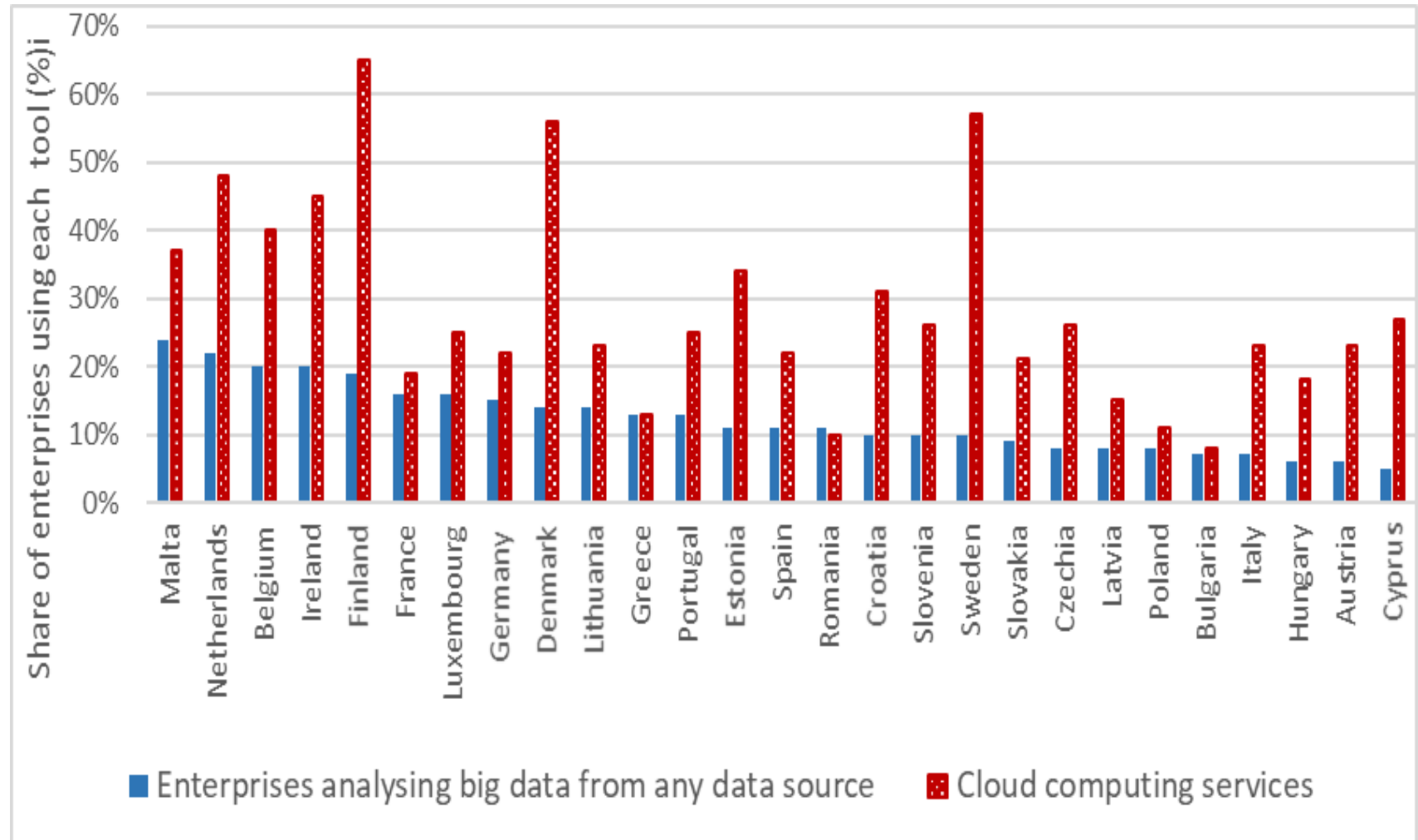
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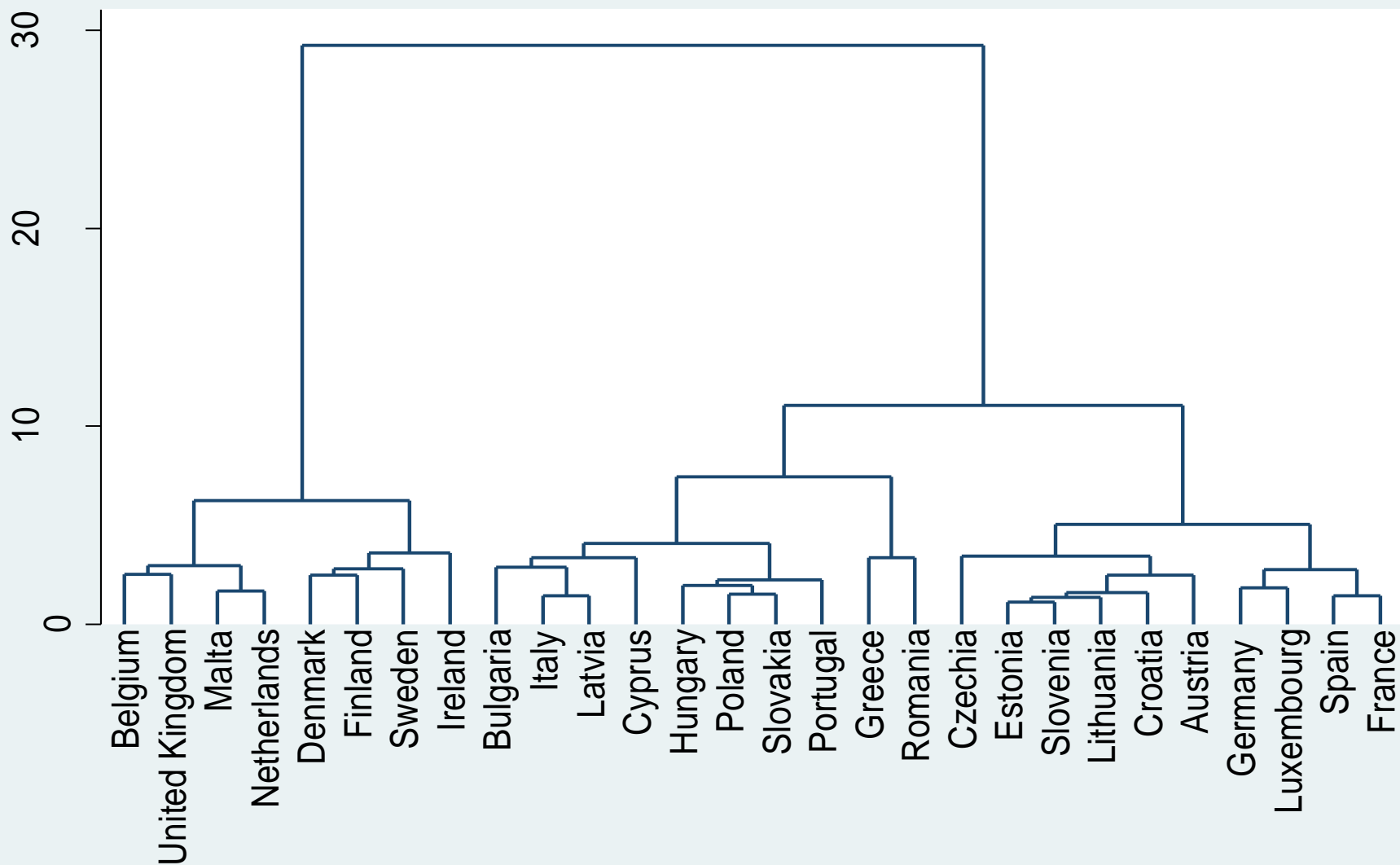
Results



The share of enterprises analysing big data and using cloud computing



Dendrogram of cluster analysis: similarity/dissimilarity in overall digital readiness of enterprises in EU countries



Summarized results of cluster analysis, ranking of clusters in each category

Cluster		Countries	Variables – rank of each cluster										Overall
			A	B	C	D	E	F	G	H	I	J	
Cluster I.	C1	Belgium	2.	2.	2.	2.	2.	1.	1.	2.	1.	2.	Very good digital readiness
		United Kingdom											
		Malta											
		Netherlands											
	C2	Denmark	1.	1.	1.	1.	1.	2.	2.	1.	2.	1.	Excellent digital readiness
		Finland											
		Sweden											
Cluster II.	C3	Bulgaria	5.	5.	5.	5.	5.	5.	3.	5.	6.	5.	Low digital readiness
		Italy											
		Latvia											
		Cyprus											
		Hungary											
		Poland											
		Slovakia											
	Portugal												
	C4	Greece	6.	6.	6.	6.	6.	6.	6.	6.	4.	4.	Very low d.r.
		Romania											
	C5	Czechia	3.	4./5.	4.	4.	4.	4.	5.	3.	5.	6.	Rather low digital readiness
		Estonia											
		Slovenia											
Lithuania													
Croatia													
Austria													
C6	Germany	4.	4./5.	3.	3.	3.	3.	4.	4.	3.	3.	Moderate digital readiness	
	Luxembourg												
	Spain												
	France												

Ranking of the countries according to digital preparedness based on the factors scores

Rank	Country	Factor score	Rank	Country	Factor score	Rank	Country	Factor score
1.	Denmark	1.8342	11.	Luxembourg	0.046	21.	Italy	-0.674
2.	Ireland	1.711	12.	France	-0.068	22.	Slovakia	-0.728
3.	Finland	1.613	13.	Spain	-0.111	23.	Poland	-0.777
4.	Sweden	1.55	14.	Lithuania	-0.14	24.	Hungary	-0.789
5.	Belgium	1.142	15.	Slovenia	-0.17	25.	Greece	-1.023
6.	Netherlands	0.982	16.	Germany	-0.185	26.	Latvia	-1.037
7.	United Kingdom	0.846	17.	Estonia	-0.294	27.	Bulgaria	-1.712
8.	Malta	0.791	18.	Croatia	-0.316	28.	Romania	-1.752
9.	Czechia	0.146	19.	Cyprus	-0.416			
10.	Austria	0.142	20.	Portugal	-0.61			

Conclusions

- Results suggest that there are rather significant differences in readiness of the business sector for digital economy among EU countries.
- The popularity of e-commerce among enterprises is the highest in Ireland, Denmark and Sweden and these three countries mostly dominate in other indicators as well. Romania, Bulgaria and Greece are positioned on the other end of the ranking.
- These countries are also included in the same clusters.
- Our results is in line with some other previous studies (Kinnunen et al., 2019; Borowiecki et al., 2020).
- We also provided a comprehensive ranking of EU countries based on factor scores (factor analysis).

Policy implications

- The EU policies have to address a very significant gap between the best and worst EU countries. Regional support must be strongly focused also on digitalisation and innovation.
- Our findings confirm the necessity of significant investments into the digital economy allocated especially in the Next-generation EU program as well as the new Multiannual Financial Framework.
- However, the exact allocation of resources is also important.
- Especially these three main priorities seem to be crucial to support digital transformation:
 - elimination of administrative barriers,
 - creation of economic incentives for business digitalization;
 - further development of ICT infrastructure; and investments in digital skills (Dobrolyubova, 2017).