

CONCORDi

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Digital Transformation and employment in Italian enterprises

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This presentation: a work in progress, spanning across diverse topics

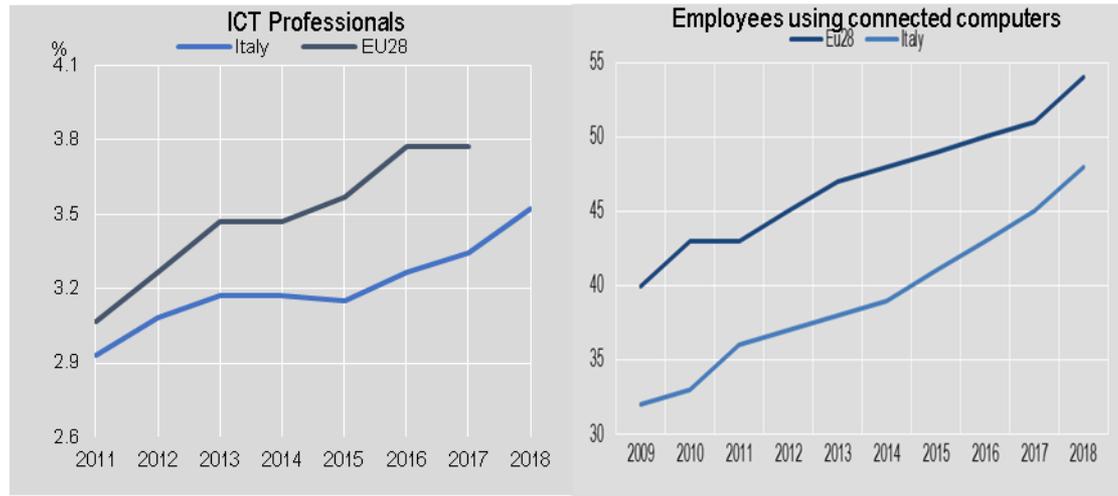
- 1. Education:** *predicts firms' IT behaviour and performance, other things being equal*
- 2. IT adoption:** *can be modelled, identifying patterns of digitalisation and enterprise profiles*
- 3. Employment dynamics:** *strong quality differences depending on enterprise digitalisation*

The digital transformation is moving fast...

Can be exemplified by the shares of ICT professionals in the economy and of employees using computers. Both items show a remarkable growth; Italy lags behind the EU, but the gap has been narrowing over time

- *ICT specialists increased from 2.9 to 3.5 percent of workforce from 2011 to 2018 (3.8% in the EU28)*
- *48 % of workers in firms w/10+ use a connected computer, up from 32% in 2009 (nearly 55% in the EU28)*

Share of ICT professionals in total employment and employees using connected computers

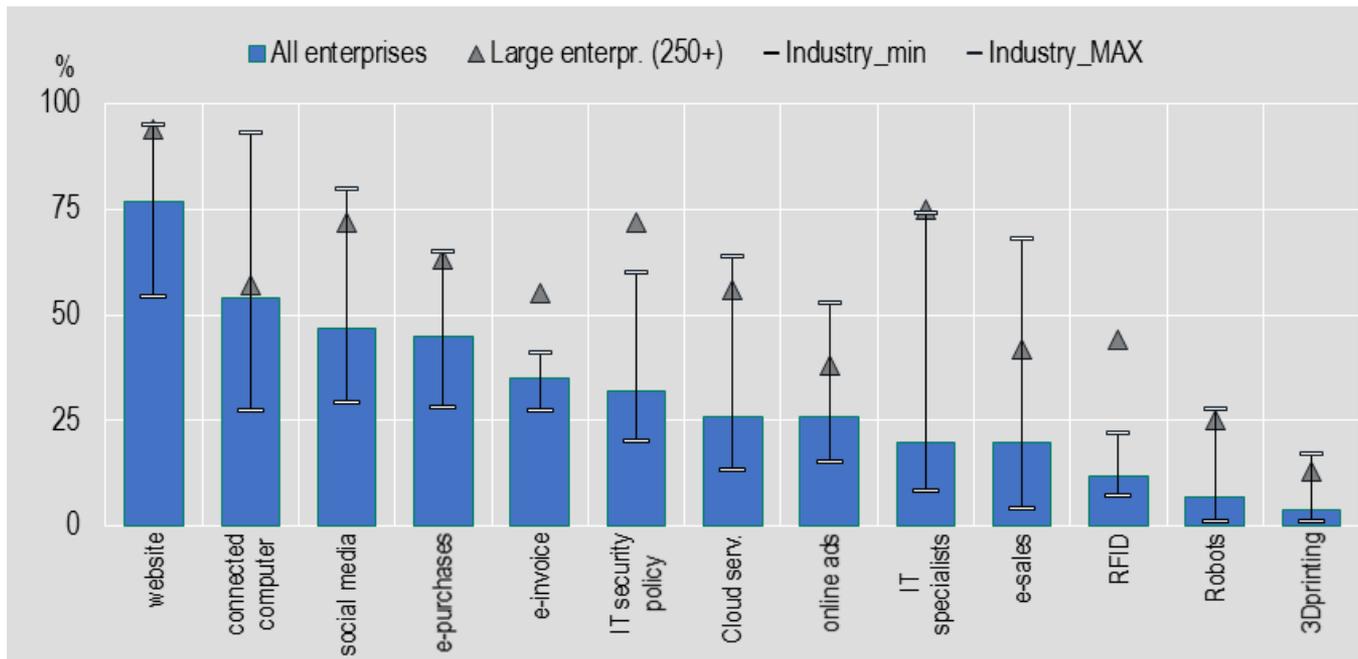


Sources: Istat and Eurostat LFS data (left); Eurostat, Community survey on ICT usage in enterprises (right).

NOTE: usage of connected computer refers to enterprises with at least 10 persons employed in manufacturing and market services, excluding finance

Industry and employment size make the difference, even for “mature” items

IT uptake in EU28 enterprises, by size and industry. Year 2018 (or most recent available)



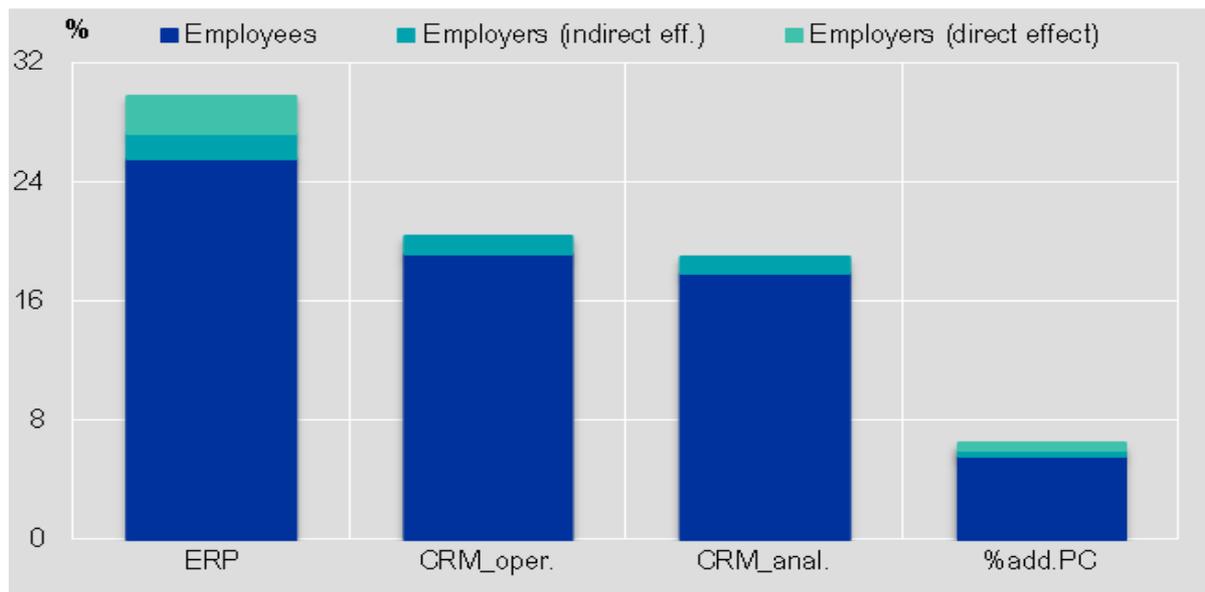
Source: Eurostat, Community survey on ICT usage in enterprises

Education matters for IT behaviour (and performance) of firms

- In small firms, this holds true for both entrepreneurs and, especially, for employees.
- An additional year of education of the workforce increases the probability of using information management tools (ERP) by ca. 30% , after controlling for other factors

Effect of one additional year of education to firm's average on the probability of using selected ITs

Year 2015, Italian non-agricultural employer enterprises with less than 50 persons employed

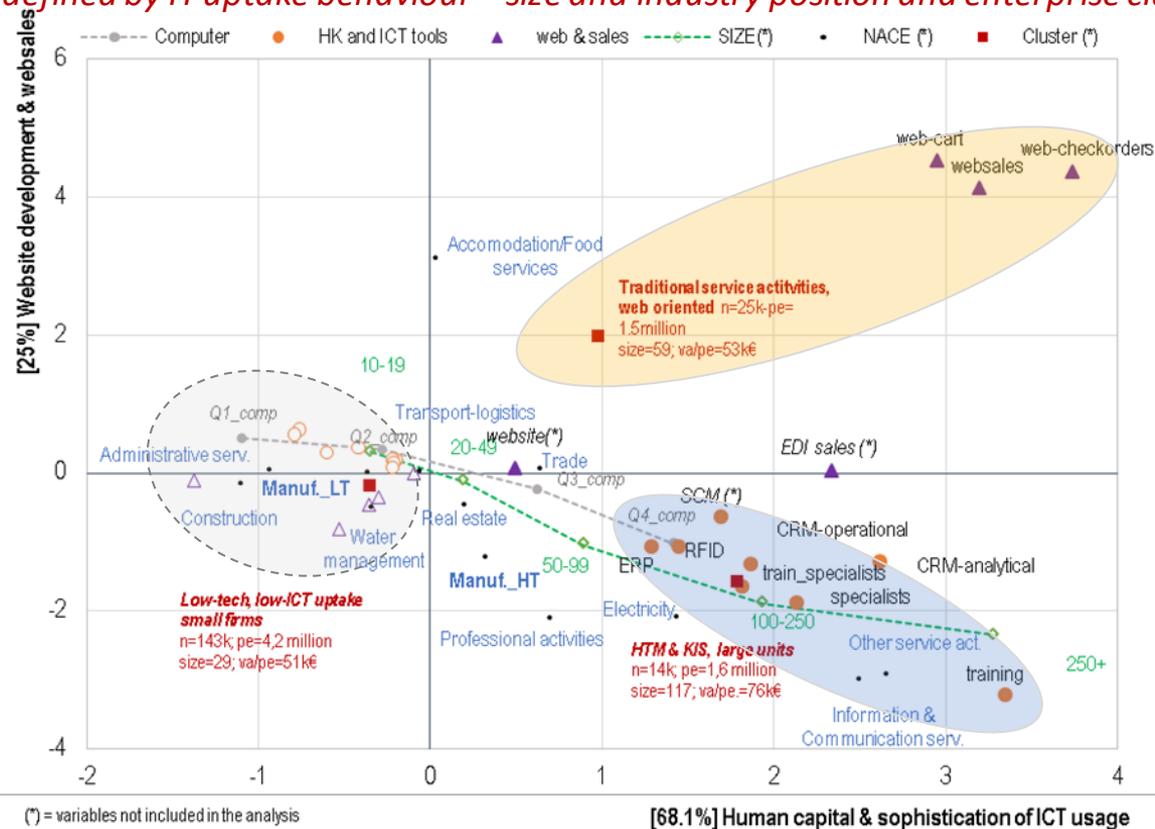


Source: de Panizza and De Santis, 2018 (in Istat, *Rapporto sulla conoscenza 2018*)

Digitalisation patterns and enterprise profiles

Digitalisation of Italian enterprises. Year 2017; enterprises with 10+ persons employed in industry and market services

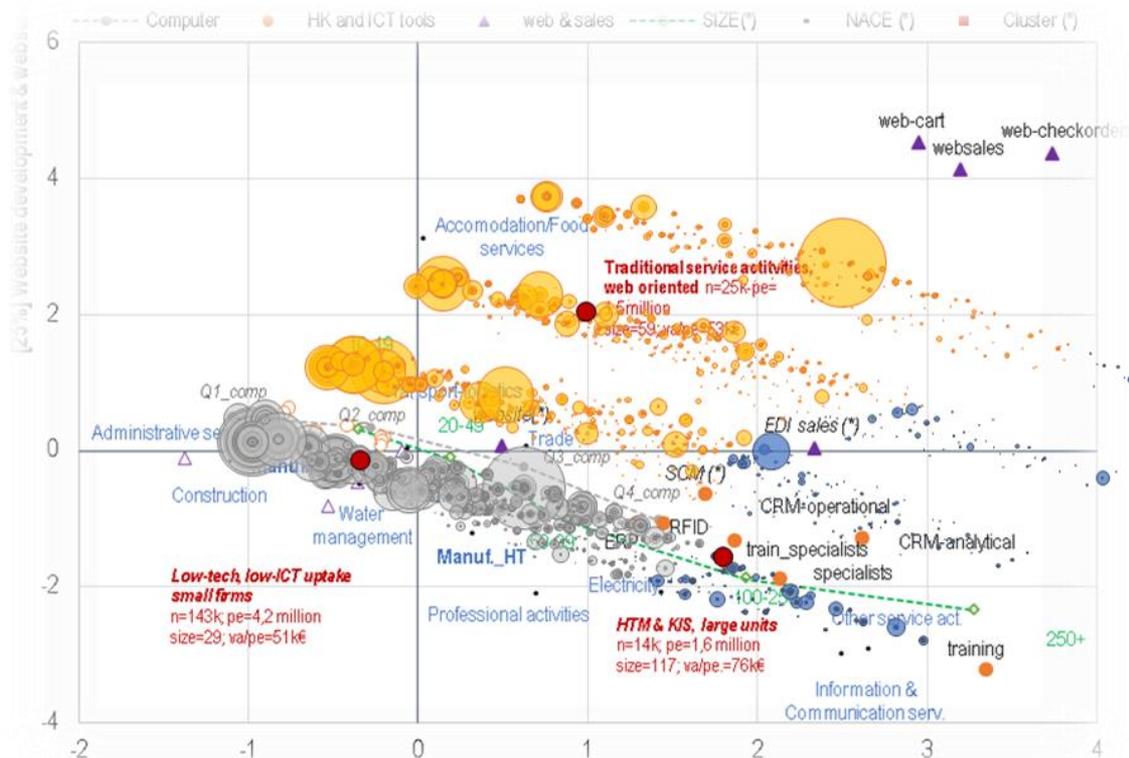
Factor space defined by IT uptake behaviour – size and industry position and enterprise clusters



Digitalisation patterns and enterprise profiles

Digitalisation of Italian enterprises. Year 2017; enterprises with 10+ persons employed in industry and market services

Enterprises in factor space and cluster centroids



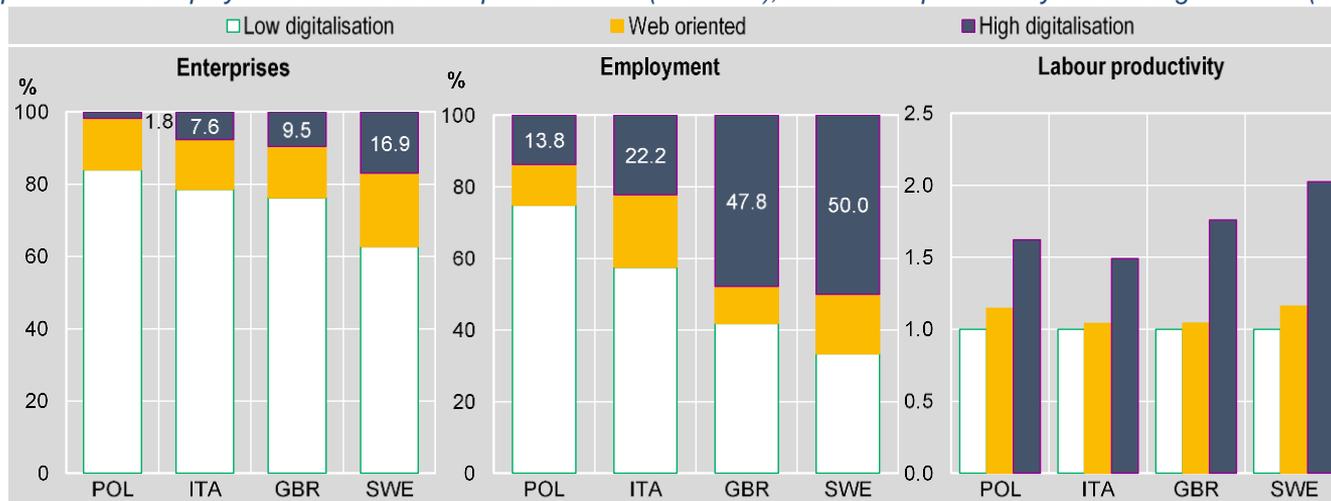
Source: Authors' computation on EC Survey on ICT usage in enterprises and Istat Statistical Archive on Active Enterprises (ASIA)
Note: bubbles are computed for the 21 thousand enterprises in the ICT survey; their size shows each observation's coefficient of expansion, so to portray the whole population of about 180 thousand enterprises.

Digitalisation is similar across countries: shares of enterprises differ

- Italy occupies an intermediate position between Poland and Sweden
- Highly digitalised enterprises tend to be larger and have a comparatively higher productivity

Digitalisation of enterprises in Italy, Poland, Sweden and the UK. Year 2017.

Population and employment shares of enterprise clusters (% values), and labour productivity vs. low digitalisation (= 1.0)



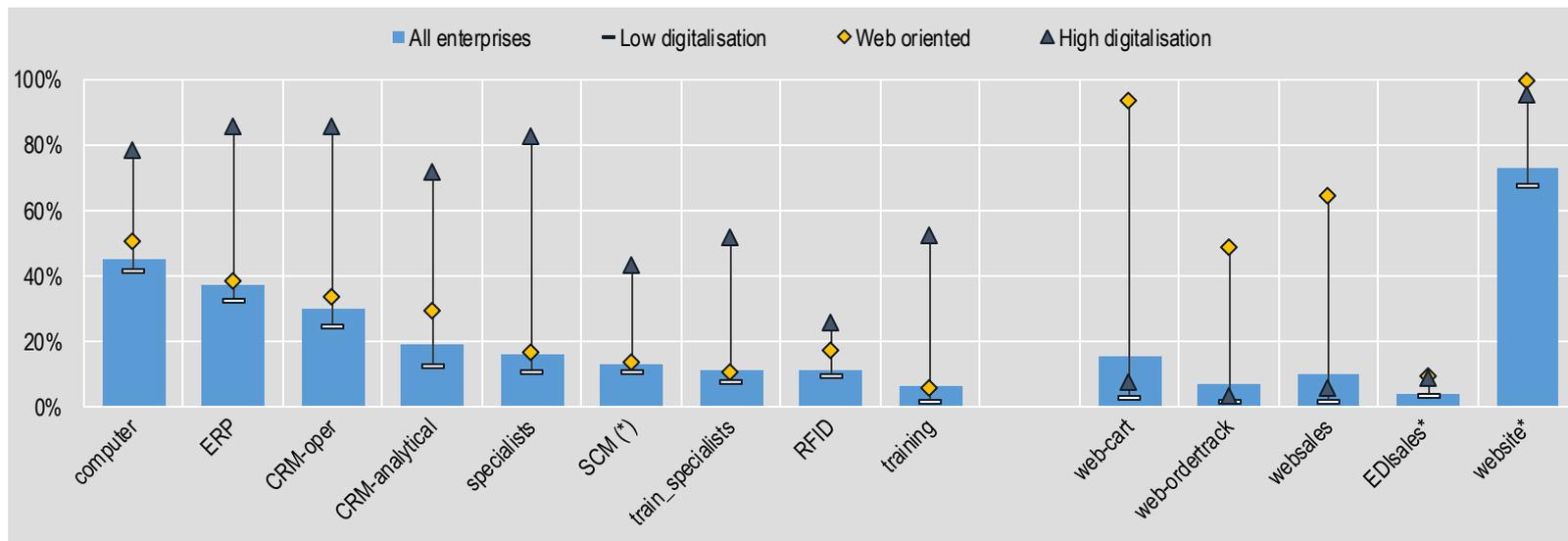
Source: elaboration on the European community survey on ICT usage in enterprises, from OECD (2019).

Note: populations of enterprises with at least 10 persons employed in manufacturing and market services, excluding financial activity. Relative labour productivity is computed as turnover per person employed except for Italy, where it portrays value added p.p.e

Clusters are strongly characterized by IT uptake...

- In the highly digitalised cluster the diffusion of computers, IT tools and investment in IT related human capital are twice or three times the average
- “Web oriented” enterprises (not very diverse from the low-digitalised ones in this respect) outline a *soft digitalisation* model, with little investment and need for training

Digitalisation models and the use of technologies - Year 2017. Percentage values by enterprise profile

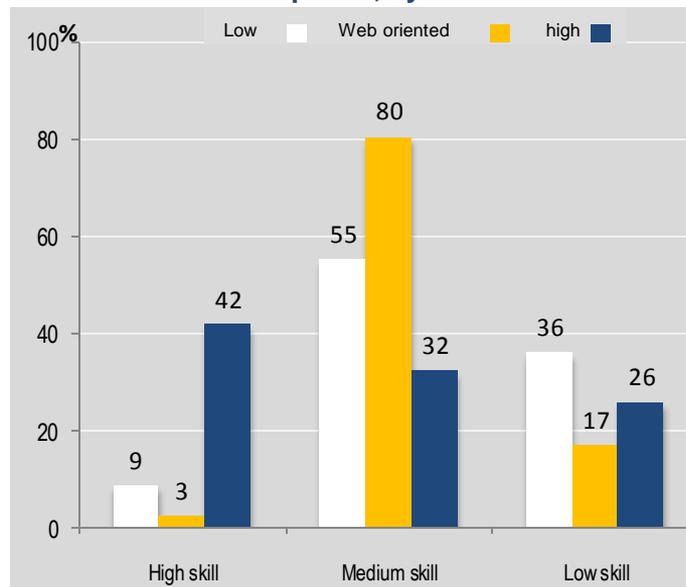
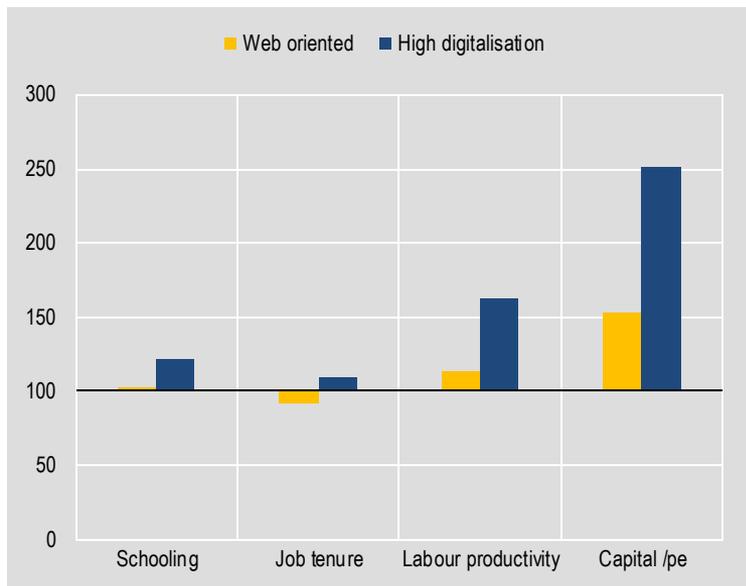


Source: Eurostat, Community survey on ICT usage in enterprises

... with respect to assets and job creation...

- Larger endowments of physical and intangible capital concur to the productivity advantage of HD firms
- 2015 & 2016 similar employment growth in the three groups, but a very diverse quality composition (ISCO levels)

Structural features (left) and employment growth (right) by skill level in Italian enterprises, by cluster. Years 2014 to 2016

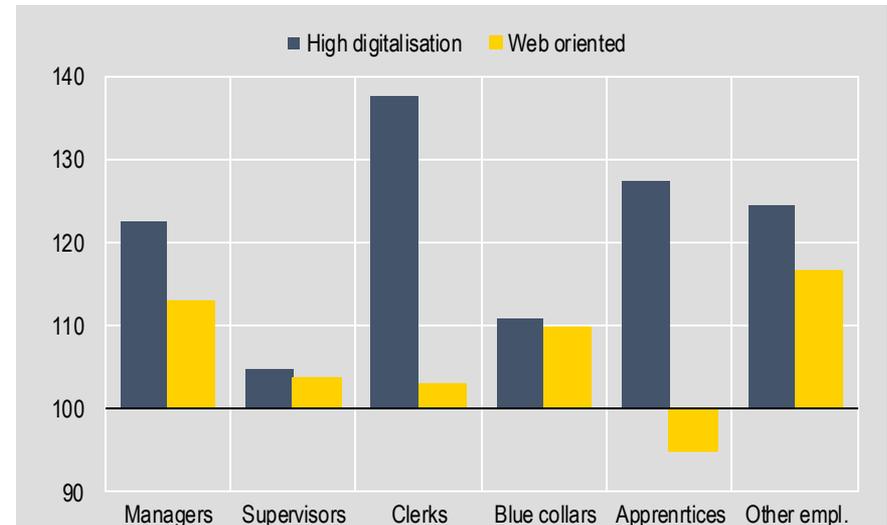
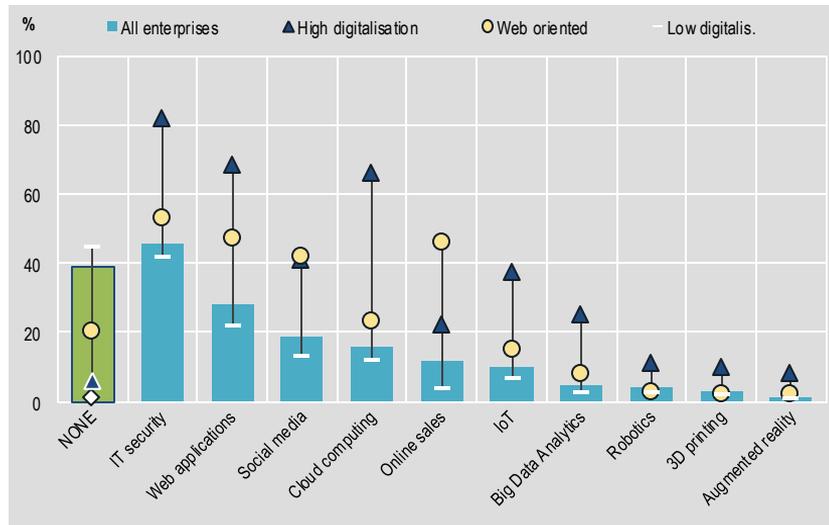


Source: Eurostat, Community survey on ICT usage in enterprises

... previous IT investment and employees' wages

- Highly digitalised enterprises (in 2017) were characterised by a much higher diffusion of IT investment in the three preceding years, and give pay higher wages to their personnel, across most occupations
- web oriented* enterprises are also relatively more generous with employees and show a higher-than-average propensity to IT investment, but in specific fields only

Diffusion of specific IT investments by digitalisation cluster year 2017 Wages of newly hired personnel. Low digitalisation enterpr.=100; year 2017



Sources: Author's calculations on EU community survey on ICT usage in enterprises, Istat Business register ASIA and Frame-SBS

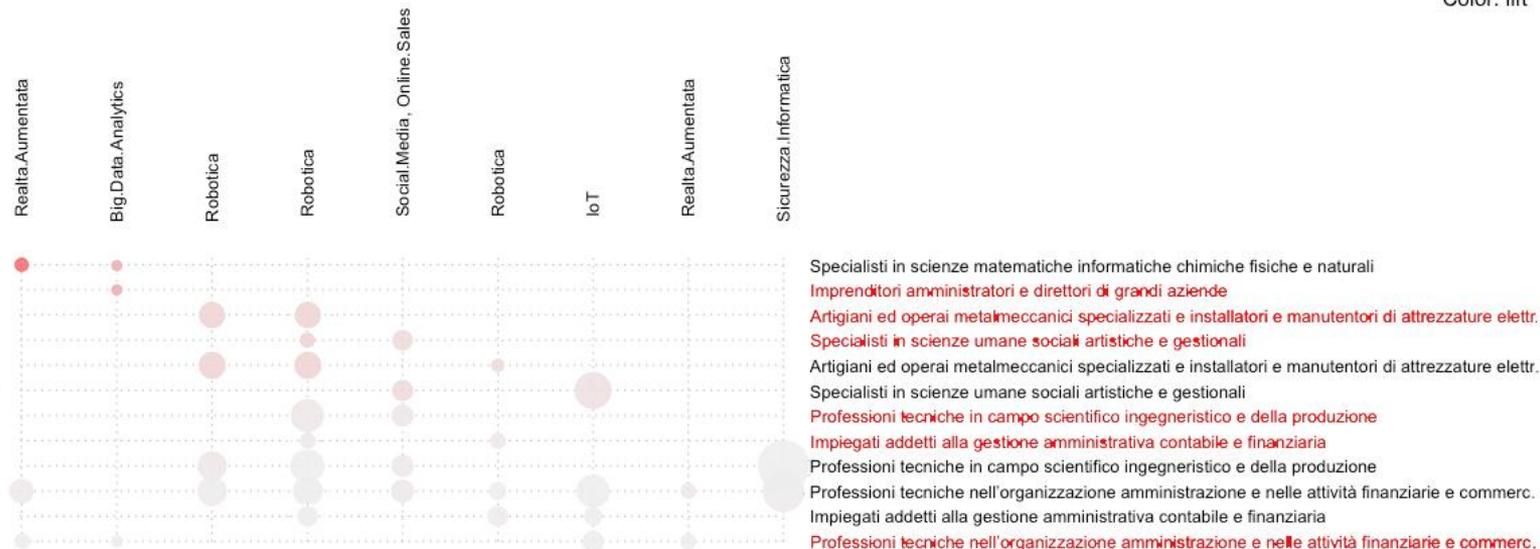
IT investment and demand for specific skills (Market Basket Analysis)

- High association (affinity) of investment in some tech clusters with technical profiles (e.g. software)
- Complementarity demand for more generic skills (e.g. “bureau employee”), at times adapted to technology (blue collars); some profiles highly mobile both in- and out- of employment

Associations between IT investment clusters and professional profiles

Grouped matrix of physical & human capital investment

Size: support
Color: lift



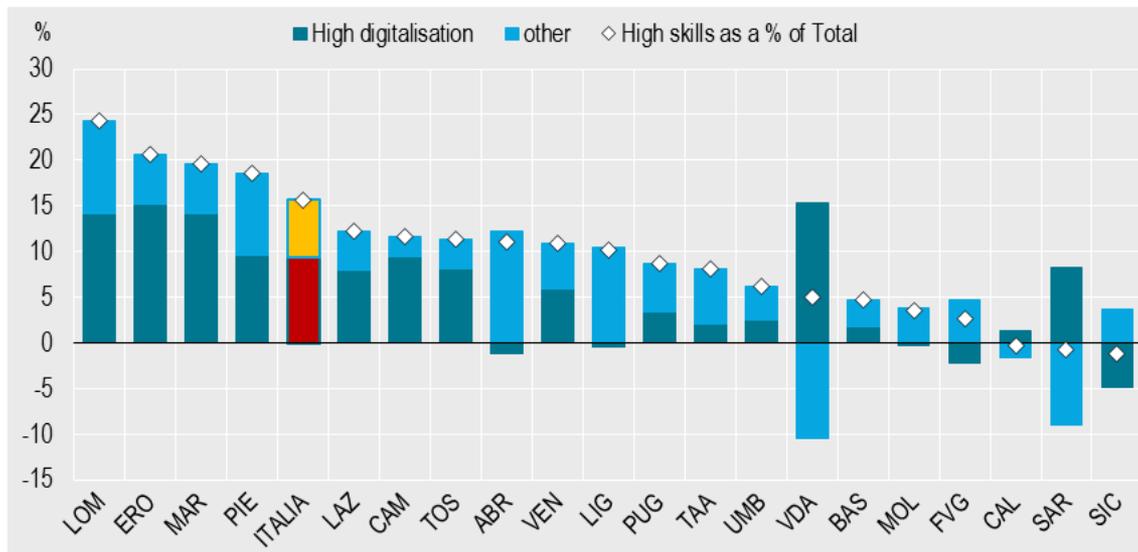
Source: adapted from Istat (Rapporto Annuale 2019) based on the EU community survey on ICT usage in enterprises Istat Business register ASIA and Frame-SBS

Digitalisation and regional differences in absorptive capacity of skilled individuals

- In the years 2015 and 2016 qualified employment (ISCO 1 to 3) represented 16% of net job creation, with very broad regional differences.
- These can be largely attributed to the presence of high-digitalisation enterprises

Net flows of highly qualified personnel

Years 2016 vs. 2014; % of total new net employment and contribution of highly digitalised enterprises



Source: Authors' calculations on EC Community survey on ICT usage in enterprises and on Ministry of Labour Administrative records

That's it... so far

Thank you for your attention

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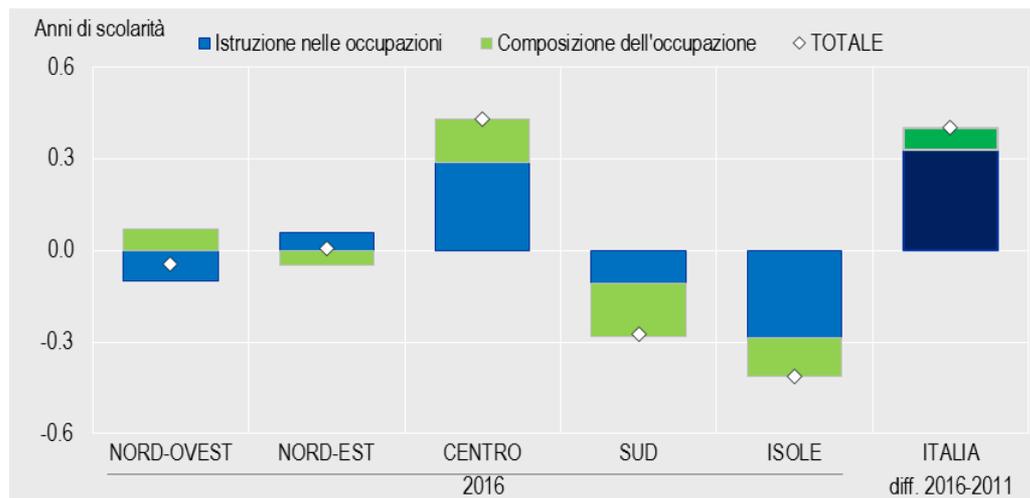
Extra slides

Employment structure and dynamics by level of education

- From 2011 to 2016 education of persons employed grew about .4 years p.c., mostly *within* professions, and only to a limited extent due to changes in the employment structure
- People in employment are better educated in regions of the Centre (influenced by Rome) and less in regions of the South (mostly due to composition) and the Islands (mostly due to lower education in jobs)

Differences in years of schooling of persons employed, by macro-region.

Years 2011-2016, total in years and components' contribution



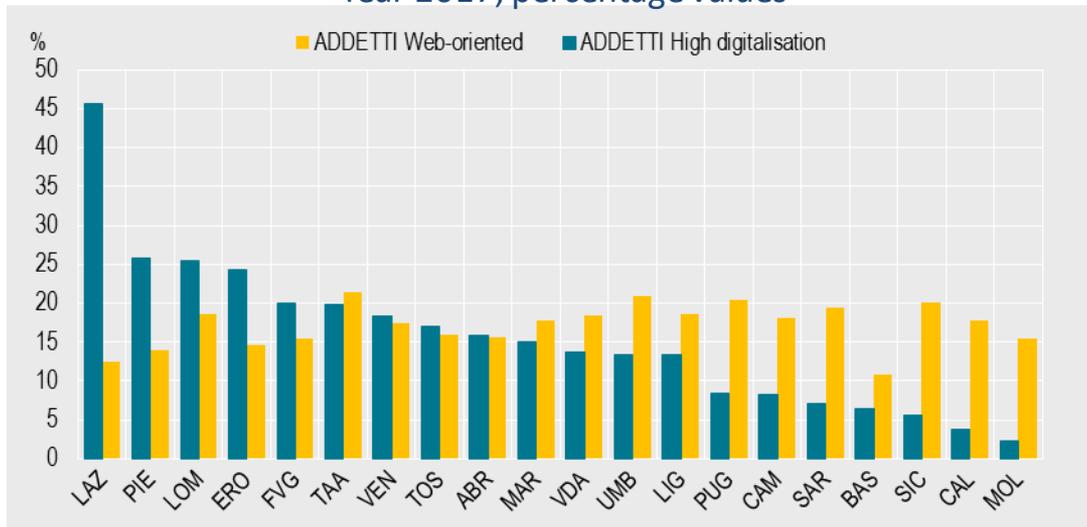
Employment shares of enterprises by digital profile, by region

Regional differences in (employment of) highly digitalised enterprises are crucial in hiring skilled workers.

- In Latium region close to 50% of workers are employed in HD enterprises.
- Shares are around 20-25% in regions of the North and Centre and go down below 10% in *Mezzogiorno*, where (partly as a consequence) the share of workers in web oriented enterprises is relatively high

Shares of workers by enterprise digitalisation profile and region

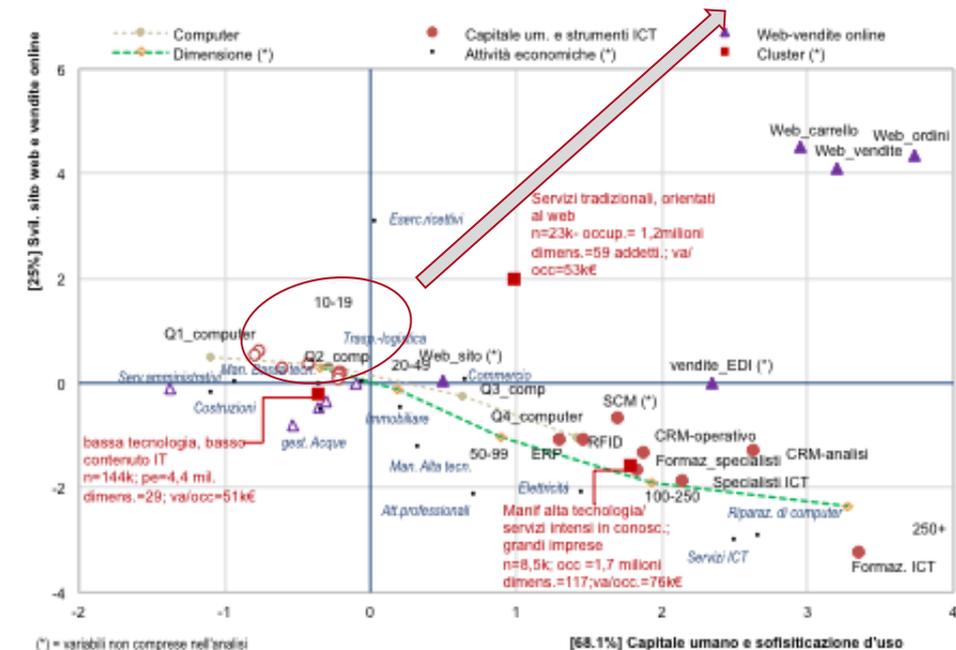
Year 2017, percentage values



Source: Authors' calculation on EC Survey on ICT usage in enterprises

The transition from low digitalisation to Web oriented: a multivariate (DM) analysis

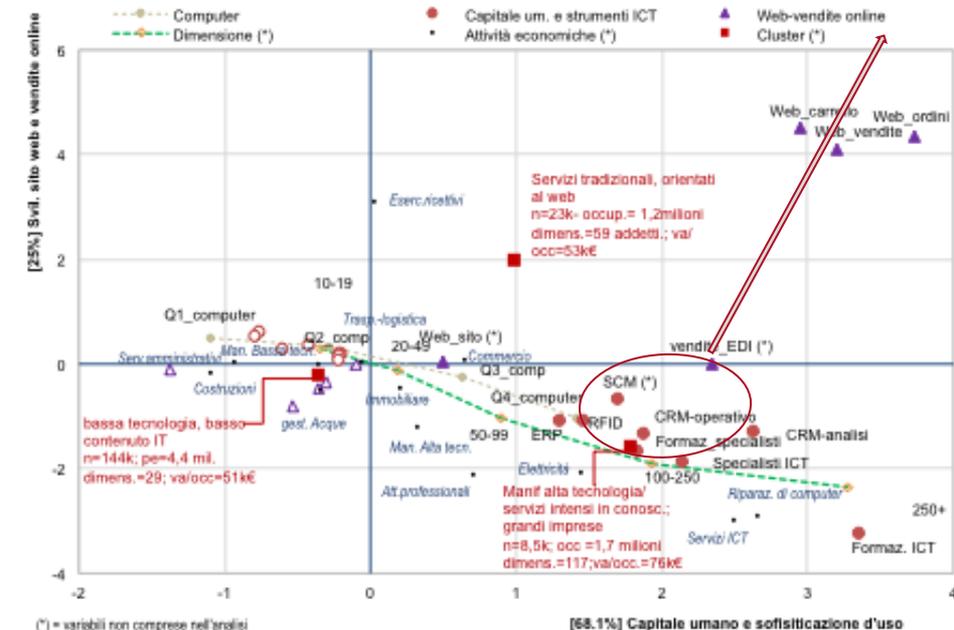
Tipo Imprese	addetti	fatturato	alfabetizzazione	k_add	VAPRO	% of persons employed	ICT specialists	ICT training for ICT specialists	ICT training for other persons employed	ERP	CRM for operational purposes	CRM for analytical purposes	Website with shopping
nucleo "duro"	61,7	9.722.963	10,3	80.122	50.591	13,2	0,05	0,00	0,03	0,07	0,64	0,61	0,01
In transizione	118,3	29.338.846	11,1	181.541	74.281	34,2	0,24	0,01	0,10	0,15	0,63	0,69	0,00



(*) = variabili non comprese nell'analisi

The transition from low to high digitalisation: a multivariate (DM) analysis

Tipo Imprese	addetti	fatturato	alfabetizzazione	k_add	VAPRO	% of persons employed	ICT specialists	ICT training for ICT specialists	ICT training for other persons employed	ERP	CRM for operational purposes	CRM for analytical purposes	Website with shopping
nucleo "duro"	66,7	11.278.650	10,4	93.197	53.709	15,1	0,07	0,00	0,04	0,08	0,64	0,62	0,01
In transizione	147,1	40.948.017	11,2	196.146	77.304	43,0	0,33	0,01	0,10	0,19	0,61	0,73	0,00



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Business unit classifier: a data mining application

Factors of digitalisation and innovative behaviour - a MV (DM) Analysis

