



Technequality

Understanding the relation between technological innovations and social inequality

Deliverable D5.1

Database with measurements of national and regional automation in Europe

Version 1.0

01-07-2020



Funded by the Horizon 2020
Framework Programme of the
European Union



Deliverable	:	5.1
Title	:	Database with national and regional automation in Europe
Author(s)	:	Pantelis Koutroumpis
Reviewer(s)	:	Tomas Korpi, Mark Levels, Didier Fourage, Raymond Montizaan
Document type	:	OTH
Document level	:	PU
Date	:	01-07-2020
Status	:	complete

TECHNEQUALITY partners

UOXF University of Oxford

Document change log

Version	Date	Comments

Verification and approval

Name	Date	Comments

Description of deliverable (100 words)

Deliverable 5.1 is a database including data on robot penetration at a disaggregated industry-national level in the EU (from in Task 1.3) and supplemented with data on relevant regional predictors. It builds on data from administrative offices, proprietary firm-level databases (Orbis Europe) and the International Federation of Robotics (IFR). The data is aggregated at the industry-national level, merged with the AI related adoption rate data gathered in Task 1.1, and matched with compatible industry classification level (likely NACE Rev. 2). EU KLEMS



is used to provide data on the number of employees by industry. Full database is available in the Excel documents D5.1_Task13 and D5.1_Task51.

Comparing D5.1 with the original DOA we have some changes in the variables that are described below:

- Task 1.3 delivers all the variables discussed in the DOA
- Task 5.1 delivers the following variables
-

Variables	Status	Notes
industry-national level data on payroll tax (aggregated from firm level data from ORBIS or Amadeus)		Payroll tax is not reported in Orbis Europe
industry-national level data on capital gains tax	Done	
industry-national level data on investment into robots	Done	Total Capital and R&D available
industry-national level data on other forms of automation (ditto)	Done	Total Capital and R&D available
industry classification level indicator (NACE Rev. 2/ 2-digit ISIC)	Done	
estimates on number of employees by industry (from business surveys)	Done	Source: Orbis Europe
employee wages	Done	Generated by the division of Wagebill by # employees in Orbis
employment by industry	Done	
Government data on fiscal revenue, differentiated by type of tax receipt	Done	Corporate taxes only available from Orbis Europe



1. Description of indicators

Tables 1 and 2 provide a description of indicators collected from Task 1.3 and Task 5.1 that will be used in WP1 and WP5 deliverables accordingly.

The level of regional disaggregation for Task 1.3 is at the NUTS3 level for the variables described (separate by each country) in Table 1. For Task 5.1 the level of disaggregation is at the country-industry-year level. To produce regional estimates, the automation estimates from Task 1.3 can be matched to regional firm-level characteristics (employment, output, corporate taxes, wages) from Orbis Europe. These estimates are provided separately in the database document D5.1_Task51 in the NUTS3_Employment regression results tab for the fixed effects (FE) and instrumental variable (IV) regressions results.

Given the proprietary nature of some data (IFR and Orbis Europe) we only provide the matching codes (country, year, region, industry) in these tabs so that the data can be matched with the full databased. This is done in D5.1_Task13 tab EUKLEMS_ROBOTS and D5.1_Task51 Orbis CountryXSector and EU_KLEMS CountryXSect tabs.

Table 1. Description of regional (municipality) indicators related to employment characteristics and automation

Variable description	Note	Data sources	
Denmark			
Demark municipality code 2007		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1344
Demark region		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1345
Denmark province		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1346
female population		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1347
male population		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1348
total population		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1349
population over 65 years old		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1350
foreign born		Statistics	https://www.statbank.dk/statba

		Denmark	nk5a/default.asp?w=1351
population between 15 and 69 years old		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1352
education attainment less than high school completed		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1353
education attainment high school		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1354
education attainment college and above		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1355
natural log of total population		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1356
employed persons		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1357
employment in manufacturing industries		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1358
female employment in manufacturing industries		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1359
employment in light manufacturing industries	ISIC V.4 2-digit: 13-15, 17-18	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1360
employment in mining industries		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1361
employment in construction industries		Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1362
share of male population	pop_male/pop	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1363
share of population over 65 years old	pop_65over/pop	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1364
share of foreign born	foreign/pop	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1365
share of education attainment less than high school	edu_lesshigh/pop	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1366
share of education attainment high school	edu_high/pop	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1367
share of education attainment college and above	edu_coll/pop	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1368
share of employment in manufacturing	empe_manu/empe	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1369
share of female employment in manufacturing	empe_manu_fe/empe_manu	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1370
share of employment in light manufacturing	empe_lightmanu/empe	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1371
share of employment in construction	empe_cons/emp	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1372
share of employment in mining	empe_mining/empe	Statistics Denmark	https://www.statbank.dk/statbank5a/default.asp?w=1373
Denmark chinese import competition exposure between 1993 and 2007	author's calculation	UN Comtrade	https://comtrade.un.org/



		Database	
Denmark chinese import competition exposure between 1993 and 2000	author's calculation	UN Comtrade Database	https://comtrade.un.org/
Denmark chinese import competition exposure between 2000 and 2007	author's calculation	UN Comtrade Database	https://comtrade.un.org/
Finland			
Finland sub region code 2019		Statistics Finland	https://www.stat.fi/index_en.html
Finland sub region name 2019		Statistics Finland	https://www.stat.fi/index_en.html
Finland region code 2019		Statistics Finland	https://www.stat.fi/index_en.html
female population		Statistics Finland	https://www.stat.fi/index_en.html
male population		Statistics Finland	https://www.stat.fi/index_en.html
total population		Statistics Finland	https://www.stat.fi/index_en.html
population over 65 years old		Statistics Finland	https://www.stat.fi/index_en.html
foreign born		Statistics Finland	https://www.stat.fi/index_en.html
education attainment less than high school completed		Statistics Finland	https://www.stat.fi/index_en.html
education attainment high school		Statistics Finland	https://www.stat.fi/index_en.html
education attainment college and above		Statistics Finland	https://www.stat.fi/index_en.html
natural log of total population		Statistics Finland	https://www.stat.fi/index_en.html
employed persons		Statistics Finland	https://www.stat.fi/index_en.html
employment in manufacturing industries		Statistics Finland	https://www.stat.fi/index_en.html
female employment in manufacturing industries		Statistics Finland	https://www.stat.fi/index_en.html
employment in light manufacturing industries	ISIC V.4 2-digit: 13-15, 17-18	Statistics Finland	https://www.stat.fi/index_en.html
employment in mining industries		Statistics Finland	https://www.stat.fi/index_en.html
employment in construction industries		Statistics Finland	https://www.stat.fi/index_en.html



share of male population	pop_male/pop	Statistics Finland	https://www.stat.fi/index_en.html
share of population over 65 years old	pop_65over/pop	Statistics Finland	https://www.stat.fi/index_en.html
share of foreign born	foreign/pop	Statistics Finland	https://www.stat.fi/index_en.html
share of education attainment less than high school	edu_lesshigh/pop	Statistics Finland	https://www.stat.fi/index_en.html
share of education attainment high school	edu_high/pop	Statistics Finland	https://www.stat.fi/index_en.html
share of education attainment college and above	edu_coll/pop	Statistics Finland	https://www.stat.fi/index_en.html
share of employment in manufacturing	empe_manu/emp	Statistics Finland	https://www.stat.fi/index_en.html
share of female employment in manufacturing	empe_manu_fe/empe_manu	Statistics Finland	https://www.stat.fi/index_en.html
share of employment in light manufacturing	empe_lightmanu/empe	Statistics Finland	https://www.stat.fi/index_en.html
share of employment in construction	empe_cons/emp	Statistics Finland	https://www.stat.fi/index_en.html
share of employment in mining	empe_mining/emp	Statistics Finland	https://www.stat.fi/index_en.html
Finland chinese import competition exposure between 1993 and 2007	author's calculation	UN Comtrade Database	https://comtrade.un.org/
Finland chinese import competition exposure between 1993 and 2000	author's calculation	UN Comtrade Database	https://comtrade.un.org/
Finland chinese import competition exposure between 2000 and 2007	author's calculation	UN Comtrade Database	https://comtrade.un.org/
Spain			
EU NUTS3	2010 NUTS3 version from Eurostat	IPUMS International	https://international.ipums.org/international/index.shtml
male population		IPUMS International	https://international.ipums.org/international/index.shtml
total population		IPUMS International	https://international.ipums.org/international/index.shtml
population over 65 years old		IPUMS International	https://international.ipums.org/international/index.shtml

foreign born		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
education attainment primary school completed		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
education attainment secondary school completed		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
education attainment university or above		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
routine occupation employment		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
natural log of total population		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
employed persons		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
employment in manufacturing industries		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
female employment in manufacturing industries		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
employment in light manufacturing industries	ISIC V.4 2-digit: 13-15, 17-18	IPUMS Internati onal	https://international.ipums.org/international/index.shtml
employment in mining industries		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
employment in construction industries		IPUMS Internati onal	https://international.ipums.org/international/index.shtml
share of male population	pop_male/pop	IPUMS Internati onal	https://international.ipums.org/international/index.shtml
share of population over 65 years old	pop_65over/pop	IPUMS Internati onal	https://international.ipums.org/international/index.shtml
share of foreign born	foreign/pop	IPUMS Internati onal	https://international.ipums.org/international/index.shtml
share of education attainment primary school completed	edu_pri/pop	IPUMS Internati onal	https://international.ipums.org/international/index.shtml
share of education attainment	edu_sec/pop	IPUMS	https://international.ipums.org/international/index.shtml



secondary school completed		International	international/index.shtml
share of education attainment university or above	edu_uni/pop	IPUMS International	https://international.ipums.org/international/index.shtml
share of routine occupational employment	occ_routine/emp	IPUMS International	https://international.ipums.org/international/index.shtml
share of employment in manufacturing	empe_manu/empe	IPUMS International	https://international.ipums.org/international/index.shtml
share of female employment in manufacturing	empe_manu_fe/empe_manu	IPUMS International	https://international.ipums.org/international/index.shtml
share of employment in light manufacturing	empe_lightmanu/empe	IPUMS International	https://international.ipums.org/international/index.shtml
share of employment in nondurable industries	empe_nondurable/empe	IPUMS International	https://international.ipums.org/international/index.shtml
share of employment in construction	empe_cons/emp	IPUMS International	https://international.ipums.org/international/index.shtml
share of employment in mining	empe_mining/empe	IPUMS International	https://international.ipums.org/international/index.shtml
UK chinese import competition exposure between 1993 and 2011	author's calculation	UN Comtrade Database	https://comtrade.un.org/
UK chinese import competition exposure between 1993 and 2001	author's calculation	UN Comtrade Database	https://comtrade.un.org/
UK chinese import competition exposure between 2001 and 2011	author's calculation	UN Comtrade Database	https://comtrade.un.org/
Sweden			
Sweden local labour market 1998		Statistics Sweden	https://www.scb.se/en/
Sweden local labour market name 1998		Statistics Sweden	https://www.scb.se/en/
Sweden county code		Statistics Sweden	https://www.scb.se/en/
male population		Statistics Sweden	https://www.scb.se/en/



total population		Statistics Sweden	https://www.scb.se/en/
population over 65 years old		Statistics Sweden	https://www.scb.se/en/
foreign born		Statistics Sweden	https://www.scb.se/en/
foreign born, female		Statistics Sweden	https://www.scb.se/en/
foreign born, male		Statistics Sweden	https://www.scb.se/en/
education attainment less than high school completed		Statistics Sweden	https://www.scb.se/en/
education attainment high school		Statistics Sweden	https://www.scb.se/en/
education attainment college and above		Statistics Sweden	https://www.scb.se/en/
natural log of total population		Statistics Sweden	https://www.scb.se/en/
gainfully employed 16+ years by region of work		Statistics Sweden	https://www.scb.se/en/
employment in manufacturing industries	gainfully employed 16+ years by region of work	Statistics Sweden	https://www.scb.se/en/
female employment in manufacturing industries	gainfully employed 16+ years by region of work	Statistics Sweden	https://www.scb.se/en/
employment in light manufacturing industries	ISIC V.4 2-digit: 13-15, 17-18, gainfully employed 16+ years by region of work	Statistics Sweden	https://www.scb.se/en/
employment in mining industries	gainfully employed 16+ years by region of work	Statistics Sweden	https://www.scb.se/en/
employment in construction industries	gainfully employed 16+ years by region of work	Statistics Sweden	https://www.scb.se/en/
share of male population	pop_male/pop	Statistics Sweden	https://www.scb.se/en/
share of population over 65 years old	pop_65over/pop	Statistics Sweden	https://www.scb.se/en/
share of foreign born	foreign/pop	Statistics Sweden	https://www.scb.se/en/
share of education attainment	edu_lesshigh/po	Statistics Sweden	https://www.scb.se/en/



less than high school	p	Sweden	
share of education attainment high school	edu_high/pop	Statistics Sweden	https://www.scb.se/en/
share of education attainment college and above	edu_coll/pop	Statistics Sweden	https://www.scb.se/en/
share of employment in manufacturing	empe_manu/empe	Statistics Sweden	https://www.scb.se/en/
share of female employment in manufacturing	empe_manu_fe/empe_manu	Statistics Sweden	https://www.scb.se/en/
share of employment in light manufacturing	empe_lightmanu/empe	Statistics Sweden	https://www.scb.se/en/
share of employment in construction	empe_cons/emp	Statistics Sweden	https://www.scb.se/en/
share of employment in mining	empe_mining/empe	Statistics Sweden	https://www.scb.se/en/
Sweden chinese import competition exposure between 1993 and 2007	author's calculation	UN Comtrade Database	https://comtrade.un.org/
Sweden chinese import competition exposure between 1993 and 2000	author's calculation	UN Comtrade Database	https://comtrade.un.org/
Sweden chinese import competition exposure between 2000 and 2007	author's calculation	UN Comtrade Database	https://comtrade.un.org/
United Kingdom			
UK local authority district code, prior to April 2015	London boroughs are grouped into NUTS3 2003 version	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
UK local authority district name, prior to April 2015		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
UK region code		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
male population		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
total population		NOMIS &	https://www.nomisweb.co.uk/

		Scotland's Census	
population over 65 years old		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
foreign born		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
education with qualification		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
ethnic groups: white		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
ethnic groups: black		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
ethnic groups: all asian		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
occupational employment		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
routine occupation employment		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
natural log of total population		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
employees		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
employment in manufacturing industries		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
female employees		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/



female employment in manufacturing industries		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
employment in light manufacturing industries	ISIC V.4 2-digit: 13-15, 17-18	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
employment in mining industries		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
employment in construction industries		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
employment in nondurable industries		NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of male population	pop_male/pop	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of population over 65 years old	pop_65over/pop	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of foreign born	foreign/pop	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of education with qualification	edu_qualified/pop	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
shre of ethnic group, white	race_white/pop	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
shre of ethnic group, black	race_black/pop	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
shre of ethnic group, asia	race_asia/pop	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of routine occupational employment	occ_routine/occ_tot	NOMIS &	https://www.nomisweb.co.uk/



		Scotland's Census	
share of employment in manufacturing	empe_manu/empe	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of female employment in manufacturing	empe_manu_fe/empe_manu	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of employment in light manufacturing	empe_lightmanu/empe	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of employment in nondurable industries	empe_nondurable/empe	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of employment in construction	empe_cons/emp	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
share of employment in mining	empe_mining/empe	NOMIS & Scotland's Census	https://www.nomisweb.co.uk/
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UK chinese import competition exposure between 1993 and 2001	author's calculation	UN Comtrade Database	https://comtrade.un.org/
UK chinese import competition exposure between 2001 and 2007	author's calculation	UN Comtrade Database	https://comtrade.un.org/

Table 2. Description of indicators related to firm-level characteristics and automation

Variable description	Variable	Data sources
Economic Variables (region)		



Gross output	Gross Output	EU KLEMS 2019
Employees	Employment share	EU KLEMS 2019
Percentage point difference of Total Factor Productivity levels relative to base year (2010)	TFP	EU KLEMS 2019
Value Added	Value Added	EU KLEMS 2019
Economic Variables (firm-level)		
Number of employees	Nemployees	Orbis Europe
Total Corporate Tax Paid by firms	Tax	Orbis Europe
Total Operating Revenues of firms	OpRev	Orbis Europe
Total Sales of firms	Sales	Orbis Europe
Value Added	VA	Orbis Europe
Total Factor Productivity	logTFP	Orbis Europe
Total wagebill of firms	Wagebill	Orbis Europe
Total capital of firms	Capital	Orbis Europe
R&D expenditures of firms	RD	Orbis Europe
Mean age of firms	age	Orbis Europe
Automation variables (country-sector)		
industrial robot operational stock	robots	International Federation of Robotics
industrial robot operational stock in other EU countries	ivrobots	International Federation of Robotics
industrial robot operational stock in Germany, France, Italy, Spain and the UK	iv5robots	International Federation of Robotics

