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Workpackage WPB Implementation – Online Job Vacancies

**Replication of the analyses of 2019
using the 2nd CEDEFOP Dataset
(March 2020)**

**Prepared by:
Swiss Federal Statistical Office
(Francis Saucy)**

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Workpackage Leader:

Tomaž Špeh (SURS, SI)
e-mail address: tomaz.speh@gov.si
mobile phone: +38651672116

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Technical considerations

This report aims to replicate the analyses conducted in 2019 on the first version (referred as V1) of the BDTI DataLab for OJAs with the data of the version provided in the beginning of 2020 (referred as V2). The analyses have been restricted to the level of the country.

The analyses have been conducted during the second week of March 2020 (10th to 17th; V1: mid-June to mid-August 2019). They refer to the set of V2 CEDEFOP data version provided in the beginning of 2020 (V1 referred to data presented in June 2019 at the physical meeting in Thessaloniki). They cover the period July 2018- September 2019, i.e. a period of 15 months or 5 quarters (V1: July 2018 to March 2019, i.e. a period of 9 months or 3 quarters) for all 28 EU countries (V1: selection of 13 EU countries.) Data have been accessed using Jupyter notebooks on the new BDTI platform (cloud amazonaws). Statistical analyses and modelling have been conducted using the open source software R.

Data description

Number of records per country

The V2 dataset encompasses 107.83 millions of records (V1: 64.3; +43.5 millions; +67.6%). After exclusion of duplicate cases (query: SELECT COUNTRY, COUNT(DISTINCT GENERAL_ID) as num_job_vacancy), the V2 dataset displays 92.4 millions of unique records, or “OJAs = Online job advertisements” (V1: 55.5 millions; +36.9 millions; + 66.5%) (Table 1).

Table 1 Number of recorded OJVs per country (all months confounded: updated for V2 data and for revised figures of GDP)

COUNTRY	id	Population 2018	jvs_rate 20183	Nominal GDP (millions USD)	OJA : V2 Jul18_Sep19	OJA : V1 Jul18-Mar19	OJA: V2 Jul18_Mar19	Diff OJA: VI-V2 Jul18_Mar19	Diff % OJA: VI-V2 Jul18_Mar19
ÖSTERREICH	AT	8.8	3.0	456.2	1'981'163	1'413'784	1'406'058	-7'726	-0.5%
BELGIQUE-BELGIË	BE	11.4	3.6	532.3	3'139'043	1'802'390	1'829'102	26'712	1.5%
БЪЛГАРИЯ (BULGARIA)	BG	7.1	0.9	65.2	432'529		190'959	190'959	
ΚΥΠΡΟΣ (KYPROS)	CY	0.9	2.1	24.5	39'336		20'041	20'041	
ČESKÁ REPUBLIKA	CZ	10.6	5.9	245.2	1'198'313	541'947	647'077	105'130	19.4%
DEUTSCHLAND	DE	82.9	3.0	3'951.3	23'909'118	15'679'793	15'838'960	159'167	1.0%
DANMARK	DK	5.8	2.0	352.1	288'828		153'138	153'138	
EESTI	EE	1.3	1.9	30.8	158'443		58'836	58'836	
ESPAÑA	ES	46.7	0.8	1'427.5	3'393'480	1'832'400	1'760'318	-72'082	-3.9%
SUOMI / FINLAND	FI	5.5	2.1	274.2	409'992		204'982	204'982	
FRANCE	FR	67.2	1.1	2'780.2	18'448'919	11'959'196	11'947'093	-12'103	-0.1%
Greece	GR	10.7	0.6	218.2	64'676		24'101	24'101	
HRVATSKA (CROATIA)	HR	4.1	1.5	60.8	93'861		45'078	45'078	
MAGYARORSZÁG (HUNGARY)	HU	9.8	2.8	161.2	371'111		204'094	204'094	
IRELAND	IE	4.8	1.0	382.8	1'066'146	570'060	579'248	9'188	1.6%
ITALIA	IT	60.5	1.1	2'075.9	4'016'631	2'371'035	2'331'295	-39'740	-1.7%
LIETUVA	LT	2.8	1.5	53.3	146'164		50'919	50'919	
LUXEMBOURG	LU	0.6	1.8	69.6	137'189	77'559	75'027	-2'532	-3.3%
LATVIJA	LV	1.9	2.5	34.9	117'435		48'321	48'321	
MALTA	MT	0.5	2.8	11.4	23'818		14'000	14'000	
NEDERLAND	NL	17.1	3.0	914.5	7'059'518	3'483'875	3'480'913	-2'962	-0.1%
POLSKA	PL	38	1.2	585.8	2'713'781	1'444'290	1'538'132	93'842	6.5%
PORTUGAL	PT	10.3	1.0	240.9	833'383		394'276	394'276	
ROMÂNIA	RO	19.5	1.3	239.6	719'963		322'036	322'036	
SVERIGE	SE	10.1	2.1	556.1	1'716'988	1'063'498	1'074'005	10'507	1.0%
SLOVENIJA	SI	2.1	2.6	54.1	57'203		20'488	20'488	
SLOVENSKO	SK	5.4	1.2	106.6	317'218		176'398	176'398	
UNITED KINGDOM	UK	66.2	2.8	2'828.8	19'781'809	13'303'636	13'394'207	90'571	0.7%

Population :	https://ec.europa.eu/eurostat/documents/2995521/9063748/3-10072018-BP-FR.pdf/fbaad51a-5e4f-4b1a-9636-6e9b85f5d8e0					
JVS rate 20183	https://ec.europa.eu/eurostat/statistics-explained/images/3/30/Quarterly_job_vacancy_rates_not_seasonally_adjusted%2C_Q3-2018_-_Q3-2019.png					
GDP 2018 (updated)	https://en.wikipedia.org/wiki/List_of_sovereign_states_in_Europe_by_GDP_(nominal)					

As shown in Table 1, the numbers of OJAs of the second CEDEFOP dataset do not correspond exactly to the first dataset for the period July 2018 to March 2019. In most cases, differences are small except for PL (+6.5%) and CZ (+19.4%). This indicates that results from the first version V1 cannot be compared directly to the V2 dataset without care.

Annual and monthly OJAs figures

Changes in OJAs through time may depend on several factors , such as structure of the job market, conjuncture, period of the year (seasonality), as well as choices of time periods. The first CEDEFOP data set covers a period of 9 months (July 2018-March 2019), while the the second covers a span of 15 months (July 2019-September 2019). In order to get average monthly estimates we averaged the OJAs over the four possible 12-months periods from Jul18-Jun19 to Oct18-Sep19 and derived monthly averages from these averaged figures (Table 2).

Table 2 Annual and monthly averages of OJAs per country from the V2 dataset

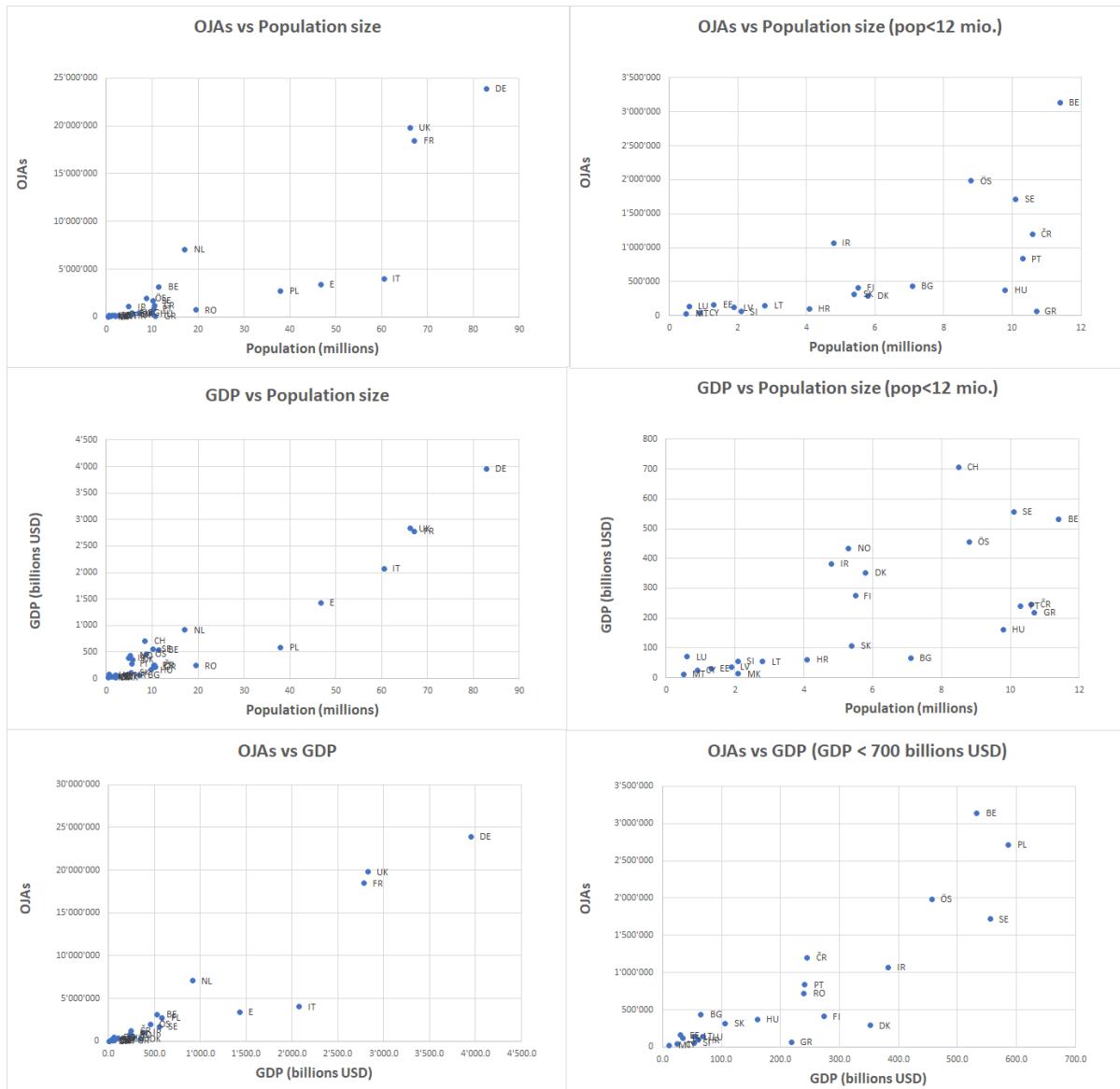
num_job_vacancy	num_job_vacancy	Jul18/Jun19	Aug18/Jul19	Sep_18/Aug19	Oct18/Sep19	Min	Max	Average 12 months	Monthly average
AT	1'655'048	1'581'599	1'567'150	1'518'698	1'518'698	1'655'048	1'580'624	131'719	
BE	2'513'535	2'614'780	2'613'825	2'616'502	2'513'535	2'616'502	2'589'661	215'805	
BG	318'067	356'734	388'338	415'601	318'067	415'601	369'685	30'807	
CY	29'492	33'698	36'252	37'336	29'492	37'336	34'195	2'850	
CZ	925'655	991'395	1'035'281	1'068'333	925'655	1'068'333	1'005'166	83'764	
DE	19'337'398	19'606'565	19'710'774	19'569'053	19'337'398	19'710'774	19'555'948	1'629'662	
DK	218'818	248'181	256'020	272'577	218'818	272'577	248'899	20'742	
EE	112'426	128'200	142'187	156'740	112'426	156'740	134'888	11'241	
ES	2'510'150	2'666'874	2'776'667	3'020'809	2'510'150	3'020'809	2'743'625	228'635	
FI	322'485	354'359	372'649	387'418	322'485	387'418	359'228	29'936	
FR	14'590'985	14'617'725	14'451'207	14'892'553	14'451'207	14'892'553	14'638'118	1'219'843	
GR	42'366	47'715	56'125	62'586	42'366	62'586	52'198	4'350	
HR	69'566	78'313	83'997	90'593	69'566	90'593	80'617	6'718	
HU	274'834	292'647	317'847	334'513	274'834	334'513	304'960	25'413	
IE	836'178	882'532	902'431	906'644	836'178	906'644	881'946	73'496	
IT	2'987'680	3'157'764	3'230'974	3'391'910	2'987'680	3'391'910	3'192'082	266'007	
LT	98'207	116'058	127'515	143'849	98'207	143'849	121'407	10'117	
LU	108'321	116'941	120'691	123'368	108'321	123'368	117'330	9'778	
LV	83'315	96'031	105'707	116'169	83'315	116'169	100'306	8'359	
MT	18'881	19'944	21'083	20'937	18'881	21'083	20'211	1'684	
NL	4'145'543	5'414'076	5'568'369	6'069'639	4'145'543	6'069'639	5'299'407	441'617	
PL	2'045'712	2'148'217	2'211'870	2'211'192	2'045'712	2'211'870	2'154'248	179'521	
PT	608'112	689'983	736'794	774'093	608'112	774'093	702'246	58'520	
RO	480'732	565'016	618'292	693'840	480'732	693'840	589'470	49'123	
SE	1'516'392	1'557'856	1'531'545	1'475'701	1'475'701	1'557'856	1'520'374	126'698	
SI	36'287	40'812	46'989	53'879	36'287	53'879	44'492	3'708	
SK	253'996	276'961	289'454	288'727	253'996	289'454	277'285	23'107	
UK	15'724'206	15'378'152	14'886'272	15'492'912	14'886'272	15'724'206	15'370'386	1'280'865	

Search for Patterns

OJA versus country population size and GDP

In the first CEDFOP dataset a clear relationship between OJA and population size and GDP has been found with two subsets of countries. Figure 2 presents the results for the V2 dataset. The same pattern appears with RO and several small countries (mostly from Eastern Europe, but also FI, DK and PT) joining the group of Poland, Spain and Italy with relatively lower rates of OJAs relative to population size.

Figure 1 Scatterplots of relationships between OJA population size and GDP for V2 CEDEFOP datasets. Left: all countries; right : focus on smaller countries with populations size < 12 mio. or GDP < 700 billions USD)



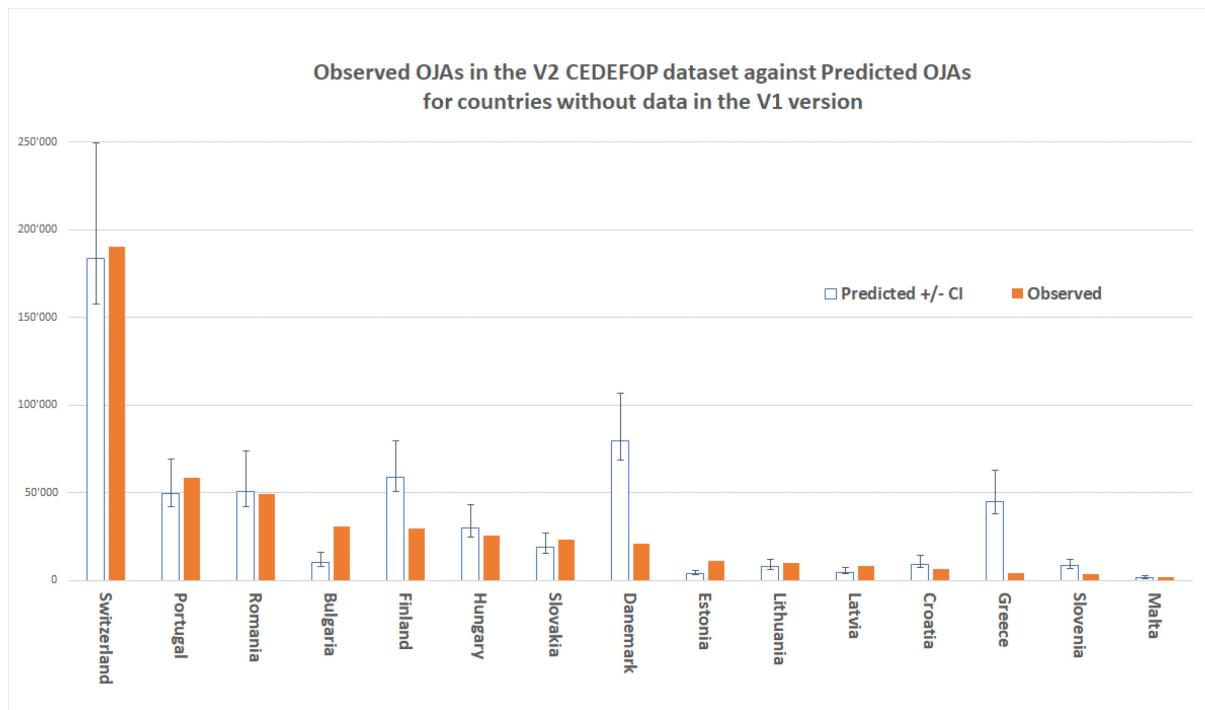
Replication of modelling OJVS versus population and GDP (NUTS1 model; V1 dataset)
(R script: nuts1_ojvs_pop_gdp.R)

The adequacy of the model derived from the V1 CEDEFOP dataset (13 countries) can be assessed for the remaining EU countries. The results are shown in Table 3 in which observed OJAs from the V2 version have been reported. The same data are also displayed graphically in Figure 2. It appears that in most cases the observed OJAs are encompassed in the range (95% confidence interval) of the predicted values. There are nevertheless spectacular exceptions for FI, DK and GR with significantly less observed OJAs than predicted by the model, as well as for BG with more reported OJAs as predicted. Running the model with V2 data only slightly affects the parameters, which does not modify the general conclusions drawn from V1 data. While the economic conjuncture during the last decade may account for the low observed OJAs for Greece, the cases of Finland and Denmark remain to be explained.

Table 3 OJVs predictions for the 19 countries for which no data are available in the V1 CEDEFOP dataset (monthly averages and 95% confidence intervals). Monthly V2 observations from the V2 dataset have been added to the original table

idcountry	country	m_pred	m_pred_lwr_9	m_pred_upr_9	Monthly V2
AL	Albania	1'799	1'341	3'239	
BY	Belarus	8'965	6'944	14'943	
BA	Bosnia Herze	2'514	1'912	4'348	
BG	Bulgaria	10'201	8'105	16'159	30'807
HR	Croatia	9'420	7'660	14'246	6'718
DK	Danemark	79'566	68'629	106'946	20'742
EE	Estonia	3'961	3'227	5'967	11'241
FI	Finland	59'028	50'887	79'426	29'936
GR	Greece	44'864	37'891	62'892	4'350
HU	Hungary	30'087	25'037	43'448	25'413
IS	Iceland	3'435	2'851	4'986	
LV	Latvia	4'766	3'860	7'266	8'359
LT	Lithuania	7'980	6'540	11'882	10'117
MA	Malta	1'714	1'388	2'614	1'684
ME	Montenegro	511	381	918	
NO	Norway	103'257	88'615	140'200	
PT	Portugal	49'784	42'279	69'029	58'520
RO	Romania	50'649	41'893	74'036	49'123
RS	Serbia	7'211	5'603	11'944	
SK	Slovakia	18'911	15'768	27'204	23'107
SI	Slovenia	8'396	6'980	12'150	3'708
CH	Switzerland	183'499	157'402	249'391	190'000
UA	Ukraine	23'858	17'882	42'470	
MD	Moldova	1'294	922	2'552	
MK	North Maceo	1'408	1'051	2'524	

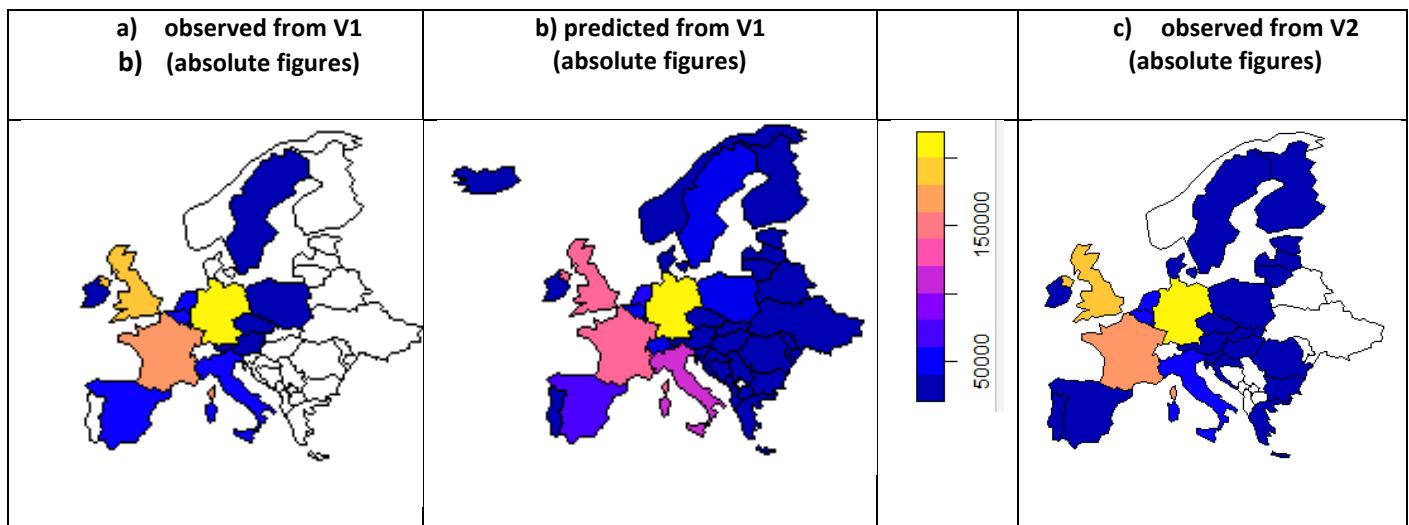
Figure 2 Observed OJAs in the V2 CEDEFOP data set versus Predicted values from the regression model for countries without data in the V1 Dataset



Prediction map from the V1 CEDEFOP dataset compared to actual map from the V2 dataset

The prediction map (Figure 3b) drawn from the V1 dataset (Figure 3a) is displayed below against the map drawn from actual data for the period July 2018 to March 2019 (Figure 3c). It shows a good agreement between predictions of the model and actual observations for the additional countries which were absent from the first dataset.

Figure 3 Prediction map based on the NUTS1 model compared to observed OJA



Conclusions:

The replication with the second CEDEFOP dataset confirm the major results and conclusions reached through the analyses using the first CEDEFOP dataset at the country level. The good agreement obtained suggest that the conclusions also apply at the NUT2 level.