COMPARISONS AND DEVELOPMENT OF GENDER GAP INDICATORS IN SELECTED CLUSTERED COUNTRIES

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Abstract

In representative democracy, diversity is a key element for true representation of the society. In addition, previous research has unequivocally demonstrated the positive impacts of gender equality in leadership. Based on current research and data from OECD sources we picked up sample of 28 countries. Then we identified variables necessary for our research such: Gender wage gap, Full-time women´s employment, Part-time women´s employment, Gender Index, Gender wage gap at median. Within main part of our contribution, we performed a cluster analysis, through which we created clusters of countries. However, for the purposes of cluster analysis, it is necessary to exclude statistically significant but weaker dependencies, as they could skew the result of cluster analysis. It is therefore necessary to test the statistical significance of Pearson correlation coefficients. We were therefore able to prove a presumption of a strong relationship between some variables with use of cross-correlation of variables. We identified the number of significant components; we calculated the shares of component variability in the total variability of the data from which we calculated the components. Based on the 3 components we created a dendrogram and then 28 countries may be divided into 6 clusters through cluster analysis.

Key word: Gender wage gap, Full-time women´s employment, Part-time women´s employment, Gender Index.

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Introduction

People over the world are influenced by gender stereotypes. Standards, resp. unwritten rules often determine what is appropriate for both girls and for boys, especially women, and men in society. Due to gender stereotypes, girls and women are often less appreciated and often have a lower social status. Women are more likely to experience the limitations of their mobility, their lower status in society, more harassment, and less opportunity to choose in which way

they should live their lives (World Economic Forum 2020). However, many men also suffer. Negative masculinity evokes feelings of discrimination and inequality. Denying the freedom to choose one's life path on the grounds of sex prevents one from realizing her/his full potential. Understanding the roots of gender inequality is a step towards eliminating discrimination and the glass ceiling. Gender discrimination describes a situation in which people are treated differently simply because they are men or women and not based on their individual abilities or disabilities (World Economic Forum 2020). Many people see them primarily as mothers, wives, and caregivers. Although the equality of women and men in advanced economies is relatively high today, we think it is always an area that needs to be worked on or explored (Rubenstein et al., 2020).

1. Gender gap comparisons and development in clustered countries

The trends in some characteristics proved gradual continuous consolidation of ratio women versus men in leadership positions, there are differences between the nations influenced by social, religious, family even economic conditions and behaviour (World Economic Forum 2020). Women make up (slightly more than) 50 percent of the population, and as a matter of justice and equity, those women need to be equally represented in our parliamentary chambers, because one’s life experience as a woman is relevant to that representation (Rubenstein et al., 2020).

Byrne et al. (2021) examined female leaders' attitudes toward demand-side strategies to close the gender-leadership gap and discussed implications for organizations based on interviews within North American women in senior leadership roles. They found five key themes related to women leaders' attitudes toward demand-side strategies. Support for these strategies was dependent on perceptions of backlash regarding the implementation of these strategies and the participants' career stage. Importantly, participants advocated that the implementation of demand-side strategies would be insufficient unless organizations encourage greater dialogue regarding the gender-leadership gap, that top management support more gender inclusive leadership, and that male colleagues act as allies for women in leadership.

Globally, equal representation remains a distant goal, with women making up only 24.3 percent of national parliamentarians (IPU 2020), while only three countries out of the 193 members of the United Nations members (Rwanda, Cuba, and Bolivia) had achieved a 50/50 gender balance in parliament (Mlambo-Ngcuka, 2019). In Australia, men outnumber

women by 105 to just 46 in the House of Representatives, its most powerful governing body (APH 2020). Anne Phillips (2018) argues that it is unjust to exclude women from political life, just as it is unjust that they should be “typists but not directors.”

In representative democracies, diversity is a key element for true representation of the society. The COVID-19 pandemic has laid bare some of the real-world implications of gender inequalities in the leadership context (Rubenstein et al., 2020). They examined the differential impacts of COVID-19 on women and reflect on potential pathways for women’s active participation This study searches population-weighted, “sex- and age-disaggregated” official COVID-19 mortality data (as of July 25, 2020) from the United States to understand gender gaps (men-women) across age. The analysis yields three key findings: (1) all age groups report about 8 percentage points more deaths among men than women; (2) non-elderly adults (<65 years) have a larger gender gap in reported mortality than elderly (>= 65 years) adults; and (3) the gender gap in reported mortality varies across states, with thirteen states reporting more deaths among women than men. Women's lack of access to healthcare and a state's healthcare capacity has a significant correlation with the gender gap in reported mortality for both non-elderly and elderly adults. The findings underscore the possible presence of an underreporting bias against women in the officially reported COVID-19 death tolls in the US (Akter, 2020). Gender equality in hospitality, based on Bradley's (2013) approach that considers the operation of gender in the "production" and "reproduction" spheres of social life. Culture of an open dialogue, bringing men into the equation and educating the future workforce, emerged from data to propose new insights on "what can be done" about gender equality in tourism and hospitality, including practical suggestions for transformations of gender relations in organisations. (Gebbels et al., 2020).

Czymara et al. (2020) pointed out the clear differences among genders: women worried more about childcare while men were more concerned about paid work and the economy. The authors argued that the COVID-19 pandemic is affecting women more heavily than men not only at the physical level of work (e.g., women are reducing more paid work hours than men), but also through increasing the division regarding the cognitive level of work (e.g., women are more worried about childcare work while men are about paid work). Lower implicit affiliation was associated with more income growth over time and implicit personality predicted income growth beyond a model only consisting of explicit personality. (Apers et al., 2020).

2. Methodology

We performed a cluster analysis, by which we mean a set of statistical as well as mathematical techniques, through which we can identify clusters. The similarity between countries can be measured by different groups of degree of similarity of objects. The choice of individual degrees of similarity also depends on the monitored features, the values of which characterize the surveyed countries. The best known are the distance measures, the association coefficient, the correlation coefficient, and the probability similarity measures. In this analysis, we use a measure of distance called the Euclidean distance.

$$d_{ij} = \sqrt{\sum_{k=1}^{n} \left(X_{ik} - X_{jk} \right)^2} \qquad (1)$$

where:

X_{ik} is the value of the kth variable for the i-th country,

X_{jk} is the value of the k-th variable for the j-th country.

The goal of business aggregation is to find groups of similar countries in our data. In this analysis, we use a hierarchical approach, the essence of which is that the number of clusters of companies is not known at the beginning of the analysis, but on the other hand, a country that is already included in one cluster cannot be re-included in another cluster. This approach allows analysis for smaller selections of research objects. Then we decided to use Ward's method. The method does not calculate the distance between clusters. Clusters are defined by maximizing intra-noise homogeneity. Using the Ward method, we achieve relatively the same size and shape of the clusters themselves, although this condition may not always be met. However, we must determine the appropriate number of these groups based on certain criteria (e.g., hierarchical tree - dendrogram). By performing correlations of input variables at the level of significance of 5% (alpha = 0.05), we observe the dependence between them. A high degree of dependence between variables can affect the accuracy of the classification results. We will achieve a certain elimination of this problem by using the method of main components. In this case, we transform the input indicators into new variables. The new variables obtained, called the main components, are already independent of each other.

We drew the data for the analysis from OECD statistics. These are data that represent different perspectives on men and women in businesses in different countries. The data relate to the representation of women in business, the pay gap, or the so-called gender index. We

used the R programming language for statistical analysis. It is advantageous for creating statistical models, data analysis, for creating graphs, as well as for graphical data analysis. By studying significant secondary data from OECD sources, we arrived at a sample of 28 countries for which we identified data that we consider to be variables for our research and present them in Table 1.

Tab. 1: Variables chosen for our study

	A	B	C	D	E	F	G	H
Australia	14.00	15.40	54,18	45.82	16.10	13.55	4.14	4.22
Austria	19.20	17.70	52,31	47.69	11.70	16.46	2.62	2.49
Belgium	7.00	3.30	58.73	41.27	11.20	4.36	2.46	2.30
Canada	19.00	19.20	74.40	25.60	18.30	18.52	2,59	2,61
Czech Republic	15.80	16.30	87.95	12.05	19.80	15.65	1.49	1.55
Denmark	8.90	6.30	67.97	32.03	10.40	5.80	1.47	1.80
Estonia	27.80	28.30	82.37	17.63	14.10	28.34	2.52	2,31
Finland	18.90	19.60	77.45	22.55	15.30	18.48	1.89	1.91
France	14.10	13.20	71.54	28.46	11.10	13.39	2.21	2.24
Germany	16.70	17.20	52.35	47.65	15.00	15.67	2.26	2.31
Greece	12.20	9.10	86.44	13.56	27.10	6.68	4.65	4.88
Hungary	6.40	3.80	92.48	7.52	25.70	7.85	2.76	3.07
Ireland	14.30	10.60	71.21	28.79	17.10	10.61	2.18	2.28
Italy	9.90	5.60	67.09	32.91	13.50	5.56	3.55	3.86
Mexico	11.60	18.30	66.52	33.48	29.00	15.82	2.30	2.20
Netherlands	17.90	14.10	26.54	73.46	16.10	14.11	2.31	2.24
New Zealand	7.00	6.10	70.29	29.71	16.70	7.13	4.08	4.01
Norway	8.10	6.30	61.49	38.51	14.50	6.49	0.98	0.90
Poland	7.20	11.10	89.86	10.14	17.40	10.66	2.42	2.49
Portugal	13.50	18.90	87.37	12.63	11.20	15.52	2.81	2.92
Slovak Republic	14.90	14.40	92.99	7.01	16.50	14.33	1.81	1.87
Slovenia	1.00	5.00	86.94	13.06	12.90	5.00	2.38	1.94
Spain	13.50	11.50	76.22	23.78	14.30	11.54	3.24	3.27

Sweden	9.40	9.20	70.79	29.21	10.50	8.16	1.44	1.62
Switzerland	20.10	16.90	40.16	59.84	8.10	15.60	3.20	3.33
Turkey	3.10	6.90	83.83	16.17	25.10	6.88	1.28	1.34
United Kingdom	19.20	17.40	59.29	40.71	17.50	16.0	1.36	1.31
United States	18.80	17.50	71.53	28.47	17.90	18.28	1.25	1.22

Source: Database OECD (https://www.oecd.org/gender/data/

3. Research results

By comparing the value of Sig. (p-value) with a set significance level of 0.05, we can state that based on testing the data using the Shapiro-Wilk test and Kolgomorov-Smirnov test, indicators A, B, C, F do not have a presumption of a normal distribution. For the other variables (D, E, G, H), normality was confirmed by both tests as we may see in Table 2.

Tab. 2: Indicator Shapiro-Wilk test and Kolmogorov–Smirnov test (K–S test or KS test)

Indicator	Shapiro-Wilk test	Kolgomor-Smirnov test
A	<0.001	0.027
B	0.04	0.07
C	<0.001	0.032
D	0.342	0.067
E	0,538	0.15
F	0.072	0.016
G	0.608	0.123
H	0.992	0.15

Source: own processing

From the results of the correlation matrix, we can determine what the dependence between the individual variables is. We can notice that for some variables this dependence is higher, for some lower. For example, there is a high, direct linear relationship between the variables A and B or G and H.

We also used the Spearman correlation coefficient for the variables A, B, C, F, which do not have normal differences, while analysing the relationships between the variables. We can state that in all cases the p-value is lower than the significance level of 0.05, which means that there is dependence between the variables. However, for the purposes of cluster analysis, it is necessary to exclude statistically significant but weaker dependencies, as they could skew the result of cluster analysis. It is therefore necessary to test the statistical significance of Pearson correlation coefficients. The output from the R software is automatically crossed out by a cross with a statistically insignificant coefficient at the significance level of 0.05. We also used the Spearman correlation coefficient for the variables A, B, C, F, which do not have

normal differences, while analysing the relationships between the variables. We can state that in all cases the p-value is lower than the significance level of 0.05, which means that there is dependence between the variables. The values of the correlation coefficient are given in Table 3. The ongoing testing of relationships between variables shows that e.g., in the case of the variable G, E, all coefficients are statistically insignificant. However, in the case of the variables H, F, some of their mutual correlations are statistically significant. For the variables A, B, C, F, all relations are equally significant. We were therefore able to prove a presumption of a strong relationship between the variables. This means that there may be a problem in clustering in cluster analysis, as the clustering method requires the cross-correlation of variables. Therefore, it is necessary to use principal component analysis.

Tab. 3: Spearman correlation coefficient

Correlation between variables	r_s
A vs. B	0.54587
A vs. C	-0.1829
A vs. F	0.55633
B vs. C	-.41723
B vs. F	0.83854
C vs. F	-0.37417

Source: own processing

We also used this analysis of the main components, which works with standardized variables. To identifying the number of significant components, we calculated the shares of component variability in the total variability of the data from which we calculated the components with results given in Table 4.

Tab. 4: Analysis of main components

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
Standard derivation	1.759338	1.458175	1.369128	0.8798391	0.3158293	0.1445535	0.09583197	4.219387e-05
Proportion of Variance	0.38691	0.265780	0.234310	0.0967600	0.0124700	0.0026100	0.00115000	0.00024
Cumulative Proportion	0.38691	0.65269	0.88701	0.983770	0.996240	0.998850	0,9997600	1.00000000

Source: own processing

The first component labelled PC1 explains the most and the last PC8 the least variability. At the same time, we see that to clarify 88.70% of the variability of the original file, we only need to use 3 components (PC1, PC2, PC3). We can therefore say that we have complied with the rule that the number of main components explains at least 70% of the total variance of the data.

Based on the 3 components selected by us for use in cluster analysis, we created a hierarchical, also called a dendrogram. Due to minimizing our article to limited size we are just describing the tree.

The next step was to select the number of clusters of countries in our analysis. Based on a heuristic approach (Stankovičová and Vojtková, 2007), where the number of clusters is the result of the selection of the author of the research, we classified the set of countries into 6 clusters. The number of countries in particular clusters is given in the Table 5. Subsequently, we also drew the clusters in a hierarchical tree, where the individual clusters are marked. We can see that 6 clusters have been formed, which are heterogeneous with each other, but the countries are homogeneous within their cluster. This means that enterprises in one cluster have similar characteristics in terms of indicators A, B, C, D, E, F, G and H and at the same time have different characteristics of these indicators with countries in other clusters.

Tab. 5: Number of countries in individual clusters

No of cluster	1	2	3	4	5	6
No of countries in a cluster	4	4	4	11	1	4

Source: own processing

From dendrogram we can state that the set of 28 countries was divided into 6 clusters through cluster analysis. The largest cluster included 11 countries and is the third in the picture marked with a green field, where the Slovak Republic is located along with Mexico, Great Britain, USA, Spain, France, Ireland, the Czech Republic, Portugal, Canada, and Finland.

Conclusion

We found by taking into an account the indicators from "A" to "H", the most (11) countries fit into the biggest cluster no. 4. This dominant cluster has an average value of the indicator A Gender wage gap at the level of 15.78% and the indicator "B" Gender wage gap at the value of 16.08%. Both indicators show the difference in wages between men and women, with the data referring to full-time employees. The indicator "C" Full-time women's employment reached 76.04% and the part-time work for women represented by the indicator "D" Part-time women's employment reached 23.95%.

The Gender Equality has an average E Gender Index 17.09%. The index measures the cost of human development in relation to gender inequality. The higher the value of the index, the greater the differences between women and men and the greater the loss of human

development. The gender pay gap described by the F Gender wage gap at median indicator is 15.35%.

Similar mean values in cluster no. 4 have the indicators G Share of self-employed (2017) and H Share of self-employed who are women - employers (2016). These indicators reached an average value of 2.10% and 2.12%. Approximately the same values we found in the results of an OECD study (2017), which confirms that the share of employees who have a second job as self-employed persons is 1-2%. For women, it is 70% work in the field of services.

Just at the most numerous cluster no. 4 we see differences in almost all selected indicators, from which we can state their deterioration compared to the averages. Those are precisely differences that could have been caused by the existing extreme values of the indicators of the countries located in cluster no. 4.

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