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Article

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Study of Correlation Between the Gender Gap Index, Economic Efficiency, and Governance in European Countries

Nazar Podolchak , Volodymyr Martyniuk , and Natalia Tsygylyk 

ABSTRACT

As gender equality is a priority for 17 sustainable development goals, it is appropriate to establish a correlation between the Gender Gap Index (GGI), economic efficiency and governance. Three hypotheses have been investigated. It is established that there is no general direct relationship between the level of GGI and GDP per capita growth (annual) for all countries, regardless of their level of development. In the UK, small fluctuations in GDP per capita growth (annual) do not affect GGI levels; however, the Covid-19 pandemic does have its impact. In Germany, any fluctuations in GDP per capita growth (annual) do not affect the level of GGI, yet it is affected by changes in population, in particular by increasing migration. In Ukraine, significant fluctuations in GDP per capita growth (annual) do not affect the level of GGI, although this index is reduced by the effects of the pandemic a year after its onset. In addition, the relationship between the population, civil servants, their distribution by sex, average wages and GDP per capita growth (annual) and, consequently, the welfare of the population of these countries was established. The obvious efficiency of the UK's and Germany's strategic governance systems has different implications for achieving gender equality and well-being. It is proposed to use the Windmill economic model to achieve gender equality among civil servants in the developing country.

KEY WORDS:

civil service, economy, gender equality, Gender Gap Index, public administration.

JEL Classification: J16, J18.

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1. Introduction

In the 21st century, the world community is striving to overcome poverty, create equal and decent living conditions and opportunities for all the inhabitants of our planet. This is clearly reflected in the 17 goals of sustainable development, which are the global strategic direction of the world until 2030 (Chopra et al., 2022). Achieving the set goals as well as all the activities in the necessary direction is bound to have an impact on the economy of participating countries as well as the living standards of their inhabitants.

Among other goals, gender equality is particu-

larly important. The success of each country in this area has been assessed annually since 2006 by the Gender Gap Index and published in the World Economic Forum's Global Gender Gap Report 2021, Report on gender equality in the EU (World Economic Forum, Global Gender Gap Report, 2021, European Commission, 2022). In addition, the Human Development Report publishes the Gender Inequality Index, which assesses gender inequality in several dimensions. In particular, reproductive health, empowerment, and economic status are assessed.

As the world's leading countries are an example for developing countries, and public administra-

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tion is a tool for achieving strategic goals, the aim of the work was to study the correlation between the gender gap index, economic efficiency and public administration in the leading European countries - Germany and the United Kingdom. Germany, as a member of the EU and a leader among EU countries, and the United Kingdom, as a country that has left the EU but held the second position in terms of economic development during its EU membership. In addition, the relationship between these same indicators was studied for Ukraine as an example of a developing country. To achieve this goal, the following tasks were set:

- to form and justify the hypotheses to determine the correlation between the Gender Gap Index (GGI), economic efficiency, and governance;
- to assess the correlation over a 7-year period of the impact of governance on the Gender Gap Index and GDP per capita growth (annual) of the leading country in Europe, the EU, and a developing country with a strategic goal of becoming a full member of the EU;
- to determine the relationship between the quantity of population, civil servants, their distribution by sex, average wages and GDP per capita growth (annual), and hence the welfare level of the population in these countries;
- if the correlation exists - to build on its basis an economic model for achieving gender equality among civil servants of a developing country.

The civil service was chosen as a sectoral area for evaluation, as in all countries the activities of its employees directly affect the efficiency of the state as a whole and the living standards of the population (Podolchak et al., 2022). The UK was chosen as the leading European country for analysis because it is not a member of the EU, and according to the World Population Review in 2022, it has the highest GDP (\$2.93 trillion) among non-EU countries in Europe (World Population Review, 2022). Germany was chosen as the leading EU country for the analysis, as according to the World Population Review in 2019 it had the highest GDP (\$4.16 trillion) among EU countries (World Population Review, 2022). Ukraine was chosen as a developing country for analysis, as it is a European country on its way to the EU membership, and in 2022 is in the most

difficult situation of all European countries due to martial law. According to the World Population Review, Ukraine's GDP in 2019 amounted to \$147.17 billion (World Population Review, 2022). According to The World Bank, during the Covid-19 pandemic in 2020, the value of GDP per capita growth (annual %) was: 4.7% for Germany, 9.9% for the United Kingdom, and 3.4% for Ukraine. The set tasks are especially relevant in the framework of the civil service reform, which is currently being actively pursued in the developing country.

If a correlation between the gender gap index, economic efficiency, and governance in European countries and a developing country is established, it will be possible to refine the strategic development plan for the developing country regarding the achievement of gender equality. This will accelerate the transition of such a country into the rank of developed countries.

2. Literature Review

According to the statements of many scientists since the 1990s, gender inequality hinders the economic development of countries (Agénor & Canuto, 2015; Braunstein, 2012; Cuberes & Teignier, 2016; Echevarria & Moe, 2000; Ramanayake & Ghosh, 2017; Santos Silva & Klase, 2021). However, based on data from the World Economic Forum in 2021, the gender situation has generally improved in most countries since 2006. The average (population-weighted) distance to gender parity reached 68% (World Economic Forum, 2021), compared to 68.8% in 2019 (World Economic Forum, Global Gender Gap Report, 2020). The slight decline is attributed to the economic losses caused by the Covid-19 pandemic. The same report from 2021 predicts that it will take approximately 135.6 years to bridge the gender gap globally under these conditions. Thus, there is a need to develop mechanisms to accelerate the elimination of the gender gap.

A study conducted by the University of Pittsburgh with the support of the United Nations Development Programme highlights the importance of achieving gender equality in the field of public administration. It significantly improves the functioning of the government and the quality

of services provided. This, in turn, enhances public trust, as public administration becomes a standard that the country as a whole aspires to achieve (United Nations Development Programme, 2021).

Certainly, achieving gender equality is not possible without implementing specific instruments influenced by the system of public administration. In turn, the system of public administration affects the level of economic growth indicators, and gender inequality can have a negative impact on a country's economic development, as research has shown that industries with better gender equality tend to be more profitable compared to other sectors of the economy (Bertay et al., 2020).

In their work, Klasen and Lamanna described research using cross-country and panel regressions, which revealed a significant negative impact of gender inequality in education and employment on economic growth (Klasen & Lamanna, 2009). Analyzing data from the period between 1960 and 2000, the authors confirmed and updated the results of previous studies regarding the impact of gender inequality in education on growth and also included indicators of gender inequality in employment in the analysis. Specifically, regions such as the Middle East, North Africa, and South Asia experience a loss of 0.9 to 1.7 percentage points of growth due to the combined effect of educational and labor-related gender inequality. The authors also noted an increased influence of gender inequality in employment on economic growth. However, no correlation was found between the magnitude of gender inequality and economic growth.

After analyzing gender inequality in different states of India using education and healthcare as key indicators, Arora (2012) found that higher per capita income at the subnational level in India correlates with lower gender inequality. However, in some high-income states, high gender inequality is observed. Nevertheless, the study did not establish a correlation between gender inequality indicators, per capita income, and the system of public administration.

Cabeza-García et al. (2018) examined gender-related factors contributing to economic growth in 127 developed and developing countries. For the analysis of gender factors, they used education,

access to the labor market, fertility, and democracy. They added value and stability to the results using dynamic models. It was found that when women have greater access to average education and the labor market under conditions of equality and are involved in state governance, the effects are positive. However, the study did not consider a wide time interval, and a clear correlation between the type of state governance and the situation with gender equality and economic growth was not established.

Klasen (2018) published an article stating that determining the impact of gender gaps on economic efficiency is quite challenging. All methods used for this purpose have their advantages and disadvantages. Additionally, the author noted that studies attempting to calculate GDP growth without gender gaps in employment significantly overestimate potential effects. Nevertheless, reducing gender gaps in education contributes to increased economic efficiency, but the research on the impact of other gaps remains limited. The author also points to substantial evidence that reducing specific gender gaps at the household, farm, or firm level can enhance economic efficiency in certain contexts. However, the study does not investigate the influence of the system of public administration on achieving gender equality and economic efficiency.

Altuzarra et al. (2021) attempted to examine this in their work. Specifically, based on World Bank data from 1990 to 2017, the study found that gender equality in education contributes to economic growth in developing countries, especially in Sub-Saharan Africa. However, the presence of women in parliaments positively correlates with economic growth in all developing countries but negatively correlates in Sub-Saharan African countries, possibly due to existing obstacles for women in changing political priorities. Jayasuriya and Burke (2013) analyzed the impact of women's political representation on economic growth for 119 democratic countries. The authors demonstrated that at the beginning of the 21st century, countries with a higher percentage of women represented in parliament experience greater economic growth.

Dahlum et al. investigated the relationship between improving gender equality in government

and economic growth in 182 countries. The authors emphasized three aspects that promote technological change and, therefore, improve economic growth:

- protection of civil liberties and participation in civil society;
- increase in the quantity and diversity of new ideas;
- procedures to enhance the selection of more effective ideas;

The authors highlighted that the correlation is more pronounced for "non-Western" countries (Dahlum S. et al., 2022). However, the authors did not examine the relationship under complex conditions, such as during Covid-19, and did not explore the correlation in its full understanding. Thus, it was established that the investigation of the correlation between gender equality, economic efficiency, and government governance is still insufficiently explored. In particular, it requires in-depth research and analysis of the impact of gender inequality on economic efficiency and, even more importantly, the influence of governance on economic efficiency.

3. Methodology

In the study, three hypotheses were used:

- there is a direct correlation between the Gender Gap Index (GGI), economic efficiency, and governance;
- there is absolutely no connection between these indicators;
- there is an indirect relationship between these indicators.

At the preparatory stage of the study, a detailed inductive analysis of literature sources for the last 12 years was conducted. Numerical data were collected and analyzed from the official websites of the statistical services of Germany, Great Britain, and Ukraine. These data were used to establish correlations between gender inequality, economic efficiency, and the type of governance. The analysis was performed using Excel, and its results are presented in Table 2. It is worth noting that the article examines both correlation through the comparison and juxtaposition of statistical data and causal relationships regarding the impact of the public gov-

ernance system on the Global Gender Gap Index (GGI) and GDP. Causal relationships are investigated using the analysis and synthesis method.

The growth of GDP per capita is a cyclical quantity, while GGI is more structural, but both depend on the public governance system. Specifically, GGI measures the magnitude of gender gaps in four key areas:

- economic participation and opportunities - this indicator assesses the wage gap between men and women, participation in the workforce, and access to top positions.
- education - this indicator considers access to education for men and women at all levels (from primary to higher education).
- health and survival - this indicator measures life expectancy and gender disparities in life expectancy.
- political representation - this indicator evaluates the representation of women in political structures, such as parliaments, as well as high-level government positions.

The chosen period for the correlation analysis covers 2015-2021, including two years that coincide with the Covid-19 pandemic. This allows for a clear understanding of the impact of crisis events on the correlation between the studied indicators and to confirm or refute the proposed hypotheses. Crisis phenomena intensify the interactions between system elements if they exist. Microsoft Excel was used to build the graphical dependencies. Dialectical and formal-logical methods were used to interpret the results and establish the relationship between the indicators: analysis, logical synthesis, scientific abstraction and generalization.

In Table 1, data on potential ways to achieve gender equality obtained through the Delphi method are presented. The Delphi method is a forecasting technique that was used to reach a consensus among experts regarding the selection of possible ways to achieve gender equality in the United Kingdom, Germany, and Ukraine. Applying the Delphi method ensured high reliability of the obtained results. Experts from higher education institutions in the fields of public administration, sociology, and psychology were selected as participants:

- 6 professors, doctors of science;

Table 1

Initial Data for Factor Analysis: A List of Indicators of Impact on Achieving Gender Equality Among Civil Servants in a Developing Country

Components	Name of the indicator	Code of the indicator
State support	Gender quotas at all levels of the civil service.	X1
	Non-discrimination based on gender.	X2
	Compensation for babysitting services for children aged 0 to 5 in case the child does not attend kindergarten	X3
	Establishment of mini-centers for temporary stay of the child for 4 hours a day at each organization.	X4
	Granting additional leave of 14 k.d. to both parents of children under 16 in equal proportions, regardless of the number of children.	X5
	Providing children of working women with a place in a full-time nursery/kindergarten.	X6
	Providing children of working women with a place in a nursery/kindergarten or school that is located close to the home or work of the mother, father, grandmother, grandfather (optional).	X7
	Ensuring that mother, father, grandmother, grandfather (optional) of a child under 3 years old are on leave.	X8
	Providing a 50% surcharge in the case of grandparents on childcare leave and a child not attending a nursery or junior kindergarten.	X9
	Compensation for tutoring for children aged 6 to 10 for full-time civil servants.	X10
	Provision of leave lasting up to 4 hrs. per day if necessary to examine a child aged 0 to 16 by a doctor.	X11
Employer support	Ensuring a transparent recruitment mechanism according to clearly defined criteria.	X12
	Ensuring general availability of information on available vacancies and working conditions.	X13
	A clear description of the payment system while providing bonuses and surcharges.	X14
	Mechanism for women to work while on childcare leave (part-time, telecommuting, flexible working)	X15
	Guaranteeing a favorable microclimate in the team.	X16
	Providing people on parental leave with the opportunity for further advanced training.	X17
	Prolongation of the employment contract for a year after the expiration of the employee's contract provided the employee's desire to go to work.	X18
	Family support	Ensuring a favorable climate at home for working parents of children aged 0 to 16.
Providing moral support to working parents of children aged 0 to 16.		X20
Ensuring equal rights for both sexes of working parents in raising a child.		X21
Ensuring equal rights of both sexes of working parents to rest.		X22
Ensuring equal time for working parents to spend with child		X23

6 associate professors, candidates of science.

The degree of effectiveness of the proposed ways to achieve gender equality was requested to be assessed by the chosen experts on a scale from 0 to 1: 0 - not effective, 1 - highly effective. To obtain the final results, the experts' opinions were averaged, taking into account the weighting coefficient. Specifically, a weight of 2 was assigned to doctors of science, and a weight of 1 to candidates of science. After consolidating the experts' responses, the table was sent to them for review and refinement five times. The degree of consensus among the experts was found to be entirely acceptable, as the coefficient of variation was 3. This approach ensured achieving consensus, complete convergence of opinions, and a diverse range of evaluations. Consequently, after selecting all possible ways to achieve gender equality, factor analysis was used to identify the most effective methods to be justified for use in the economic model.

A linear-standardized model with uncorrelated residues and mutually orthogonal factors was used, which was also applied to estimate the elements of the covariance matrix. In the analysis of factor load the following degree of influence of indicators was established: up to 0.5 – weak, from 0.5 to 0.7 – average, more than 0.7 – strong.

4. Results

Based on the inductive analysis of literature sources, it has been established that increasing gender equality can positively impact GDP per capita through various avenues, including:

- increase in the labor force - when women have equal employment opportunities, the size of the labor force expands, potentially leading to economic growth;
- boost in productivity - gender equality can lead to better utilization of talents and skills across the entire population. Women often bring unique skills and perspectives that can enhance productivity and innovation;
- enhanced decision-making equality - gender equality in decision-making can result in more balanced and effective governance, including increased investments in social services, education, and healthcare, which can contribute to economic growth;

- social advantages - greater gender equality can lead to reduced poverty and improved education and health outcomes for the population, which can have a positive impact on economic development.

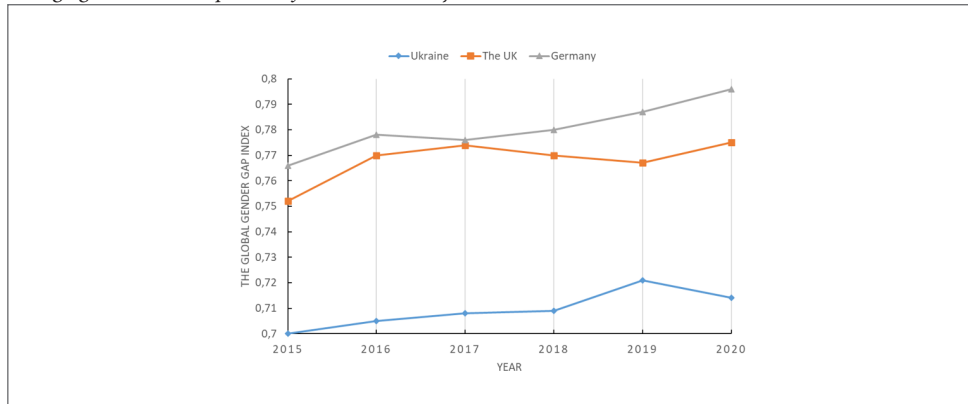
Influence on demographic factors: Improving the status of women can influence demographic processes such as fertility rates and population aging, which can affect economic growth.

All of the above are direct and indirect pathways through which gender equality can stimulate economic development and, consequently, increase GDP per capita.

In the UK from 2015 to 2021 the population increased to 3035 thousand people. The male population in this country increased from 32.1 million to 33.8 million, whereas the female population increased from 33 million to 34.7 million. At the same time, the gender gap index increased from 0.752 to 0.775, and the UK moved from 20th to 23rd place in the world ranking of 156 countries (Fig. 1) (The Global Gender Gap Reports, 2016-2021). In Ukraine, from 2015 to 2021 the population decreased by 1341 thousand people. During this period the male population in this country decreased from 20.9 million to 20 million, while the female population decreased from 21.9 million to 21.4 million. At the same time, the gender gap index increased from 0.7 to 0.714, and Ukraine moved from 69th to 74th place in the world ranking of 156 countries (Fig. 1) (The Global Gender Gap Reports, 2016-2021). In Germany, from 2015 to 2021 the population increased by 1670 thousand people. During this period the male population in this country increased from 40 million to 41 million, and female population increased from 41.4 million to 42.1 million. At the same time, the gender gap index increased from 0.766 to 0.796, and Germany moved from 13th to 11th place in the world ranking of 156 countries (Fig. 1) (The Global Gender Gap Reports, 2016-2021).

The total number of civil servants in the UK from 2015 to 2021 was increased from 439323 to 484880 people. At the same time, the total number of women civil servants increased from 53.8% to 54.2% (Fig. 2). As can be seen from Fig. 6a during this period the number of women working at the level of:

- Senior Civil Servants (SCS) increased from 38.9 to 46.8%;

Figure 1*Changing the Gender Gap Index of the UK, Germany and Ukraine in 2015-2021*

Source: Compiled by the authors based on The Global Gender Gap Reports, 2016-2021

- Grades 6 and 7 (G6&7) increased from 43.8 to 48.4%;
- Senior and Higher Executive Officers (SEO/HEO) increased from 47.4 to 51.1%;
- Executive Officers (EO) increased from 56.1 to 57%;
- Administrative Officers and Assistance (AO/AA) decreased from 58.1 to 56.4% (Fig. 3 a).

The total number of civil servants in Germany from 2015 to 2021 was increased from 1671010 to 1716725 people. At the same time, the total number of women civil servants increased from 45.4% to 56.5% (Fig. 2). As can be seen from Fig. 6 b during this period the number of women working at the level of:

- Lower Service increased from 23.6 to 43.4%;
- Middle Service increased from 32.9 to 34%;
- Upper Service increased from 52.1 to 54.9%;
- Senior Service increased from 49.4 to 53.7% (Fig. 3 b).

The total number of civil servants in Ukraine from 2015 to 2021 decreased from 268370 to 171469 people. At the same time, the total number of women civil servants decreased from 76.1% to 74.6%. As can be seen from Fig. 3 c for this period the number of women working at the level of:

- A increased from 0.02 to 0.04%;
- B decreased from 22.9 to 22.2%;

- C increased from 77 to 77.8% (Fig. 3 c).

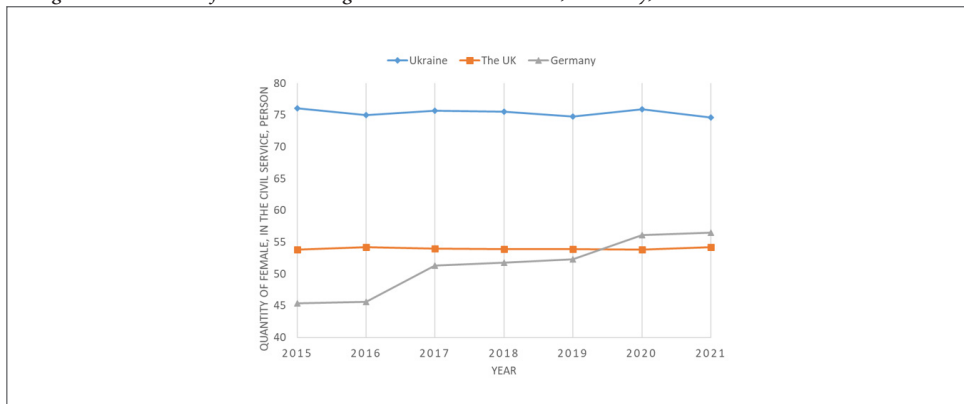
The GDP per capita growth annual in the UK (a), Germany (b) and Ukraine (c). In the UK, the value of GDP per capita growth annual was 1.813% in 2015, and in 2021 it was 6.7% (the maximum value for the entire period under analysis). For the period from 2015 to 2021, the minimum value was -9,907 in 2020. In Germany, the value of GDP per capita growth annual was 0.617% in 2015, and in 2021 it was 2.8% (the maximum value for the entire period under analysis). For the period from 2015 to 2021, the minimum value was -4,739 in 2020. In Ukraine, the value of GDP per capita growth annual was -9.444% (minimum value for the entire period under analysis) in 2015, and in 2021 it was 2.36%. The maximum value for the entire period under analysis was 4.016% in 2018.

Fig. 4 shows the change in the Gender Pay Gap (GPG) in 2015-2021 in the UK (a), Germany (b) and Ukraine (c) defined as the average for the entire working population. In the UK, the value of GPG decreased from 19.3% in 2015 to 15.4% in 2021. In Germany, the value of GPG decreased from 23% in 2015 to 20% in 2021. In Ukraine, the value of GPG decreased from 25, 1% in 2015 to 18% in 2021.

To formulate an economic model for achieving gender equality among civil servants, Table 2 is presented. It shows the change value of all data in

Figure 2

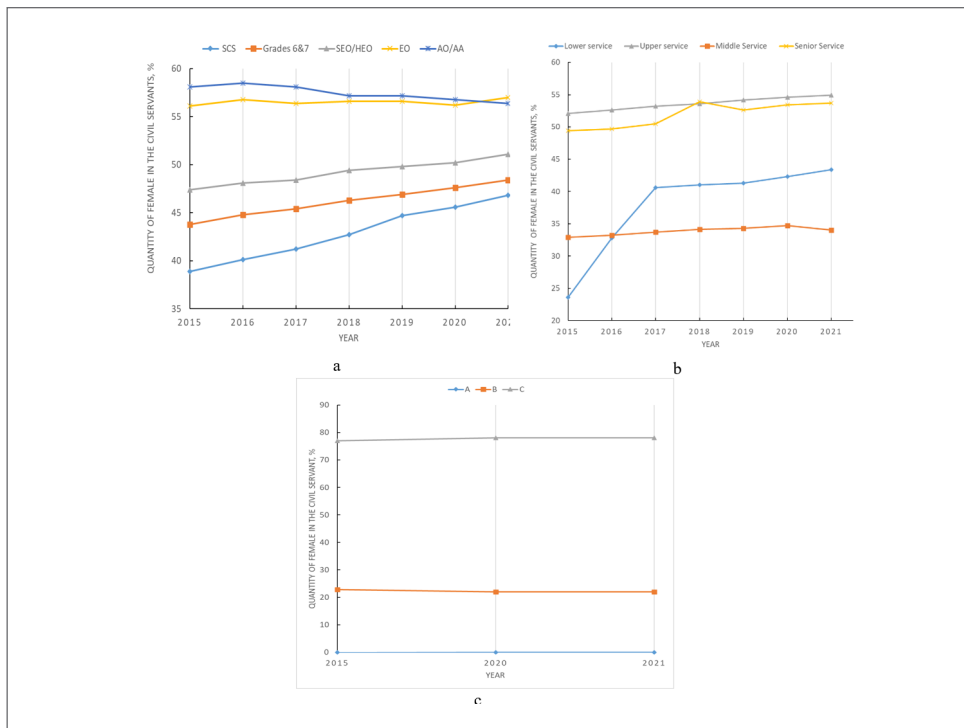
Change in the Number of Women Among Civil Servants in the UK, Germany, Ukraine in 2015-2021



Source: Compiled by the authors based on the Office for National Statistic 2015-2021; Statistisches Bundesamt 2015-2021; State Statistic Service of Ukraine 2015-2021; The World Bank 2015-2021

Figure 3

Change in the Number of Women by Level of Civil Service: a – the UK; b – Germany; c – Ukraine



Source: Compiled by the authors based on the Office for National Statistic 2015-2021; Statistisches Bundesamt 2015-2021; State Statistic Service of Ukraine 2015-2021; The World Bank 2015-2021

2015-2021. To build this model, some additional tables were used: Table 3 shows the results of factor analysis, Table 4 shows the intensity of factor loads in factor analysis, and Table 5 shows the occurrence of indicators to the factors that were identified during the analysis.

In the table, "++" indicates strong influence, "+" - medium influence, "-" - no influence of factors on the achievement of gender equality among civil servants.

Fig. 5 shows the windmill economic model for achieving gender equality among civil servants for a developing country.

5. Discussion of Research Results

For 7 years from 2015 to 2021 the population of developed countries, the UK and Germany, increased by 5% and 2% respectively, whereas the population of a developing country, Ukraine, decreased by 3%. During this period, the number of women in the UK increased by 5%, and the number of men also increased by 5%. In Germany the number of women increased by 2% and the number of men increased by 2%. In Ukraine however the number of women decreased by 2% whereas the number of men decreased by 4%. At the same time, in the period from 2020 to 2021, the intensity of population growth increased significantly in

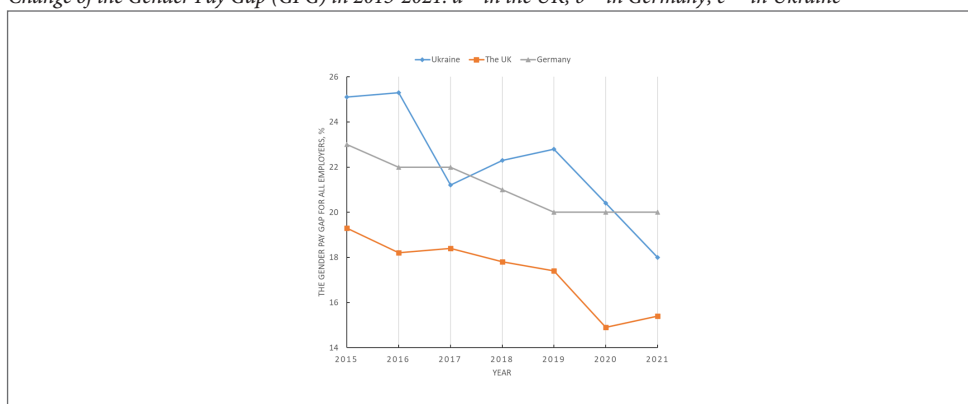
the UK. This is primarily due to living conditions in these countries, as population growth in these developed countries is mainly due to migration. In a developing country, the population is decreasing due to declining birth rates as a result of difficult living conditions and people migrating to developed countries.

Despite the negative dynamics in terms of population, the developing country shows a positive trend in improving the GGI. Estimation of the overall dynamics for this country over a seven year period, shows a 3% improvement, whereas GGI in the UK increased by 2%, and in Germany it increased by 4% (Fig. 1, Table 2). It should be noted that in 2020 the GGI in Ukraine decreased by 0.007 units compared to 2019. This is due to the negative impact of the Covid-19 pandemic, which did not manifest itself immediately. It is interesting to note that compared to 2018, the value of GGI in 2020 is still higher (by 0.005 units). Such positive dynamics can be explained by a properly developed public administration strategy and the successful implementation of gender equality as one of the 17 goals of sustainable development.

The analysis of the situation with GGI in the UK shows that Covid-19 has dealt a more devastating blow to the sustainable development of this country. In particular, the GGI in 2019 at the beginning

Figure 4

Change of the Gender Pay Gap (GPG) in 2015-2021: a – in the UK; b – in Germany; c – in Ukraine



Source: Compiled by the authors based on the Office for National Statistics 2015-2021; Statistisches Bundesamt 2015-2021; State Statistic Service of Ukraine 2015-2021; The World Bank 2015-2021

Table 2

The Summarized Results of the Analysis the Changing from 2015 to the 2021 Year for Economic Modeling to Achieving Gender Equality Among the Ukrainian's Civil Services

Changes during 2015-2021 period, %								
Country	Popula- tion	GGI	Total amount of civil servants	the number of female civil servants			GDP growth per capita (annual)	GPG
				Higher level	Middle level	Lower level		
	↑5	↑2	↑9	↑17	↑6	↑3	↑73	↑20
	↓3	↑3	↓36	↑50	↓4	↑1	↑75	↓28
	↑2	↑4	↑3	↑8	↑4	↑46	↑78	13

Table 3

Results of Factor Analysis to Achieve Gender Equality Among Civil Servants in a Developing Country

Factor #	Eigenvalue of the factor	Percentage of the total variance of the factor, %	Accumulated variance of factors,%
1	9,4251	29,4521	33,4551
2	2,7124	7,9218	69, 3534
3	5,4639	13,4633	43,6489

of the pandemic decreased by 0.003 units. However, in 2020 it exceeded the figure for 2018 by 0.005 units. From this we can conclude that the system of public administration in the UK is more sensitive to negative factors, but has a faster response and adequate elimination of the consequences of negative influences. In these respects, it surpasses the system of public administration of a developing country.

Germany's GGI declined during this period only in 2017, despite the fact that it was a record year with a budget surplus of all levels of about 37 million euros. This jump in GGI can be explained by high migration rates. In particular, the migration balance in 2017 amounted to 416 thousand people. In 2020, this figure was 220 thousand people, and GGI, respectively, increased by 0.02 and amounted to 0.796. The results of the GGI analysis allow us to conclude that the civil service model of Germany and its approach to achieving gender equality is the most effective of the civil services of the

three countries. Of course, it will take more than one year to achieve full gender equality, both for developed countries and for a developing country. However, this process can be significantly accelerated by identifying the necessary components for achieving gender equality, building a model based on these components, and implementing the results in practice.

As public administration directly affects the level of well-being of the population and GGI indicators, we will analyze the situation with gender equality among civil servants in the three countries. After all, it is at the level of the civil service, as an example to follow, that mechanisms for achieving gender equality must be implemented first of all. For the period from 2015 to 2021 the number of civil servants in the UK increased by 9% and in Germany by 3% (Table 2). This is due to the growing population and the need to ensure the effective functioning of the civil service. It should be noted

Table 4
Intensity of Factor Workloads to Achieve Gender Equality Among Civil Servants in a Developing Country After the Rotation Procedure

Code of indicator	Factor workload value		
	factor 1	factor 2	factor 3
X1	0,923035	0,026443	-0,015419
X2	0,661875	-0,001769	0,170216
X3	0,123451	-0,045632	-0,068345
X4	0,543762	0,012435	-0,043657
X5	0,245361	-0,345621	-0,054672
X6	0,643286	0,012543	0,075831
X7	0,876238	0,142673	-0,045632
X8	0,573452	0,202342	0,001246
X9	0,234562	0,123475	-0,023654
X10	0,147623	0,005671	0,002678
X11	0,632476	0,014356	-0,087641
X12	0,054873	-0,189673	0,0145769
X13	-0,045672	0,867593	0,0346538
X14	-0,567429	0,576548	-0,095682
X15	0,136587	0,759423	0,087645
X16	-0,154678	0,245673	-0,054873
X17	0,064572	0,576983	0,003657
X18	-0,126543	0,648376	0,001576
X19	0,057385	-0,156473	0,687453
X20	-0,786539	0,008749	0,256836
X21	0,003465	0,238759	0,913567
X22	0,023461	-0,098476	0,594356
X23	-0,075631	0,124652	0,837645

Figure 5
"Windmill" Economic Model to Achieve Gender Equality Among Civil Servants for the Developing Country

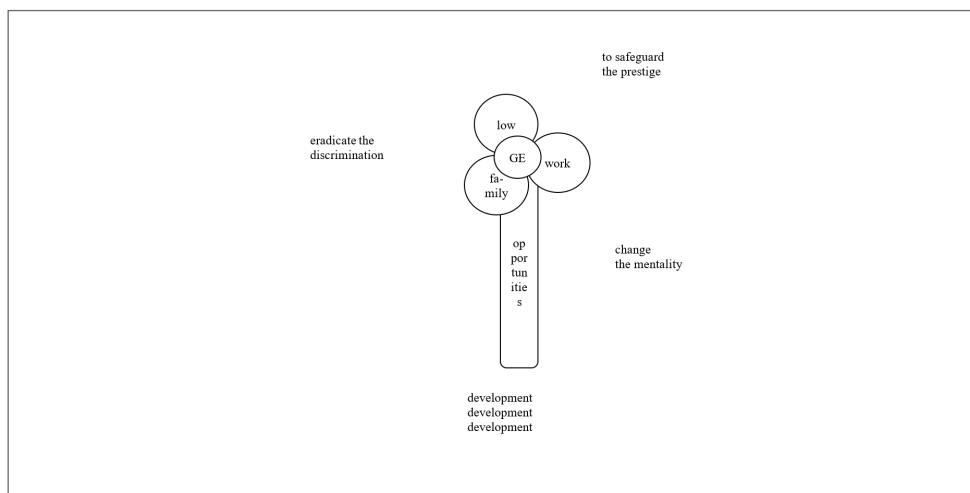


Table 5

Inclusion of Indicators in the Factors for Conducting Economic Modeling of Achieving Gender Equality Among Civil Servants

Code of indicator	Factor workload value		
	factor 1	factor 2	factor 3
X1	++	-	-
X2	+	-	-
X3	-	-	-
X4	+	-	-
X5	-	-	-
X6	+	-	-
X7	++	-	-
X8	+	-	-
X9	-	-	-
X10	-	-	-
X11	+	-	-
X12	+	-	-
X13	-	++	-
X14	-	+	-
X15	-	++	-
X16	-	-	-
X17	-	+	-
X18	-	+	-
X19	-	-	+
X20	-	-	-
X21	-	-	++
X22	-	-	+
X23	-	-	++

that population growth - the number of civil servants increase ratio during this period in the UK was 1.8, and 1.5 in Germany. In contrast to developed countries, the number of civil servants in Ukraine decreased by 36% during this period (Fig. 1, Table 2). This is due to the reform of the civil service in Ukraine, one of the tasks of which is to reduce to an optimal level the number of civil servants, taking into account the functions of state structures and the active introduction of digitalization. The ratio of population decline to the decline in the number of civil servants during this period in Ukraine was 0.08.

While estimating the change in the number of women working in the civil service, we can conclude that in the UK it increased by 0.4%, and in

Germany by 11% due to an increase in the number of civil servants, whereas in Ukraine it decreased by 1.5% due to the reduction of the total number of civil servants. At the same time, the total number of women in the civil service exceeds the number of men: in the UK by 4.2%, in Germany by 6.5%, and in Ukraine by 24.6% (Fig. 2). However, the number of men at higher levels of the civil service is much higher than the number of women. This is due to the centuries-old gender discrimination against women. That calls for developing a mechanism to achieve gender equality at all levels of the civil service. To show the difference, let us summarize the level ratios for the three countries as follows:

– Junior (AO/AA in the UK; Lower Service in Germany; category C in Ukraine);

- Middle (EO, SEO/HEO, Grades 6 & 7 in the UK; Middle Service, Upper Service in Germany; category B in Ukraine);

- Senior (SCS in the UK; Senior Service in Germany; category A in Ukraine).

Figure 3 illustrates the change in the number of women at different levels of public service over time. Fig. 3 a shows that in the UK at the Junior level in 2021 the number of women exceeded the number of men by 6.4%. This is the result of the work done to achieve gender equality, as since 2015 this number decreased by 1.7%. In 2021, the number of women at the Middle level:

- EO exceeded the number of men at the same position by 7%; compared to 2015, this number increased by 0.9%;

- SEO/HEO exceeded the number of men by 1.1%; compared to 2015, this number increased by 3.7%;

- Grades 6&7 showed lower numbers than the number of men by 1.6%; however, compared to 2015, the number of women at this level increased by 4.6%.

In 2021, the number of women at the Senior level in the UK is lower than the number of men by 3.2%; however, compared to 2015, the number of women at this level increased by 7.9%.

The results of the analysis confirm the correctness and effectiveness of the government's action on gender equality. These techniques have to be implemented to achieve gender equality among civil servants in a developing country.

Fig. 3 b shows that in Germany at the Junior level in 2021 the number of women is 6.6% lower than the number of men. Compared to 2015, this number increased by 19.8%. In 2021, the number of women at the Middle level:

- Middle Service shows lower number of women than the number of men by 16%; compared to 2015, this number increased by 1.1%;

- in the Upper Service the number of men exceeds 4.9%; compared to 2015, this number increased by 2.8%;

In 2021, the number of women at the Senior level in Germany is 3.7% higher than the number of men; compared to 2015, the number of women at this level also increased by 4.3%.

It should be noted that this situation is not typical for EU countries, as usually the number of women in senior management positions is much smaller than men. If we also take into account that in general Germany is at a very high level in terms of GGI, it is logical to assume that such an approach to achieving gender equality should be implemented in a developing country. However, public administration bodies should also work to achieve gender equality at the lower levels of the civil service.

Fig. 3 shows that in Ukraine at the Junior level in 2021 the number of women was higher than the number of men by 28%. Compared to 2015 this number increased by 1%. In 2021, the number of women at the Middle level was less than to the number of men. The number of women in 2021 at the Senior level was 49.96% less than the number of men; compared to 2015, the number of women at this level also increased by 0.02%.

It should be noted that the number of women civil servants at the highest level is extremely small. At the same time, at a lower level, this value is much higher than the corresponding figures in the UK and Germany.

GDP per capita growth (annual) of all three countries under analysis tends to grow. With the growth, there are jumps to negative values, which are caused by the impact of destructive factors on the economy. In particular, the jump to negative values of 9,907 GDP per capita growth (annual) in the UK and to 4,739 in Germany in 2020 was due to the impact of the global Covid-19 pandemic on the economy of these countries. It should be noted that the decline in the UK was twice as much as that in Germany. This once again confirms the greater efficiency of German management system. In 2021, the GDP per capita growth (annual) of the UK was 2 times higher than that of Germany, which proves the UK crisis management system to be more effective.

In Ukraine, the decline in GDP per capita growth (annual) to negative values was observed 2 times: in 2015 and in 2020. In 2015, the decline was due to the impact of the situation in the east of the country, and in 2020, similarly to Germany and the UK, was caused by Covid-19 pandemic. It should be noted that in 2020 in Ukraine it decreased only to -3,351

compared to the fall in GDP per capita growth (annual) of the UK and Germany. This is 3 times less than in the UK, and 1.4 times less than in Germany. This indicates the adaptability of Ukraine's governance system to crisis situations, which means that when building an economic model of achieving gender equality, the government should not completely reject the work in this direction.

The best GPG in 2021, compared to other countries under analysis, was in the UK. Since 2015, it has decreased by 3.9% and amounted to 15.4% in 2021. The GPG of Germany during this period decreased by 3% and in 2021 amounted to 20%. The largest decrease of GPG by 7.1% is observed in Ukraine, but it has not yet reached the level of the UK and Germany (Fig. 4).

While estimating the impact of the GGI level on GDP per capita growth (annual) in the dynamics of 7 years, we can conclude that there is no direct relationship, but there may be indirect impact, which varies depending on the level of development. In particular, in the UK in 2019 there was a decline in GGI due to the Covid-19 pandemic, but a sharp decline in GDP per capita growth (annual) occurred only the following year. Slight fluctuations in GDP per capita growth (annual) in the UK have absolutely no effect on the GGI. In Germany, a slight decline in GGI was observed in 2017, despite the fact that GDP per capita growth (annual) reached 2.297%. This can be explained by the impact of the increased level of external migrants who created a gender imbalance. The following year, effective management efforts resulted in the situation improvement and the fact that GGI continued to grow. The Covid-19 pandemic did not affect Germany's GGI, although it significantly worsened GDP per capita growth (annual) to -4.739% in 2020.

In Ukraine, the GGI fell by 0.007 units in 2020 due to the Covid-19 pandemic. This level of decline is 0.004 units greater than in the UK in 2019. It should be noted that the impact of the pandemic on the GGI was seen not immediately, but a year later, in contrast to developed European countries. At the same time, in the developing country, the fall in GGI coincided with the fall in GDP per capita growth (annual). Interestingly enough is the fact that with significant fluctuations in GDP per cap-

ita growth (annual) in Ukraine, except for those caused by the pandemic, there is no negative impact on GGI.

Thus, it can be seen that out of the three hypotheses, the third one has been confirmed: there is no general direct relationship between the level of GGI and GDP per capita growth (annual) for all countries, regardless of their level of development. In the UK, small fluctuations in GDP per capita growth (annual) do not affect GGI levels; however, the Covid-19 pandemic does have its impact. In Germany, any fluctuations in GDP per capita growth (annual) do not affect the level of GGI, yet it is affected by changes in population, in particular by increasing migration. In Ukraine, significant fluctuations in GDP per capita growth (annual) do not affect the level of GGI, although this index is reduced by the effects of the pandemic a year after its onset.

The data presented confirm the effectiveness of Ukraine's activities in achieving gender equality. However, in order to achieve this goal, additional efforts are needed: to develop and implement an economic model for achieving gender equality. At the same time, it should be based on the management approaches of Germany to achieve gender equality at the highest level of the civil service, and the UK to achieve gender equality at the middle and lower levels of the civil service.

After analyzing the results of factor analysis on 23 factors (Table 3-5), which, based on the above analysis, can contribute to gender equality to build an economic model, 6 main factors and 9 auxiliary factors were selected for 3 indicators (Table 5). As every 2 factors belonged to 1 indicator out of three, the Windmill economic model was developed to achieve gender equality among civil servants in the developing country (Fig. 5). According to it, in order to provide opportunities for achieving gender equality, work should be optimized at three levels:

- legislative;
- employer;
- family.

At the legislative level, additional support should be provided for women working in the civil service. In particular, it is necessary to ensure gender quotas at all levels of the civil service and provide children of working women with a place in a

nursery/kindergarten or school that is located close to the home or work of the mother, father, grandmother or grandfather (optional). The following should be considered as additional factors of influence:

- avoid gender-based discrimination;
- create mini-centers of temporary stay for a child during 4 hours a day at each organization;
- provide children of working women with a place in a full-time nursery/kindergarten;
- ensure a stay on childcare leave for up to 3 years to mother, father, grandmother, grandfather (optional);
- provide time off for up to 4 hours per day if necessary to examine a child aged 0 to 16 by a doctor;
- ensure a transparent recruitment mechanism according to clearly defined criteria.

It is the legislative level that is the driving force behind the effective operation of this system, which, in addition to achieving gender equality, will ensure the professional development of female civil servants.

At the level of the employer it is necessary:

- ensure general availability of information on available vacancies and working conditions;
- develop and implement a mechanism to ensure the possibility of women's employment during childcare leave (part-time employment, telecommuting, flexible scheduling).

As an additional factor of influence the employer should provide:

- a clear description of the payment system when providing bonuses and surcharges;
- the possibility of advanced training for persons on childcare leave;
- the possibility of prolonging the employment contract for a year after the expiration of the employee's contract provided the person's desire to go to work.

At the family level, the following should be provided:

- equal rights for working parents of both sexes in the upbringing of the child.
- spending the same amount of time by working parents with the child.

As an additional factor of influence in the family

the following should be provided:

- favorable climate at home for working parents of children aged 0 to 16.
- equal rights to rest for working parents of both sexes.

Of course, while it is still possible to monitor the implementation of the above factors at the employer level, it is very complicated to do so at the family level. However, it is possible to carry out explanatory work in this direction with the involvement of the media and popular social networks.

Other countries with similar levels of GGI and GDP, as well as the type of governance, can use the proposed model to achieve gender equality. However, it should be noted that the model will be effective only if the initial data are similar, as it was built based on them using factor analysis. Otherwise, the high efficiency of achieving gender equality may not be guaranteed.

6. Conclusions

Based on the results of this work, we can conclude that:

1. There is no general clear relationship between the GGI level and GDP per capita growth (annual) for all countries, regardless of their level of development, thus, the third hypothesis of the study has been confirmed:

- it has been established that for the leading non-EU European country (the UK) small fluctuations in GDP per capita growth (annual) do not affect the level of GGI, which however is not true for the pandemic. Covid-19 reduced the GGI by 0.003 units, and this effect occurred immediately after the onset of the pandemic. Due to a properly formed management system, this impact was quickly reduced and GGI increased by 0.008 units with a negative value of GDP per capita growth (annual) in 2020.

- it has been established that for a developed EU member (Germany) any fluctuations in GDP per capita growth (annual) do not affect the level of GGI, however changes in population, including increased migration, does affect this indicator. Due to the high efficiency of the management system, this impact was quickly reduced. Even though Covid-19 did not affect the GGI, it still reduced GDP per capita growth (annual) in 2020 to negative values;

– it has been established that for a developing European country (Ukraine) significant fluctuations in GDP per capita growth (annual) do not affect the GGI level, except for the impact of the pandemic. The GGI drop by 0.007 units in 2020, when GDP per capita growth (annual) fell to negative values, is a good example of this influence. Moreover, the level of decline in GGI was 0.004 units greater than in the UK in 2019.

2. The relationship between the population, civil servants, their distribution by sex, GPG, average wages and GDP per capita growth (annual) and the welfare of the population of these countries has been established:

– it was found that for the leading non-EU European country (the UK) with a population growth of 5%, the number of civil servants increased by 9%. At the same time, the number of female civil servants holding Senior positions increased by 7.9%, which is still 3.2% short of achieving parity. At the Middle level, the number of female civil servants increased by an average of 5.8%. At the Junior level, the number of female civil servants is not high, although it exceeds the equality threshold by 6.4% and has decreased by 1.7% in 7 years. At the same time, GPG decreased by 3.9% and remains the best indicator (15.4%) among the three countries being compared. The high level of welfare of the population is confirmed by GDP per capita growth, which increased by 4.9%. This leads to the conclusion that the methods of achieving gender equality used in the UK should be implemented in a developing country.

– it has been established that for a developed EU member (Germany) with the growth of the population by 2% the number of civil servants increased by 3%. At the same time, the number of female civil servants holding Senior positions increased by 4.3%, although their number already exceeds the parity by 3.7%, which is not typical. At the Middle level, the number of female civil servants increased by 1.9% on average. At the Junior level, female civil servants are 6.6% short of parity, although their number has increased by 19.8%. At the same time, GPG decreased by 3%. The growth of welfare is confirmed by GDP per capita growth, which increased by 2.2%. This leads to the conclusion that

the methods of achieving gender equality used in Germany must also be implemented in the developing country;

– it has been established that for a developing European country (Ukraine) with a decrease in population by 3%, the number of civil servants decreased by 36%. At the same time, the number of female civil servants holding Senior positions increased by only 0.02% and remains very low (0.04% compared to the number of male civil servants). At the Middle level, the number of female civil servants is also low (22%) and is declining over time as the total number of civil servants decreases. At the Junior level, the number of female civil servants is very high (78%) and is increasing despite a decline of the total number of civil servants. At the same time, GPG decreased by 7.1%, which positively characterizes the effectiveness of work to achieve gender equality. GDP per capita growth increased by 11.8%, but in 2021 it did not exceed 2.36%. These indicators show an improvement in the welfare of the population, but they are still far from being sufficient. Therefore, it is necessary to intensify the processes of achieving gender equality, finding new methods and approaches for their implementation.

3. In order to achieve gender equality among civil servants in the developing country, it is proposed to use "Windmill" economic model, which is based on selected important factors in the methods of achieving gender equality in the UK, Germany and Ukraine. In particular, they stipulate support from the state at the level of the law, the employer and the family.

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