

Analyzing the Trends in Gender Pay-Gap in Europe from 2010-2021

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ABSTRACT

This paper uses Eurostat's data on gender pay gaps during 2010-2021 to conduct a trend analysis of the pay gap for 10 industries across 16 countries in the European Union. Using techniques of descriptive statistics, we observed a 3.03% decrease in the gender pay gap across the sampled countries and industries. We also found that the pay gap is lower in the public sector, as suggested by the reviewed literature. A minor negative correlation was observed between per capita GDP and gender pay gap. Finally, using hypothesis testing, we concluded that, on average, there has been at least a 3.5% decrease in the gender pay gap across Europe between 2010 and 2021.

Key Words : Gender Pay-Gap, Occupational Segregation, Labour Market, GDP Correlation

INTRODUCTION

Gender pay gaps persist as a significant issue in developed countries, reflecting underlying labor market inequalities. Understanding the trends and factors influencing these gaps is crucial for formulating effective policies to promote gender equality in earnings. This paper analyzes the gender pay gap in 16 European countries across 10 industries from 2010 to 2021.

The gender pay gap measures the difference in average earnings between men and women. It serves as an indicator of workplace gender inequality, influenced by factors like occupational segregation and discrimination. This study utilizes Eurostat data to examine changes in the pay gap over 12 years, aiming to identify patterns, drivers, and potential mitigating factors.

The paper begins with a literature review, highlighting the role of social expectations, wage structures, and policy responses in shaping the pay gap. Descriptive statistics provide an overview of earnings disparities in each industry. The analysis explores factors like ownership and job type, comparing pay gaps in different contexts.

Additionally, the relationship between per capita GDP

and the pay gap is examined to uncover potential associations between economic development and earnings equality. Hypothesis testing assesses changes in the pay gap between 2010 and 2021.

This research aims to contribute to knowledge on gender pay gaps, providing a comprehensive analysis of trends, industry variations, and influencing factors. The findings can inform targeted strategies and policies to foster gender equality in earnings and create inclusive labor markets.

Literature Review:

The literature reviewed focuses on the gender pay gap and its determinants in developed countries. Arnaud Chevalier (2006) suggests social expectations and gender roles influence the gap, with women valuing family commitments leading to lower wages. Janneke Plantenga and Chantal Remery (2006) highlight how the pay gap widens with age, pointing to occupational segregation and wage structures as significant factors. Francine D. Blau and Lawrence M. Kahn's work includes multiple papers: "Analysing the Gender Pay Gap" (1999) emphasizes wage structure's role in explaining the gap, rather than

just gender-specific factors. Their 2003 paper explores international differences, showing that egalitarian institutions contribute to reduced gaps. In “The Gender Pay Gap: Have Women Gone as Far as They Can?” (1999), Blau and Kahn discuss factors such as qualifications, discrimination, and industry disparities. Lastly, Petroula M. Mavrikiou and JulijanaAngelovska (2020) highlight how vertical and horizontal gender segregation within industries contribute to the pay gap across Europe, influenced by unpaid care work and career choices.

METHODOLOGY

Data Source:

Eurostat (statistical office of the European Union)

Time Series Data:

Since the data set represents gender pay gap across 16 European countries with respect to 10 major industries across 12 years (2010-2021), the data is time series. Our analysis primarily focuses on the trends in gender pay gap in Europe across the years.

Variables:

The 3 variables are:

Year (on the x-axis - independent variable):

The gender pay gap is measured across the years

to create a time series. This variable represents the time dimension and indicates the specific year for each observation. It is a categorical variable and does not have a specific unit of measurement. The analysis is conducted over 12 years (2010-2021).

Gender Pay Gap (on the y-axis - dependent variable):

It is calculated as the difference between the male average gross hourly wages and the female average gross hourly wages as a percentage of the male wages. It represents the difference in average earnings between men and women in each combination of industry, country and year. The unit of measurement is percentage.

Industry (the construction of each time trend graph is based on one industry):

The gender pay gap for all 12 years is measured singularly for each industry- business, manufacturing, retail trade, transportation, information, finance, real estate, administration, education and health. It is also a categorical variable and does not have a specific unit of measurement.

RESULTS AND DISCUSSION

Tabulation:

We’ve calculated the weighted average gender pay gap of each industry, our weights being the GDP per capita of each of the 16 countries in 2021.

Business (2021)		Manufacturer (2021)		Retail Trade (2021)	
Statistic	Value	Statistic	Value	Statistic	Value
Average (Weighted)	15.3%	Average (Weighted)	13.7%	Average (Weighted)	18.7%
Median	14.7%	Median	16.1%	Median	18.9%
Minimum	8.6%	Minimum	2.1%	Minimum	9.5%
Maximum	22.3%	Maximum	24%	Maximum	31.8%
Range	13.7%	Range	21.9%	Range	22.3%
Standard Deviation	4.29%	Standard Deviation	6.84%	Standard Deviation	5.14%
Skewness	0.13	Skewness	-0.41	Skewness	0.57
Kurtosis	-0.97	Kurtosis	-0.89	Kurtosis	1.87

Transportation (2021)		Information (2021)		Finance (2021)	
Statistic	Value	Statistic	Value	Statistic	Value
Average (Weighted)	4.8%	Average (Weighted)	17.2	Average (Weighted)	25.3
Median	3.5%	Median	19.0	Median	28.7
Minimum	-16.4%	Minimum	10.5	Minimum	7
Maximum	11.2%	Maximum	29.3	Maximum	37.5
Range	27.6%	Range	18.8	Range	30.5
Standard Deviation	7.30%	Standard Deviation	6.08	Standard Deviation	7.73
Skewness	-1.18	Skewness	0.20	Skewness	-1.22
Kurtosis	1.77	Kurtosis	-1.05	Kurtosis	1.89

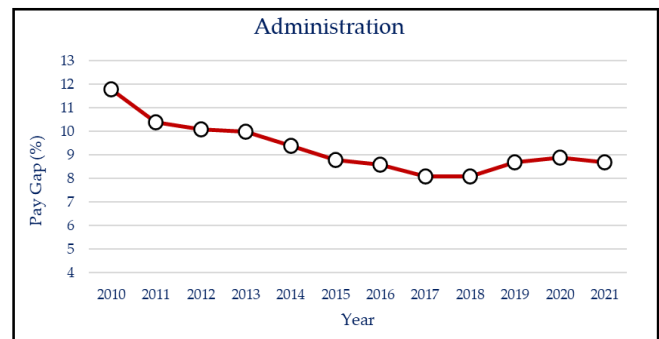
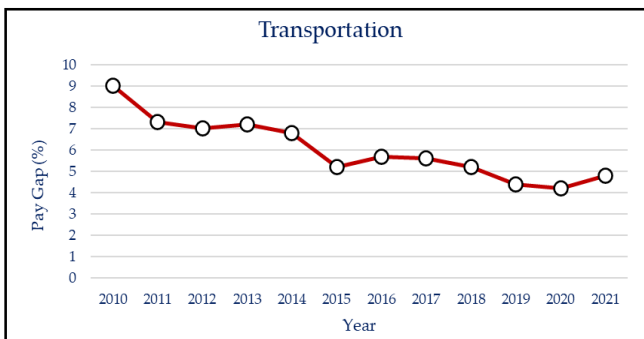
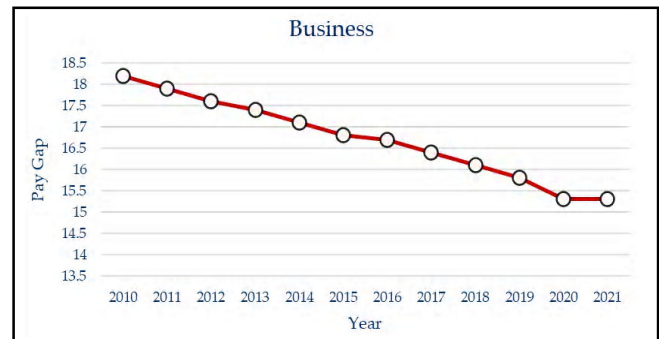
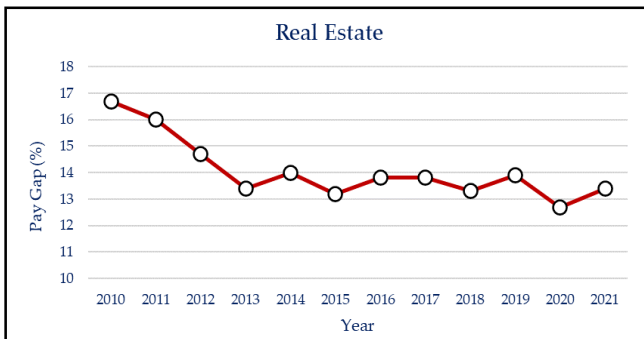
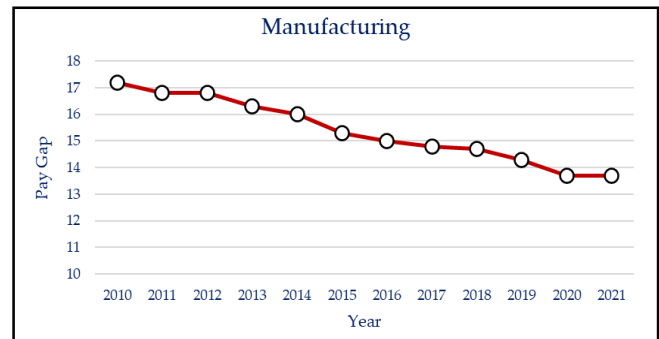
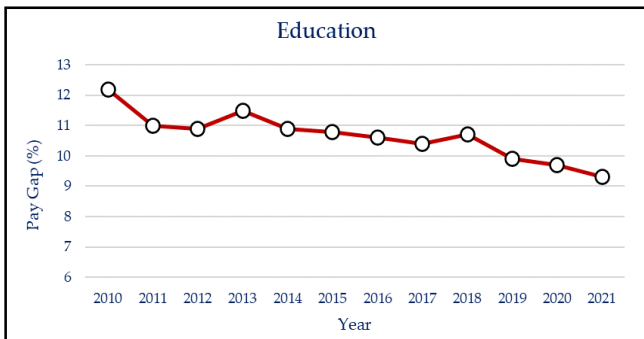
Real Estate (2021)		Administration (2021)		Education (2021)	
Statistic	Value	Statistic	Value	Statistic	Value
Average (Weighted)	13.4	Average (Weighted)	8.7	Average (Weighted)	9.3
Median	9.2	Median	8.7	Median	9.6
Minimum	-7.2	Minimum	-22.5	Minimum	2.8
Maximum	23.1	Maximum	18.9	Maximum	18.5
Range	30.3	Range	41.4	Range	15.7
Standard Deviation	8.44	Standard Deviation	12.13	Standard Deviation	5.11
Skewness	-0.47	Skewness	-1.72	Skewness	0.41
Kurtosis	-0.11	Kurtosis	2.49	Kurtosis	-1.05

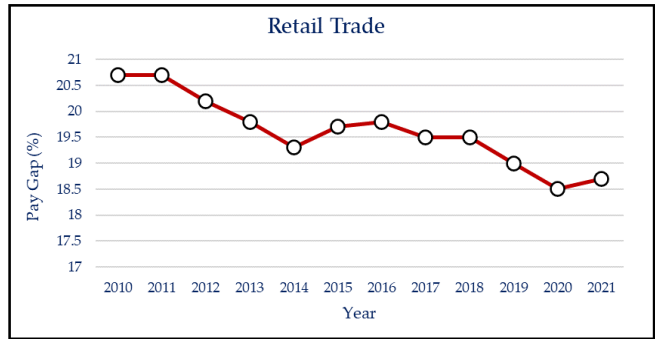
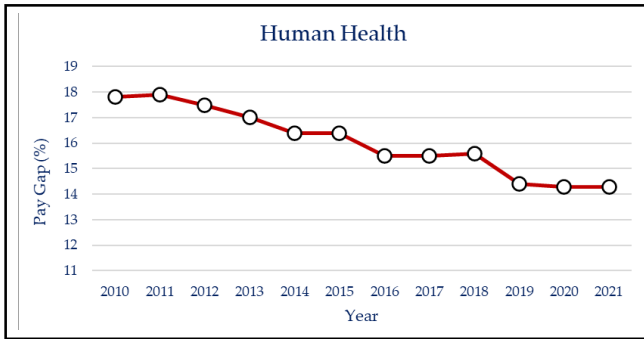
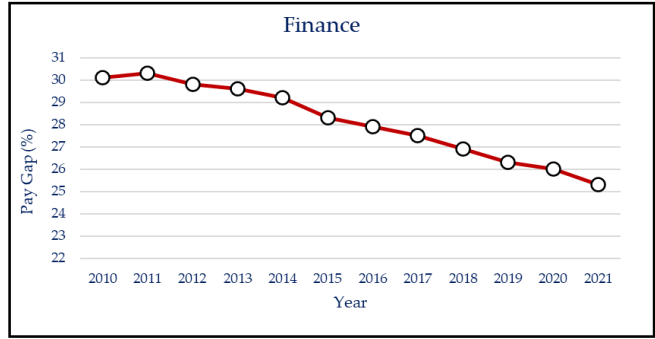
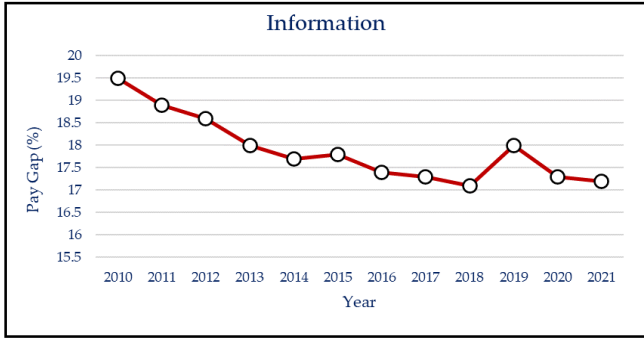
Health (2021)		Standard Deviation	
Statistic	Value	Statistic	Value
Average (Weighted)	143	Standard Deviation	7.64
		Skewness	-0.16
		Kurtosis	-1.02

Data Visualization (Time Trends):

The aim of this study was to analyse the trends of the gender pay gap in 16 European countries across 10 industries for the time period 2010-2021. The main

observation was that the gender pay gap has generally decreased, which is supported by a sample mean difference of -3.0312% between 2010 and 2021. We will also be segmenting the industries based on certain

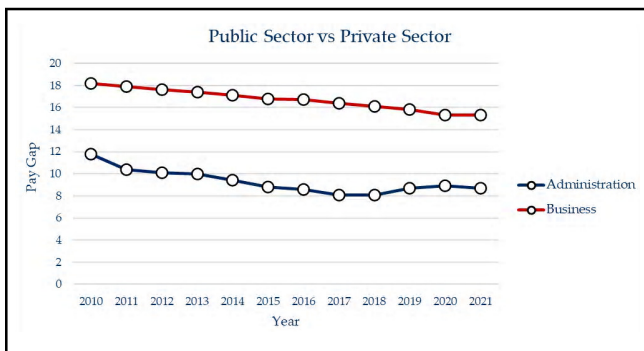




differences such as ownership (public sector vs private sector), job type (blue collar vs white collar) etc.

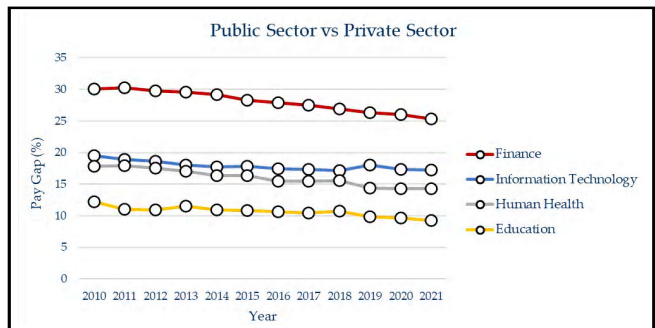
Public Sector vs Private Sector:

The gender pay gap is generally narrower in the public sector, notably in administration, compared to private sectors like business. This is due to factors like a compressed wage structure, higher female representation in professional roles, and emphasis on equal opportunities policies. However, while progress has been made, gender pay gaps still persist in the public sector, necessitating ongoing efforts for greater equity.



There's a stark difference visible in the gender pay gap of the public sector (administration) versus the gender pay gap in the private sector (business) even over the years. The gender pay gap time trend has been created

by calculating an industry-wide weighted average (weights being the GDP per capita in a certain year) across Europe.

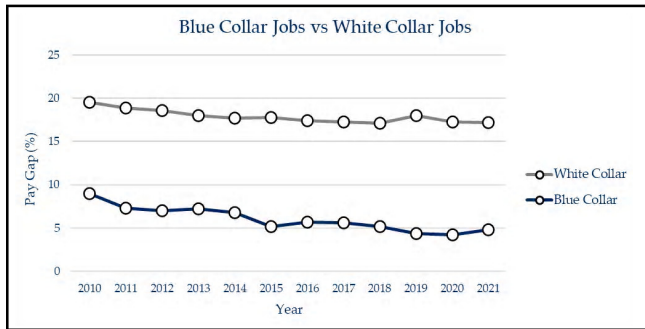


In a detailed analysis considering diverse industries, we observe that majorly public-owned sectors (human health, education) have lower gender pay gaps than private sectors (finance, IT). This is due to standardized pay structures and transparency in the public sector, collective bargaining and unions, legislative gender equality measures, and a cultural emphasis on fairness and equality.

Blue Collar Jobs vs White Collar Jobs:

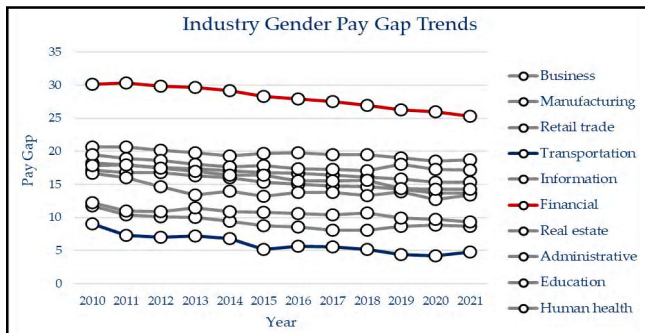
The graph displays gender pay gaps in white collar and blue collar jobs, with blue collar jobs having a lower gap. This is due to transparent wage systems in blue

collar jobs and stronger collective bargaining power through unions, which help diminish the gap.



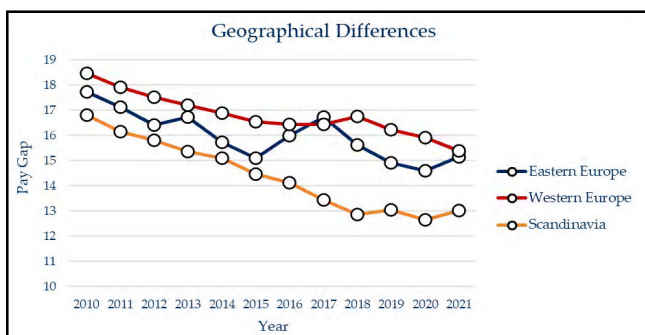
Industry Gender Pay Gap Trends:

The graph shows gender pay gap trends in European industries, with Finance (high gap) and Transportation (low gap) highlighted. The gaps result from occupational segregation in Finance and more balanced representation in Transportation, industry culture favoring flexibility in Transportation, and stronger gender equality policies in public-owned Transportation.



Geographical Differences:

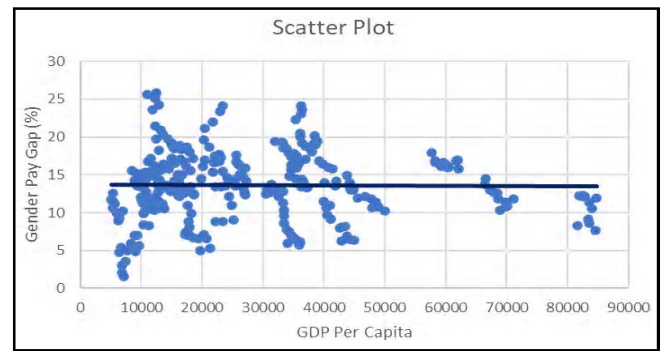
The graph shows Scandinavian countries with the lowest gender pay gap and Western European countries with the highest. Reasons for the gap in Scandinavia include gender equality policies, strong education systems, work-life balance support, robust social welfare, and



progressive cultural attitudes. In Western countries, the gap is due to occupational segregation, lack of work-life support, biases, part-time work, career interruptions, and women’s underrepresentation in leadership roles.

Correlation Between GDP Per Capita and Gender Pay Gap:

The graph indicates a vague correlation between gender pay gaps and GDP per capita in European countries (correlation coefficient: -0.01534763). This might stem from data limitations and shared backgrounds. Literature suggests a potential inverse link due to factors like economic development, regulated labor markets, and progressive social norms fostering gender equality.



Hypothesis Testing:

We have based our hypothesis on the change in gender pay gap percentage across all the 16 countries and 10 industries.

For this, we have considered two dependent variables X and Y. X denotes the pay gap percentage for a particular country and industry in 2021 while Y denotes the same for 2010. D is the difference between these two variables.

A negative value of D indicates a decrease in the gender pay gap over the past 12 years while a positive value indicates an increase.

We have 160 observations for the variable D, because of which we can invoke the Central Limit Theorem and assume \underline{D} to be approximately normal.

Our null hypothesis suggests that there is atleast a 3.5% decrease in the gender pay gap in the time period 2010-2021.

Sample size (n) = 160

Sample mean (\underline{d}) = -3.0312

Sample standard deviation (s) = 4.9024

Critical values- right-tailed test ($\hat{\alpha}$):

– $\alpha_1 = 0.01$ implies $Z_1 = 2.33$

- $\alpha_2 = 0.05$ implies $Z_2 = 1.64$
- $\alpha_3 = 0.1$ implies $Z_3 = 1.28$

Null Hypothesis (H_0) = $\mu = -3.5$
 Alternate Hypothesis (H_a) = $\mu > -3.5$

Test Statistic = $\bar{d} - \mu / (s / \sqrt{n}) = -3.0312 - (-3.5) / (4.902498 / \sqrt{160}) = 1.209$

- Since the Test Statistic $< Z_1$ in a right-tailed test, do not reject H_0 at $\alpha_1 = 0.01$.
- Since the Test Statistic $< Z_2$ in a right-tailed test, do not reject H_0 at $\alpha_2 = 0.05$.
- Since the Test Statistic $< Z_3$ in a right-tailed test, do not reject H_0 at $\alpha_3 = 0.1$.

Limitations:

The present study has the following limitations which could be worked upon in future versions:

- **Incomplete Country Representation:** The dataset covers 16 European countries, but some diversity is excluded, potentially impacting findings' applicability and introducing biases.
- **Limited Industry Coverage:** Including only 10 industries may not fully represent Europe's economic spectrum, limiting insights into the gender pay gap.
- **Scope of Variables:** The dataset's focus on the gender pay gap might overlook crucial factors like job roles, education, career progression, and work-life balance.
- **Endogeneity Concerns:** Relationships between gender pay gap, industries, and time could be affected by unaccounted endogeneity issues, potentially distorting results.
- **Contextual Generalizability:** Findings might only apply to Europe due to differing cultural norms, policies, and labor dynamics in other regions.

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