The effect of board age diversity on the gender pay gap

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ABSTRACT,
Women systematically get paid less than men which is one of the biggest gender inequalities in today's world. Still researchers have not been able to entirely explain why this is the case. This thesis explores the relationship between the age diversity within the board of directors and the gender pay gap in United Kingdom firms. The gender pay gap is defined as the difference in earnings between men and women. In this thesis several Ordinary Least Squares regressions and correlation analysis were conducted. This research has found that there is a significant positive relationship between the age diversity of the board and the gender pay gap meaning more age diversity leads to an increase in the gender pay gap. Knowing the causes and effects of the gender pay gap may help to decrease and hopefully close the gender pay gap.

During the preparation of this work, the author used ChatGPT in order to create RStudio codes. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the work.

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1. INTRODUCTION

1.1 Situation and complication

Despite government legislation and attention being paid to the issue, the gender pay gap is still an active problem in today's society. The gender pay gap causes the mental state of women to worsen and makes women more likely to suffer from anxiety and depression (Zheng, 2021). Another reason why the gender pay gap is a problem is that the world's economy suffers from women not being given equal opportunities. "(…) recent data show that if women would have equal opportunities as men, the global GDP would rise by 26%, the equivalent of $28 trillion (…)" (Nassar et al., 2021). Lastly, the gender pay gap is a problem because the fact women get paid less for doing the same job is simply unfair. "The gender pay gap, broadly defined as the difference between male and female earnings, is one of the most salient aspects of modern-day inequality" (Blundell, 2021). That leads people to question why the gap still exists and maybe more importantly how do we solve it? This research will look at a possible explanation for this gap which is board age diversity.

"Although five decades have passed since equal pay laws were enacted, women continue to receive significantly lower pay than men and are underrepresented at the highest levels in organisations" (Walsh, 2025). The gender pay gap in the United Kingdom in 2018 was on average 17,9% (Ahamed et al., 2019). A gap of this percentage means that every hour a woman earns 17,9 percent less than a man. To have the same earnings at the end of a full-time day of eight hours, a woman would have to work approximately one hour and twenty-six minutes longer.

The government of the United Kingdom has recognized the need for government involvement in closing the gender pay gap. The UK government introduced a bill in 2017 requiring companies that employed more than 250 UK employees to report their gender pay gaps annually (Walsh, 2025). Similar to the United Kingdom other European countries also implemented laws trying to mitigate the gender pay gap. Differently to the UK these countries like Austria and Denmark did not have to publish their gender pay gaps to the public. "In both Denmark and Austria, pay gaps were not made publicly available, but rather were just available to employees within the firm. Pay gap reports were also made specific to occupations, in contrast to the cruder unconditional nature of the UK's reporting policy." (Blundell, 2021). This means that only internal employees were able to access the information about the gender pay gap within their own company.

The gender pay gap has been researched frequently in past years in search of a clear cause for the gap (Ahamed et al., 2019; Blau & Kahn, 2017; Carter et al., 2017). The European Commission has identified four factors explaining part of the gender pay gap. They find that sectoral segregation, the balance between unpaid and paid work, the glass ceiling, and pay discrimination all contribute to the existing gender pay gap (European Commission, 2022). Sectoral segregation is a term used for the fact that women work more in lower paid sectors like healthcare and education. Women also work more part-time than men, but women do more unpaid work next to their job like housekeeping (European Commission, 2022). The glass ceiling "is defined as an invisible barrier that prevents qualified women from upward advancement in the corporate hierarchy" (Taparia & Lenka, 2022). Pay discrimination means that women get paid less than men for equal work based on their gender (European Commission, 2022). The European Parliament points to some of the same factors for the gender pay gap as the European Commission but also identifies two new factors. Women make career choices more often influenced by family responsibilities and there are fewer and lower paid female managers (European Parliament, 2020). Though these factors explain part of the gender pay gap both institutions note that "the far largest part of the gender pay gap remains unexplained in the EU and cannot be linked to worker or workplace characteristics such as education, occupation, working time or economic activity the person works for" (European Commission, 2022).

A specific aspect that may have a relation to the gender pay gap is boardroom diversity. "The function of the board of directors is to monitor the performance of the top management team and approve important corporate decisions. They focus on balancing the stakeholders' welfare, which conflicts with the management team's profit maximization goals" (Ahamed et al., 2019). Different factors of boardroom diversity have been researched in relation to the gender pay gap. It was concluded that more female representation on boards of directors leads to smaller gaps in salary and total pay level (Carter et al., 2017). The cause for this could be either lower gender discrimination or better governance oversight, but the authors cannot distinguish between the two options (Carter et al., 2017). Still, having a significant number of female directors on the board does not close the gap entirely. Also, it was found "that firms with the presence of foreign directors on board reduce the GPG of the firms in Britain. This result is more pronounced with the profitable firms, and with those that have less than 5,000 employees" (Ahamed et al., 2019). The authors theorize that the underlying reason for this relationship is that the companies' emphasis on diversity in boards also causes the improvement in pay equality (Ahamed et al., 2019).

1.2 Research objective and question

This paper suggests another demographic of the board of directors that could influence the gender pay gap: the age of the directors. The effect of the age of the board of directors will be researched by looking at the relationship between age diversity and the gender pay gap. This is a demographic that has not been directly researched before and therefore has a great opportunity to explore. Age diversity means the difference between the different ages of board members. This research intends to show whether age diversity of the board of directors influences the gender pay gap. That leads to the following research question:

"What is the relationship between age diversity within the board of directors and the gender pay gap in UK firms?"

1.3 Academic and practical relevance

It has been previously concluded that there is still a great part of the gender pay gap that remains unexplained. Many possible factors have been discussed by the European Parliament (2020) and the European Commission (2022) like sectoral segregation, discrimination, glass ceiling, part time work, family responsibilities, and less female managers.

The relationship between board diversity and the gender pay gap has also been researched and it has been proven that gender diversity within the board has a negative effect on the gender pay gap, thus partly closing the gap (Carter et al., 2017). The same has been proven true for nationality diversity of the board of directors (Ahamed et al., 2019). This leaves an academic gap that considers age diversity as a significant influence on the gender pay gap. By researching this relationship between age diversity on boards and the gender pay gap, this research could possibly provide a better understanding of the gender pay gap in academic literature.

The goal of this research is to fill the partial knowledge gap currently existing and possibly find an explanation that adds to the causes of the gender pay gap. This is necessary because despite previous research and legislation from governments the gender pay gap has continued to exist. The World Economic Forum has predicted that it will take 131 years to fully close the gender pay gap if we keep going at the current rate (World Economic Forum, 2023). Being able to explain the causes of the gender pay gap more, could hopefully lead to the closing of it in less than 131 years.

Besides the academic relevance of this research, there are also valuable insights for the practical field. If the nature of the relation between age diversity and the gender pay gap is known, multiple actors can use this knowledge to their advantage. Both employers and employees will know that having a diverse board will most likely improve their pay gap. Knowing the cause of the gender pay gap can also help legislators make bills that will help close the gender pay gap. The current initiatives by the United Kingdom government have not been sufficient in closing the gap but adding new legislation targeting other aspects of the gender pay gap might be helpful.

2. LITERATURE REVIEW

2.1 The gender pay gap

Before starting to research possible causes for the gender pay gap, it is important to define what the gender pay gap is. The European Parliament defines it as "(…) the difference in average gross hourly earnings between women and men" (European Parliament, 2020). Different terms commonly used for the gender pay gap are gender wage gap, gender earnings gap, gender wage disparity, gender income gap, and gender pay inequality.

According to Blau and Kahn (2017) the gender pay gap could be explained by skills, college attendance, and work force commitment. Women used to have less work skills and did not attend higher education often which caused a noticeable gap between payment of men and women. The same can be said for work force commitment, which means that women used to work less than men also explaining the gap. Traditionally, this explained the gap but currently these facts do not hold true anymore since the skills of women have improved, the college attendance has been reversed with more women attending than men, and workforce commitment has also improved (Blau & Kahn, 2017).

The factors that explain the gender wage gap currently have been researched by the European Parliament (2020) and the European Commission (2022). The main explanations for the gender pay gap are sectoral segregation, the balance between unpaid and paid work, the glass ceiling, pay discrimination, career choices based on family obligations, and fewer and lower paid female managers). Sectoral segregation is a term used for the fact that women work more in lower paid sectors like healthcare and education. Women also work more part-time than men, but women do more unpaid work next to their job like housekeeping (European Commission, 2022). The glass ceiling "is defined as an invisible barrier that prevents qualified women from upward advancement in the corporate hierarchy" (Taparia & Lenka, 2022). Pay discrimination means that women get paid less than men for equal work based on their gender (European Commission, 2022). Women often make career choices more based on family obligations like taking care of their children. Cohen and Huffman (2007) conclude that having more women in high management position benefits the promotion of other women and decreases the gender pay gap. But there are lesser and fewer paid female managers which prevents this from happening.

Iceland is one of the best countries when it comes to gender equality. Iceland has nearly closed the gender pay gap by implementing thorough legislation (Sarnelli, 2022). There are multiple differences between the policy in Iceland and the United Kingdom, but a very noticeable one is the fact that Iceland has a law which obligates boards with more than 3 members to have at least 40% representation of both genders (Sarnelli, 2022). The United Kingdom does not have this regulation. This shows that board diversity has improved the gender pay gap in these countries.

"The UK Government introduced reporting requirements under Section 78 of the Equality Act 2010 that requires all private, public, and voluntary sector organisations with over 250 employees to publish their gender pay gaps (mean and median) annually on a government website, including the percentage of men and women in each of the four pay quartiles and those receiving a bonus payment" (Walsh, 2025). Blundell (2021) found that the introduction of the legislation led to an improvement of 1.6 percentage point in women's wages relative to those of men.

Despite all the explanations of the gender pay gap and the legislation introduced by the United Kingdom, the gender pay gap remains and continues to be partly unexplained.

2.2 Board age diversity

Board age diversity refers to the representation of different ages within a board. The effect of board age diversity can have both positive and negative impacts on a company. According to Fernández Temprano and Tejerina-Gaite (2020) there is a positive relation between age diversity within the board and firm performance. In contrast to this, other studies have found that age diversity causes too much communication barriers and therefore negatively impacts firm performance (Talavera et al., 2018).

Research about age diversity in relation to Corporate Social Responsibility (CSR) practices is more conclusive. Ferrero-Ferrero et al. (2015) measured age diversity by grouping board members into generations (Veterans, Boomers, Gen X, etc.) and looked at the effect on Corporate Social Responsibility. "This study concludes that generational diversity is a key component for improving good corporate governance codes." (Ferrero-Ferrero et al., 2015). Similarly, Beji et al. (2021) measured age diversity by grouping the board members into self-made categories with the same interval (40-49, 50-59, 60-69, etc.). They also concluded that "(…) age diversity is positively associated with corporate governance, human resources, human rights, and environmental activities." (Beji et al., 2021). Lastly, Islam et al. (2022) measured how age diversity impacts CSR performance and concluded "(…) that board gender and age diversity enhance CSR investment and approach decisions, and, in turn, they improve the CSR performance of organizations."(Islam et al., 2022). Islam et al. say that the reason for this is that younger directors are more knowledgeable and aware of CSR practices and older directors are more nuanced and bring wisdom to the table. This combination makes for a better approach according to Islam et al. (2022).

This shows that the relationship between board age diversity and the gender pay gap as part of Corporate Social Responsibility is interesting to explore.

When taking a more general view of group dynamics and decision making, it has been found that homogenous groups tend to think alike and have more bias than a heterogeneous group (Schulz-Hardt et al., 2000). "(…) a problem of homogeneous groups could be that they don't recognize this similarity bias in the group composition and thus overestimate the validity of their social consensus information" (Schulz-Hardt et al., 2000). This means that groups that have similar demographics do not recognize their own potential biases and do not notice that they have similar opinions or views. Having more diversity in a decision-making body could enable the group to make better informed decisions that also serve minority groups (Schulz-Hardt et al., 2000), for example women in the case of the gender pay gap.

2.3 Hypothesis

In literature it has been proven that age diversity leads to increased performance in Corporate Social Responsibility, also known as CSR (Beji et al., 2021; Islam et al., 2022). Considering that in the Corporate Social Reporting Directive from the European Union gender pay equity is considered as a sub-category (Profeta et al., 2021).

Another theory contributing to this hypothesis is, when boards are more age diverse there might be a bigger focus on inclusion. If it is a conscious decision to have more age diversity in the board of directors, it might be the case that they also pay more attention to inclusion and equality within the company and therefore pay more attention to the gender pay gap.

Combining these theories leads to the expectation that there is a positive relationship between age diversity within the board of directors and the gender pay gap. This leads to the following hypothesis where 'age diversity within the board of directors' is the independent variable and 'the gender pay gap' is the dependent variable:

"There is a negative relationship between age diversity within the board of directors and the gender pay gap in UK firms."

This means that an increase in age diversity would lead to a smaller gender pay gap. This relationship is expected because it has been proven that age diversity leads to increased CSR performance (Beji et al., 2021; Islam et al., 2022). Equal and fair pay is part of CSR so you would expect age diverse boards to perform better in the area of gender wage gap. This is likely because companies that pay attention to diversity in the board are more likely to pay attention to the gender wage gap (Ahamed et al., 2019).

3. METHODOLOGY

3.1 Research design

In this research a quantitative research design was used to examine the relationship between age diversity within the board of directors and the gender pay gap in UK firms. Quantitative research "(…) consists of systematic observation and description of the characteristics or properties of objects or events for the purpose of discovering relationships between an independent (predictor) variable and a dependent (outcome) variable within a population" (Mohajan, 2020). Since, the goal of this research is to prove a relationship between the age diversity of the board (independent variable) and the gender pay gap in UK firms (dependent variable) this research design is most effective, because it allows to run several analyses on a great set of companies.

3.2 Data and measurement

The data that was used for the analysis is from the United Kingdom government. Every United Kingdom firm with over 250 UK employees must report their gender pay gap annually (Walsh, 2025). This data set includes the mean and median gender pay gap. It also includes "percentage of men and women in each of the four pay quartiles and those receiving a bonus payment" (Walsh, 2025). The data concerning the board compositions was taken from Orbis database.

For the analysis the median gender pay gap reported was used, because "the sample median can often be a provably better estimator of the underlying fitness function since it is robust to outliers" (Doerr & Sutton, 2019). The variable DiffMedianHourlyPercent shows the difference between male and female earnings per hour in percentages. For example, if the value is ten that means that a man earns ten percent more than a woman per hour in a certain company. If the number is negative that means that women earn more than men in that company.

The independent variable is the age diversity of the board. This was measured by looking at the Blau Index of the age, which shows the diversity. All other provided age variables were also tested in relation to the dependent variable. The used variables and their respective meaning can be viewed in Table 1. Each independent variable was squared to research the possibility of a non-linear relationship between the predictor variable and the gender pay gap measured in median hourly pay difference measured in percentages.

3.3 Data analysis

To answer the research question, the data was analyzed in RStudio. To have the best results, multiple analytical methods were used. Firstly, to get more insight into the relationship between the several independent variables and the dependent variable DiffMedianHourlyPercent, the correlation of each independent variable to the dependent variable was researched and can be viewed in Table 2. Similarly, the correlation between all different independent variables was also computed to check the relationship between all the possible independent variables. Secondly, an OLS (Ordinary Least Squares) regression was performed for each independent variable with multiple control variables. The OLS regression of all the independent variables can be viewed in Table 3 individually or in a model with their squared term. However, some variables proved not to be statistically significant, they were put into the last model (Model 7) with all independent variables.

Table 1 – Variable overview

Variable name	Variable meaning
Independent variables:	
Age_min	The age of the youngest director on the board
Min_Age_Squared	The age of the youngest director on the board squared
Age_max	The age of the oldest director on the board
Max_Age_Squared	The age of the oldest director on the board squared
Age_range	The age of the oldest director minus the age of the youngest director
Range_Age_Squared	Age_range squared
Age_sd	Standard deviation of the age of the board
Sd_Age_Squared	Standard deviation of the age of the board squared
Age_cv	Covariance of the age of the board
Cv_Age_Squared	Covariance of the age of the board squared
Age_mean	Average age of the board
Mean_Age_Squared	Average age of the board squared
BlauIndex_Age	Age diversity of the board
BlauIndex_Age_Squared	Age diversity of the board squared
Control variables:	
Size250_499	Dummy variable for companies with 250 to 499 employees (1 if yes, 0 if no)
Size500_999	Dummy variable for companies with 500 to 999 employees (1 if yes, 0 if no)
Size1000_2499	Dummy variable for companies with 1000 to 2499 employees (1 if yes, 0 if no)
Size2500_4999	Dummy variable for companies with 2500 to 4999 employees (1 if yes, 0 if no)
Size5000_14999	Dummy variable for companies with 5000 to 14999 employees (1 if yes, 0 if no)
Size15000_higher	Dummy variable for companies with 15000 or more employees (1 if yes, 0 if no)
HasPatents	Dummy variable controlling for companies that have patents (1 if yes, 0 if no)
Industry_Industry	Dummy variable controlling for the companies operating in the industry sector (1 if yes, 0 if no)
Industry_AdminSupport	Dummy variable controlling for the companies operating in the administration and support sector (1 if yes, 0 if no)
Industry_PublicAdmin	Dummy variable controlling for the companies operating in the public administration and education sector (1 if yes, 0 if no)
GovernmentInstitution	Dummy variable controlling for government institutions (1 if yes, 0 if no)
LimComGuarantee	Dummy variable controlling for limited companies by guarantee (1 if yes, 0 if no)
PrivateLimCom	Dummy variable controlling for private limited companies (1 if yes, 0 if no)

4. RESULTS

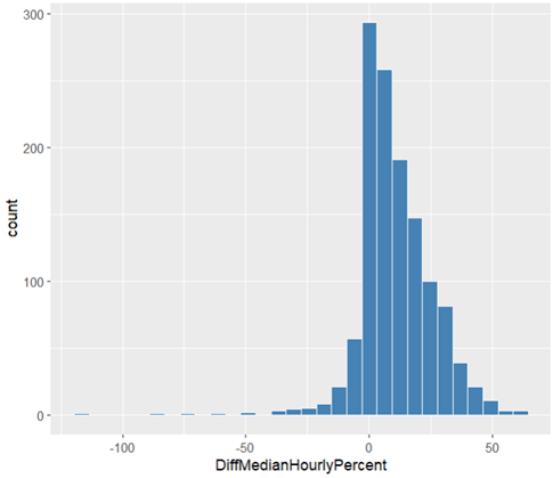
4.1 Descriptive statistics

The research question for this thesis was: *"What is the relationship between age diversity within the board of directors and the gender pay gap in UK firms?"* A hypothesis was tied to this research question based on previous research about board age diversity and CSR practices. The hypothesis was: *"There is a negative relationship between age diversity within the board of directors and the gender pay gap in UK firms."*. Based on the data provided by the United Kingdom government several analyses were performed.

4.1.1 Pay gap distribution

To get a better understanding of the gender pay gap in this data, a visualization of the distribution graphic was made. The result is presented in Figure 1. The X-axis shows the median hourly difference, and the Y-axis shows the count of companies falling into the different bins. This distribution shows that there are some extreme outliers, but most of the observations are close together. The extreme outliers on the left side were examined to see what causes them to have such a pay gap between men and women. In these companies women earned substantially more than men. This was the case with four companies who had more than fifty percent difference in pay. The company's websites did not explain this phenomenon, nor did their industry sector. They all operate in different industries, have different numbers of employees, and have no clear explanation for this pay difference. However, for this research it was decided to leave the outliers in the sample, since these outliers are assumed not to be an error and their influence is small due to the small number (four) of outliers. To test the potential effects of the outliers, robust regressions were run for each model in Table 3 using Huber weighting. The results of the robust regressions were consistent with that of the OLS regressions in direction and significance. This suggests that the main findings of this research are not influenced by the outliers.

Figure 1 – Pay gap distribution



4.1.2 Correlations

4.1.2.1 DiffMedianHourlyPercent

As explained earlier, all available age variables were tested in this research in relation to the gender pay gap and in relation to each other. Thus, Pearsons' correlation was computed to view the relationship between the independent variables and dependent variable and between all the separate independent variables. These correlations can be viewed in Table 2.

The variable Age_min shows a slight negative relationship, meaning that when the youngest director on the board is older, the pay gap slightly closes. Min_Age_Squared shows an even stronger negative relationship, indicating that there is a nonlinear effect between minimum director age and the gender pay gap.

Many variables have such a small correlation that it is almost zero. Age_mean and Mean_Age_Squared both have a small negative correlation (-0.079 and -0.086, respectively). This indicates the possibility that when the mean age of the board is higher, the gender pay gap closes. Similar to the minimum age, this also shows a stronger correlation with the squared variable. Again, this suggests a nonlinear relationship.

BlauIndex_Age and BlauIndex_Age_Squared both show a positive correlation to the dependent variable, however not a strong relationship. The positive relationship indicates that should board diversity increase, so would the gender pay gap.

4.1.2.2 Linear and non-linear terms

In Table 2 it can also be observed that there are several extremely strong relationships. These relationships range between 0.995 and 0.943. However, there is a logical explanation for these high numbers. The correlations are so high due to the fact that the linear terms are measured against their non-linear terms, resulting in extreme correlations.

Table 2 – Pearsons' correlation of independent age variables to the gender pay gap

Independent variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. **DiffMedianHourlyPercent**	1														
2. Age_min	-0.098	1													
3. Min_Age_Squared	-0.106	0.991	1												
4. Age_max	-0.015	0.057	0.086	1											
5. Max_Age_Squared	-0.016	0.043	0.072	0.994	1										
6. Age_range	0.053	-0.621	-0.591	0.748	0.753	1									
7. Range_Age_Squared	0.034	-0.559	-0.513	0.727	0.748	0.944	1								
8. Age_sd	-0.018	-0.534	-0.516	0.681	0.687	0.887	0.807	1							
9. Sd_Age_Squared	-0.033	-0.444	-0418	0.646	0.663	0.801	0.797	0.945	1						
10. Age_cv	-0.011	-0.647	-0.626	0.548	0.552	0.853	0.766	0.977	0.911	1					
11. Cv_Age_Squared	-0.030	-0.562	-0.529	0.508	0.518	0.767	0.751	0.918	0.958	0.943	1				
12. Age_mean	-0.079	0.627	0.653	0.742	0.719	0.166	0.188	0.168	0.185	-0.016	-0.007	1			
13. Mean_Age_Squared	-0.086	0.636	0.668	0.733	0.715	0.153	0.178	0.167	0.186	-0.016	-0.006	0.995	1		
14. BlauIndex_Age	0.074	-0.563	-0.573	0.397	0.378	0.686	0.523	0.607	0.444	0.623	0.461	-0.066	-0.090	1	
15. BlauIndex_Age_Squared	0.077	-0.581	-0.578	0.426	0.409	0.721	0.590	0.617	0.472	0.634	0.492	-0.059	-0.082	0.956	1

4.2 Regression analysis

For each age variable an Ordinary Least Squares regression was performed with multiple control variables. All the statistically significant results were put into different models which can be viewed in Table 3. The coefficient, which is the first number, shows the effect on the dependent variable if the independent variable would increase with one unit. The standard error, which is located between the brackets, shows the uncertainty of the prediction of the coefficient. For some variables the standard error is high meaning that the coefficient cannot be predicted with great accuracy (Adeboye et al., 2014). "Statistical significance measures the probability of the null hypothesis being true compared to the acceptable level of uncertainty regarding the true answer." (Tenny & Abdelgawad, 2017) A result is considered statistically significant when the P-value is lower than 0.05.

4.2.1 Control variables

Model 1 shows the effect of the control variables on the DiffMedianHourlyPercent. Some of the control variables had a statistically significant effect. It can be seen that companies with more employees show a significantly lower pay gap ($p<0.05$). Companies ranging from 5000 to 14999 employees have a 5.332 percent lower gender pay gap and the effect is even higher for companies with more than 15000 employees with 7.880 percentage point decrease. A possible explanation for this is that larger companies are more institutionalized than smaller companies. This could lower the pay gap because there are frameworks in place that determine the payment of employees.

Companies that have patents show a statistically significant higher pay gap ($p<0.05$). All industry related control variables also showed statistically significant relationships with the highest effect being for companies operating in public administration and education with a 5.311 reduction and a p smaller than 0.001. Government institutions proved to have a higher gender pay gap with 13.860 percentage point increase in the pay gap ($p<0.001$). Private limited companies and limited companies by guarantee both proved to reduce the gender pay gap ($p<0.01$ and $p<0.001$).

4.2.2 Minimum age

To test the relationship between the age of the youngest board member and the dependent variable, two variables were made: a linear and nonlinear variable. When tested individually Age_min proved to have a statistically significant effect. The same goes for Min_Age_Squared. As can be seen in Table 3 when the two variables were put into one model (Model 2), the linear term was no longer statistically significant, but the nonlinear term was. This is due to the high correlation between Age_min and Min_Age_Squared which can be seen in Table 2 is 0.991. To examine the multicollinearity between the two variables, a VIF (Variance Inflation Factors) test was run. Age_min had a VIF of 57.833 which indicates a very high multicollinearity. Similarly, Min_Age_Squared had a VIF of 57.204 also indicating very high multicollinearity. The fact that Min_Age_Squared is still statistically significant suggests that there is a curvilinear relationship between the independent variable and the gender pay gap. "Curvilinearity is said to occur when the functional relationship between the dependent and the independent variables is negatively accelerated (concave) or positively accelerated (convex)." (Ganzach, 1997) Since the coefficient is negative this points to an inverted u-shaped relationship.

Table 3 – OLS regression of age variables related to the gender pay gap

Independent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age_min		0.762				0.497	-1.658
		(0.393)				(0.503)	(1.272)
Min_Age_Squared		-0.010*				-0.006	0.010
		(0.004)				(0.006)	(0.012)
Age_max							0.690
							(1.175)
Max_Age_Squared							0.003
							(0.010)
Age_range							NA
Range_Age_Squared							-0.011
							(0.007)
Age_sd							0.510
							(3.230)
Sd_Age_Squared							0.045
							(0.077)
Age_cv							-84.11
							(173.7)
Cv_Age_Squared							-110.5
							(226.00
Age_mean			1.506*			0.743	2.556
			(0.712)			(0.883)	(2.075)
Mean_Age_Squared			-0.016*			-0.008	-0.032
			(0.006)			(0.008)	(0.018)

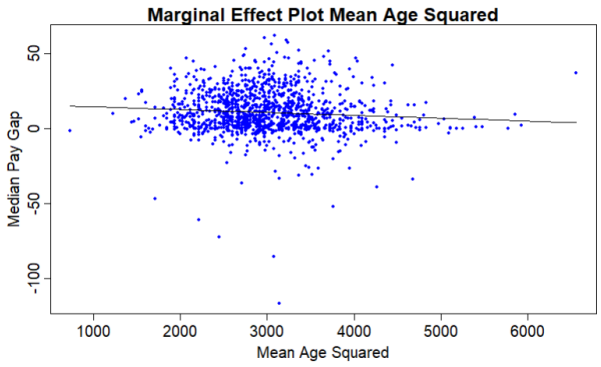
BlauIndex_Age				4.542*		-0.960	-2.432
				(2.790)		(6.4980	(7.113)
BlauIndex_Age_Squared					6.905*	3.931	-0.717
					(2.818)	(9.972)	(10.57)
Control variables							
Size250_499	-2.721	-3.155*	-2.763*	-2.922*	-2.925*	-3.045*	-2.609
	(1.398)	(1.392)	(1.390)	(1.398)	(1.398)	(1.399)	(1.441)
Size500_999	-1.126	-1.389	-1.173	-1.184	-1.183	-1.305	-0.646
	(1.442)	(1.433)	(1.434)	(1.439)	(1.439)	(1.439)	(1.488)
Size1000_2499	-3.297*	-3.808*	-3.487*	-3.498*	-3.489*	-3.732*	-3.848*
	(1.544)	(1.538)	(1.538)	(1.543)	(1.543)	(1.546)	(1.592)
Size2500_4999	-4.649*	-5.188*	-4.894*	-4.839*	-4.781*	-5.104*	-5.375*
	(2.077)	(2.067)	(2.066)	(2.074)	(2.073)	(2.072)	(2.114)
Size5000_14999	-5.332*	-5.763*	-5.725*	-5.276	-5.203	-5.730*	-7.163*
	(2.703)	(2.690)	(2.691)	(2.698)	(2.698)	(2.696)	(2.790)
Size15000_higher	-7.880*	-8.409*	-8.031*	-7.823*	-7.688*	-8.159*	-9.184*
	(3.733)	(3.710)	(3.712)	(3.726)	(3.727)	(3.721)	(3.750)
HasPatents	2.523*	2.216*	2.164*	2.531*	2.558*	2.184*	1.681
	(1.011)	(1.008)	(1.009)	(1.009)	(1.009)	(1.011)	(1.035)
Industry_Industry	-3.367**	-3.392**	-3.431**	-3.300**	-3.263**	-3.382**	-3.271**
	(1.216)	(1.209)	(1.209)	(1.214)	(1.214)	(1.211)	(1.236)
Industry_AdminSupport	-2.592*	-2.609*	-2.828*	-2.388*	-2.406*	-2.675*	-2.419
	(1.208)	(1.201)	(1.206)	(1.209)	(1.208)	(1.213)	(1.262)
Industry_PublicAdmin	-5.311***	-5.396***	-5.347***	-5.327***	-5.346***	-5.373***	-5.623***
	(1.546)	(1.537)	(1.537)	(1.543)	(1.543)	(1.540)	(1.593)
GovernmentInstitution	13.860***	13.730***	13.495***	13.754***	13.645***	13.492***	13.14***
	(2.664)	(2.647)	(2.650)	(2.659)	(2.660)	(2.658)	(2.670)
LimComGuarantee	-11.406***	-11.439***	-10.987***	-11.542***	-11.592***	-11.209***	-11.03***
	(3.077)	(3.070)	(3.060)	(3.071)	(3.072)	(3.083)	(3.118)
PrivateLimCom	-7.235**	-6.785**	-7.596***	-6.677**	-6.677**	-7.007**	-5.998*
	(2.307)	(2.294)	(2.299)	(2.313)	(2.313)	(2.324)	(2.350)

*Note: ***, **, and * coefficients are statistically significant at 0.001, 0.01, and 0.05, respectively.*

4.2.3 Mean age

The individual OLS regression of both Age_mean and Mean_Age_Squared were found to be statistically significant. They were combined into Model 2. In this model both independent variables are still statistically significant in relation to the gender pay gap in UK firms. There is a positive relation between the linear variable Age_mean which suggests that when the mean age of the board of directors increases, so does the median hourly pay difference. However, this effect seems to be curvilinear because the nonlinear term Mean_Age_Squared shows a negative relation. This negative coefficient suggests an inverted u-shape relationship. This inverted u-shape means that when the mean age of the board is low, an increase in mean age would cause an increase of the pay difference. But, after a certain point the effect changes because an increase in mean age will then cause the gender pay gap to decrease. This curvilinear effect can be seen in Figure 2 where a marginal effects graph was plotted. This shows the effect of the mean age squared on the gender pay gap while keeping all other variables consistent. To assess multicollinearity for this model, another VIF test was conducted. Which again showed high values for the independent variables Age_mean and Mean_Age_Squared (111.516 and 111.416).

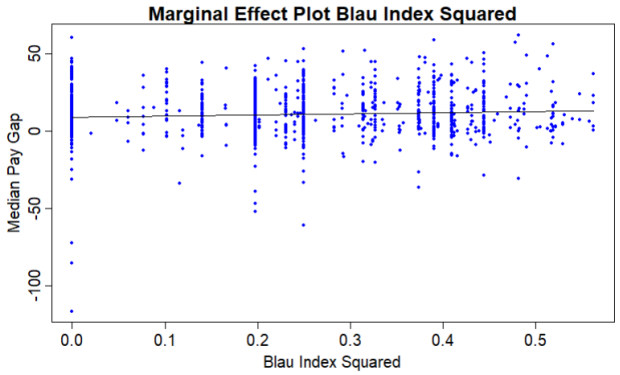
Figure 2 – Marginal effects graph of mean age squared on the gender pay gap



4.2.4 Blau Index age

To answer the hypothesis, the most important independent variables were BlauIndex_Age and BlauIndex_Age_Squared. That is why they were both put into an individual model (Model 4 and Model 5). From the Ordinary Least Squares regression it can be concluded that both have a positive relationship with the gender pay gap in UK firms. In Model 4 shows a statistically significant positive relationship between the age diversity and DiffMedianHourlyPercent. This suggests that when age diversity in the board of directors increases, so does the gender pay gap with 4.542 respectively. Model 5 also shows a statistically significant relationship between the nonlinear term for age diversity and the median hourly pay. This is a positive relation and thus it suggests a curvilinear relationship which is u-shaped. This suggests that at low points of age diversity, an increase in age diversity would cause a closing of the pay gap. However, after a certain point this effect reverses and increases in the age diversity will increase the median hourly pay gap. This means that the hypothesis can be rejected because there is not a negative relationship between age diversity within the board of directors and the gender pay gap in UK firms. A visualization of the effect of the Blau Index squared can be seen in Figure 3 where a marginal effects graph was plotted. This shows the effect of the Blau Index squared on the gender pay gap while keeping all other variables consistent.

Figure 3 – Marginal effects graph of Blau index squared on the gender pay gap



4.2.5 Statistically significant variables

Model 6 is a combination of all age variables that were statistically significant when tested individually: Age_min, Min_Age_Squared, Age_mean, Mean_Age_Squared, BlauIndex_Age, and BlauIndex_Age_Squared. This model shows that none of these variables are statistically significant when added into one model. A possible explanation for this is that the many independent variables are too highly correlated, which causes them to lose statistical significance. A VIF test was conducted to check the exact level of multicollinearity, which are for all independent variables in the model; Age_min: 94.753, Min_Age_Squared: 105.341, Age_mean: 171.452, Mean_Age_Squared: 181.370, BlauIndex_Age: 13.476, BlauIndex_Age_Squared: 13.977. Values above ten are considered high multicollinearity. So, it can be concluded that all independent variables have a high multicollinearity.

4.2.6 Independent variables

Several variables were not statistically significant when tested individually: Age_max, Max_Age_Squared, Age_range, Range_Age_Squared, Age_sd, Sd_Age_Squared, Age_cv, and Cv_Age_Squared. Despite their insignificance, the effect of these variables and all other variables combined on the gender pay gap can be viewed in Model 7. In this model none of the predictor variables prove to be statistically significant, which can be due to the correlation between all variables. Age_range was even not computed by r studio due to the fact that it was so highly correlated with the other variables, hence the NA as a result. The only variables that were still statistically significant were some of the control variables like size, industry, and company form. When running a VIF test there was also an error with Age_range since it is computed by Age_max minus Age_min. For this reason, Age_range was left out while running the VIF test. The respective results of the VIF test are this; Age_min: 518.907, Min_Age_Squared: 395.337, Age_max: 683.153, Max_Age_Squared: 792.565, Range_Age_Squared: 71.640, Age_sd: 1151.617, sd_Age_Squared: 250.630, Age_cv: 1070.497, Cv_Age_Squared: 224.468, Age_mean: 843.180, Mean_Age_Squared: 767.853, BlauIndex_Age: 13.695, BlauIndex_Age_Squared: 14.091. All these values point to very high multicollinearity which explains why there is no statistical significance in this model.

5. DISCUSSION

By analysing data from the United Kingdom government, through regressions and correlation tests, this research set out to answer the following research question:

"What is the relationship between age diversity within the board of directors and the gender pay gap in UK firms?"

To answer this question about the gender pay gap, a hypothesis was constructed based on the limited research already done about age diversity within the board of directors:

"There is a negative relationship between age diversity within the board of directors and the gender pay gap in UK firms."

5.1 Conclusion

To test the hypothesis, this research looked at two variables in particular: BlauIndex_age and BlauIndex_Age_Squared. Previous literature already made the connection between age diversity within the board of directors and CSR performance (Beji et al., 2021; Islam et al., 2022), of which the gender pay gap is a part. Based on that it was hypothesized that there is a negative relationship between age diversity and the gender pay gap. However, it can be concluded form the results that there is a statistically significant, non-linear, and U-shaped relationship. This leads to the conclusion that the hypothesis can be rejected.

It has previously been concluded by Talavera et al. (2018) that age diversity in a board can negatively impact firm performance due to too much conflict in the decision-making process. The hypothesis and research question of this research do not focus on firm performance, but nevertheless the same problem causing poorer performance for the firm, can be the problem in closing the gender pay gap for a company.

It can also be concluded that companies that have patents have a statistically significant higher pay gap. This can be due to the fact that women are underrepresented and discriminated in the copywrite and trademark system (Oliar & Dalton, 2024; Sugimoto et al., 2015).

Government institutions have proved to have significantly higher pay gaps. Bermúdez-Figueroa and Roca (2022) previously concluded that there is still a significant gap in the public sector in Spain. They write the gender pay gap up to "(…) horizontal occupational segregation, glass ceilings, sticky floors, and the undervaluing of women's work, among other phenomena." (Bermúdez-Figueroa & Roca, 2022) The same explanations they have found in Spain could be relevant for the United Kingdom and explain this strong positive relationship between government institutions and the gender pay gap.

Besides the effect of the control variables and the Blau Index, other variables were tested for statistically significant relationships. We can conclude that four independent variables that fit into this category: Age_min, Min_Age_Squared, Age_mean, and lastly Mean_Age_Squared. In both cases, it can be concluded that the linear term (Age_min and Age_mean) has a positive relationship to the gender pay gap, which means that an increase would cause the gender pay gap to increase as well. However, the nonlinear term of both these variables were negative and statistically significant related to the gender pay gap in UK firms ($p<0.05$). Suggesting that both variables have a curvilinear relationship which is shaped like an inverted u-shape. Meaning that an increase at low values of minimum age or mean age would cause the gender pay gap to increase, but after a certain point the effect reverses and will cause a decrease in the gender pay gap. This research has not found a clear explanation for this effect.

5.2 Theoretical implications

The conducted research contributes to the current knowledge and literature about the gender pay gap and specifically the effect of board diversity on the gender pay gap. Past research already showed relationships between the gender pay gap and female representation on boards and nationality diversity on boards (Ahamed et al., 2019; Blau & Kahn, 2017; Carter et al., 2017).

No research before directly researched the relationship between board age diversity and the gender pay gap. This research has proven that it is in fact a predicting factor. By doing this, this research contributes to the hope that one day the entire gender pay gap can be explained and closed. This thesis may be a starting point for future research that potentially will dig further into the relationship between age diversity and the gender pay gap.

5.3 Practical implications

The practical implication of this research is that the results that were created can be used to inform companies of the effect their board of directors may have on the gender pay gap within their own company. If companies are aware of the level of age diversity and understand the effect it has on their own gender pay gap, they can close the pay gap more easily. This knowledge can specifically be used during the hiring process of the board of directors to ensure that there is a correct amount of age diversity within the board that has a closing effect on the gender pay gap.

Not only companies can benefit from the knowledge gained by this research, but also policymakers, legislators, and governments can potentially use this information for creating legislation in the future when the relationship between age diversity and the gender pay gap has been researched more and can be clearly explained. In doing this, they may create sufficient legislation that can one day close the gender pay gap or make it significantly smaller.

5.4 Future research and limitations

Despite these positive contributions to the current knowledge, this research is limited. The entire thesis was based solely on the data provided by the United Kingdom government and Orbis. To have a more detailed explanation of the causes of the gender pay gap, it would be beneficial to conduct more research into the exact composition of the board by including the personality of members and other potential influential factors and their ways of working to be able to define the reasons behind the pay gap.

In this research it was concluded for some variables that there is a curvilinear relationship. To have more insight into the effects of these variables, it could be suggested that the point where the relationship reverses is examined more closely.

The general limitations of this research are that this thesis only had so many age variables. For future research it is a possibility to look at the age of board members and see which historical events they lived through and see if there is a relationship. Another interesting factor to research when it comes to the board of directors might be family composition. Board members with daughters or other close female relatives might be more knowledgeable about the gender pay gap. Another option for future research is to conduct analyses on other countries outside of the United Kingdom. Other countries have different legislation, a different culture, and different demographics. To be able to explain the gender pay gap to its fullest, it is a possibility to investigate these factors.

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