BOURNEMOUTH UNIVERSITY

ASSESSING THE IMPACT OF FLEXIBLE WORKING ARRANGEMENTS ON THE GENDER PAY GAP IN THE UNITED KINGDOM

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SEPTEMBER 2021

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Abstract

The rise and spread of technology, changing societal norms and values, the demand for an excellent work-life balance, and the COVID -19 pandemic, among others, all contributed to discussions concerning how work can be completed easily. Through these conversations, Flexible Working Arrangements (FWAs) emerged. At the same time, discourse about pay structures favouring one gender over another has been ongoing for an extended period, culminating in the gender pay gap and equal pay between the sexes. With the increasing demand for work-related flexibility and the drive to narrow the gender pay gap, this study investigated the influence of flexible work arrangements on the gender pay gap. To understand its impact, the study utilised quantitative analysis, specifically linear regression and prediction modelling, to examine how flexible working arrangements and other hypothesized variables influenced pay. It further assessed how well flexible working arrangement variables performed in predicting pay.

The study uncovered some causal relationships between some forms of flexible working arrangements and employee pay, specifically for flexible working arrangements that influence the amount of time an employee spends working. Further, it discovered the weak influence of flexible working arrangements when predicting pay.

Based on the results, the study's limitations were discussed, recommendations to key stakeholders were proposed, and likely areas of interest for future work were suggested.

Table of Contents

DISSERTATION DECLARATION ..... **ii**
Abstract ..... **iii**
Table of Figures ..... **vi**
Table of Tables ..... **vi**
CHAPTER 1: INTRODUCTION **7**
1.1 Research Background **7**
1.2 Research Aim **9**
1.3. Research Objectives **9**
CHAPTER 2: LITERATURE REVIEW **10**
2.1 Introduction **10**
2.2 Understanding the Gender Pay Gap and factors that influence it **11**
2.3 Closing the Gender Pay Gap **13**
2.4 Flexible Working Arrangements **15**
2.4.1 Forms of Flexible Work Arrangements **15**
2.5 Flexible Working Arrangements and the Gender Pay Gap **17**
2.5.1 Flexibility Stigma **17**
2.5.2 Flexible Work arrangement, Ideal Worker concept and the Gender Pay Gap **18**
2.6 Theoretical model **19**
2.7 Data Analysis Tool **21**
2.7.1 Data Analysis Process **21**
3.1 Research Approaches **25**
3.2 Research Methods **26**
3.3 Data access **27**
3.3.1 Data restrictions **27**
3.3.4 Outcome variable **32**
3.3.5 Explanatory variables **32**
3.3.6 Flexible working arrangement variables **33**
CHAPTER 4: DATA ANALYSIS **34**
4.1 Data Preparation **34**
4.3 Demographic Analysis **36**
4.4 Gauss Markov Assumptions **42**
4.5 Metrics for Measurement **43**
4.6 Results **44**
4.6.1 Linear Regression **44**
4.6.2 LASSO Regression **50**

CHAPTER 5: CONCLUSION **57**
5.1 Summary of Findings **57**
5.2 Limitations **58**
5.3 Recommendations and Future work **58**
References **59**
Appendices **66**

Table of Figures

Figure 1: Pictorial representation of the theoretical framework 21
Figure 2: Moderation by Flexible Working Arrangements 23
Figure 3: Saunders Onion 25
Figure 4: Boxplot for working hours 35
Figure 5: Gender Barplot 36
Figure 6: Marital Status Barplot 37
Figure 7: Dependent Child Barplot 38
Figure 8: Age breakdown barplot 39
Figure 9: Education Barplot 40
Figure 10: Ethnicity Barplot 41
Figure 11:Fitted vs Residuals 42
Figure 12: Gender vs Pay boxplot 46
Figure 13: Age and Pay boxplot 47
Figure 14:Important variables, Lasso without FWAs 51
Figure 15:Important variables Lasso with FWAs 52

Table of Tables

Table 1: Variable Definition Table 70
Table 2: Descriptive Statistics table 70
Table 3: GVIF Result table 71
Table 4: Homoscedasticity equation 72
Table 5: Gender regression result summary 74
Table 6: Education and Gender moderation results 75
Table 7: Age and Gender moderation results 75
Table 8: FWA and Pay regression results 80
Table 9: FWA moderation against Gender 80

CHAPTER 1: INTRODUCTION

1.1 Research Background

The Gender Pay Gap is the term used to describe the difference between the earnings of males and females. Per the British government's definition, the Gender Pay Gap is the difference in the average hourly wage of the sexes (White 2021).

The phenomenon of pay inequality between the sexes has existed for an extended period. For instance, in the United States of America, as far back as 1963, legal regulations, precisely the Equal Pay Act, were enacted to discourage employers from pay discrimination based on gender (Sbrocchi 2019).

Often, men receive higher salaries, and some of the arguments raised to explain this outcome include; the concentration of women in lower-earning fields with limited opportunities for career progression (Women's Bureau (DOL), Washington, D.C. 1976), the increased tendency of women to work flexibly based on family commitments, (Nicks et al. 2019) among others.

The glass ceiling effect and the motherhood penalty are two explanations given for the gender pay gap. The glass ceiling effect investigates women's challenges in reaching upper-level managerial roles (Davidson and Burke 2000). Per Davidson and Burke (2000), stereotypes about female competence, a lack of mentoring, and male-dominated hierarchical work structures all reinforce the glass ceiling effect, contributing to the widening pay gap.

The motherhood penalty analyses why mothers receive lower wages than female colleagues without children and male colleagues. A loss of skills during career breaks, lowered effort in performing work-related tasks, and employer discrimination against women are some hypothesised causes of the motherhood effect. (Cukrowska-Torzewska and Matysiak 2020)

Over the years, several countries have devised means to reduce the gender pay gap; notable among these is the United Kingdom's Gender Pay Gap reporting framework (Government Equalities Office 2020). The British government requires employers with 250 or more employees to publish annual snapshots of their pay gap information. In addition, businesses can add reports explaining their steps to improve their gender pay gap situation (Government Equalities Office 2020).

Flexible working, as defined by the British government, relates to a way of working that supports the needs of an employee (Government Digital Service 2012). Flexible working allows employees to complete their tasks using favourable methods.

Flexible working has existed for an extended period. Earlier forms of flexible working arrangements (FWAs) include part-time work, freelancing, telework, shift working, and others (Soga et al. 2022, Thomson 2008, Hohl 1996). Contemporary, flexible working formats include job-sharing, where two people share the same job but work different hours; working from home, where employees work outside the office space; compressed hours, where employees work full-time hours spread out across fewer days; flextime, where employees pick their start and end work time within the given working hours; annualised hours, where employees work for an agreed number of hours in a year, picking times that best suit them; staggered hours, where employees have a different start, end and break times from their colleagues and phased retirement, where older workers pick when they want to retire (Government Digital Service 2012).

Flexible working arrangements can be grouped into subcategories depending on the aspect of work life they influence. FWAs can be grouped into work time flexibility, work scheduling flexibility, workload flexibility, and workplace flexibility (Amirul et al. 2020, Ciarniene and Vienazindiene 2018). The rise of flexible work arrangements can be attributed to growth in technology, the reduction in the prices of computing devices and the availability of internet connectivity, among others (Burgmann 2012).

Working flexibly has advantages for both the employee and the employer. For the employee, flexible working arrangements help promote a good work-life balance. For female employees who may have care-related responsibilities, these arrangements allow them to cater to the needs of those they care for; further, it can help employees to reduce commuting costs (Nicks et al. 2019, Amirul and Shaari 2021). For employers, FWAs can serve as a way to attract and retain talent, a means to cut down on operating-related costs, and an avenue to encourage higher levels of productivity from employees, who may work harder as a show of gratitude for the opportunity to access these FWAs (Shagvaliyeva and Yazdanifard 2014).

Although flexible working arrangements possess multiple benefits to both the employee and the organisation, they aren't viewed as strategic methods to increase productivity. Instead, they are portrayed as family-friendly policies to improve employee work-life balance. Further,

some human resource policies can sometimes make it difficult for employees to access FWAs when needed (Thomson 2008).

With the gender pay gap reduction as a goal for several developed and developing economies, multiple trends influencing its state have been examined, and flexible working arrangements are part of these trends.

Arguments have been raised supporting FWAs ability to close the gender pay gap. For instance, the Charted Management Institute and the British Government Equalities Office argue that well-designed flexible working arrangements can help women balance work and care duties, allowing them to be more active and remain in the workforce for an extended period (Chartered Management Institute and Government Equalities Office 2020).

On the other hand, some arguments present an opposing view that working flexibly has a widening impact on the gap due to, the lack of opportunities for growth for employees who choose to work flexibly, the harsh penalties imposed on flexible workers by organisations, and more (Goldin 2015, Smithson et al. 2004).

As a result of these varying schools of thought, this paper, through quantitative analysis, seeks to identify whether flexible working impacts the gender pay gap in the United Kingdom.

1.2 Research Aim

The research presented in this paper aims to investigate the possibility of a relationship between the gender pay gap and flexible working arrangements (FWAs) by assessing how FWAs influence employee pay.

1.3. Research Objectives

1. Explore and understand the gender pay gap and some leading factors that influence it through literature.
2. Quantitatively analyse the selected leading factors to discover whether they tally with the findings presented in the literature
3. Using findings from the literature to assess how the various forms of flexible working influence critical aspects of employment (for example, the number of hours an employee works, where an employee works from) and how these influence the gender pay gap.
4. Quantitatively analyse how flexible working arrangements impact the gender pay gap by assessing whether they increase or decrease employee earnings.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This research explores the relationship between flexible working arrangements (FWAs) and the gender pay gap in the United Kingdom. The paper aims to identify if flexible working arrangements influence the gender pay gap.

The phenomenon of differences in pay, between the genders, with men usually receiving higher salaries, has persisted for an extended period, even in developed economies. This has contributed to a gap when considering cumulative pay between the sexes. Citing the United Kingdom as an example, the Equal Pay Act of 1970, requiring employers to pay employees equally for equivalent work, has existed for over 50 years (Francis-Devine and Ferguson 2020). However, as of 2021, the gender pay gap was 15.4%, falling 12.1% since 1997, approximately 24 years (White 2021). This is particularly interesting because if employees performing equal work receive equal pay, this should have significantly impacted the pay gap.

Several reasons have been given to explain the pay gap. With more companies adopting flexible working initiatives, it has become essential to understand if and how they might contribute to the gap.

Flexible working, as defined by the British government, relates to a way of working that supports the needs of an employee (Government Digital Service 2012). Flexible working initiatives may impact the total number of hours an employee works, the location from which an employee works, the seasons or periods in a given calendar year of the organisation when an employee works, and the total amount of work completed by the employee.

Using changes in pay before tax and deductions as a marker, the paper examines how the different FWAs presented in the data set either increase or decrease pay levels for employees, specifically of the male and the female gender types. The assumption is that if the selected FWA causes changes in pay levels by gender, then it can influence the gender pay gap. To achieve this, the section examines the literature on the gender pay gap, considering its history, methods of calculation, and prevalence among the workforce in the United Kingdom. It further examines the existing literature on flexible working arrangements, their varying formats, and some advantages and disadvantages for businesses and employees. Finally, the section assesses and analyses the characteristics of other factors which can influence employee pay.

2.2 Understanding the Gender Pay Gap and factors that influence it

The gender pay gap explores pay inequality between male and female employees; it divides the difference between the earnings of male and female employees as a proportion of male employee pay and converts the figure obtained into a percentage (Buhler and Abdel-Raouf 2020). Per United Kingdom government guidance, an organisation can calculate its pay gap using employees' mean or median hourly pay, or bonus pay (Government Equalities Office 2020).

The gender pay gap impacts women, with female employees receiving less pay; research reveals that the gap affects women of all races, educational backgrounds, age groups, and marital statuses (Blau and Kahn 2007). Thus, it is hypothesised that:

H1: Gender negatively influences a female employee's earning ability and thus affects the gender pay gap

Considering racial differences, Asian women at 24.5% have the most significant pay gap compared to their male counterparts, followed by White women at 18.5%, Hispanic women at 14.3%, and finally, Black women (Buhler and Abdel-Raouf 2020). A likely contributor to these differences could be the number of females represented in each racial group compared to their male counterparts and the earning level of these females. Taking Asian employees as an example, it could be that there are more higher-earning Asian males than females, and more Asian males present in the workforce in general; meaning, on average, the earnings of Asian males may far surpass that of their female colleagues, and this can account for the increased gap in pay.

Women, through education, have been able to raise their earning capacity; the resulting impact on the gender pay gap has been mixed, with some claiming that schooling has a negligible effect on the pay gap, while others claim the opposite. Per the Pew research centre, women have developed high-level analytical, managerial, social, and fundamental skills through education, contributing to a rapid rise in female earnings in job roles requiring these skills. This rise has contributed to narrowing the pay gap (Kochhar 2020). Buhler and Abdel-Raouf, (2020) argue that education has a negligible impact on the gender pay gap; in fact, women with advanced degrees such as Master's and PhDs are more likely to earn less than their male colleagues. This fact can also be attributed to representation at these levels. In white-collar jobs, females are predominantly present at lower levels; female representation becomes sparse as one moves up the ladder (Beaton and Tougas 1997). Females with higher

qualifications are more likely to attain higher positions; however, since they are underrepresented in top-level positions, collectively, their earnings may not compare to their male counterparts, creating a wider gap for advanced degrees. Thus it is hypothesised that:

H2: Education increases a female employee's earning ability and thus affects the gender pay gap

A workforce consists of workers of different ages. Women of varying ages may be present in any given workforce, and the ages of female employees influence the gender pay gap. As of November 2021, the gap between younger full-time employees aged 18 -21 was 1%, followed by a gap of 0% for employees between 22-29. As employees began to age, the gap grew more expansive; the total gap values for employees aged 30-39, 40-49, and 50-59 were 12%, 21%, and 22 %, respectively (Francis-Devine and Booth 2020). At 60+, the gap dropped to 18% (Francis-Devine and Booth 2020). Thus, it is hypothesised that

H3: Age influences a female employee's earning abilities and thus affects the gender pay gap

The motherhood effect or penalty describes the situation where women who take time off to attend to family needs, precisely needs surrounding childcare, struggle immensely to re-enter the workforce. Perceived notions surrounding the loss of skills, lack of loyalty to the job, and more attention given to family, create hurdles for mothers who may want to re-enter the workforce (Cukrowska-Torzewska and Matysiak 2020). Again, mothers, in a bid to juggle family and work responsibilities, may opt for less time-consuming or demanding jobs to enable them to meet each of their duties successfully. Paternity leave has been proposed as a means to curtail the impact of the motherhood penalty. Paternity leave allows fathers to take time off work when they and their partners get a child through childbirth, surrogacy, or adoption (Government Digital Service 2013). Andersen (2018) proposes that the length of paternity leave, and the amount of active participation from male spouses, can reduce the gender pay gap by allowing females to reduce the duration of their maternity leaves. This way, mothers have more time to engage in the labour force actively. Thus, it is hypothesised that:

H4: Having dependent children impacts a woman's earning ability and contributes to widening the gender pay gap

Marital status also has a severe impact on the gender pay gap. Academic research has revealed that marriage enables men to earn more; as a result, single men earn less than married men. In the case of females, marriage has either a negative or no impact on their earnings (Hoon et al. 2008). The increased wages among married males can be attributed to the extra responsibility of catering to the needs of their families. This increased responsibility may force them to work harder, thus becoming more productive and earning more. In the case of married women, new responsibilities may present themselves in the domestic form. In such situations, their attention might be taken away from active participation in the labour force to tackling domestic issues. With married males earning more and married females making the same or less, the difference in pay between the sexes increases, and the gender pay gap also expands.

2.3 Closing the Gender Pay Gap

To tackle the widening gap, many regulations have been proposed. The Equal Pay Act of 1970, requiring employers to pay employees equally for equal work done, is one of these regulations (Francis-Devine and Ferguson 2020). In the United Kingdom, for instance, in 2017, regulations requiring employers with 250 or more employees to report their gender pay gap were instated (Government Equalities Office 2020). The European Union recently voted in favour of regulations that allow them to enter negotiations with E.U. governments on pay transparency issues (European Parliament 2022).

Interventions that directly affect the employee have also been suggested; some of these include access to mentorship and coaching for female employees to encourage them to aim higher on the corporate ladder and to increase overall career satisfaction (Aryee et al. 1996; Gardiner et al. 2007). Doing this can improve female representation in high-level business and management roles.

The provision of flexible working initiatives, including remote working, part-time working, flexitime working, job sharing, and compressed hours among others, to encourage participation in the labour force, were also proposed (O'Donnell et al. 2020, Government Equalities Office 2017). This way, females with family and other care responsibilities can still participate in the labour force while attending to their duties.

Although these measures have been effective in some regard, progress toward closing the gender pay gap has been slow.

It has been suggested that, rather than focusing on employees, the proposed solutions should be geared toward changing existing work-related structures to narrow the gap quickly. For example, gender-blind recruitment practices can be employed during recruitment to reduce unconscious biases, which may present a male as a better candidate, although a female may have equal or better qualifications (Johnson and Kirk 2020). This can result in a significant increase in the number of females employed, an increase in female representation in the workforce, and also contribute toward closing the gender pay gap.

As against their scarcity in senior management roles, the abundance of female employees in lower-paying jobs significantly contributes to the gender pay gap. The think manager, think male effect, considerably impacts this. The think manager, think male phenomena, masculinises the qualities of a good manager, thus making them better suited to men (Schein et al. 1996). Its effects appear in various ways, for example, through job role descriptions and specifications for promotions, among others. In these situations, qualified females are automatically at a disadvantage, which can significantly reduce the number of females in the workforce and upper-level management. To remedy this, more gender-neutral processes and descriptions can be employed when companies write job role descriptions and state the characteristics of ideal candidates for promotions.

Another proposed solution encourages organisations to reform their salary systems. Gender stereotypes and societal norms have created an expectation that women should be selfless, communal, and socially oriented while men are supposed to be assertive, task-oriented, and driven (Wade 2001). These stereotypes tend to negatively impact women's ability to negotiate, as the act of pay negotiation goes against the selfless, socially oriented, and communal stereotype set for women. Instead, pay negotiations present women in a different light as selfish and domineering, among others. As a result, a woman might be doing an equal job with a man, but she may receive less pay due to a shortfall in pay negotiations. To remedy this, employers should be ready and willing to provide credible salary ranges for salary negotiations; they should encourage all employees to negotiate their pay without the fear of being judged (Government Equalities Office 2017). This contributes to closing the pay gap by increasing female earnings.

2.4 Flexible Working Arrangements

Flexibility in the work setting is a topic that has received and is still receiving considerable attention; this may be due to the perceived benefits it can carry for both the organisation and the employee.

Flexibility, in general, can be viewed from multiple lenses; the organisational and the employee levels are two of these lenses. From the organisational level, flexibility should allow the business to vary its resources, human resources included, to meet the needs of the clients and the market. The employee lens should allow workers to select the time or period and the duration they want to work for (Dettmers et al. 2013).

Flexible work arrangements (FWAs) fit the mould when considering flexibility from an employee's perspective. FWAs provide a way of working that fits well with the employee's lifestyle (Government Digital Service 2012). These arrangements allow employees to actively engage in work without giving up other vital sections of their lives. To achieve this goal, the various forms of flexible working arrangements address different aspects of an employee's work schedule; the amount of time (the number of hours and the length of the period spent working) an employee works for, the location from which an employee works, the scheduling of an employee's working hours, and the amount of work an employee needs to complete. It is necessary to note that some flexible working arrangements fit multiple aspects of an employee's work schedule.

Aside from organisations and employees, other influential parties that can show interest in flexibility in the working environment, and flexible working arrangements include governments, trade unions, researchers, human resource professionals and others.

2.4.1 Forms of Flexible Work Arrangements

Part-Time Work

Part-time work is a form of FWAs which allow the employee to work fewer hours over fewer days (Government Digital Service 2012). It impacts both the number of hours and the length of the period an employee spends working. This way, an employee can access extra time during the week to meet other commitments. Part-time work arrangements are usually offered to employees as part of their employment contracts (Dettmers et al. 2013; Wheatley 2016). Although part-time work provides time-related benefits to the employee, concerns about the quality of work are rife when part-time work is mentioned; again, female workers form a significant part of the part-time workforce (Wheatley 2016).

Compressed Hours

This form of flexible working allows the employee to work for fewer days in the week. Here, the employee works full-time but for fewer days (Government Digital Service 2012). It impacts the length of the period an employee spends working. A potential pitfall of this form of FWA is the possibility of an employee working very long hours to ensure they complete all necessary tasks, as they only work for some days each week.

Flexi-Time

Flexi-time workers pick their start and end times within a given workday (Government Digital Service 2012). Usually, the employer sets a general time during the workday when work should be carried out; a flexi-time worker can situate their working time between these hours (Kuhne and Blair 1978). Flexi-time impacts the length of time an employee spends working.

Remote Work

This FWA allows employees to complete their tasks from locations outside their workplace (Government Digital Service 2012). Assessing some of its benefits, working from home/ remote working helps the employee save on transport-related costs. It can also help the business cut costs incurred by providing workspaces for all their staff.

Job Sharing

In job sharing, the responsibilities of a job role are split among two or more, but usually two employees (Government Digital Service 2012). This significantly impacts the total amount of work an employee needs to perform. Responsibilities associated with the position can be split such that the employees involved are jointly responsible for all the tasks under the role, the employees involved perform separate and unrelated tasks but still under the same position, and finally, the employees divide the tasks equally between themselves (Crampton et al. 2003).

Annualised Hours

Annualised hours allow the employer and the employee to come to an arrangement on the periods and the number of hours within a given year when the employee needs to work (Government Digital Service 2012). Similar to part-time work, Annualised hours deal with the number of hours and the length of period for which an employee works.

Generally, all forms of flexible working arrangements benefit employees by creating some ease around when, where, and how much work is performed, but individually their impact on the employee's work life differs. Part-time work specifically reduces the number of working hours an employee completes. Compressed hours reduce the number of days; Flexitime allows the employee to select their working hours; Remote work enables the employee to pick their work location, Job sharing reduces an employee's workload, and Annualised hours allow the employee to select when in terms of the period in a given calendar year when they work.

2.5 Flexible Working Arrangements and the Gender Pay Gap

The relationship between flexible working arrangements and pay inequality between the sexes is convoluted. Literature has revealed mixed opinions on the impact of FWAs on the pay gap, thus presenting flexible working arrangements as a double-edged sword regarding the gender pay gap.

Generally, depending on their form, flexible working arrangements have been said to provide good work-life balance to employees, increase commitment among employees, increase productivity, reduce instances of absenteeism, and more (O'Donnell et al. 2020; Wheatley 2016; Government Equalities Office 2017). Ideally, these benefits can translate into increased earnings for the business and the employee. Employees may feel gratitude toward employers for providing FWAs and, as a result, work harder, thereby increasing their output and income. If they are female employees, this can help reduce the pay gap. FWAs may allow female staff to remain in the labour force while managing other domestic responsibilities. This can also narrow the pay gap. As a result of an excellent work-life balance, employees can also stay on top of their game and work effectively, thus increasing business productivity and earning capacity. If these employees are women, again, this can contribute to narrowing the pay gap.

2.5.1 Flexibility Stigma

Flexibility stigma examines the negative thoughts and opinions resulting from using FWAs. Flexibility stigma supports false perceptions surrounding an employee's level of commitment, contrary to accepted notions of ideal workers. The negative consequences of these perceptions impact an employee's desire to utilise flexible working arrangements (Ferdous et al. 2020). Flexibility stigma further contributes to the notion that employees who use FWAs are subpar workers; this impacts the earning capacity of these employees. With women forming a significant percentage of flexible workers, this can immensely widen the

gender pay gap. Further, due to flexibility stigma, employees who utilise FWAs may suffer repercussions in the form of career derailment, low-performance review scores, and reduced probability of promotions, among others (Williams et al. 2013). These repercussions contribute to expanding the gender pay gap by reducing representation, in this case, representation of women in senior-level positions.

2.5.2 Flexible Work arrangement, Ideal Worker concept and the Gender Pay Gap

The first significant challenge identified evaluates the likely gendered nature of the conflict between flexible working and who an ideal worker is. To be recognised as an ideal worker, one must be entirely devoted to their organisation's goals and ensure they have no external duties that can distract them (Davies and Frink 2014). Inferring from this definition of an ideal worker, an employee who aims to be ideal should be available to work consistently. Consistency in working can be assessed through the length of time an employee works and the amount of work an employee completes. For a worker who isn't perceived as ideal, repercussions include slower career progression, lowered ability to earn, reduced access to the necessary training and upskilling programs, and others (Wheatley 2016). Workers who employ flexible working arrangements cannot fit the mould of an ideal worker, as flexibility means they are not always readily available for the business. Unfortunately, women request flexible working arrangements more than their male colleagues. Thus, flexible work arrangements can present women in a poor light as uncommitted, affecting their ability to earn and increasing the gender pay gap.

2.5.3 Flexible Work Arrangements, Female Representation and the Gender Pay Gap

Flexible working arrangements can impact the representation of females in the workforce and in higher-level management. Aside from the lack of commitment associated with FWAs, there are some negative perceptions about the quality of work run on FWAs (Wheatley 2016). Further, the literature reveals a negative impact of flexible working arrangements that require employees to be out of the office frequently on career progression (Kelliher and Anderson 2008). For more impactful job roles, there may exist reduced flexibility. These jobs may require one to work longer hours and need one's presence in the workspace. As such, women who have duties outside work might have difficulties balancing their work and home lives. These women are left stuck with low-skilled, lowing paying jobs, which are considered poor quality, and working in these roles has negative career implications for women. For instance, they might miss out on chances to network within their industry. As

other players may have negative opinions about their job roles, they may be denied access to the necessary training to increase their skill level. It is essential to understand that these women do not pick such positions out of choice but rather because of the likely inflexible nature of better jobs (Wheatley 2016). This situation reduces or severely impedes a woman's ability to rise in her field, thus, contributing to the reduced number of females represented in senior-level jobs and the increase in the gender pay gap.

Considering sections 2.5, 2.5.1, 2.5.2, and 2.5.3, it is hypothesised that

H5: An employee's use of, or the availability of, flexible working arrangements influences an employee's earning ability, thus, influencing the gender pay gap.

2.6 Theoretical model

The Human Capital Theory was developed after discovering an unexplained gap in the factors influencing production. It investigates the impact of human knowledge through education and training on productivity within a given organisation. It views education and training as an investment in human resources that can increase the organisation's productivity (Becker 1975; Nafukho et al. 2004; Teixeira 2014).

Concerning the gender pay gap, the human capital theory considers the lifetime participation of the employee in the labour market; it posits that an employee's earnings are affected not only by the educational investment but also by the duration of time the employee remains within the workforce (Polachek 2004, Grybaitė 2006).

Per the theory, once an employee knows they will spend less time in the labour market, there is more reluctance from the employer and the employee to invest more in gaining knowledge. This translates to lower productivity and a reduction in their earning ability. Considering females in the workforce, the probability of intermittent presence in the labour force is higher due to a myriad of reasons, including family and domestic responsibilities; thus, their lifetime participation in the labour market is shorter, resulting in lower earnings.

In as much as the Human Capital Theory explains some factors that can influence the pay gap, it does not sufficiently account for all circumstances that explain the difference in pay between the sexes (Lips 2012; Grybaitė 2006).

The Labour Market Discrimination model investigates portions of the gender pay gap which are not attributable to overt differences like the level of education and others. There are

varying forms of discrimination, including economic or direct discrimination, crowding, and individual tastes for discrimination (Grybaitė 2006; Elvira and Saporta 2001).

Individual tastes for discrimination occur when an employer, employee or customer intentionally or subconsciously shows discriminatory actions against female employees; for instance, when an employer prefers to hire women over men for secretary roles (Becker 1972).

Crowding is a phenomenon where women are only allowed access into specific industries creating instances of occupational segregation; the abundance of women trying to get into these fields and already in these fields impacts wages negatively (Bergmann 1974).

Economic or direct discrimination occurs when employees are paid differently for doing the same job (Grybaitė 2006).

To assess the impact of flexible working arrangements on the gender pay gap, this analysis combines the human capital theory and the labour market discrimination models to create a theoretical framework. The human capital model will account for the pay gap's demographic and social causes, including the employee's gender, marital status, educational status, and whether the employee has dependent children. The labour market discrimination model will also account for variables of the social and demographic nature that may form a basis for employee discrimination, like gender; it will also account for other variables that may create a foundation for discrimination, like whether the employee has external care responsibilities.

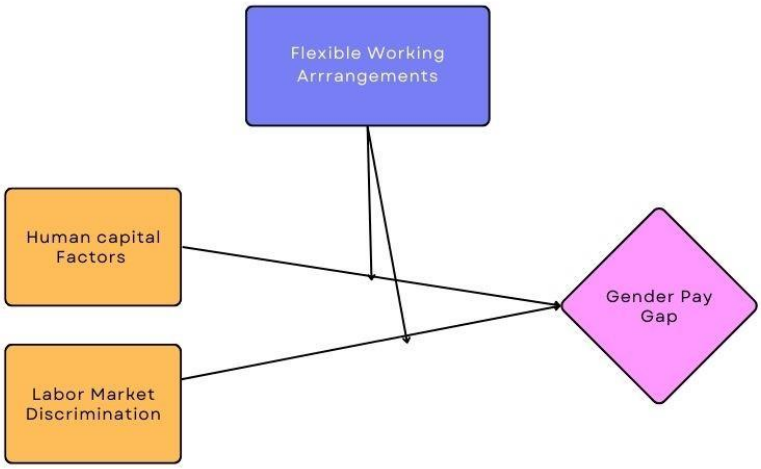

Figure 1: Pictorial representation of the theoretical framework

2.7 Data Analysis Tool

As this analysis requires quantitative investigation, the R programming language will be used to analyse the data set. R is an open-sourced programming language developed in 1993; it grants access to numerous graphical and statistical libraries with which data analysis can be performed. Its capabilities can further be extended with the countless amounts of libraries it has. R can be used for data mining, data analysis, and statistical computing, among others. For this project, R will be run using RStudio. R studio is an integrated development environment that allows users to interact with the code they are writing; users also get to view the graphics they generate.

2.7.1 Data Analysis Process

Regression Analysis

Linear regression from the Ordinary least square model will be used to assess the impact of flexible working arrangements. The linear model will consist of a dependent or outcome variable (Y) and independent variable (X), the coefficient of the independent variable (βnth) and a constant value (β0). The constant value represents the dependent variable if the independent variables are all 0 values.

A problem usually raised with linear regression is the omitted variable bias. Omitted variable bias occurs when significant explanatory variables are left out of the regression model. The absence of these variables can skew the outcome variable. Identifying all the crucial variables that impact the outcome variable can be difficult; through multiple linear regression, it becomes possible to add as many explanatory variables as possible to predict the outcome variable.

An important issue that can arise from the addition of multiple explanatory variables is multicollinearity between variables. Multicollinearity occurs when the independent or explanatory variables in the model are correlated; this creates problems in interpreting the model because it becomes difficult to understand the effect of the individual explanatory variables on the outcome variable.

To check for multicollinearity, the generalised variance inflation factor will be employed. The goal is for all variables in the model to score less than 5. Variables that score between 1 to 5 are considered not multicollinear.

The linear regression created will take the format presented below.

$y = \beta 0 + \beta 1X1 + \beta 2X2 \ldots\ldots\ldots + \mu$

To understand the impact of flexible working arrangements, p-values, coefficients, and their magnitudes, the adjusted R-squared and Root Mean Square Error (RMSE) values will be assessed. The p-values create room for hypotheses to be accepted or rejected; if the p-value is less than the set level of significance, usually 0.05, then the presence of statistical significance can be inferred, and the null hypothesis can be rejected.

The magnitude of the coefficients of the explanatory variables determines the presence of either a positive or negative relationship, and the R-squared and RMSE values investigate how well the explanatory variable explains the outcome variables.

Moderation

Moderation explores the impact of a variable on the relationship between the outcome and the explanatory variable. The effect of the new variable on the relationship can be determined by changes in the coefficients, adjusted r-squared, and p-values. The various formats of flexible working arrangements presented in the dataset will be used as moderating variables. The moderation relationship is shown in the diagram below.

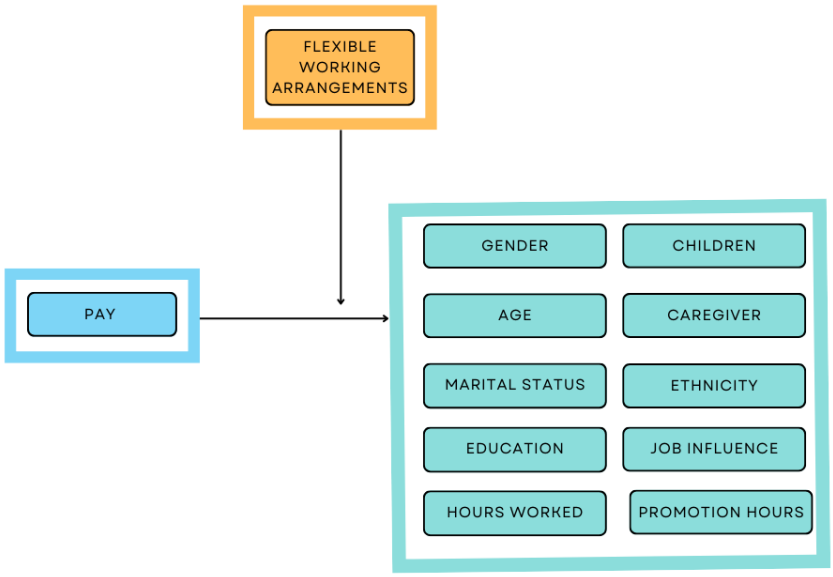

Figure 2: Moderation by Flexible Working Arrangements

Prediction Models

The impact of flexible working on the gender pay gap will also be assessed using prediction modelling. Prediction modelling facilitates the calculation of coefficients which can be applied to the data sample to estimate the outcome variables. The accuracy of the coefficients relies heavily on the relevance of the explanatory variables used. On the other hand, out-of-sampling prediction modelling allows for the creation of a model which can predict occurrences outside the dataset. The model will be built using a section of the data and tested to see how well it can predict the other section of the data when flexible working variables are present and absent. To assess the model's validity, the adjusted R-squared and RMSE (root mean squared error estimates the differences between predicted and observed outcome variable values, the lower the RMSE, the better the model) will be used.

The LASSO model is the selected prediction model. LASSO regressions automatically select the most relevant variables for prediction model creation. Using LASSO, the most important variables will be assessed to show if flexible work variables are present and the level of importance attached to them.

CHAPTER 3: RESEARCH PHILOSOPHIES

Research philosophies are the belief systems and assumptions that impact the knowledge development process (Saunders et al. 2019). Breaking this down, research philosophies communicate how researchers can collect, (techniques, time frame, collection instruments), analyse (methodological choices, theory development approaches) and utilise data for research purposes.

In the knowledge development process, a researcher might make some assumptions consciously or unconsciously. These assumptions are referred to as research paradigms. They can pertain to the nature of reality; identifying the inferences one makes to believe something is real (ontological assumptions), how we get to know something, specifically, how knowledge in its various forms can be acquired and transferred to others (epistemological assumptions), and how the researcher's values impact the research process (axiological assumptions) (Saunders et al. 2019, Kivunja and Kuyini 2017).

Positivism and Interpretivism are two widely recognised forms of research philosophy.

Positivism approaches research from a scientific lens. It is objective. It posits that events can be observed empirically and validated logically; the information gathered can then be generalised to the broader society (Alharahsheh and Pius 2020). The positivist researcher has an objective perspective on the world and looks for measurable links between variables to evaluate and validate their study assumptions (Warfield 2010).

Generally, the positivist research philosophy is attributed to quantitative research, proposing some hypotheses and utilising large sets of empirical or numeric data to validate these hypotheses.

Interpretivism views knowledge as subjective. It proposes that there is no singular truth; instead, truth is based on each person's unique experiences (Ryan 2018). The Interpretivism research philosophy is attributed to qualitative studies

Considering the overarching goal of this research is to identify the validity of the stated hypothesis against a likely truth that exists outside, the paper will use the positivist research philosophy as it supports the use of large secondary datasets and empirical analysis for hypothesis validation.

3.1 Research Approaches

Research approaches tackle the interrelationship between data and theories and their effect on the overall design of the research project (Saunders et al. 2007). Per Saunders onion, there are two primary forms of research approaches: the inductive and deductive methods.

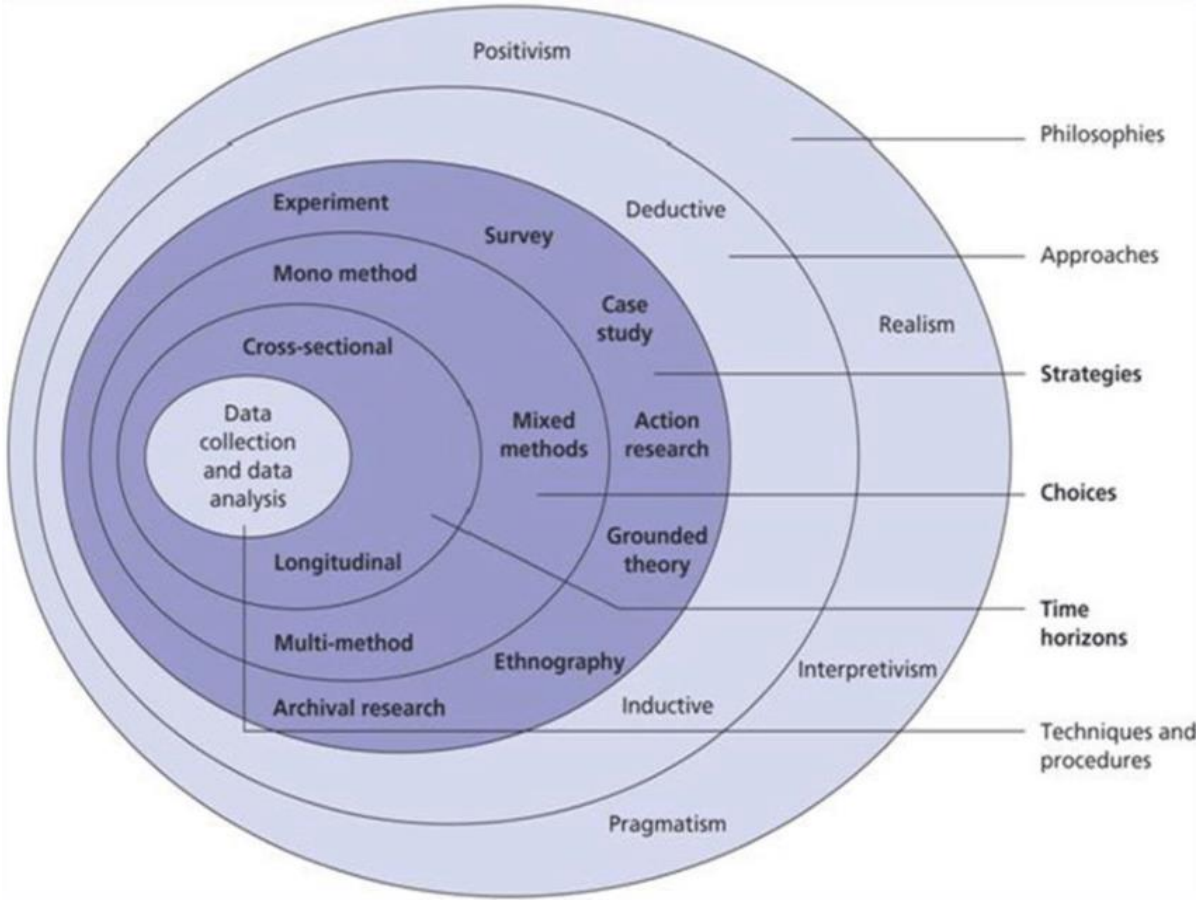

Figure 3: Saunders Onion (Saunders et al. 2007)

These approaches sit on the second layer of the onion. The deductive approach requires the researcher to develop a theory and some hypotheses which are tested extensively (Zefeiti and Mohamad 2015; Saunders et al. 2007). The outcome of the hypothesis tests can either validate or invalidate the proposed theory. This approach predominantly uses quantitative data, which can be in the form of large secondary datasets. Variables here need to be operationalised to be easily understandable and measurable using quantitative means. Finally, as the results from the deductive approach can be generalised, it is necessary to ensure the selected sample size is representative (Saunders et al. 2007).

The Inductive research approach also sits on the second layer of Saunders onion. For the inductive method, the researcher creates the theory based on data gathered (Zefeiti and Mohamad 2015). Unlike the deductive approach, the inductive approach is less rigid in

structure and gives room for alternate explanations. Again, the smaller sample sizes allow the researcher to engage more in the data collection process. The inductive approach has been linked to the qualitative research method (Saunders et al. 2007).

This research aims to identify if a causal relationship exists between flexible working and the gender pay gap by reviewing findings from existing literature and testing hypotheses using a secondary dataset. As a result, the deductive research approach is a good fit.

3.2 Research Methods

As this project relies on empirical evidence, a large dataset to be analysed numerically, and a research philosophy and approach geared toward the scientific method, it is only fair to employ a quantitative approach as its research method.

There exist two forms of research methods that can be employed in three different ways; these research method forms are quantitative and qualitative research methods. In research design, they can be used on their own or together, i.e. quantitative method alone, the qualitative method alone, or mixed methods (a combination of quantitative and qualitative methods) (Vishal 2012; Muijs 2004).

Quantitative methods allow researchers to explain theories using data that is analysed mathematically; researchers have no impact on the data and the outcome of the analysis. (Muijs 2004). Sometimes a dataset may not be numerical, but such datasets can be recoded into binary formats. The data is then analysed using statistical tools, including R, SPSS, and Stata (Queiros et al. 2017).

Qualitative research aims to unearth information that adequately explains the research topic. The researcher here is interested in accurately capturing the perceptions of research participants. Information here is collected using instruments including interviews, observation, case studies and others. As the results of qualitative research are not generalisable, the sample sizes for these studies are usually small. There exists a fair bit of subjectivity as the researcher can influence the data and outcomes (Muijs 2004; Queiros et al. 2017; Vishal 2012).

3.3 Data access

The data used in this analysis is the Workplace Employment Relations Study (WERS) dataset from 2011, specifically the employee survey data. The survey has been conducted six times, first in 1980, then in 1984, 1990, 1998, 2004, and finally in 2011. It aims to present a nationally representative assessment of working conditions and employment relations across the U.K.

The main objective of WERS is to identify and track changes in workplace relations in Britain to contribute toward policy development, encourage discourse about workplace relations, and finally serve as a reliable, publicly available dataset on workplace relations across all industries in Britain.

The study collected data using both interviews and questionnaires. A sample of 2680 British businesses was selected to participate. In each of these workplaces, interviews were conducted with the top manager in charge of matters relating to employment and personnel. Questionnaires assessing financial performance were given to trade sector workers at workplaces with employees who formed part of a trade union; permission was sought from the managers to interview one employee in the trade union and one not in the trade union. Also, with the manager's consent, questionnaires were shared with 25 randomly selected employees. The data has been made publicly available in several formats, and the U.K. data service is one place where the data can be accessed.

The study covers equal opportunities, work-life balance and well-being, flexibility and performance, pay systems, and more.

3.3.1 Data restrictions

The employee survey dataset for the WERS study contained a total of 21981 observations and 151 variables. To restrict the data, variables relevant to the research topic were selected and recoded; 5798 observations were removed, leaving a total of 16183 observations with 28 variables.

The variables selected were as follows; explanatory variables: Gender, Marital Status, Caregiver, Dependent children, Influence over tasks performed, Influence over work pace, Influence over working methods, Influence over order of tasks, Influence over start and end of workday, Age, Ethnicity, Promotion hours, Education and Hours worked weekly. The Flexible working variables were as follows: Flexitime, Job-sharing, Reduced hours, Compressed hours, Remote work and Annualised work. The outcome variable was Average

Yearly Pay. It was obtained by finding the averages of the pay ranges provided for each employee.

3.3.3 Variable definitions

Variable	**Definition**
Explanatory Variable	
Hours_worked_weekly	A numeric variable representing the number of hours an employee worked weekly, capped at 60 hours on the higher end and at 15 hours on the lower end, as working hours above and below these values were revealed to be outliers.
Gender	A binary variable with two levels checking the gender of the respondent 1- Male 2- Female
Marital_Status	A binary variable assessing whether an employee is married or not married 1- Not married 2- Married
Caregiver	A binary variable assessing whether an individual provides care to others. Initially, the variable contained six levels, these were reduced to 2 to reduce the impact of multicollinearity resulting from small sample sizes. 1- Not a caregiver 2- Caregiver
No_dependent_child	A binary variable assessing whether an individual has dependent children 1- No dependent child 2- Dependent child
Age	A nominal categorical variable with eight levels assessing the age of a respondent. Initially contained nine groups, one level was removed due to its small sample size

	and the influence of multicollinearity. 1. 18-19 2. 20-21 3. 22-29 4. 30-39 5. 40-49 6. 50-59 7. 60-64 8. 65 and above
Education	A nominal variable assessing the type of educational qualification a respondent has. Originally contained 17 levels, nine levels, namely NVQ/SVQ level 1-5, completion of trade apprenticeship, other professional qualifications and other vocational, prevocational levels removed due to their small observation sizes and the influence of multicollinearity. The remaining groups are as follows 1. GCSE grades D_G/CSE grades 2-5 SCE O grades D-E/SCE Standard grades 4-7 -level 1 qualification 2. GCSE grades A-C, GCE O-level passes, CSE Grade 1 SCE O grades A-C, SCE Standard -level 2 qualification 3. 1 GCE 'A' level grades A-E, 1-2 SCE Higher grades A-C, AS levels 4. 2 or more GCE 'A' levels grades A-E, 3 or more SCE Higher grades A-C 5. First degree, eg. BSc, B.A., BEd, HND, HNC, MA at first degree level 6. Higher degree, eg. MSc, MA, MBA, PGCE, PhD 7. No academic qualification 8. Other academic qualification
Influence over task performed	A binary variable assessing if an employee had influence over tasks performed 1. Influence over task performed 1- No influence over job

	2- Influence over job
Influence over work pace	A binary variable assessing if an employee had influence over work pace 1. Influence over work pace 1- No influence over work pace 2- Influence over work pace
Influence over working methods	A binary variable assessing if an employee had influence over working methods 1. Influence over working methods 1- No influence over working methods 2- Influence over working methods
Influence over order of tasks	A binary variable assessing if an employee had influence over order of tasks 1. Influence over order of tasks 1- No influence over order of tasks 2- Influence over order of tasks
Influence over start and end of workday	A binary variable assessing if an employee had influence over work pace 1- No influence over start and end of workday 2- Influence over start and end of workday
Ethnicity	A nominal categorical variable with 6 levels assessing the respondent's ethnicity which initially contained 17 levels. The variable was recoded according to the Uk governments 2021 census survey; the new levels are as follows 1. Asian or Asian British 2. Black, Black British, Caribbean or African 3. Mixed or multiple ethnic groups

	4. White 5. Other ethnic groups
Promotion Hours	A nominal categorical variable with three levels assessing employee opinions on whether one has to work long hours to gain a promotion 1. Agree 2. Neither Agree or Disagree 3. Disagree
Outcome variable	
Gross pay	A categorical variable with 13 levels providing information about respondent pay ranges 1. 0 or less per week (,120 or less per year) 2. 1 - 00 per week (,121 - ,200 per year) 3. 01 - 30 per week (,201 - ,760 per year) 4. 21 - ,050 per week (2,641 - 4,600 per year) 5. 21 - 60 per week (1,441 - 3,520 per year) 6. 31 - 70 per week (,761 - ,840 per year 7. 61 - 10 per week (3,521 - 6,120 per year) 8. 71 - 30 per week (9,241 - 2,360 per year) 9. 21 - 50 per week (7,041 - 3,800 per year) 10. 31 - 20 per week (2,361 - 7,040 per year) 11. 51 - 20 per week (3,801 - 2,640 per year) 12. 71 - 20 per week (,841 - 1,440 per year) 13. 051 or more per week (4,601 or more per year)
Averagr_Yearly_Salary_Estimate	A numeric variable estimating the respondents Average yearly salary using the

	Gross salary ranges
Flexible Working Variable	
Flexitime	Binary variable assessing whether a respondent has access to this type of FWA
Jobsharing	Binary variable assessing whether a respondent has access to this type of FWA
Compressed_hours	Binary variable assessing whether a respondent has access to this type of FWA
Reduced_hours	Binary variable assessing whether a respondent has access to this type of FWA
Annualized_work	Binary variable assessing whether a respondent has access to this type of FWA
Emergency_paid_leave	Binary variable assessing whether a respondent has access to this type of FWA
Remote_work	Binary variable assessing whether a respondent has access to this type of FWA

3.3.4 Outcome variable

Gross pay, representing the employees' earnings before any deductions are made, will be used to calculate the outcome variable. This variable presented pay ranges for each employee; based on the pay range, an average pay value was calculated and assigned to each employee.

3.3.5 Explanatory variables

A total of 14 explanatory variables will be used in this analysis. These variables were selected based on the findings literature. Among these variables, gender, education, age and having dependent children were revealed to be significant determinants of differences in pay between the sexes, as indicated by the literature review. Further literature has shown that they are also very persistent and have impacted the pay gap for an extended amount of time. These four variables formed the basis for some of the hypotheses examined within this study. The explanatory variables assessed were as follows: Gender, Marital Status, Caregiver, Dependent children, Influence over tasks performed, Influence over work pace, Influence over working methods, Influence over order of tasks, Influence over start and end of workday, Age, Ethnicity, Promotion hours, Education and Hours worked weekly. The Flexible working

variables were as follows: Flexitime, Job-sharing, Reduced hours, Compressed hours, Remote work and Annualised work.

3.3.6 Flexible working arrangement variables

A moderating variable impacts the relationship between an independent and dependent variable through its ability to change the magnitude and direction of the relationship. The flexible working arrangement variables will be moderated against the explanatory variables in the model. The goal is to assess how their presence impacts the variables in the regression by examining their significance and magnitude and the overall impact on the employee's pay. The flexible working arrangement variables explored were Flexitime, Job-sharing, Reduced hours, Compressed hours, Remote work and Annualised work.

CHAPTER 4: DATA ANALYSIS

4.1 Data Preparation

The data set contained twenty-one thousand nine hundred and eighty-one (21981) observations with a total of one hundred and fifty-two (152) variables. A total of five thousand seven hundred and ninety-eight (5798) observations were removed through cleaning and recoding, and sixteen thousand one hundred and eighty-three (16183) observations and twenty-eight (28) variables remained. Two hundred fourteen variables (214) were removed from the Gross salary variable used to estimate the outcome variable.

The outcome variable "Average Yearly Pay" was calculated using pay range values from the Gross Salary variable (See Appendix A for variable definition table).

The independent variables consisted of nine (9) binary variables (Gender, Marital Status, Caregiver, Dependent children, Influence over tasks performed, Influence over work pace, Influence over working methods, Influence over order of tasks, Influence over start and end of workday), four (4), nominal independent variables (Age, Ethnicity, Promotion hours, Education) and one (1) numeric variable (Hours worked weekly).

The flexible working variables represented were Flexitime, Job-sharing, Reduced hours, Compressed hours, Remote work and Annualised work. They were recoded into binary format.

4.2 Descriptive Statistics

Some independent and moderating variables used in this study are categorical (nominal with several levels and binary); as a result, their minimum and maximum values are 0 and 1. For their salary estimate, on average, employees receive £4279 with a minimum payment value of £120 and a maximum pay value of £7681. For working hours, on the higher end, some employees work up to 96 hours in a given week, which is over double the typical 40-hour working week. Employees who work such long hours tend to be outliers. Employees who work longer than 60 hours per week were removed. Per the United Kingdom's standard for weekly working hours, unless they opt out, employees should work a maximum of 48 hours every week (Government Digital Service 2011). On the lower end, work hours under approximately 15 hours were also shown as outliers; as such, they were removed. Averagely, employees work about 37 hours per week. The outliers and average values are displayed in the boxplot below.

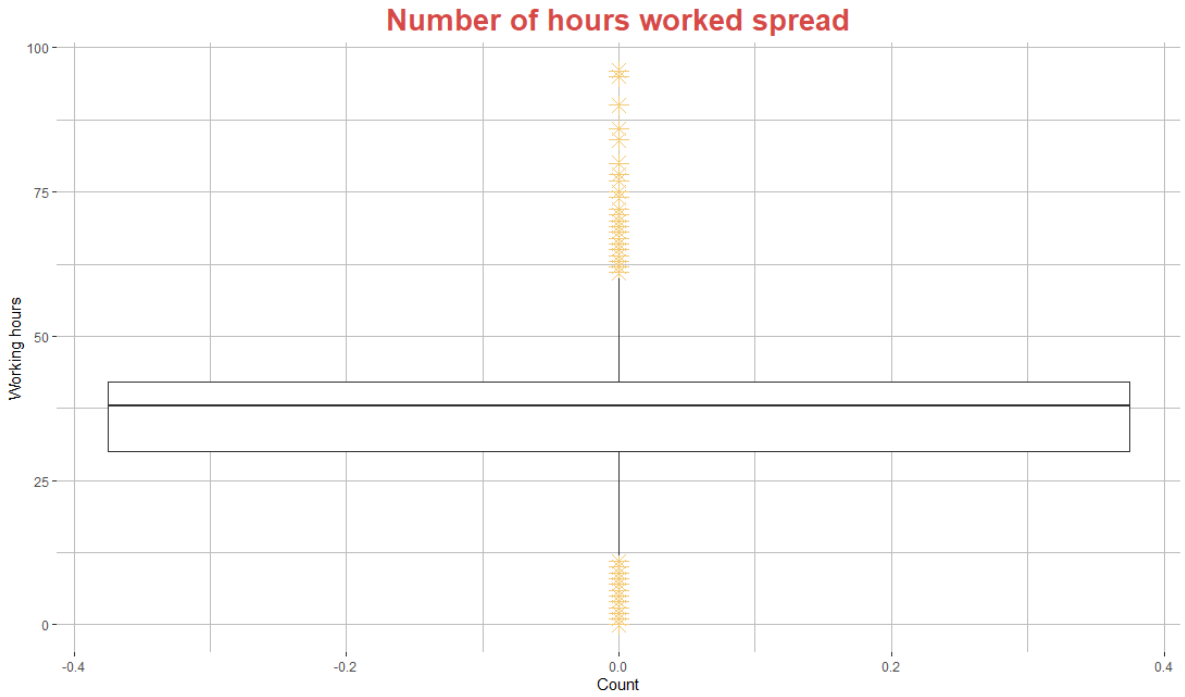

Figure 4: Boxplot for working hours

On average, 67% of employees have used or have access to flexible working arrangements, studying the flexible working arrangement variables (See Appendix B for the descriptive statistics table).

4.3 Demographic Analysis

The graphs below delve into the demographic makeup of the sample.

Gender Demographics

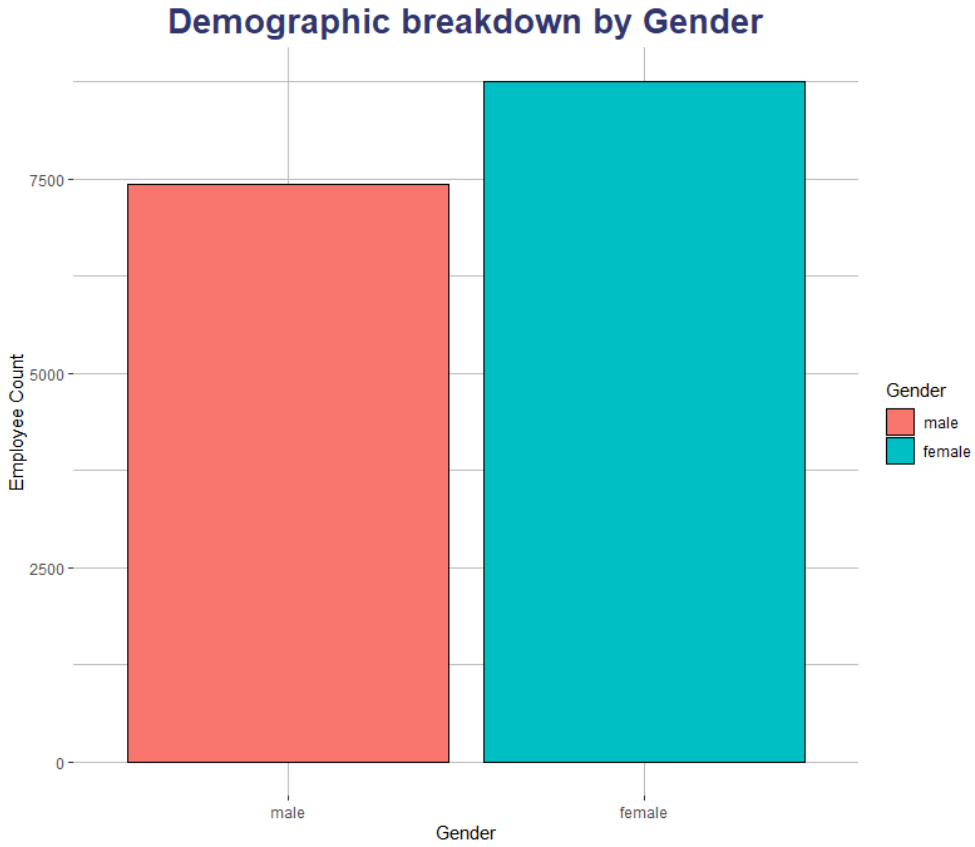

Figure 5: Gender Barplot

The graph reveals that, there are more females in the sample; in total, the number of females is approximately 10,000, and males, over 7500.

Marriage Demographics

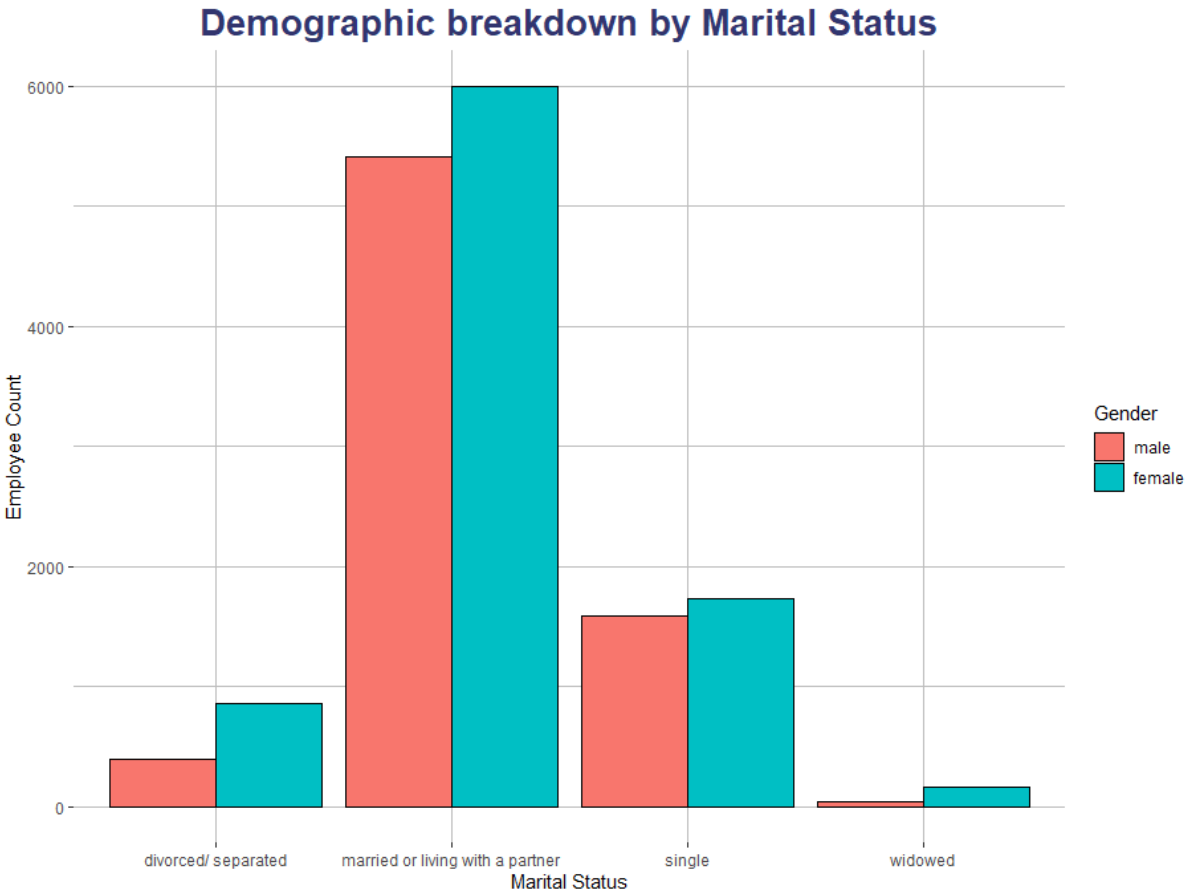

Figure 6: Marital Status Barplot

The married or living with a partner option has the highest number of respondents under marital status; the single and divorced categories follow this. Across all categories, the number of females surpasses the number of males. The total number of married males is over 5000 and females approximately 6000. The widowed category has the fewest respondents. Huge differences in category size can contribute to multicollinearity (Kroll and Song 2013). As such, this category was recoded to married and not married

Dependent child Demographics

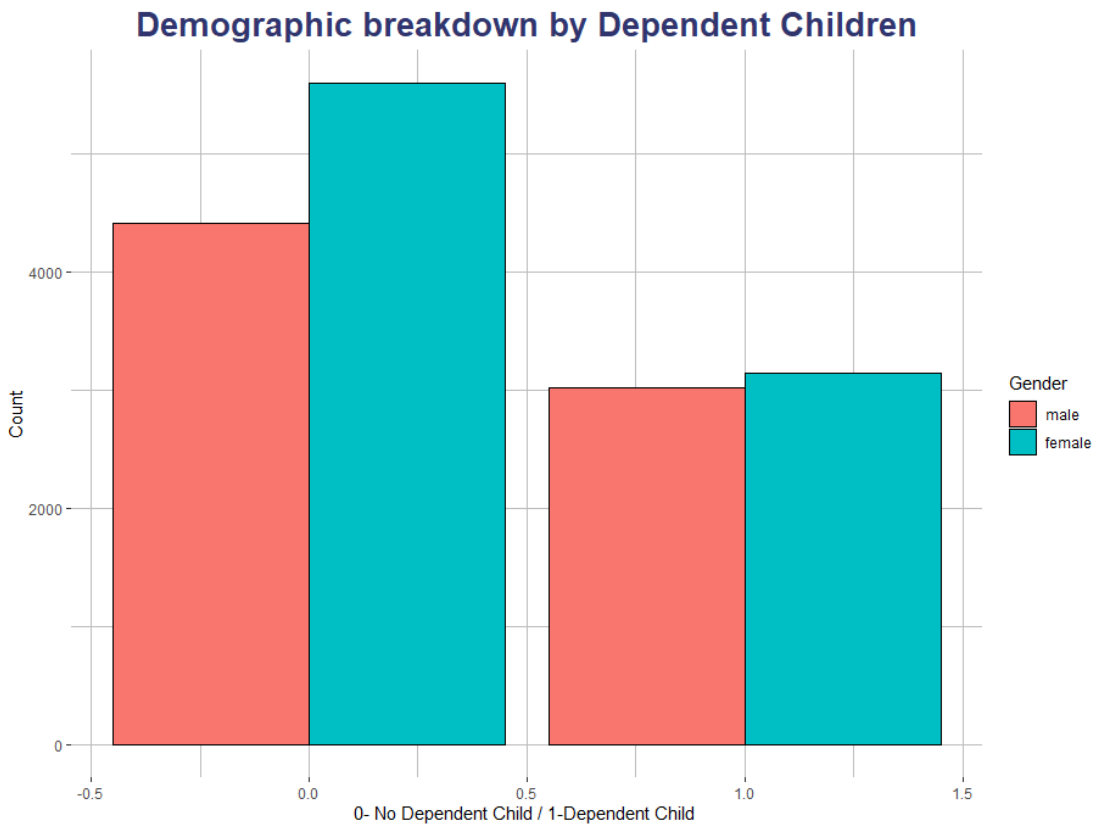

Figure 7: Dependent Child Barplot

More employees do not have dependent children as compared to those who have. There are more females than males in the category of those who do not have. Again, there are more females than males in the category of those who have.

Age Demographics

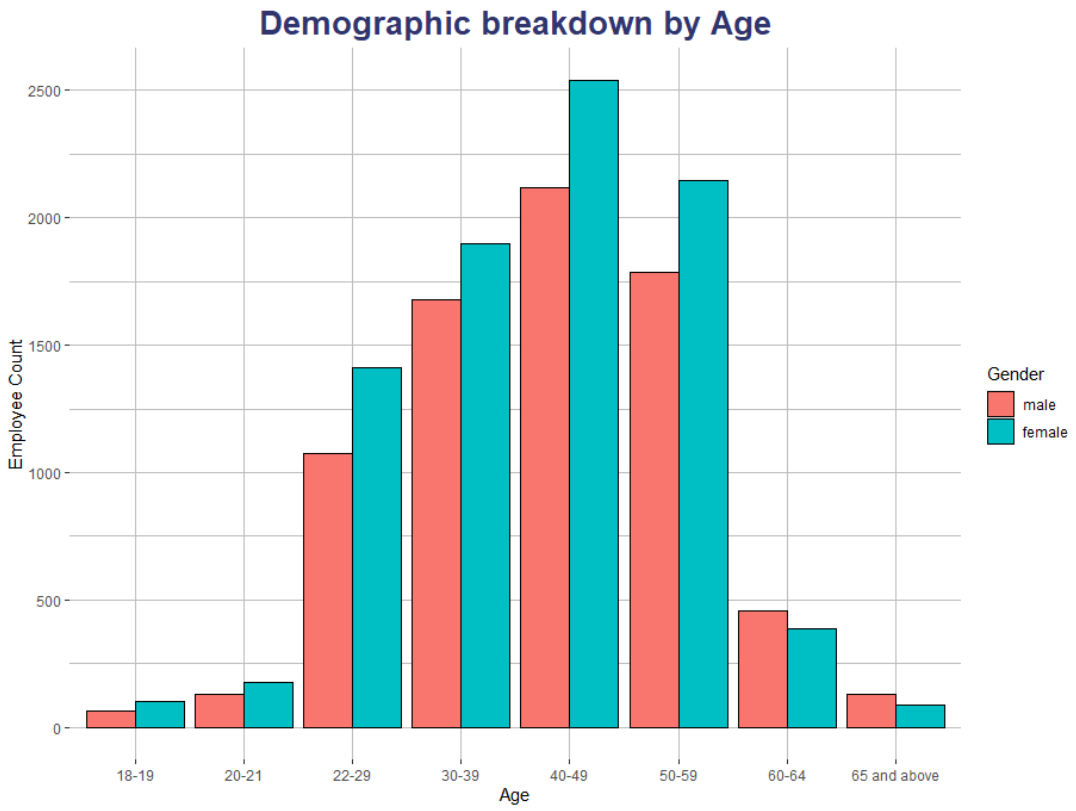

Figure 8: Age breakdown barplot

Many of the employees in the sample are between the ages of 22 to 59, and the age group with the most employees is the 40 – 49 age group. Females are well represented across all age groups; they form the majority in the 18 – 19, 20 – 21, 22 – 29, 30 – 39, 40 – 49, and 50 – 59 age groups. The number of males slightly surpasses females in the 60 -65 and above age groups. The 16-17 age group contained the least number of observations; it was removed to reduce the influence of multicollinearity.

Education Demographics

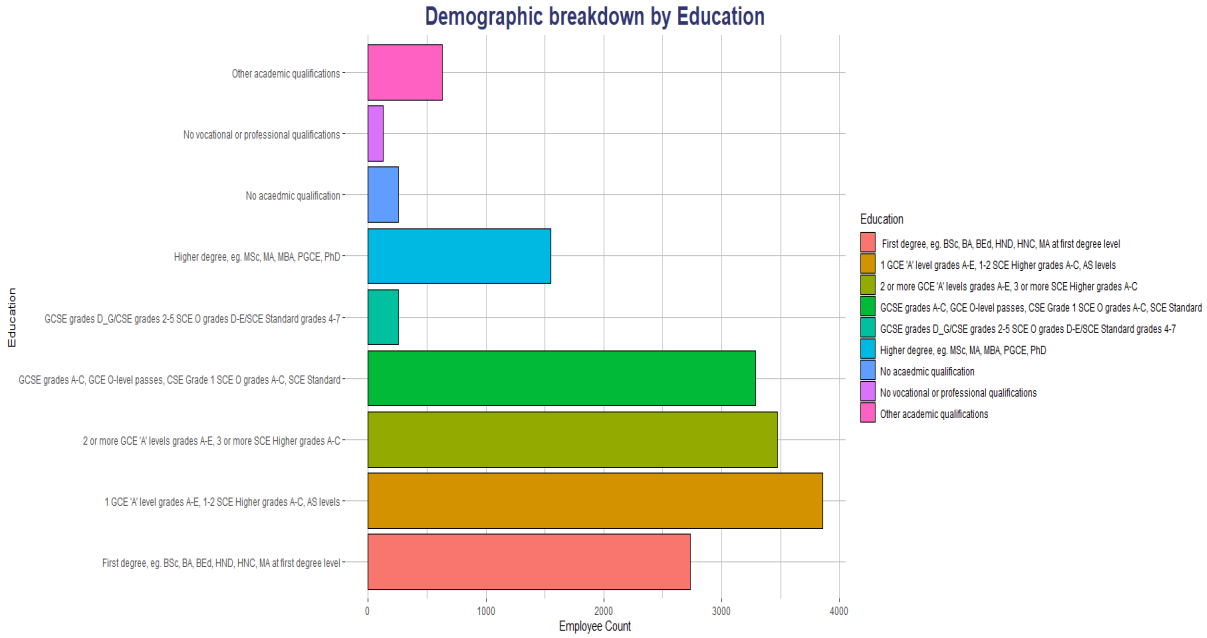

Figure 9: Education Barplot

Most of the employees in the data set have GCE qualifications, with nearly 4000 observations under GCE A-level qualification. The two (2) or more GCE A-level qualification records the next highest number of employees, followed by the GCSE A – C, First degree and Higher degree qualifications. No professional or vocational qualification records the least number of employees. The data set initially contained 17 levels; however, some levels were removed due to their small sample sizes.

Ethnicity Demographics

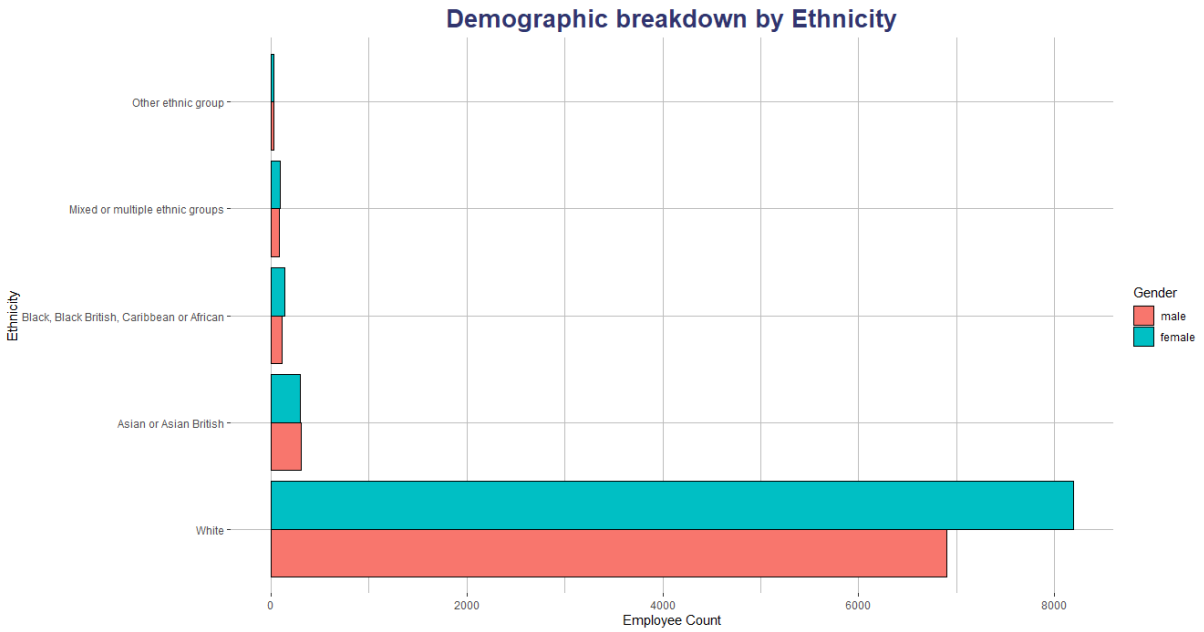

Figure 10: Ethnicity Barplot

The predominant ethnicity in the sample is "White", followed by "Asian or Asian British", and then "Black, Black British, Caribbean or African". The dominance of the "White" subset could be attributed to the fact that, the data was collected in the United Kingdom from British businesses.

In summary, the sample is female-dominated, with several respondents from the "White" ethnicity. Several respondents fall between the ages of 22-59, are married or living with a partner and have GCE, GCSEs, first degrees or higher education degrees as their educational qualification.

4.4 Gauss Markov Assumptions

As the analysis utilises linear regression models, the Gauss Markov assumptions for linear models should be satisfied.

Normality: Using the central limit theorem rule about large datasets, the assumption is made that the sample distribution is likely to be normal.

Multicollinearity: Using the generalised variable inflation factor (GVIF^(1/(2*Df))), the correlation between the variables were calculated; all variables reported scores less than 5, meaning they are not correlated with each other (See Appendix C for GVIF values for each variable).

Linearity and Homoscedasticity: Helps to determine if the error term across all observations of the independent variable are the same. If the variance between error terms widely differs, it can skew the standard error values and inflate the other values in the regression model. To assess homoscedasticity, the model's residuals and the fitted values were obtained and plotted against each other. The plot revealed that the model followed a negative linear trend; y values decreased when x values increased. Further, as the graph showed a pattern and was not random, it revealed some level of bias, likely because some relevant variables are still not present within the model. As a result, the conclusion drawn was, that the model was homoscedastic, biased and linear (See Appendix C for the equation used)

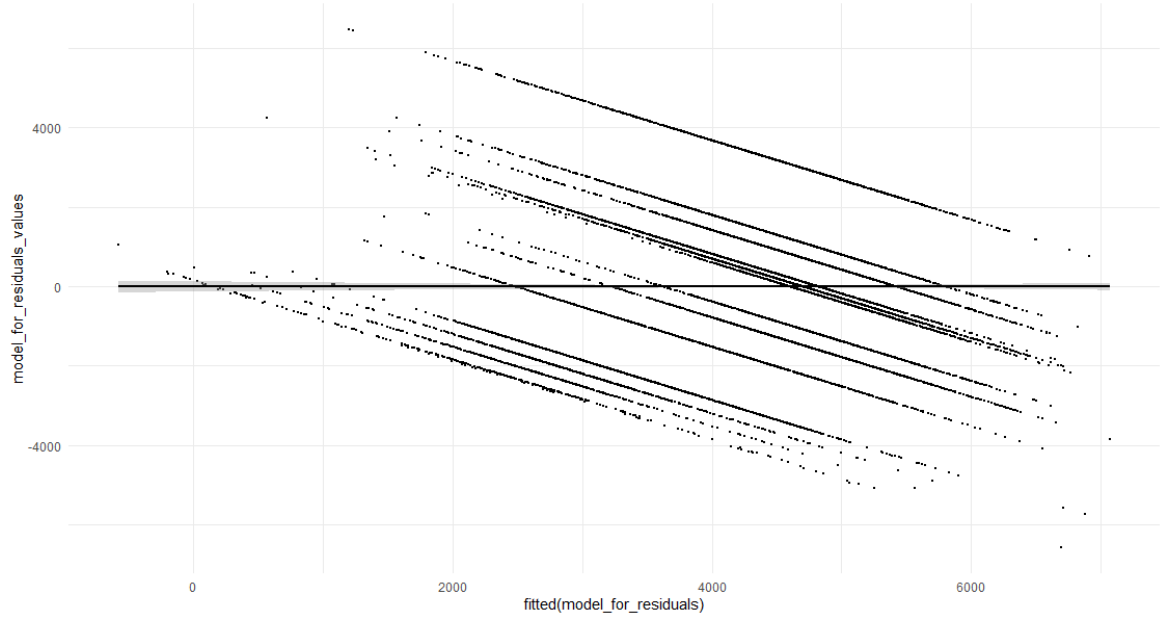

Figure 11:Fitted vs Residuals

To create the plot, residuals were plotted against fitted values, with residuals on the y-axis and fitted values on the x-axis.

4.5 Metrics for Measurement

To determine whether the FWA variables have an impact on the model, specific metrics are used. The metrics used in this study are as follows, R-squared/ adjusted R-squared, Root Mean Square Error (RMSE), and p-values.

R-square / Adjusted R-square

Derived from the Pearson's Correlation Coefficient, the R squared value assesses the amount of variation within the dependent variable that can be accounted for by the independent variables. It is obtained by subtracting one (1) from the ratio of the sum of squares of the regression, divided by the total sum of squares of the model (Penn State Eberly College of Science 2018). The R- squared value changes with each new variable added to the model. As a result, the adjusted r-square is a better measure of the variation as it accounts for each new variable added. Since the r-squared value represents a proportion, it falls between 0 and 1, with zero (0) revealing that the dependent variables explain no variation and one (1) indicating that the dependent variable explains all variation in the model. Generally, a higher r-square value means the model is better as it accounts for a larger amount of variation (Gujarati et al. 2012). Specifying a value that represents what an ideal r-square should be, can be complex; for instance, in studies that consider data that are predictable and unchanging or extremely precise, for example, in pure science and engineering, a higher r-square value is expected. In contrast, studies that investigate data based on relationships that consistently change, for example, social science studies of human behaviour, are usually lower (Ozili 2022, Penn State Eberly College of Science 2018). Models between 0.10 and 0.50 are acceptable in social sciences if some or most of the explanatory variables are significant (Ozili 2022).

Root Mean Square Error (RMSE)

The root mean square error is the square root of, the square of the difference between the predicted and observed values in a regression. It helps to give an idea of how far the predicted value is from the observed value, and the closer the predicted value is to the observed value, the better the fit of the model. As such, the smaller the RMSE value, the better the model. Assessing how good an RMSE value is, is dependent on the range of values present in the data; for instance, if the values contained in the data set are between 100 – 200 and the RMSE value is 5, it can be concluded that the RMSE provides a good fit as the value is small as compared to the values present in the dataset.

P-values

P-values reveal the level of significance of variables within the model. In hypothesis testing, it provides a threshold at which the proposed hypotheses can either be rejected or fail to be rejected. Holding the null hypothesis true, the p-value represents the probability of producing a value more extreme than the observed value. The optimal metric for the p-value can be set based on the expected results; however, many statisticians use a value of 0.05. Statistician Ronald Fischer proposed this value in his book Statistical Methods for Research Workers (Biau et al. 2009).

4.6 Results

4.6.1 Linear Regression

From the literature review, these variables (Gender, Age, Education and Children) were pointed out as significant determinants of differences in pay between male and female employees, and thus influence the gender pay gap. Following this discovery, the study sought to use them as key explanatory variables within the model, but before this, they were tested to reveal if they held true according to literature. Using hypothesis testing and linear regression, the presence of a causal relationship between each of these variables and the outcome pay variable was investigated. Find below the outcome of these tests.

With an employee's gender being a foundational basis for the presence of the gender pay gap, the first hypothesis sought to examine how it contributed to the pay gap. As such, the following hypothesis was developed.

Hypothesis One

H0:Gender does not negatively influence a female employee's earning ability

H1: Gender negatively influences a female employee's earning ability and thus affects the gender pay gap.

Equation used:

Influence of Gender = median_yearly_salary_estimate (Y) = β0 + **β1* Gender** + β2*Marital_Status + β3*Caregiver + β4*No_dependent_child + β5*Hours_worked_weekly + β6*as.factor(Age) + β7*as.factor(Education) + β8*as.factor(Ethnicity) + β9*as.factor(Promotion_hours) + β10a*influence_over_task_perfomed + β10b*influence_over_workpace + β10c* influence_over_working_methods + β10d*influence_over_order_of_tasks + β10e*influence_over_start_end_of_workday

Results:

With a p-value of 2.11e-08, the model shows the value obtained is extreme; as such, the null hypothesis is rejected, and it is concluded that gender is a significant determinant of pay. Gender essentially reduces pay for female employees. The model, through its coefficient, estimates that, female employees are likely to earn approximately £173 less than their male colleagues solely based on their gender (See Appendix D for full table).

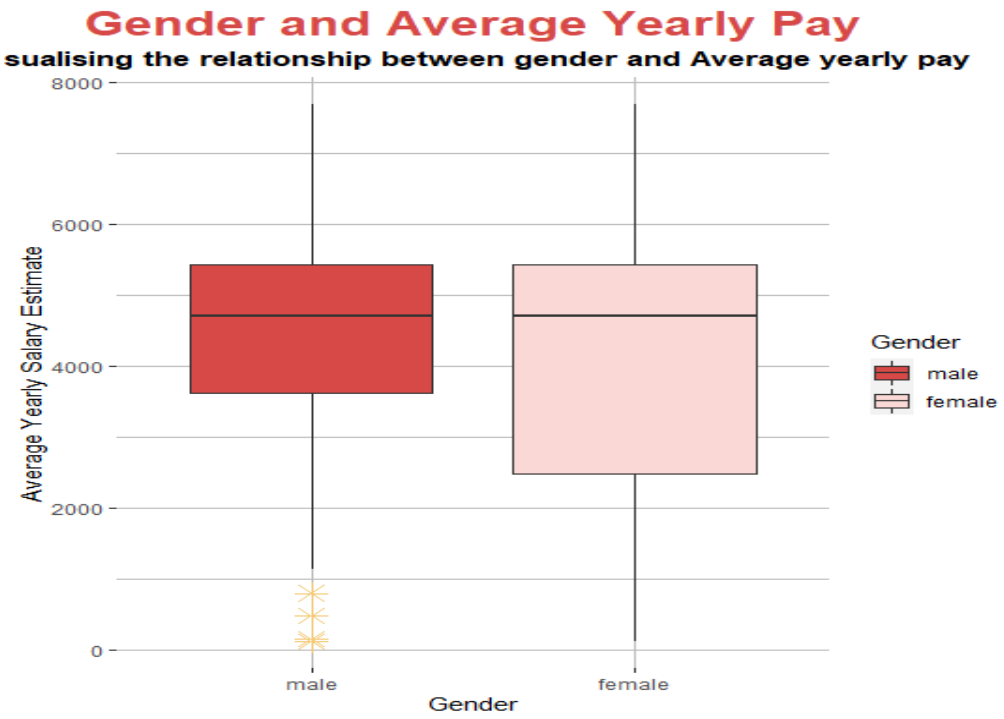

Figure 12: Gender vs Pay boxplot

Visualising the relationship between the variables reveals a significant difference in the pay rates for the 1st 25% of the dataset. It is likely that, a substantial number of male pay values within the lowest 25% of the dataset, are higher than female pay values that fall in the lowest 25%, and 25% between the 1st and 2nd quartile (the median). Again, pay values for males, above the first quartile but below the 3rd quartile, have a higher lower bound value than for females, meaning a significant number of males in this range earn more. Also, the median values show slight differences, with males scoring the higher.

Hypothesis Two

H0: Education does not increase a female employee's earning ability
H1: Education increases a female employee's earning ability and thus affects the gender pay gap

This regression explored the impact of education on the average yearly salary estimate. Assessing other education variables against employees with a first degree, at p-value levels of 0.00620, 0.01292, and 0.00508, respectively, 2 or more GCE A-levels, GCSE A-C, and GCSE grades D- G were the only significant levels. Employees with 2 or more GCE A-levels were projected to earn approximately £127 more, than those with a first degree. Employees who held GCSEs earned £119 and £332 less than employees with a first degree (See Appendix D for full table).

To analyse the impact of education on the pay value estimate, based on gender, education was moderated against gender, and the results were as follows.
When gender is considered, all the previously significant variables, aside 2 or more GCE A-levels, remain significant. Female employees with 1 GCE A-level, GCSE A-C, and GCSE D - G earn approximately £363, £595, and £1132 less than male colleagues with the same qualifications (See Appendix E for moderated variable results).

Considering that generally, many of the educational levels show no significance, and among those that show significance, most of them reveal a negative relationship, with women

earning less, there is a failure to reject the null hypothesis, thus concluding that education does not increase a female employee's earning ability.

Hypothesis Three

H0: Age does not influence a female employee's earning abilities

H1: Age influences a female employee's earning abilities and thus affects the gender pay gap

Using the 30-39 age group as the reference category, compared to employees in this age group, employees between the ages 18 and 21 earn approximately £2361 and £1189 less. Only employees between the ages of 22-29 make more. This can be attributed to influences from the human capital theory; this will be further examined in the discussion section. Further with p-values of 0.000382, 4.99e-07, 0.007121, 5.23e-16 respectively, employees between the ages of 40-49, 50-59, 60-64 and 65+ earn £145, £225.50, £197.07 and £1062.10 less than the reference category.

Examining age from a gendered standpoint, the earnings lost, start to increase as age ranges increase. From 40 -65+, wages lost rise from an initial £252 to £1073. (See Appendix F for moderated variable results). It is interesting to note that, as age increases, the value by which earnings decrease also rises. This corroborates the findings by Francis-Devine and Booth (2020), claiming that the gender pay gap grows steeper as one ages.

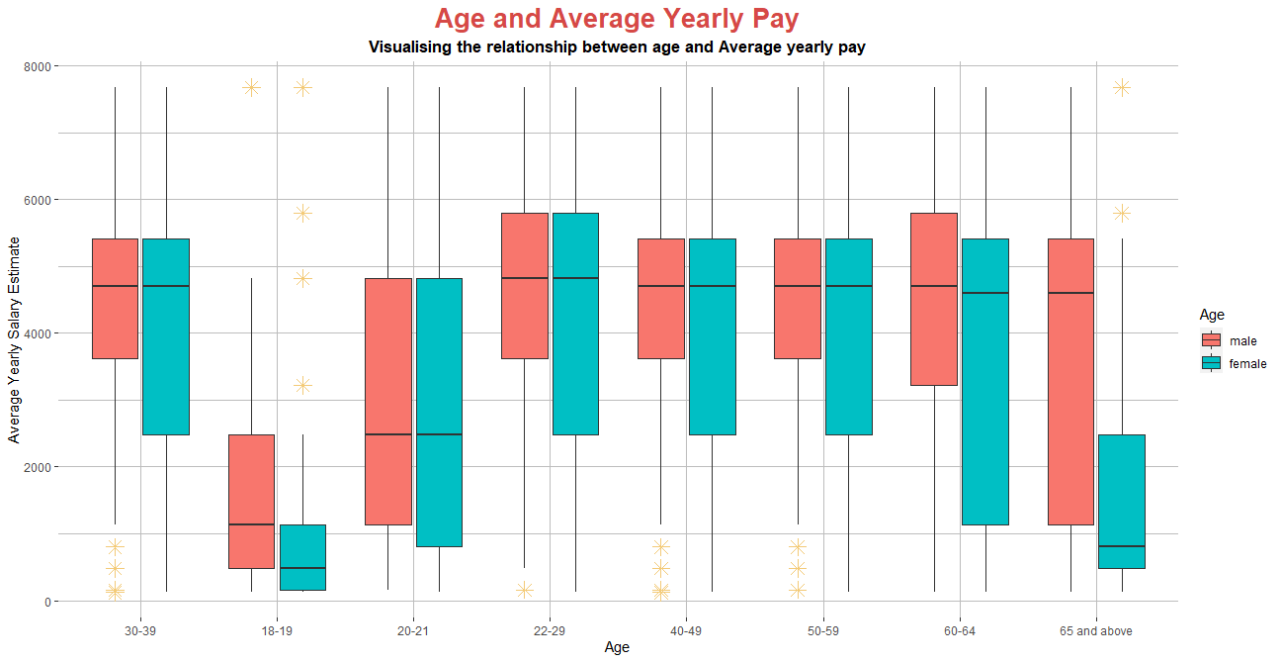

Figure 13: Age and Pay boxplot

Analysing this visually, compared to employees within the 30–39 year age group, the boxplot presented above shows that employees within the 22-29 year group earn slightly more: at the same time, employees between the ages of 18- 21 earn less. Between the ages of 40 – 65+, the graph shows a plateau and then a steady decline in female salaries. By 65+, the median earnings for females fall under £1000, while that of males is close to £5000.

Considering the results from the regressions and the visualization, the null hypothesis is rejected, and it is settled that age influences a female's earning capability.

Hypothesis Four

H0: Having dependent children does not impact a woman's earning ability
H1: Having dependent children impacts a woman's earning ability and contributes to widening the gender pay gap

The table below presents the results that explain the influence of having a dependent child on the pay value estimate (outcome variable) without the influence of gender.

Variable	**Estimate (Coefficient)**	**P-value**	**Significant or not**
No_dependent_child	-215.69	2.71e-10	Significant

From the results, with a level of significance value of 3.71e-10, employees who have dependent children earn approximately £214 less than employees who don't.

Evaluating this, considering employee gender;

Variable	**Estimate (Coefficient)**	**P-value**	**Significant or not**
No_dependent_child	-85.326	0.156798	Not Significant

The value obtained is not significant; as such, it can be concluded that irrespective of gender, when an employee has a dependent child, it is likely they will earn less. However, lower earnings received for dependent children cannot be attributed to gender. Bearing in mind the results obtained from the regression, there is a failure to reject the null hypothesis.

Hypothesis Five

H0: An employee's use of, or the availability of, flexible working arrangements does not influence an employee's earning ability.
H1: An employee's use of, or the availability of, flexible working arrangements influences an employee's earning ability, thus, influencing the gender pay gap.

To ascertain FWAs impact on pay, a two-step approach was utilised. First, the effects of FWAs were probed without the interaction of the gender term; after, they were assessed with gender. The goal was to discover whether their addition improves model fit.

Without considering the effects of FWAs from a gendered standpoint, flexitime, compressed hours, remote working and annualized working, were the most significant of the 6 FWAs in the sample. Individuals who used flexitime or compressed hours were likely to earn approximately £311 and £104 more than others who did not use this arrangement. It could be argued that, flexitime and compressed hours allowed the employee to earn more by providing avenues for increasing productivity. With flexitime, the employee gets to work at times best suited to them; they can select times when they are prepared to create good work. For compressed hours, as the employee knows, they have a shorter period to complete more work; they may be putting in extra effort and gaining higher productivity.

On the other hand, remote and annualized working schemes caused the employee to earn less, with remote working having the steepest deduction at £363.

This result shows that FWAs that impact work scheduling with no changes to working hours, as represented by flexitime and compressed hours, can positively affect pay. It further proposes that, FWAs that influence the time, in terms of the periods in a given year, or the number of hours the employee works, and the location from which they complete their tasks, can negatively influence pay (See Appendix G for full results table).

Adding the gender dimension produced some interesting results. Two of the six levels presented remained significant: remote working and flexitime working. Female employees who use these arrangements earned £571 and £396 more than their male colleagues. This could be attributed to the fact that, these FWAs allow women to balance their careers and other duties and responsibilities. For example, flexitime enables female employees to schedule their work such that, they have extra time to meet other obligations and, remote working offers them the freedom to work from any location (See Appendix H for moderation results table).

Investigating model fit without the addition of any FWA variable, produced an adjusted R-square value of approximately 0.1965, which translates to 19.7%. Adding FWAs without considering the influence of gender raised this score to 0.2070, about 20.7%. When gender was considered, the final model fit was approximately 21.4%

The results show that, some forms of flexible working arrangements can either positively or negatively influence employee pay; thus, the null hypothesis was rejected.

4.6.2 LASSO Regression

The Least Absolute Shrinkage and Selection Operator (LASSO) is an advanced model used in prediction. Rather than selecting variables manually, LASSO automatically selects the most relevant variables for the model. It does this by using a value called lambda. Lambda helps in a process called regularization, where it reduces or penalizes model coefficients to pull them towards 0. Coefficients which reach 0 are removed from the regression; only relevant coefficients remain

The LASSO model can reduce bias by eliminating overfitting, reducing multicollinearity and aiding in producing a more parsimonious model. In terms of overfitting, the model created is flawed such that, it perfectly predicts when it is run on the data on which it is trained, but performs poorly when generalized to other data. LASSO's regularisation process reduces large variable coefficients, which can form due to multicollinearity, to ensure a better fitting model.

The LASSO model selects the most significant variables within the given model, ensuring that, the final model is simplified (i.e., unnecessary variables are removed) and becomes parsimonious (i.e., simple but with an excellent ability to make predictions).

K-fold cross-validation is utilised to ensure the model can make accurate predictions. The data set is broken into “k-folds”(several sections), and the data is trained against each fold.

The goal of using LASSO in this study is to utilise its ability to select the most significant variables to

1. Help identify the individual impact of the key variables and FWA variables within the model

2. Help identify if the addition of FWA variables helps in the creation of a better model.

LASSO fills the gap because, while multiple linear regression helps uncover causal relationships between the independent and dependent variables holistically, it does not comment on the importance of each of the variables in the model. Multiple linear regression results reveal significance but do not show how significant a variable is, compared to other variables in the model. Also, the results produced through regularisation are more accurate as they are free from bias caused by overfitting and multicollinearity.

With LASSO, the quality of the prediction model can be assessed using the R-squared and RMSE metrics. Four models were created, Set A and Set B. Set A consists of a training and test model with other predictor variables for pay, without any predictor variables for FWAs. Set B consists of a training and test model with other predictor variables for income and FWAs.

The overall goal here is to investigate how high FWA variables rank, where they rank in comparison to the other variables, and if adding FWA variables creates a better model by increasing the R square value and decreasing the RMSE value. If this is the case, it can be concluded that FWAs impact pay and thus can impact the gender pay gap.

SET A: Training model without Flexible Working Arrangements

Important Variables

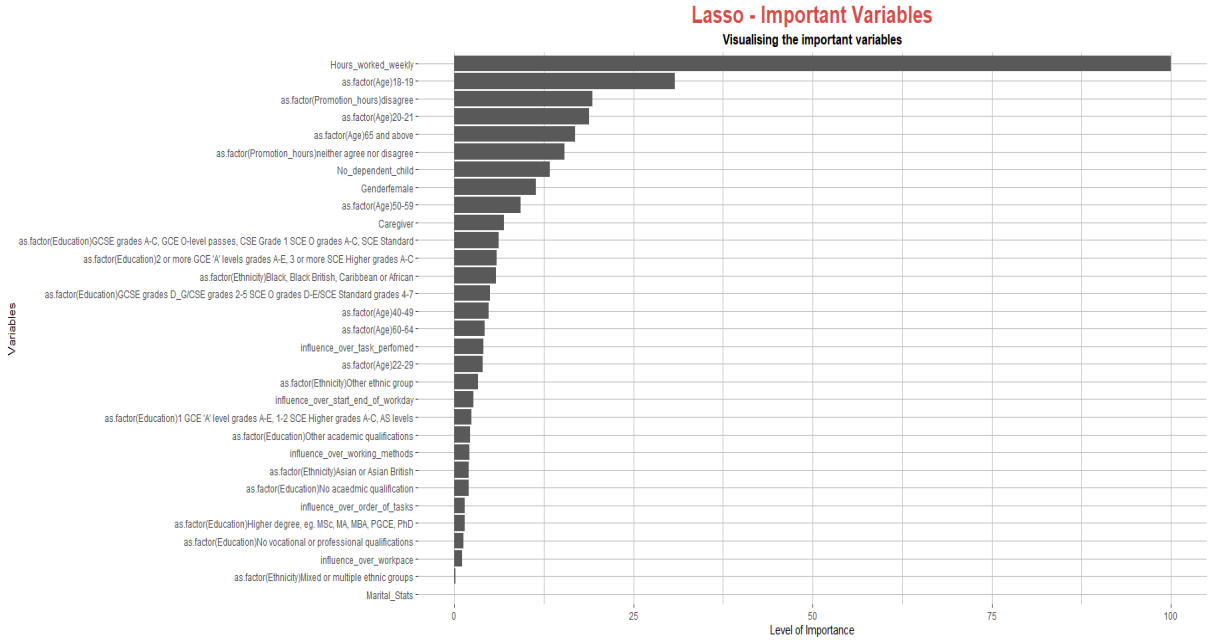

Figure 14:Important variables, Lasso without FWAs

In this model, the hours worked weekly variable ranked first. Comparing the variables covered in the hypotheses proposed, age, whether an employee has dependent children, gender and level of education, ranked. Age ranked first, with the most significant age range being 18-19. The 20-21 and 65+ were the next groups to rank. Whether an employee had a dependent child ranked next, followed by gender, specifically, female. The significant education levels ranked were GCSE A-C and 2 or more GCE A- levels. Interestingly, opinions on the number of hours one needs to work to secure a promotion ranked significantly high, with those who disagreed ranking the highest. It could be the case that the number of hours one works can be affected by their opinion on the topic.

This model's RMSE and R-square scores were 1796.795 and 0.2001881, respectively.

SET B: Training model with Flexible Working Arrangements

Important Variables

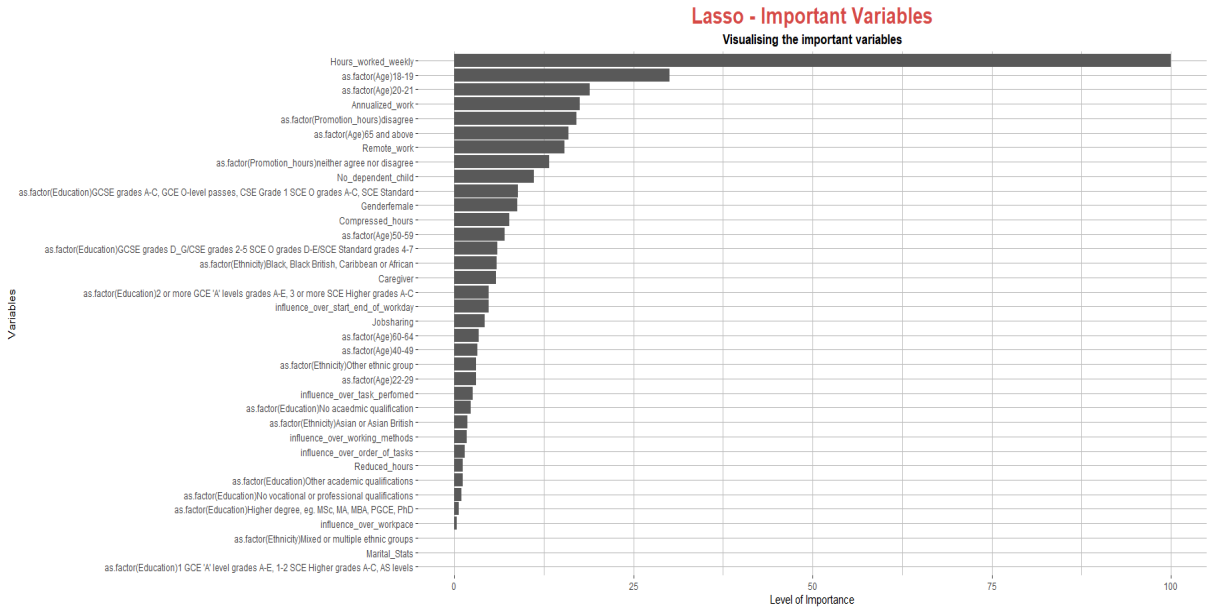

Figure 15:Important variables Lasso with FWAs

Introducing FWAs to the model slightly changed the significant variables. Hours worked weekly, again, was the most important variable. For the variables that formed the basis of the hypotheses examined, age, FWAs specifically, annualized work, remote work, compressed hours; whether an employee has dependent children; education, specifically GCSEs A-C, and gender ranked the highest. The position of annualized work and remote work supports the findings from the multiple linear regression that shows the impact on pay.

It further suggests that, work flexibility around time and location can influence an employee's salary. Job sharing and reduced hours ranked low.

The RMSE and the r- square values obtained were 1794.692 and 0.2020523, respectively.

4.7 Discussion

Demographic analysis of the data set showed that the respondents were predominantly white (this may be because the data was collected in the United Kingdom), between the ages of 22-49, married or living with a partner, with GCE or GCSE qualifications. Due to the makeup of the sample, it is difficult to generalise the findings of the models across the workforce in the UK because the workforce is multicultural. Further, as most of the qualifications are GCE and GCSE based, it leaves out many other industries requiring higher qualifications.

Results from multiple linear regression for hypothesized key variables (Gender, Age, Education, Dependent children)

The multiple linear regression model run established a causal relationship between gender, age and some levels of education.

In the case of employees with dependent children, the model revealed that, generally, employees with dependent children tend to earn less. However, when assessing the relationship further, using gender as a moderating variable, the model revealed that gender did not influence earnings when one has a dependent child. These findings did not support the conclusions of the literature.

Exploring the gender variables revealed that, women earn less than men, as highlighted by an earning loss of £173. From a visual standpoint, a boxplot showed a vast difference in the amounts of pay offered to the lowest 25% earners, with the earnings for males being significantly higher. The results support the findings from the literature. Inferring from the number of females within the dataset, crowding (a phenomenon where high barriers to entry force a large number of females into particular industries), a form of labour market discrimination, could be occurring, and this could be one of the factors influencing low remuneration. To remedy this, employers should apply gender-neutral recruitment practices.

They can achieve this through education and training focused on identifying and curbing bias, and regular audits to ensure hiring processes remain gender neutral, among others.

All Age variables except age ranges between 22-29 were significant. Compared to employees between the ages of 30-39, all other age ranges earned less. Between 18- 29, earnings increased, and after 40, earnings lost increased. Female employees aged 40 – 65+ earned less than their male colleagues. Again, the results supported the findings from the literature. Inferring from the human capital theory, it may be the case that employees in younger age groups may lack essential training and skills and may not be as productive, causing them to earn less. For employees in higher age groups, as proposed by the human capital theory, it may be that they are not actively participating in the labour force. So they may not be as interested in gaining new skills.

Education had a majority of its levels being non-significant. Without assessing the impact of gender, the results showed that employees with 2 or more GCE A-levels, GCSE A-C, and GCSE D-G earned less than those with first degrees. When gender was considered, females with 1 GCE A-level, GCSE A-C, and GCSE D-G earned less than male colleagues with similar qualifications. From the lack of significance and the negative relationship portrayed, it was concluded that education did not increase females' earning ability.

For age, gender and education, the regressions support the claims made in the literature about the influence of these variables on pay in general, and pay by sexes. As a result, it was concluded that, they have an important impact on the gender pay gap

Results from multiple linear regression for Flexible Working Arrangements (Jobsharing, Flexitime, Remote work, Annualised work, Reduced hours, Compressed hours)

In determining the impact of FWAs on the gender pay gap, the assumption was that if FWAs are found to contribute to differences in pay by gender, it would be concluded that they have some impact on the gender wage gap.

Evaluating FWAs from a general standpoint without the influence of gender, employees who used flexitime and compressed hours had higher earnings, while remote working and annualised hours had lower incomes.

From a gender standpoint, females who used remote and flexitime working arrangements earned more. These results showed that FWAs, which impacted the time, in terms of the number of hours worked, and period worked for, decreased pay, while FWAs, which maintained the number of hours, but influenced work schedule, increased income. FWAs, which influenced location, depending on gender, had either a negative or positive effect. Much cannot be said about FWAs that influence workload as they were not significant. Further, the results reveal the importance of the number of hours one works in determining pay. The analysis points to the number of hours worked as the most significant determinant of pay. At the same time, annualized hours, an FWA influencing work time, specifically, the periods when an employee works, ranked as part of the top 5 critical variables in the LASSO regression results.

Based on these results, to sustain their incomes, employees can push for FWAs that allow them to maintain their hours while providing some level of flexibility. Further, employers can introduce initiatives that enable workers to take care of their responsibilities while maintaining their hours, such as providing office nurseries for employees with young children.

Results from LASSO regression.

With causation explored within the multiple linear regression model, the LASSO prediction model was used to analyse the importance of the hypothesized predictor variables and the FWA variables, and to scrutinize the effects of FWAs on the overall model.

In the training model without FWAs, the number of hours an employee worked proved to be the most significant variable, thus, showing the influence of the number of hours worked on employee pay. Age was the first important hypothesized variable, followed by whether an employee had a dependent child, gender, and education.

In the results for the training model with FWAs again, the number of hours an employee worked was the most important variable, followed by age and whether an employee had a dependent child. The first FWA to rank was annualized hours, the 4th influential variable. Remote hours ranked next, followed by compressed hours, and job sharing and

reduced hours at the bottom. This result highlighted that, although FWAs had an impact on pay, their influence, compared to other variables, is weak.

The prediction model aimed to identify the strength of FWA variables by testing if they made the model better. To assess this, R-square and RMSE values were calculated

	RMSE	R2
No FWA	1796.795	0.2001881
FWA	1794.692	0.2020523

The better model would be the one which increases R-square values while decreasing RMSE values. From the table, the model with FWA variables marginally achieved this. It decreased RMSE values by approximately 2 points and increased R-square values by 1%.

The sample range is a significant contributing factor to the RMSE value. In this sample, the minimum value is £120, and the maximum value is £7680.5; thus, an RMSE of 1794.692 can be considered low. With FWA variables reducing the RMSE by 2.103, their contribution can be regarded as weak and negligible.

Following the assertions by Ozili (2022) and Penn State Eberly College of Science (2018) on the value of the R-square metric when considering variables impacted by human behaviour, it is concluded that, generally, at 0.2001881 or 20% Rsquare is significant; however the contribution of FWA variables at 0.0018 is weak and negligible.

Based on the results, it can be concluded that the FWA variables do not improve the model's ability to predict pay accurately; however, based on the results from the multiple linear regression, FWAs have some influence on pay as, some forms of FWAs can increase pay, and others decrease it Thus, it is concluded that, flexible working arrangements have a weak impact on pay and thus can only marginally influence the gender pay gap

CHAPTER 5: CONCLUSION

5.1 Summary of Findings

This study aimed to examine if flexible working arrangements impacted the gender pay gap in the United Kingdom. To achieve this, the study assessed the impact of flexible working arrangement variables on employee pay. The flexible working arrangement variables assessed were flexitime, reduced hours, compressed hours, remote working, annualised hours and job sharing. Without the influence of gender, the multiple linear regression model unearthed a positive relationship between flexitime and compressed hours, resulting in an increase in earnings. It further revealed a negative relationship between remote work and annualized work, culminating in a decrease in earnings. When gender was considered, a positive relationship between remote working and flexitime arrangements was revealed.

These findings suggested that flexible work arrangements that impact time, specifically reducing the number of hours an employee worked, could have a decreasing effect on employee remuneration. FWAs that introduced schedule flexibility, i.e. maintaining working hours but still creating the avenue for other activities to be performed, had an increasing impact on pay. The results of FWAs affecting work locations were mixed, with their impact changing when gender was considered. Little could be said about FWAs that influence workload as they showed no significance in both the prediction and causal models. Examining their ability to predict pay, FWA variables had a negligible impact on the metrics for measurement and marginally improved the model.

Thus, based on the results from the causal model and the prediction model, it was concluded that FWAs have a negligible impact on the gender pay gap. Based on the results, to reduce the influence of the pay gap, it is suggested that employees request more flexible working arrangements that provide schedule flexibility, like compressed work and flexitime. Employers should be more willing to provide resources to assist their employees in taking care of personal responsibilities without a time trade-off. For example, during summer breaks, employees who do not have childcare assistance might opt to take the summer off to take care of their children, causing a reduction in the time spent working. In this situation, companies can provide onsite nurseries and daycare centres. This way, the employee access childcare without having to take time off.

5.2 Limitations

The first major limitation of the study occurs because of the type of respondents assessed. The sample predominantly consisted of respondents of white ethnic backgrounds, leaving out many other ethnic groups that form a significant part of the workforce in the United Kingdom. Despite being recategorized per the United Kingdom's 2021 census ethnicity levels, White was still the predominant ethnicity.

Secondly, considering educational response levels, many responses were clustered around a few qualification levels. This could exclude many other industries as different businesses require different levels of qualifications.

These limitations cast doubt on how well these findings can be generalised to a larger community in the United Kingdom.

5.3 Recommendations and Future work

From the finding presented, find below a few recommendations that governments, policymakers, employers and employees can consider

1. There should be strong policies set up to manage workplace discrimination resulting from one's gender, as the data revealed that based on gender, women tend to earn less than their male colleagues
2. Employers should be encouraged to develop more initiatives that allow work schedule flexibility, as the data has shown that it has the potential to provide a good work-life balance while at the same time encouraging workplace productivity.
3. There should be steps taken to encourage diversity in the workplace as the data showed a significant lack of diversity in the British workspace, and the literature review mentioned how poorly women from various ethnic groups are represented within the workforce.

Further areas of study that can be pursued include

1. Examining why some forms of flexible working initiatives have a positive impact on pay while others have a negative impact
2. How flexible working arrangements impact productivity within the working environment.

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Appendices

Appendix A

Variable definitions

Variable	**Definition**
Explanatory Variable	
Hours_worked_weekly	A numeric variable representing the number of hours an employee worked weekly, capped at 60 hours on the higher end and at 15 hours on the lower end, as working hours above and below these values were revealed to be outliers.
Gender	A binary variable with two levels checking the gender of the respondent 3- Male 4- Female
Marital_Status	A binary variable assessing whether an employee is married or not married 3- Not married 4- Married
Caregiver	A binary variable assessing whether an individual provides care to others. Initially, the variable contained six levels, these were reduced to 2 to reduce the impact of multicollinearity resulting from small sample sizes. 3- Not a caregiver 4- Caregiver
No_dependent_child	A binary variable assessing whether an individual has dependent children 3- No dependent child 4- Dependent child
Age	A nominal categorical variable with eight levels assessing the age of a respondent. Initially contained nine groups, one level was removed due to its small sample size and the influence of multicollinearity.

	9. 18-19 10. 20-21 11. 22-29 12. 30-39 13. 40-49 14. 50-59 15. 60-64 16. 65 and above
Education	A nominal variable assessing the type of educational qualification a respondent has. Originally contained 17 levels, nine levels, namely NVQ/SVQ level 1-5, completion of trade apprenticeship, other professional qualifications and other vocational, prevocational levels removed due to their small observation sizes and the influence of multicollinearity. The remaining groups are as follows 9. GCSE grades D_G/CSE grades 2-5 SCE O grades D-E/SCE Standard grades 4-7 -level 1 qualification 10. GCSE grades A-C, GCE O-level passes, CSE Grade 1 SCE O grades A-C, SCE Standard -level 2 qualification 11. 1 GCE 'A' level grades A-E, 1-2 SCE Higher grades A-C, AS levels 12. 2 or more GCE 'A' levels grades A-E, 3 or more SCE Higher grades A-C 13. First degree, eg. BSc, B.A., BEd, HND, HNC, MA at first degree level 14. Higher degree, eg. MSc, MA, MBA, PGCE, PhD 15. No academic qualification 16. Other academic qualification
Influence over task performed	A binary variable assessing if an employee had influence over tasks performed 1. Influence over task performed 3- No influence over job 4- Influence over job

Influence over work pace	A binary variable assessing if an employee had influence over work pace 1. Influence over work pace 3- No influence over work pace 4- Influence over work pace
Influence over working methods	A binary variable assessing if an employee had influence over working methods 1. Influence over working methods 3- No influence over working methods 4- Influence over working methods
Influence over order of tasks	A binary variable assessing if an employee had influence over order of tasks 1. Influence over order of tasks 3- No influence over order of tasks 4- Influence over order of tasks
Influence over start and end of workday	A binary variable assessing if an employee had influence over work pace 3- No influence over start and end of workday 4- Influence over start and end of workday
Ethnicity	A nominal categorical variable with 6 levels assessing the respondent's ethnicity which initially contained 17 levels. The variable was recoded according to the Uk governments 2021 census survey; the new levels are as follows 6. Asian or Asian British 7. Black, Black British, Caribbean or African 8. Mixed or multiple ethnic groups 9. White

	10. Other ethnic groups
Promotion Hours	A nominal categorical variable with three levels assessing employee opinions on whether one has to work long hours to gain a promotion 4. Agree 5. Neither Agree or Disagree 6. Disagree
Outcome variable	
Gross pay	A categorical variable with 13 levels providing information about respondent pay ranges 14. 0 or less per week (,120 or less per year) 15. 1 - 00 per week (,121 - ,200 per year) 16. 01 - 30 per week (,201 - ,760 per year) 17. 21 - ,050 per week (2,641 - 4,600 per year) 18. 21 - 60 per week (1,441 - 3,520 per year) 19. 31 - 70 per week (,761 - ,840 per year 20. 61 - 10 per week (3,521 - 6,120 per year) 21. 71 - 30 per week (9,241 - 2,360 per year) 22. 21 - 50 per week (7,041 - 3,800 per year) 23. 31 - 20 per week (2,361 - 7,040 per year) 24. 51 - 20 per week (3,801 - 2,640 per year) 25. 71 - 20 per week (,841 - 1,440 per year) 26. 051 or more per week (4,601 or more per year)
Averagr_Yearly_Salary_Estimate	A numeric variable estimating the respondents Average yearly salary using the Gross salary ranges

Flexible Working Variable	
Flexitime	Binary variable assessing whether a respondent has access to this type of FWA
Jobsharing	Binary variable assessing whether a respondent has access to this type of FWA
Compressed_hours	Binary variable assessing whether a respondent has access to this type of FWA
Reduced_hours	Binary variable assessing whether a respondent has access to this type of FWA
Annualized_work	Binary variable assessing whether a respondent has access to this type of FWA
Emergency_paid_leave	Binary variable assessing whether a respondent has access to this type of FWA
Remote_work	Binary variable assessing whether a respondent has access to this type of FWA

Table 1: Variable Definition Table

Appendix B

Variable	**Minimum**	**Maximum**	**S.D**	**Average**
Hours_worked_weekly	15	60	9.146882	37.79046
Gender	0	1	0.498367	0.5405673
Marital_Status	0	1	0.4563899	0.7042576
Caregiver	0	1	0.3937336	0.1918062
Education	0	1	0.1932862	0.03886795
No_dependent_child	0	1	0.4856972	0.3812025
influence_over_task_perfomed	0	1	0.2821224	0.9128097
influence_over_workpace	0	1	0.306227	0.8952605
influence_over_working_methods	0	1	0.2068712	0.9551999
influence_over_order_of_tasks	0	1	0.2295408	0.9442007
influence_over_start_end_of_workday	0	1	0.4494585	0.7190879
Flexitime	0	1	0.488188	0.3918927
Jobsharing	0	1	0.3696684	0.1633195
Reduced_hours	0	1	0.4728342	0.3373911
Compressed_hours	0	1	0.4231201	0.2335784
Remote_work	0	1	0.4145403	0.2204165
Annualized_work	0	1	0.3725697	0.1665328
FWA_availabilty	0	1	0.4670233	0.6786134
Average_yearly_salary_estimate	120	7680.5	2026.372	4278.636

Table 2: Descriptive Statistics table

Appendix C

Variable	GVIF	DF	GVIF^(1/(2*Df))
Gender	1.202261	1	1.096476
Marital Status	1.156672	1	1.075487
Caregiver	1.064724	1	1.031855
No_dependent_child	1.357372	1	1.126649
Hours_worked_weekly	1.269337	1	1.105874
Age	1.601906	7	1.034230
Education	1.140202	8	1.008234
Jobsharing	1.262869	1	1.123775
Flexitime	1.319057	1	1.148502
Reduced_hours	1.410255	1	1.187542
Compressed_hours	1.331784	1	1.154029
Remote_work	1.240062	1	1.113581
Annualized_work	1.151260	1	1.072968
Ethnicity	1.035332	4	1.004350
Promotion_hours	1.057007	2	1.013957
influence_over_task_perfomed	1.410971	1	1.187843
influence_over_workpace	1.321807	1	1.149699
influence_over_working_methods	1.614645	1	1.270687
influence_over_order_of_tasks	1.555041	1	1.247013
influence_over_start_end_of_workday	1.269481	1	1.126712

Table 3: GVIF Result table

Equation Used

Equation used :

model_for_residuals <- lm(data = WERS_2011_Employee_Gender_flexibility_Data, formula = median_yearly_salary_estimate ~ Gender + Marital_Status + Caregiver + No_dependent_child + Hours_worked_weekly + as.factor(Age) + as.factor(Education) + Jobsharing + Flexitime + Reduced_hours + Compressed_hours + Remote_work + Annualized_work + as.factor(Ethnicity) + as.factor(Promotion_hours)+ influence_over_task_perfomed + influence_over_workpace + influence_over_working_methods + influence_over_order_of_tasks + influence_over_start_end_of_workday)

Table 4: Homoscedasticity equation

Appendix D

Assessing the impact of Gender on pay

	Dependent variable:
	Average_yearly_salary_estimate
Genderfemale	-173.336***
	(30.924)
Marital_Stats	29.281
	(33.615)
Caregiver	159.097***
	(37.371)
No_dependent_child	-215.688***
	(34.134)
Hours_worked_weekly	84.316***
	(1.730)
as.factor(Age)20-21	1,172.193***
	(174.427)
as.factor(Age)22-29	2,419.175***
	(146.111)
as.factor(Age)30-39	2,361.196***
	(146.267)
as.factor(Age)40-49	2,215.532***
	(145.835)

as.factor(Age)50-59	2,135.698*** (145.550)
as.factor(Age)60-64	2,164.130*** (155.392)
as.factor(Age)65 and above	1,299.096*** (188.684)
as.factor(Education)1 GCE 'A' level grades A-E , 1-2 SCE Higher grades A-C, AS levels	51.673 (46.080)
as.factor(Education)2 or more GCE 'A' levels grades A-E, 3 or more SCE Higher grades A-C	127.318*** (46.512)
as.factor(Education)GCSE grades A-C, GCE O-level passes , CSE Grade 1 SCE O grades A-C, SCE Standard	-119.316** (47.988)
as.factor(Education)GCSE grades D_G/ CSE grades 2-5 SCE O grades D-E/SCE Standard grades 4-7	-332.325*** (118.599)
as.factor(Education)Higher degree, eg. MSc, MA, MBA, PGCE, PhD	-29.254 (57.801)
as.factor(Education)No acaedmic qualification	107.937 (118.469)
as.factor(Education)No vocational or professional qualifications	-193.013 (164.451)
as.factor(Education)Other academic qualifications	-57.093 (80.455)
as.factor(Ethnicity)Asian or Asian British	-181.901** (75.659)
as.factor(Ethnicity)Black, Black British, Caribbean or African	-351.768*** (115.590)
as.factor(Ethnicity)Mixed or multiple ethnic groups	-64.710 (136.575)
as.factor(Ethnicity)Other ethnic group	-457.936* (250.251)
as.factor(Promotion_hours)disagree	362.947*** (37.252)
as.factor(Promotion_hours)neither agree nor disagree	237.809*** (33.353)

influence_over_task_perfomed	-125.362**
	(60.014)
influence_over_workpace	-12.943
	(53.570)
influence_over_working_methods	35.935
	(87.689)
influence_over_order_of_tasks	49.802
	(77.556)
influence_over_start_end_of_workday	57.486*
	(33.580)
Constant	-1,144.484***
	(174.921)
Observations	16,183
R2	0.198
Adjusted R2	0.196
Residual Std. Error	1,816.430 (df = 16151)
F Statistic	128.639*** (df = 31; 16151)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 5: Gender regression result summary

Appendix E

Variable	Estimate (Coefficient)	P-value	Significant or not
as.factor(Education)1 GCE and others: Genderfemale	**-362.519**	**7.16e-05 *** **	**Significant**
as.factor(Education)2 GCE and others: Genderfemale	7.638	0.934770	Not Significant
as.factor(Education)GCSE A-C : Genderfemale	**-595.334**	**2.80e-10 *** **	**Significant**
as.factor(Education)GCSE D-G and others:	**-1311.771**	**2.60e-08 *** **	**Significant**

Genderfemale			
as.factor(Education)Higher Degree e.g. MSc : Genderfemale	71.236	0.537694	Not Significant
as.factor(Education)No academic qualification Genderfemale	-3.815	0.987150	Not Significant
as.factor(Education) No vocational or professional qualifications:Genderfemale	-98.570	0.768271	Not Significant
as.factor(Education)Other Academic Qualification	265.986	0.098010	Not Significant

Table 6: Education and Gender moderation results

Appendix F

Variable	Estimate (Coefficient)	P-value	Significant or not
Genderfemale: as.factor(Age)18-19	-428.473	0.144416	Not Significant
Genderfemale: as.factor(Age)20-21	-348.564	0.111137	Not Significant
Genderfemale: as.factor(Age)22-29	-169.530	0.076760	Not Significant
Genderfemale: as.factor(Age)40-49	**-252.215**	**0.001871**	**Significant**
Genderfemale: as.factor(Age)50-59	**-283.898**	**0.000772**	**Significant**
Genderfemale: as.factor(Age)60-64	-173.853	0.212599	Not Significant
as.factor(Age)65 and above	**-1072.695**	**3.79e-05**	**Significant**

Table 7: Age and Gender moderation results

Appendix G

Assessing the impact of Gender on pay/FWA

	Dependent variable:
	Average_yearly_salary_estimate
Marital_Stats	47.889
	(33.423)
Caregiver	134.231***
	(37.170)
No_dependent_child	-195.864***
	(34.022)
Hours_worked_weekly	86.319***
	(1.747)
as.factor(Ethnicity)Asian or Asian British	-193.919***
	(75.179)
as.factor(Ethnicity)Black, Black British, Caribbean or African	-402.512***
	(114.903)
as.factor(Ethnicity)Mixed or multiple ethnic groups	-63.596
	(135.664)
as.factor(Ethnicity)Other ethnic group	-462.587*
	(248.617)
as.factor(Promotion_hours)disagree	317.617***
	(37.167)

as.factor(Promotion_hours)neither agree nor disagree	203.477***
	(33.223)
as.factor(Age)18-19	-2,329.582***
	(145.427)
as.factor(Age)20-21	-1,212.423***
	(109.862)
as.factor(Age)22-29	31.386
	(48.948)
as.factor(Age)40-49	-129.437***
	(40.759)
as.factor(Age)50-59	-202.654***
	(44.604)
as.factor(Age)60-64	-172.795**
	(72.774)
as.factor(Age)65 and above	-1,010.673***
	(130.204)
as.factor(Education)1 GCE 'A' level grades A-E, 1-2 SCE Higher grades A-C, AS levels	0.515
	(46.005)
as.factor(Education)2 or more GCE 'A' levels grades A-E, 3 3 or more SCE Higher grades A-C	100.065**
	(46.248)
as.factor(Education)GCSE grades A-C, GCE O-level passes, CSE Grade 1 SCE O grades A-C, SCE Standard	-180.094***
	(47.996)

as.factor(Education)GCSE grades D_G/ grades 4-7 CSE grades 2-5 SCE O grades D-E/SCE Standard	-401.348*** (118.096)
as.factor(Education)Higher degree, eg. MSc, MA, MBA, PGCE, PhD	-13.077 (57.434)
as.factor(Education)No acaedmic qualification	118.264 (117.713)
as.factor(Education)No vocational or professional qualifications	- 216.600 (163.360)
as.factor(Education)Other academic qualifications	- 39.297 (79.940)
influence_over_task_perfomed	-83.627 (59.717)
influence_over_workpace	3.469 (53.250)
influence_over_working_methods	46.446 (87.119)
influence_over_order_of_tasks	57.639 (77.052)
influence_over_start_end_of_workday	14.276 (35.555)
Genderfemale	-140.514*** (31.205)

Jobsharing	20.831
	(43.116)
Flexitime	311.484***
	(33.367)
Reduced_hours	-59.466*
	(35.622)
Compressed_hours	104.472***
	(38.684)
Remote_work	-363.129***
	(38.100)
Annualized_work	-306.119***
	(40.846)
Constant	1,115.204***
	(119.221)
Observations	16,183
R2	0.209
Adjusted R2	0.207
Residual Std. Error	1,804.228 (df = 16145)
F Statistic	115.327*** (df = 37; 16145)
Note:	*p<0.1; **p<0.05;

***p<0.01

Table 8: FWA and Pay regression results

Appendix H

Variable	Estimate (Coefficient)	P-value	Significant or not
Genderfemale:Jobsharing	144.796	0.103949	Not Significant
Genderfemale:Flexitime	**396.355**	**8.65e-10 *** **	**Significant**
Genderfemale:Reduced_hours	**20.569**	**0.777505**	**Significant**
Genderfemale:Compressed_hours	-93.167	0.234433	Not Significant
Genderfemale:Remote_work	**570.717**	**3.00e-15 *** **	**Significant**
Genderfemale:Annualized_work	**-158.766**	**0.079687**	**Significant**

Table 9: FWA moderation against Gender