

Can Human Capital Theory Alone Explain the Variation in the Gender Pay Gap throughout the United Kingdom? A Comparative Case Study of England, Scotland, Wales and Northern Ireland

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Human capital theory has been widely used to explain the gender wage differentials predominantly in the US. This dissertation explores the relationship between human capital and the gender pay gap in the context of the United Kingdom (UK). The paper looks at the gender pay gap variations between nations within the UK and attempts to determine whether these variations are attributable to differences in human capital alone. Past literature is examined to provide an understanding of the development of human capital theory. The critiques of feminist economists are also reviewed to evaluate the theory. The methodology is then discussed, with the key weaknesses and limitations being identified. The paper then analyses the data in an attempt to determine the cause of gender pay gap variations throughout the different countries in the UK. Finally, the dissertation concludes that human capital theory alone cannot explain the gender pay gap. The paper finds that public sector employment may be a contributory factor.

1. Introduction

Previous literature examining human capital theory and the gender pay gap has predominantly focused on the US. This study aims to explore whether the proposed relationship between human capital and pay is applicable to the United Kingdom (UK). This study examines the gender pay gap in each country to identify any disparities before exploring whether these disparities are attributable to variations in human capital.

Neoclassical economists use human capital theory to explain wage differentials. Mincer (1958) suggested that investment in human capital has an opportunity cost that must be compensated, therefore suggesting that an increase in human capital would lead to an increase in earnings. According to human capital theory, the gender pay gap is attributable to gender differences in human capital investment, thus resulting in wage differentials. The gender differences in human capital were explained by Mincer and Polachek (1974) and Becker (1991) as being due to women anticipating intermittent labour market participation as a result of their traditional role within the household. According to Becker (1991), the anticipation of intermittent participation reduces the incentive to invest in human capital as a consequence.

However, recent statistics show that more women than men invest in further education and training in the UK, yet the gender pay gap persists. Furthermore, there are noticeable differences in the gender pay gap between countries, with Northern Ireland having a significantly lower pay gap than the rest of the UK despite having lower female participation in apprenticeships and a higher fertility rate. This suggests that human capital theory is limited in its explanations of variations in the gender pay gap throughout the UK. Feminist economists have noted that traditional human capital variables explain little of the gender wage gap (Blau and Kahn, 2016) suggesting that other variables need to be considered.

This dissertation aims to find out whether human capital theory alone can explain gender pay gap variations in the UK. The following chapter will discuss the previous literature on human capital theory and the gender pay gap, before examining the feminist critique. Chapter 3 will discuss the methodology used in this dissertation and explain the potential limitations of the data used. Chapter 4 will analyse the data, before attempting to interpret whether the variables contribute towards the gender pay gap variation. Finally, this dissertation will conclude that human capital theory alone

cannot explain the gender pay gap, and that there is no clear relationship between the gender pay gap and the remaining variables: fertility, part-time employment and occupation.

2. Literature Review

This chapter will analyse previous literature to determine the relationship between human capital and pay before considering how this relationship corresponds to the gender pay gap. Following this, the chapter will then explore the feminist critique of human capital theory and alternative explanations for the persistent pay gap. The previous literature heavily focuses on this relationship in the US labour market where the theory was developed.

The notion of human capital was formally developed in the twentieth century (Burton-Jones and Spender, 2011). However, the concept can be traced back as far as Adam Smith because he already suggested that the skills acquired during education and training are capital fixed and realised in an individual (Smith, 1904). Neoclassical economists use the term 'human capital' to denote the stock of knowledge and skills that enable individuals to perform work that generates economic value (Burton-Jones and Spender, 2011). According to Schultz (1993) the term encompasses the innate or acquired abilities of individuals, where the innate abilities are considered to be genetic.

Becker (1993) described education and training as the most important investments in human capital, stating that investment in human capital is achieved through activities that affect real income by ingraining resources in people, thus suggesting a positive relationship between human capital and earnings. Human capital theory, based on neoclassical economic principles, suggests that investment in education and training leads to an increase in labour productivity and thus an increase in earnings (Rumberger, 1987). Mincer (1958) supported the notion that investment in human capital has a positive impact on earnings. He noted that productive efficiency is a function of both formal training, i.e. education, and experience. Building on the suggestion of Adam Smith, Mincer (1958) proposed that there was a need for individuals to be compensated for the cost of learning their trade, with cost referring to the inputs of time, labour and training fees. Mincer (1958) argued that investment in human capital had an opportunity cost, with that cost being earnings foregone, and that time spent in training was equivalent to a postponement of earnings to a later age, reducing the span of an individual's earning life. Consequently, under the assumption of rational choice, individuals who invest in their human capital would be expected to earn higher annual wages in order to equalise their lifetime earnings to occupations that require less investment.

Becker (1993) also recognised the positive relationship between earnings and human capital, noting that education indirectly affects earnings through its effects on knowledge and skills. A combination

of education and experience assist with the development of skills that make individuals more productive workers (Rumberger, 1987). Becker (1993) specified that observed earnings are affected by changes in the amount and rate of return on human capital. Earnings can be approximated by:

$$Y = X + rC \quad (1)$$

where Y denotes earnings, X is earnings when there is no investment, C measures the total investment costs and r is the average rate of return. From equation 1 it may be deduced that, assuming a positive rate of return, investing in education and training would be expected to lead to an increase in earnings as both are components of human capital.

Mincer (1974) supported this notion and later provided the following relationship:

$$\ln E_t = \ln E_0 + rs + \beta_1 t + \beta_2 t^2 \quad (2)$$

where earnings for an individual with t years of experience ($\ln E_t$) is a log-linear function of earnings capacity for an individual with no experience ($\ln E_0$), the return on education (where r is the rate and s is the years of schooling) and the return on labour market experience (where t denotes the year, β_1 and β_2 are the rates of return on experience). The model assumes that on-the-job training declines linearly over the lifecycle; hence log-earnings are a quadratic function of work experience (Heckman *et al*, 2008). From this equation it can be assumed that investment in education and training leads to an increase in earnings but at a diminishing rate. This equation is similar to that introduced by Becker (1993); however, it separates the human capital coefficient into education and training coefficients. Both Becker (1993) and Mincer (1974) indicate a direct relationship between human capital and earnings.

Mincer and Polachek (1974) developed the human capital function further by noting a link between gender, investment in human capital and time usage. Mincer and Polachek (1974) found that married women were less attached to the labour market than married men and consequently were less likely to participate in activities that developed labour market skills. Women who were unmarried and without children were expected to engage in continuous employment and thus invest more in their human capital. Variations in the lifetime labour market participation rate of women were found due to changes in their marital status and the number of children they had given birth to (Mincer and Polachek, 1974). This appears to suggest that fertility also contributes towards the gender pay gap.

Mincer and Polachek (1974) suggested that the discontinuity of employment of women caused deterioration in their human capital investments. Consequently, the post-school investment term in the original model was separated into consecutive sections of participation and non-participation in order of occurrence. They followed the adjusted formula:

$$\ln E_t = \ln E_0 + rs + r \sum_i a_i e_i \quad (3)$$

where a_i is the initial investment ratio and e_i is the duration of the i th period, also expressed as $(t_{i+1} - t_i)$. The simplified model assumes a constant rate of net investment throughout a given period. According to the model, a value of (ra_i) greater than zero denotes a positive net investment ratio, whereas a value of (ra_i) less than zero signifies net depreciation likely to occur during non-participation periods. This model suggests that the key cause of the pay gap is the deterioration in the level of human capital due to the discontinuity of participation in the labour market.

Becker (1991; 1993) also recognised the relationship between gender, investment in human capital and time usage, stating that the incentive to invest in human capital specific to an activity is positively related to time spent on that activity. According to Becker (1991), married women earn less than married men because women participate in the labour market considerably less than men and thus have less of an incentive to invest in labour market skills. These findings fit with the traditional division of labour by gender in the family, whereby women anticipated shorter, intermittent work lives and thus had less of an incentive to invest in human capital resulting in their lower earnings relative to men (Blau and Kahn, 2000).

Furthermore, Becker (1991) suggested the existence of biological differences in comparative advantage between men and women particularly with regards to reproduction. Consequently, Becker (1991) argued that an hour of household or market time of women is not a perfect substitute for that of men when they make the same investments in human capital. Women therefore specialise in the household sector and allocate their time to bearing and nurturing children and engaging in housework. Additionally, women invest in human capital that raises efficiency in these activities whereas men focus on increasing labour market activity (Becker, 1991). Becker (1985) also noted a clear division of labour within households, suggesting that the level of effort exhibited by women in their market jobs decreases with the more time spent on housework and childcare. This decrease in effort reduces their productivity and causes them to receive lower wages (Blau and Kahn, 2000). This appears to imply

that the role of women as child carers and homemakers results from their comparative advantage and thus influences their human capital investment decisions. Their decision not to invest in labour market skills is influenced by their intermittent labour market participation and results in their lower wages relative to men. This appears to support Mincer and Polachek's (1974) suggestion that fertility affects the pay gap due to traditional gender roles, whereby women assume childcare responsibilities.

Critics of human capital theory argue that conventional economic methods neglect the process by which gender affects and shapes other social forces and institutions (Figart, 2005). Feminist economists argue that a combination of labour market segmentation, other institutional variables and non-market factors exert considerable influences on wage disparities (Figart, 2005). Furthermore, Blau and Kahn (2016) recently noted that conventional human capital variables explain little of the gender wage gap; however, the significance of gender differences in occupation and industry in explaining the gap has remained. The Human Capital Model provides an explanation for occupational segregation with Polachek (1981) stating that occupational segregation stems from differences in lifetime labour market participation. Women who experience discontinuous employment maximise their lifetime earnings by choosing occupations with lower penalties for the depreciation of human capital during periods of non-participation (Polachek, 1981). Consequently, those women should enter predominantly female jobs where the penalty for time spent out of the labour force is less than in predominantly male jobs (Blau *et al*, 2002).

The human capital explanation of occupational segregation has been criticised by several feminist economists. England's (1982) study found no evidence to support the proposed relationship between women's choice of occupation and their labour market participation plans. England (1982) also found that, holding schooling, home time, and experience constant, women earned higher wages when employed in male dominated occupations. This suggests that the explanation of occupational segregation provided by human capital theory does not hold. Both Blau *et al* (2002) and England (2005) suggest that the cause of occupational segregation is attributable to both the demand-side and the supply-side of the labour market. England (2005) suggests the existence of a supply-side mechanism of men and women selecting gendered roles evidenced by gender differences in career aspirations and interests occurring from an early age. The demand-side of the labour market causes segregation through discrimination. Both Blau *et al* (2002) and England (2005) note the existence of discrimination in the labour market both in terms of gender stereotypes and prejudices driven by social norms.

Figart (2005) also rejected Polachek's (1981) explanation of occupational segregation stating that the gender pay gap and women's prevalence in low-paid occupations were neither productivity-based nor were they deliberate, individual choices to minimise human capital deterioration over the life cycle. Moreover, the human capital model has been criticised for its flawed underlying assumption of rational choices being made in a gender neutral environment (Lips, 2013), with Elson (1999) describing the labour market as a gendered institution due to the existence of social stereotypes about what constitutes "men's work" and "women's work".

Goldin (2014) offered an alternative explanation of the gender pay gap citing the flexibility of working hours as a key cause. According to Goldin (2014), hours of work in many professions are worth more when given at particular moments and when the hours are uninterrupted. This is a consequence of the non-linear relationship between earnings and hours worked. Goldin (2014) also noted occupational differences in the gender pay gap, stating that a flexible working pattern comes at a higher cost in certain professions. This appears to support Polachek's assertion, however, Goldin (2014) suggests that the pay gap is due to compensating differentials rather than a depreciation in human capital. A compensating differentials model attributes the gender pay gap to the costs of flexibility and demonstrates the non-linearity of earnings (Goldin, 2014). Although Goldin's suggestions may be valid, additional research is needed to identify when labour force interruptions and flexible hours are important and why they have an impact (Blau and Kahn, 2016).

In summary, the current literature on the relationship between human capital and the gender pay gap appears to be conflicting. The underlying assumption that women make rational choices about their human capital investments based on their anticipated labour market participation (Becker, 1993; Mincer and Polachek, 1974) has been criticised by feminist economists. Feminist economists have suggested that occupational segregation is the key cause of the gender pay gap, but the attempt of human capital theory to explain occupational segregation through occupational choice and anticipated intermittent participation has been dismissed (England, 1992). Flexibility regarding hours also appears to be a potential explanation, although there is little evidence to support this relationship. I will examine how these theories explain the gender pay gap in the UK labour market and look for any disparities between countries.

3. Methodology

This chapter will explain and justify the methodology used throughout the paper before discussing the validity of the data used in the results chapter. This dissertation uses comparative case study analysis to analyse whether variations in the level of human capital explain the differences in the gender pay gap in the UK. This study will compare England, Scotland, Wales and Northern Ireland - the individual nations that comprise the UK.

Literature that explains human capital theory has been explored, with alternative explanations for the gender pay gap also being discussed. The study uses higher education and apprenticeship statistics to assess whether human capital theory can explain gender pay gap variations between nations. Alternative factors behind the differences are then explored. The factors include occupation, fertility and part-time employment.

A case study is defined as being an empirical inquiry that examines a modern-day phenomenon within its real-life context (Yin, 2003). Case studies can be used to motivate a research question, to examine existing theory and to demonstrate how theory works in practice (Siggelkow, 2007). This is an appropriate method for this paper because its main aim is to determine whether the relationship between human capital and pay, asserted by human capital theory, provides an explanation for the discrepancies in the gender pay gap throughout the UK.

The aim of a comparative case study is to determine differences, similarities or trends across the cases (Durepos *et al*,2010). Furthermore, comparative case studies assist with both the evaluation of general causal relationships and the development of in-depth, contextual understanding (Durepos *et al*,2010). A comparative case study is an appropriate method because this paper aims to examine variations in the gender pay gap within the UK and assess whether theory provides a valid explanation for these differences.

According to Durepos *et al* (2010), the case studies selected for comparison need to exhibit enough commonality to permit comparison, therefore, comparing all of the nations within the UK is an appropriate choice due to their notable similarities. All of the nations within the UK have remained interdependent to some extent, despite the devolution of some Parliamentary powers (Brannen *et al*, 1999). This interdependence is demonstrated by the structure of the UK political system, whereby each of the individual countries is constrained by factors such as UK fiscal policy and UK labour market

institutions (Brannen *et al*, 1999). Furthermore, all of the education systems share similar key features including: the structure of education institutions and the timing of certification.

Although there are key similarities between the four nations, there are also notable differences that need to be explored further. There are noticeable variations in the gender pay gap between countries. Northern Ireland has the lowest gender pay gap in the UK, well below the pay gap of the remaining individual countries and the UK average. There are also differences in the cost of tertiary education throughout the countries. These differences have occurred due to the devolution of power over some policy areas, with education being one of those areas, and demonstrate divergence in values and ideologies between the devolved administrations (Gallacher and Raffe, 2012). As human capital investment decisions are believed to be influenced by the cost of the investment (Becker, 1991 and Mincer 1974), disparities in human capital investment between nations would be anticipated, with these disparities leading to gender pay gap variations.

The study will examine the suggested relationship between human capital and the gender pay gap. The use of tables and figures will help to illustrate variations between nations.

3.1. Measurement of Earnings and the Gender Pay Gap Statistics

The gender pay gap is calculated using statistics taken from the Annual Survey of Hours and Earnings (ASHE). The difference between the earnings of men and women is calculated and then expressed as a proportion of male earnings. The median weekly earnings values excluding overtime are used in all of the calculations. Median values can be more reliable because they are unaffected by extreme values. The data is accumulated through an annual survey of businesses. Employers are asked to provide information on employees who fall within the sample. This covers approximately 180,000 jobs from around 60,000 responding businesses. The dataset observes the same employees in each year that they are in employment.

The survey relies on the responses from employers; this means that the validity of these statistics would be affected by low response rates. A key limitation is that the statistics only cover employees; consequently, the self-employed are excluded from the data set meaning that the sample may not be a true representation of the population. The timeliness of the data provided is also a potential limitation. There is a lag of 6 to 7 months between the ASHE reference period and its publication meaning that the data provided is not up-to-date. The exclusion of overtime from the statistics may also limit the accuracy of the estimated pay gap. Furthermore, changes in the methodology over time

have made the results across all years incomparable. The data was only available from 1997 onwards, this has therefore determined the timespan of the study, and has limited the ability to study earlier periods.

3.2. Measurement of Higher Education and Occupation Statistics

The data for percentage of the population with a degree, and the percentage of females and males in each occupation were taken from the Annual Population Survey (APS) produced by the Office for National Statistics (ONS). The APS is a continuous survey of UK households that uses data from the Labour Force Survey (LFS) to provide information on essential social and socio-economic variables at local levels. (ONS, 2012a). The APS uses a large random sample to provide estimates of population characteristics over the previous 12 months. Although the APS has a large sample size, its incorporation of LFS data reduces the validity of the estimations provided. The LFS had a response rate of 50% for the second quarter of 2016 (ONS, 2016a). The relatively low response rate means that the estimations are based on a smaller sample size. This means that the estimations made based on the sample are not necessarily an accurate representation. Additionally, the LFS may be subject to sampling errors. As both the APS and LFS are survey of individuals, the responses provided are subjective; therefore, a small bias may arise if individuals fail to give accurate responses. Furthermore, the data for both variables was only available from 2004 onwards, thus limiting the comparison period.

3.3. Measurement of Apprenticeship Statistics

i) England

The apprenticeship statistics for England were obtained from the Further Education (FE) data library, a statistical release provided by the Education and Skills Funding Agency (ESFA) and the Department for Business, Innovation and Skills (BIS). The data is acquired through the Individualised Learner Record (ILR). The ILR is used to collect data about learners in the further education and skills sector. Training organisations that deliver apprenticeships funded by the Skills Funding Agency (SFA) or within SFA contracts are asked to send details. Other providers are invited to send details voluntarily.

ii) Wales

The apprenticeship statistics for Wales were taken from the Lifelong Learning Wales Record. Information is only required for those undertaking apprenticeships that are partially funded by the Welsh Government. This means that those undertaking apprenticeships funded entirely privately are not included in the statistics.

iii) Scotland

Skills Development Scotland (SDS) provides apprenticeship statistics for Scotland. All data is entered and maintained by organisations contracted with SDS to deliver apprenticeships as part of the Modern Apprenticeships Programme. Apprenticeships provided outside of SDS contracts are not included in the statistics.

iv) Northern Ireland

The Department for the Economy provides apprenticeship statistics for Northern Ireland. The data is provided through the Client Management System. It is difficult to determine the validity of the data because little information is provided about how it is collected and whether all apprenticeship providers are required to provide details.

There is the risk that statistics provided are an underrepresentation of the number of apprenticeships started in each year. Apprenticeship providers that are not required to provide information may choose not to meaning that some apprentices go unrecorded. Furthermore, the data for Scotland was only available from 2008, thus limiting the comparison period for all countries. Data for the UK as a whole was unavailable, meaning that there is no national average to base comparisons on.

3.4. Measurement of Fertility Statistics

The Total Fertility Rate (TFR) is defined as the average number of children that a cohort of women would each have if they experienced the age-specific fertility rates of that specific year throughout their childbearing lives. The TRF helps to measure the current intensity of childbearing.

Fertility statistics for England were taken from the ONS and statistics for Wales were taken from StatsWales. The data is based on registrations provided by the General Register Office for England and Wales. The National Records of Scotland (NRS) provided fertility statistics for Scotland based on information held by the Registrar General for Scotland. Statistics for Northern Ireland were taken from the Northern Ireland Research and Statistics Agency (NISRA) based on information held by the General Register Office for Northern Ireland. All births in the UK must be registered within 6 weeks of the child being born; however, births of UK citizens abroad are not required to be registered in the UK. Births abroad must be registered according to local laws, but there is no obligation to also register them in the UK. This means that the statistics may be an underrepresentation of the true total fertility rate because some births are omitted.

3.5. Measurement of Part-time Employment Statistics

Employment statistics were taken from the Labour Force Survey produced by the ONS. The data represents those aged 16 to 64. As aforementioned, the low response rate and the subjective nature of the survey may have caused the data to be an inaccurate representation of the population. Furthermore, the retirement age has increased in more recent years meaning that individuals over the age of 64 are omitted from this data. This may mean that the statistics are an underrepresentation of the true population.

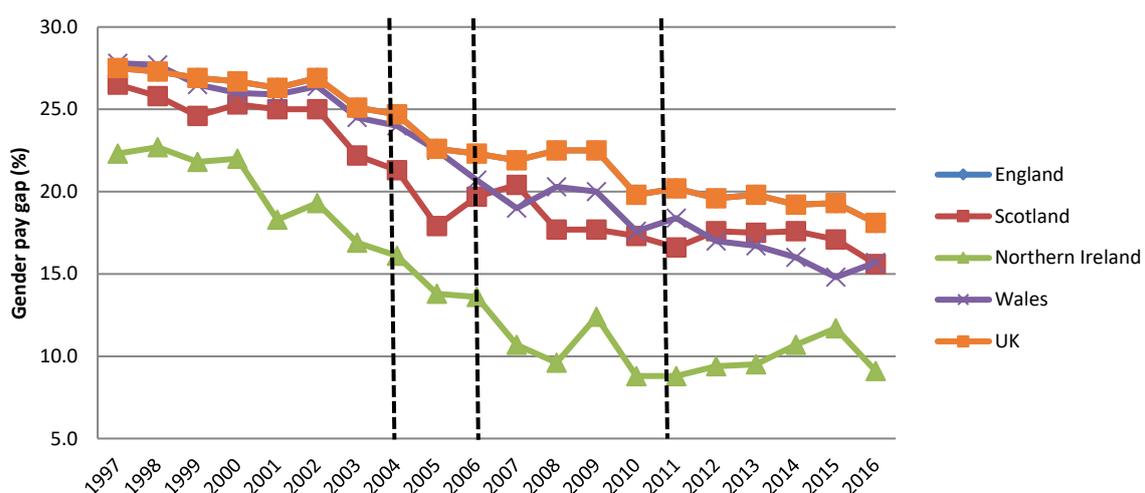
4. Results

This chapter will provide a summary of the gender pay gap data for the UK and its individual nations before examining the relationship between the pay gap and human capital. The chapter then analyses the data for each of the remaining factors to determine the key explanation for variations in the gender pay gap between countries.

4.1. Gender Pay Gap

Figure 1 shows the gender pay gap for all employees by country between 1997 and 2016. The dashed lines signify discontinuities in the estimates resulting in the incomparability of results across the whole period. England has the highest gender pay gap, throughout all of the periods with the peak being a pay gap of 27.7% in 1998. The gender pay gap for England in 2016 was 18.9%, slightly higher than the UK average of 18.1%. England matches the UK's trend the most closely; whereas Scotland and Wales appear to follow a similar trend, with a pay gap slightly lower than the whole UK. The gender pay gaps reported in Scotland and Wales in 2016 were 15.6% and 15.7% respectively. Northern Ireland has a noticeably lower gender pay gap throughout all periods. According to the Scottish Parliament Information Centre (2017), this is partly due to more women working in the public sector which has relatively high pay and a relatively low pay gap. The proportion of women working in the public sector in Northern Ireland is higher than the UK average.

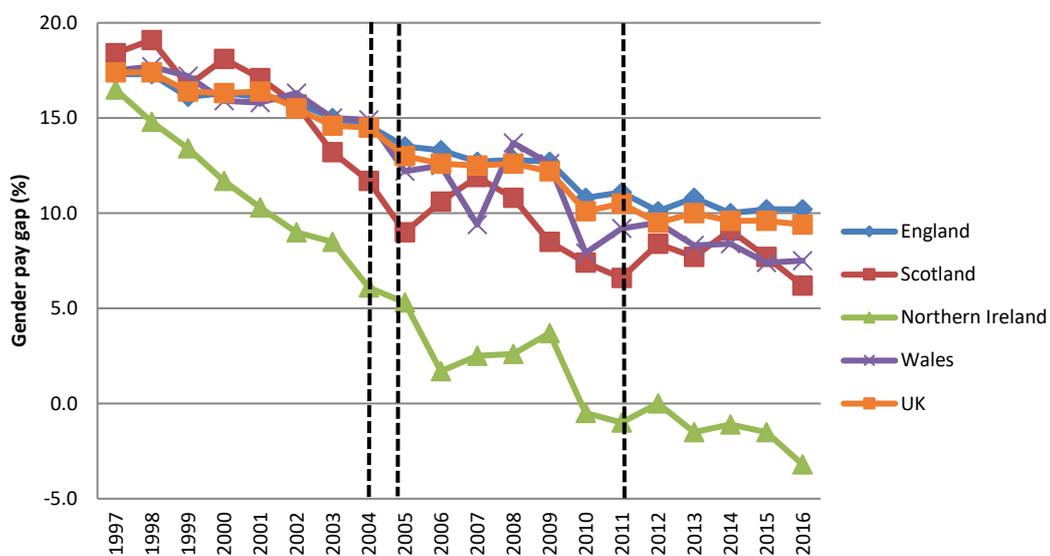
Figure 1. Gender Pay Gap for all Employees by Country, April 1997-2016



Source: Data taken from ONS (2016b).

Figure 2 shows the gender pay gap by country for full-time employees only. The gender pay gap is lower for full-time employees in all countries compared to the gap for all employees. Northern Ireland had the lowest pay gap throughout the period, achieving a negative gender pay gap from 2010 onwards and a pay gap of -3.2% in 2016. The negative pay gap indicates that women earned more than men which, as aforementioned, is partly attributable to more women working in the public sector (Scottish Parliament Information Centre, 2017).

Figure 2. Gender Pay Gap for Full-time Employees by Country, April 1997-2016



Source: Data taken from ONS (2016b).

The gender pay gap estimations for all employees and full-time employees vary because estimations are based on median incomes. More women work part-time than men, and the earnings of part-time employees tend to be less than full-time employees (ONS, 2016c). Women are therefore more likely to receive lower rates of pay because the proportion of women working part-time tends to be higher than that of men. This means that when all employees are considered there are more lower-paid women than men, resulting in a higher gender pay gap. This higher gender pay gap is usually due to a decrease in the female median wage as a consequence of including part-time employees (ONS, 2016c). This makes it difficult to establish the true size of the gender pay gap due to variations in the estimations and the use of the median income when comparing all workers.

4.2. Higher Education

Table 1 shows university tuition fees by country for the 2013/14 academic year. There are clear variations depending on the student's home nation and where they choose to study. Students from

England face the highest tuition fees in all parts of the UK, with fees of up to £9000. All other countries have a policy of reduced fees for students that choose to study in their home nation, with Scotland providing free university tuition to Scottish students. These variations may reflect differences in the devolved administrations' education policies. Tuition fees have changed since 2013/14, with Scotland still providing free tuition to Scottish students, whilst students from the other countries have faced slight increases.

Table 1. Tuition fees by country (applicable for 2013/14)

Student's home nation	Studying in England	Studying in Scotland	Studying in Northern Ireland	Studying in Wales
England	Up to £9000	Up to £9000	Up to £9000	Up to £9000
Scotland	Up to £9000	Free	Up to £9000	Up to £9000
Wales	Up to £9000	Up to £9000	Up to £9000	Up to £3575
Northern Ireland	Up to £9000	Up to £9000	Up to £3805	Up to £9000

Source: Data taken from: Student Loans Company (2016), Student Finance Wales (2013) and House of Commons Library (2016).

Table 2 shows the number of university applicants offered a place at a higher education institution in the UK. The number of applicants applying to university has consistently increased since 2010, with successful female applicants exceeding the number of successful male applicants. The Higher Education Policy Institute (2016) suggested that the dominance of women in the school workforce has contributed towards this gender gap in further education. However, there is no evidence to suggest whether this theory holds in practice.

There has been an increase in the total number of successfully placed applicants, despite the increase in university tuition fees for students in England, and those studying outside of their home nation. This

appears to suggest that cost alone does not influence the decision to invest in human capital. However, this table does not provide information on which country the students are from or where they chose to study, meaning that the impact of university tuition fees cannot be assessed accurately.

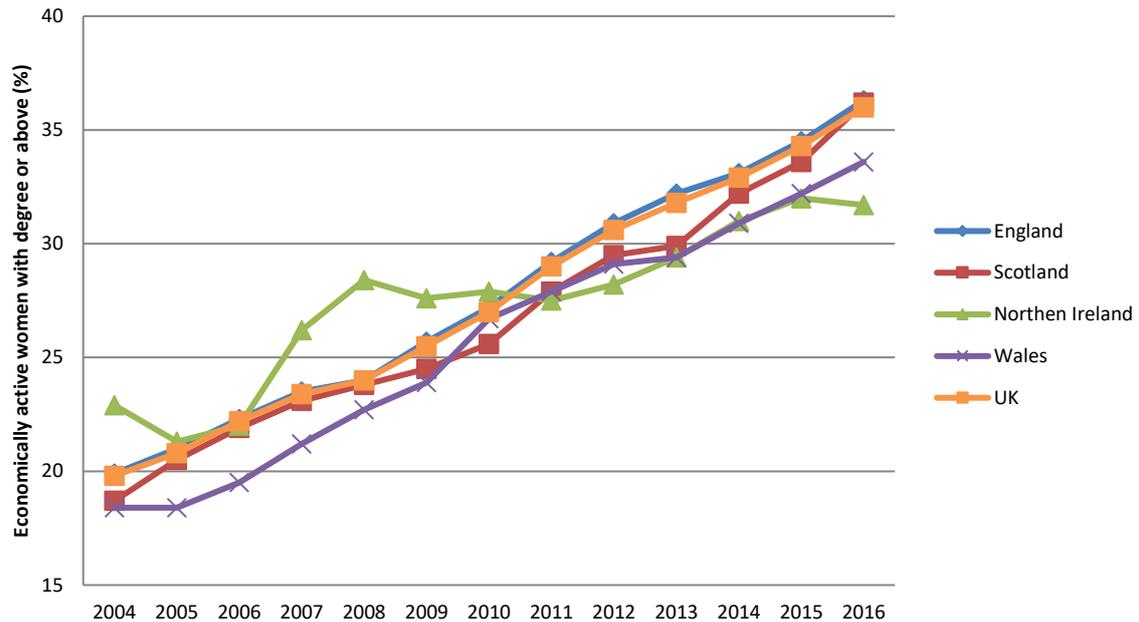
Table 2. Number of applicants placed for entry into higher education in the UK

Year	Men	Women
2010	188,460	234,835
2011	192,385	237,490
2012	192,955	225,680
2013	180,350	240,445
2014	197,320	249,885
2015	201,835	261,570
2016	201,605	263,530

Source: Data taken from UCAS (2016, 2017).

Figure 3 shows the percentage of economically active women with a degree and equivalent or above in each country between 2004 and 2016. There has been a general upward trend in all countries throughout the period. There was a steep increase in the percentage of female graduates in the population in Northern Ireland between 2006 and 2007, where figures rose from 22% to 26.2%. It is unclear why this sharp increase occurred; however, it may have been due to increases in the net migration rate. Northern Ireland had the highest net migration rate of any other UK region in 2006-7 (Northern Ireland Assembly, 2016). There may have been an increase in the proportion of graduates in the population as a result of net migration; however, there is little evidence to confirm whether this is the case.

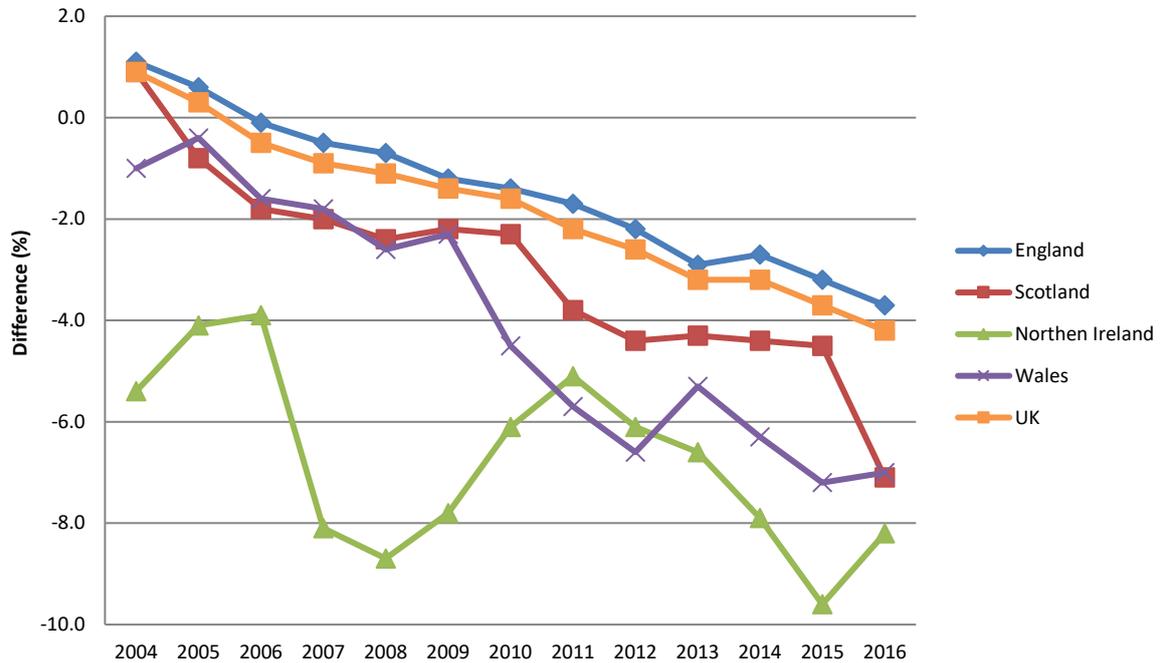
Figure 3. Percentage of Economically Active Women with a Degree and e Equivalent or above, 2004-2016



Source: Data taken from ONS (2016d).

Figure 4 shows the difference between the percentage of economically active male and female graduates by country. Northern Ireland had the largest gender gap throughout the whole period, reaching a peak of -9.6% in 2015, meaning that the percentage of economically active women in the labour market was 9.6% higher than that of men. The percentage of economically active women in all countries has been higher than that of men since 2006, with the difference between men and women in England being the smallest throughout the whole period. As aforementioned, there is little explanation as to why this difference has occurred.

Figure 4. Difference between the Percentage of Economically Active Males and Females with a Degree and Equivalent or above, 2004-2016



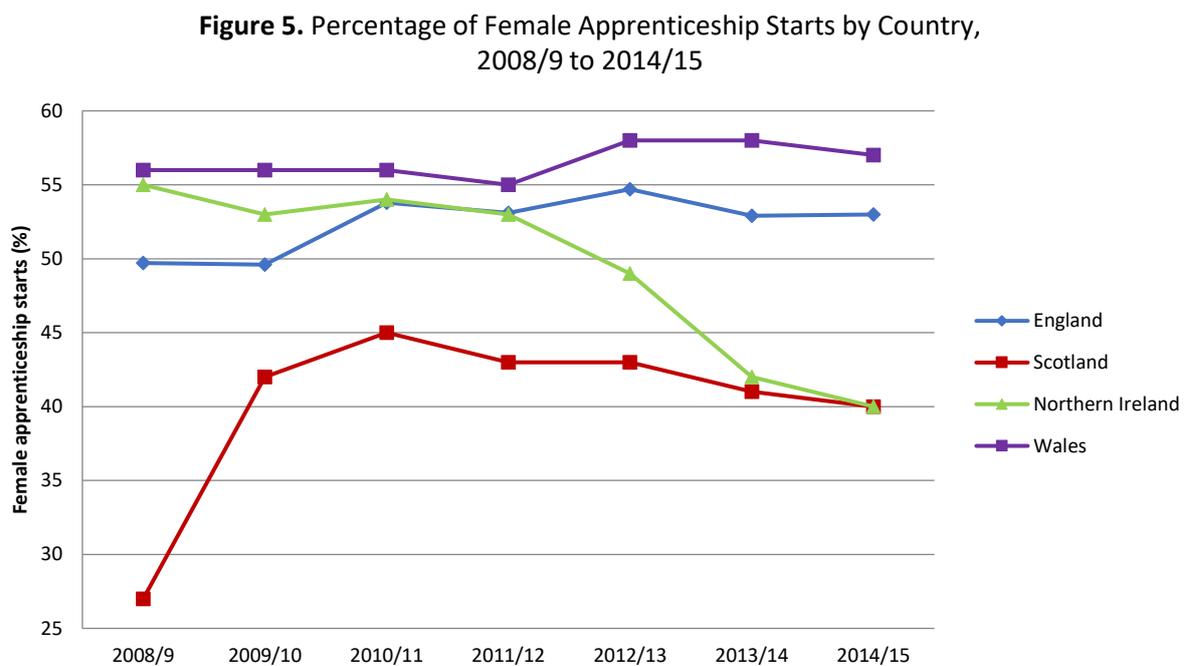
Source: Data taken from ONS (2016d).

The large gender gap in educational attainment in Northern Ireland suggests that investment in human capital in the form of university education can explain the gender pay gap for full-time employees. The data supports the relationship between investment in human capital and earnings because women earn more and a higher proportion of women than men are university educated in Northern Ireland. However, because there is a higher proportion of women with a degree or above in all countries, the data suggests that other factors must also explain gender pay gap variations in the UK. The consistent increase in the percentage of graduates with a degree in each nation suggests that disparities in the cost of tuition fees do not lead to a significant variation in the decision to invest in university education.

Although there was a higher percentage of economically active women than men in all nations in more recent years, a proportion of these women were unemployed and thus did not contribute towards the gender pay gap statistics. The term 'economically active' refers to both those who are employed, and those who are unemployed - out of work but actively seeking working (ONS, 2017a). To gain a true understanding of the relationship between human capital and the gender pay gap, the percentage of employed women with a degree or above would need to be compared with that of men.

4.3. Apprenticeships

Figure 5 shows the percentage of apprenticeships started each year by females between 2008/9 and 2014/15. There is a noticeable difference between all of the countries. Wales and England had the highest percentage of females starting apprenticeships throughout the whole period, with women accounting for 57% and 53% of apprenticeship starts in 2014/15 respectively. The proportion of women starting apprenticeships in both England and Wales was consistently higher than that of men. Scotland had the lowest percentage of women starting apprenticeships throughout all periods. There was a steep increase in the percentage of female apprenticeship starts in 2009/10; this may have been due to the introduction of new apprenticeship frameworks and the reintroduction of funding for older apprentices (Audit Scotland, 2014), however there is limited evidence to suggest whether this was the cause. The percentage of female apprenticeship starts in both Scotland and Northern Ireland was 40% in 2014/15, the lowest out of all of the countries compared.



Source: Data taken from: BIS (2016), Department for the Economy (2016), SDS (2009, 2012a, 2012b, 2012c, 2013, 2014, 2015) and StatsWales (2016).

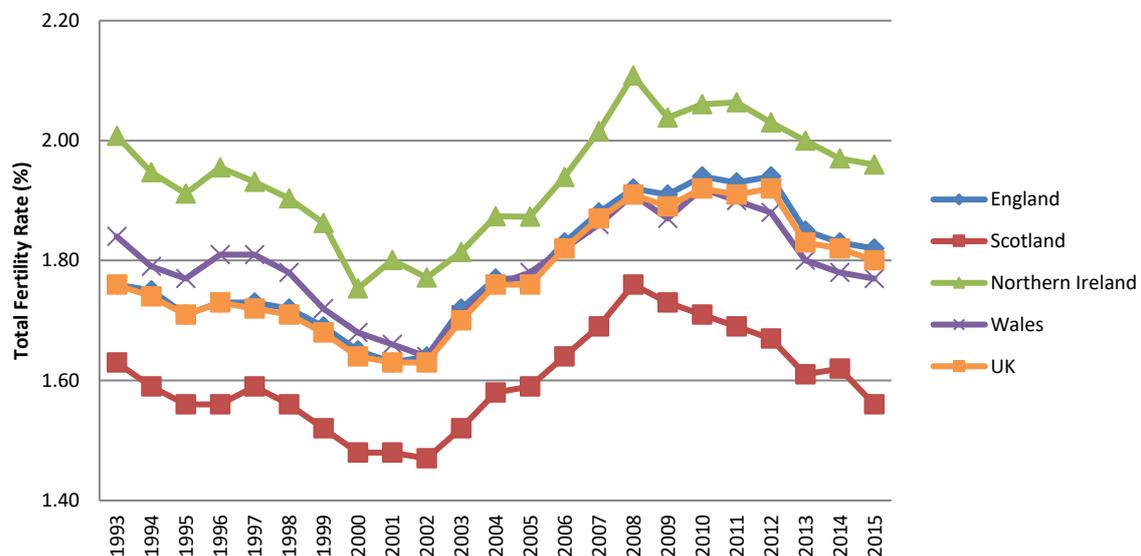
The proportion of female apprenticeship starts in Northern Ireland declined from 2011/12 to 2014/15. This decline is largely due to funding cuts in the provision of apprenticeships for people over 25. Funding of apprenticeships for those aged 25 and over was halved from September 2011 (BIS, 2013). The funding cuts mainly affected female apprentices, with the majority of apprentices over 25 being women. Women comprised 71% of the apprenticeships started by those aged 25 and over in 2008/9 (Department for the Economy, 2016).

The data further suggests that human capital theory alone cannot explain the gender pay gap variations. Women outnumber men in terms of apprenticeship starts in both England and Wales, but the gender pay gap in both of those countries still persisted. Furthermore, Northern Ireland had the lowest gender pay gap and the lowest proportion of female apprenticeship starts in 2015. This suggests that other factors determine the gender pay gap.

4.4. Fertility

Figure 6 shows the total fertility rate (TFR) by country between 1993 and 2015. There was a decline in the fertility rate in all countries between 1993 and 2000. The TFR in all countries began to increase between 2002 and 2008, where it peaked in Northern Ireland and Scotland with rates of 2.11 and 1.76 respectively. The rates began to decline again from 2009 onwards; this may have been due to the financial crisis. Scotland had the lowest fertility throughout the whole period, well below the UK average, with a TFR of 1.56 in 2015. Northern Ireland consistently had the highest fertility rate, with a TFR of 1.96 in 2015.

Figure 6. Total Fertility Rate in the UK by Nation, 1993-2015



Source: Data taken from ONS (2016e), NISRA (2016), NRS (2016) and StatsWales (2016b).

Variations in the TFR across countries may be explained by disparities in religion throughout the UK. Northern Ireland is a more religious country, with 82.3% of the population stating their religion as Christian according to the 2011 census (NISRA, 2012). Of the population purporting to be Christians, 40.8% were Catholic. Although Christianity is the largest reported religion in England and Wales

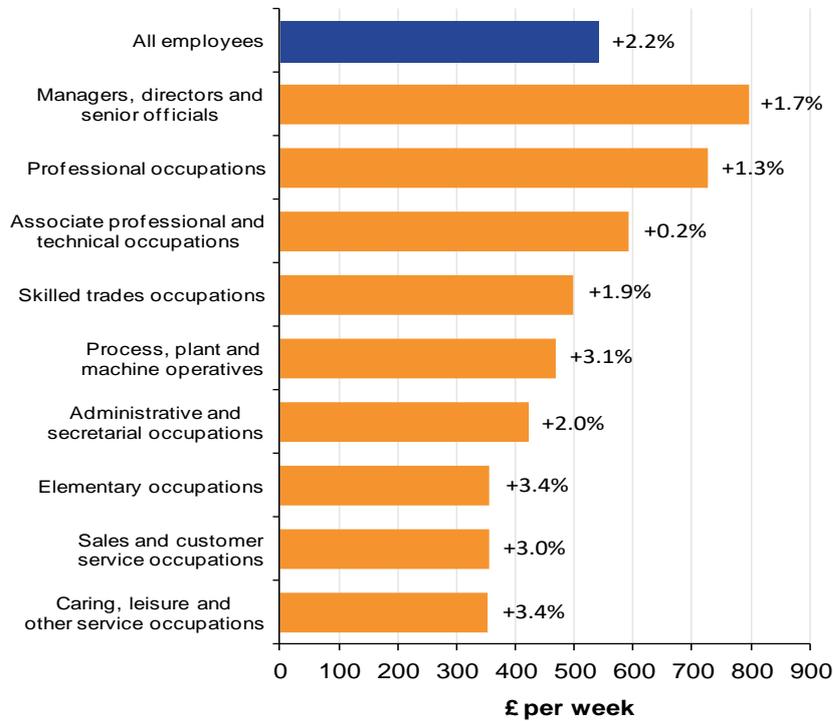
(53.9%), 25.1% of the population reported no religion in the 2011 census (ONS, 2012b). Scotland was the least religious country out of all nations, with 53.8% of the population identifying as Christian and 36.7% purporting to have no religion at all (NRS, 2013). McGregor and McKee (2016) noted that religious groups, particularly Catholics, experienced higher fertility rates. The higher fertility rates of Catholics were attributable to the pro-birth position of the church (McGregor and McKee, 2016). This may explain why Northern Ireland has the highest TFR.

This trend does not support the relationship between investment in human capital and traditional gender roles proposed by Becker (1991) and Mincer and Polachek (1974), as figures 4 and 5 show. There are higher percentage of economically active women with a degree in all of the countries, with the difference between men and women being the greatest in Northern Ireland despite the high TFR. Furthermore, Northern Ireland has the lowest gender pay gap for all employees, further suggesting that fertility does not have a notable impact on the gender pay gap.

4.5. Occupational Segregation

Figure 7 shows the median full-time earnings and growth in earnings by occupation in 2016, and table 3 shows the percentage of employed women in the three lowest paid occupations, with those being: elementary, caring, leisure and other services and sales and customer services. England and Scotland had a lower percentage of women working in these occupations when compared to Northern Ireland and Wales. The percentage of women in Northern Ireland working in these occupations was consistently higher than the UK average.

Figure 7. Median Full-time gross Weekly Earnings and Percentage Change from Previous Year, by Major Occupation Group, UK, April 2016



Source: ONS (2016f). Note that results are provisional.

Table 3. Percentage of Employed Females Working in the Three Occupations Lowest Paid Occupations 2016

Occupation	England	Scotland	Northern Ireland	Wales	UK
Elementary	10.7%	10.2%	11%	11.1%	10.7%
Caring, Leisure & Other	15.7%	16%	18%	18.1%	15.9%
Sales & Customer Service	16.8%	16.6%	18%	16.2%	16.8%

Source: Data taken from ONS (2016g).

Furthermore, there was a higher percentage of women than men working in the three lowest paid occupations. The percentage of women in each of the highest paying occupations was the lowest in Northern Ireland. The proportion of men working in the highest paying occupations tended to be higher than that of women excluding professional occupations where the percentage of women

working in these occupations was higher across all countries. This appears to suggest that the proposal of occupational segregation as a key explanation of the gender pay gap (Blau and Kahn, 2016) is limited. The fact that a higher proportion of women are employed in these typically low paying occupations may explain why the gender pay gap persists, but it does not explain variations in the size of the gap across countries. It would be expected that Northern Ireland would have the lowest percentage of women working in the low paid occupations, and the highest percentage of women working in the high paying occupations which is not the case. As the gender pay gap for full-time employees is negative in Northern Ireland, it would also be expected that the proportion of women working in high paying occupations would exceed that of men; however, this is also not the case.

The fact that the low paying occupations had the highest growth in earnings from the previous year may explain why the gender pay gap in the UK has narrowed. However, due to the unavailability of statistics on the median weekly earnings by occupation for each individual country, it is difficult to assess whether these findings are applicable to each country. From using the UK average earnings statistics, the data suggests that occupational segregation may not significantly impact the gender pay gap.

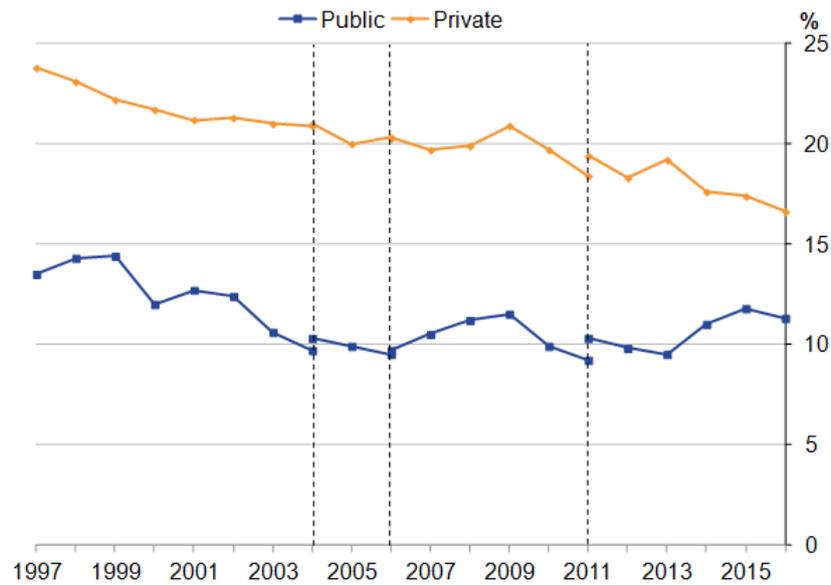
As aforementioned, according to Scottish Parliament Information Centre (2017), the negative gender pay gap in Northern Ireland may be partly attributable to more women working in the public sector than men, with the public sector receiving higher pay due to earnings being less variable than the private sector (ONS, 2016f). Figure 8 shows the gender pay gap for the public and private sector in the UK. The gender pay gap in the public sector was noticeably lower than the private sector in all years, with the provisional public sector gap being 11.3% in 2016 compared to 16.6% in the private sector.

Figure 9 shows the percentage of women employed in the public sector by country. Northern Ireland and Wales had the highest percentages of women working in the public sector throughout all periods. The percentage of women employed in the public sector was higher than that of men in all countries, with the largest variations between sexes occurring in Northern Ireland and Wales.

This supports the suggestions that the sector of employment has an impact on the gender pay gap. The lower gender pay gap in the public sector, combined with higher female employment and better pay appears to have contributed to the negative gender pay gap in Northern Ireland. However, Wales also had similar levels of female employment in the public sector but maintained a positive gender

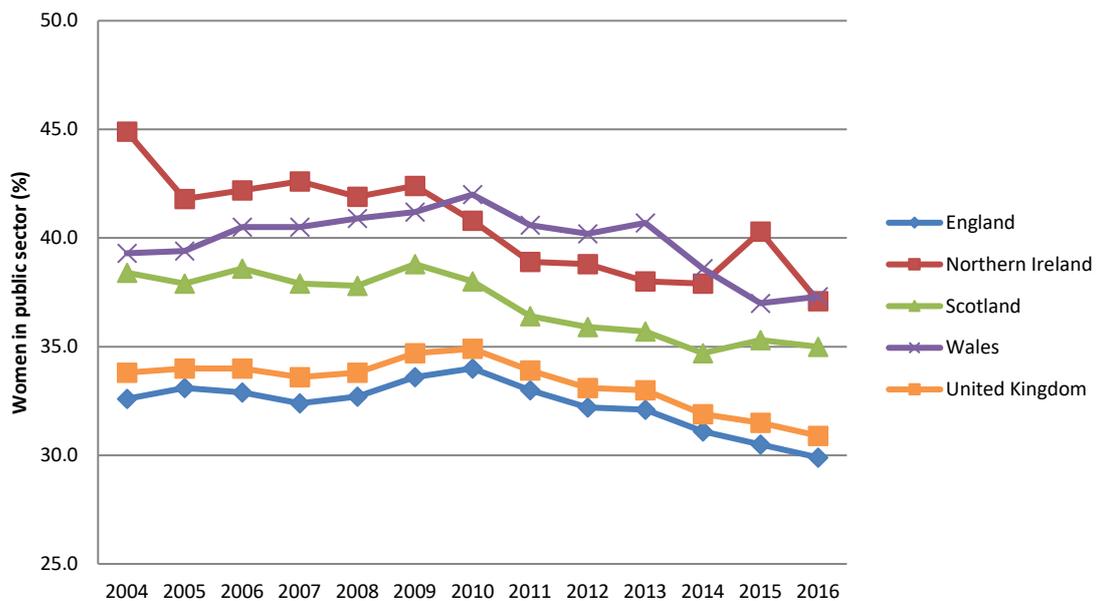
pay gap, suggesting that other factors have caused variations in the pay gap across countries. As the data on the pay gap by sector is only available at the UK level, it is difficult to establish whether the sector pay gap is applicable to each country.

Figure 8. Gender Pay Gap for Median Full-time Hourly Earnings (excluding overtime) for Public and Private Sectors, UK, April 1997 to 2016



Source: ONS (2016f). Note dashed lines reflect discontinuity in data.

Figure 9. Percentage of Women Employed in the Public Sector, 2004-2016

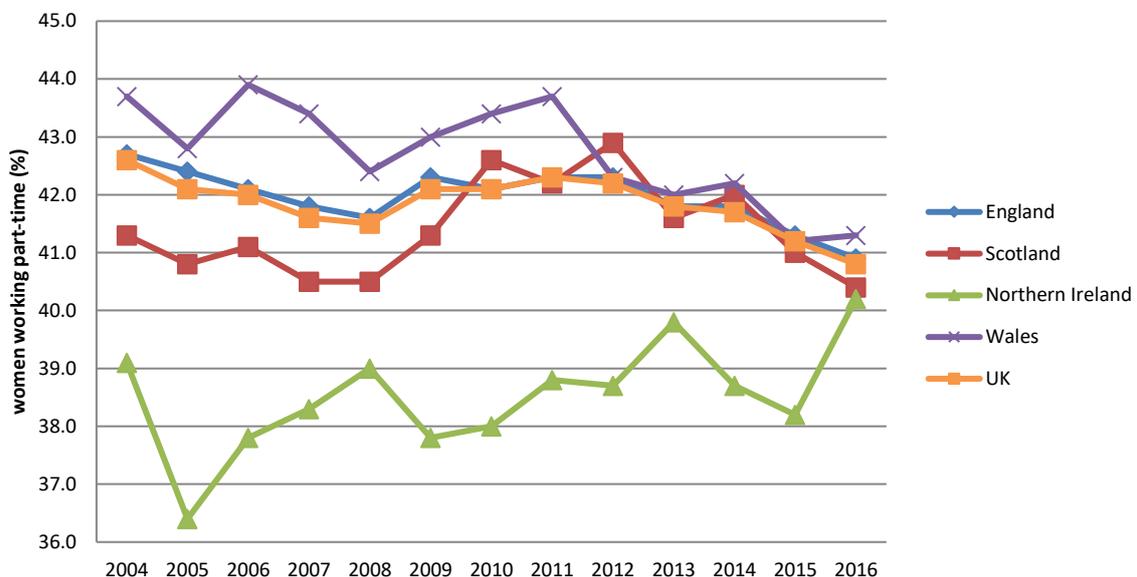


Source: Data taken from ONS (2016h).

4.6. Part-time Employment

Figure 10 shows the percentage of women in employment working part-time by country. Northern Ireland had the lowest percentage of women working part-time across the whole period, with the percentage increasing to 40.2% in 2016. The percentage of men working part-time was considerably lower in all countries throughout the whole period. The existence of traditional gender roles, whereby women assume caring and household responsibilities, may explain these gender differences. According to Bryson *et al* (2013) the idea that mothers should assume the primary care role remains. This is achieved through staying out of the labour market altogether or working part-time (Bryson *et al*, 2013).

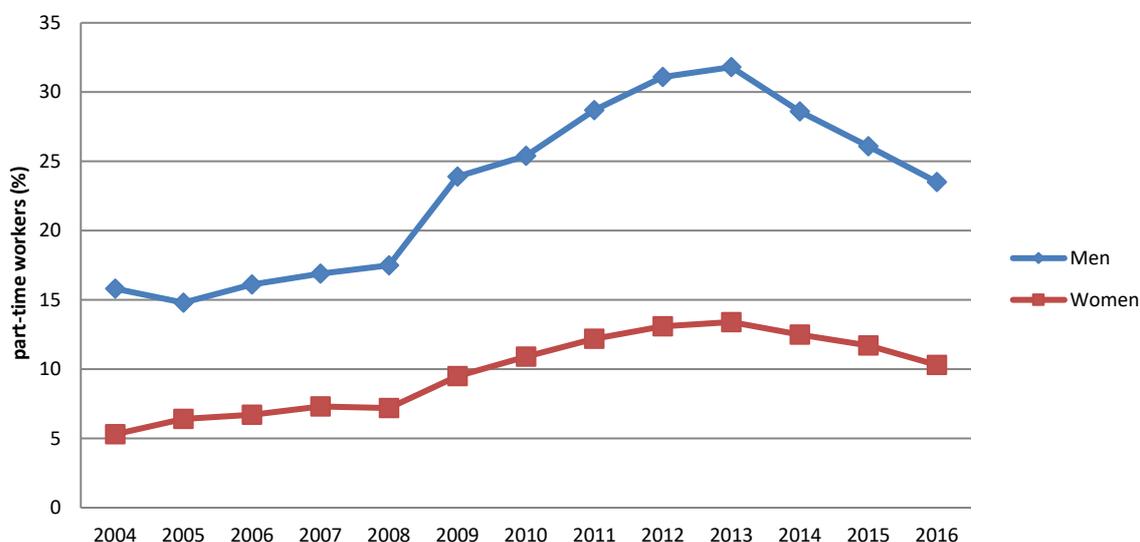
Figure 10. Percentage of Women Aged 16-64 in Employment Working Part-Time, 2004-2016



Source: Data taken from ONS (2016i).

The low percentage of women working part-time in Northern Ireland may explain the gender pay gap variation in the UK. According to Goldin (2014), the flexibility of working part-time comes at a cost, with that cost being lower earnings. Goldin (2014) suggests that part-time employment is a choice, with more women choosing to work part-time than men. Figure 11 demonstrates this suggestion by showing the percentage of male and female part-time workers who could not find a full-time job. The percentage of women seeking full-time work in the UK is lower than that of men throughout the whole period, despite a higher proportion of women working part-time than men. This supports the suggestion that part-time work is taken out of choice, however, because data was only available for the UK, it is difficult to determine whether this is the case for each of the individual countries.

Figure 11. Percentage of Part-time Workers who Could not Find Full-time Job in the UK by Gender, 2004-2016



Source: Data taken from (ONS 2017b, 2017c).

As less women work part-time in Northern Ireland than the rest of the countries, the lower gender pay gap may be attributable to this. Women forego the flexibility of working part-time and thus enjoy higher earnings to compensate for this. However, the percentage of women working part-time in Northern Ireland between 2004 and 2016 tended to increase whilst the gender pay gap for all employees continued to fall. This suggests that part-time employment has not greatly impacted the gender pay gap in Northern Ireland because the changes in part-time employment were not reflected in the gender pay gap for all employees.

Whilst the percentage of women in part-time employment increased in Northern Ireland, the opposite occurred in the remaining countries, with the percentage of part-time employed women declining during the period. The gender pay gap for all employees also decreased for all countries during the same period. These results appear to support the relationship between part-time employment and the gender pay gap; however, it is unclear whether the relationship is causal or merely correlation. The cause of the variation in female part-time employment between countries is unclear, and the lack of correlation between part-time employment statistics and the gender pay gap in Northern Ireland makes it difficult to establish whether the suggested relationship holds.

5. Conclusion

The aim of this dissertation was to assess whether human capital theory alone can explain gender pay gap variations throughout the UK. This has been realised through the examination of previous literature and a case study method to illustrate how the theory applies in reality. From the results presented in the previous chapter, it can be concluded that other factors have contributed towards the varying gender pay gap throughout the UK. Human capital theory alone cannot explain the variation.

Statistics showed similar levels in higher education participation for women in all countries despite varying education policies. Furthermore, although Northern Ireland had fewer women starting apprenticeships, the gender pay gap remained the lowest in the UK throughout the comparable period. There also appeared to be no clear relationship between the fertility rate and the pay gap, despite neoclassical theory suggesting its influence on female labour market participation. There appeared to be no clear relationship between fertility and part-time employment, with Northern Ireland having the highest TFR and the lowest percentage of women in part-time employment despite the neoclassical suggestions of traditional gender roles. The low proportion of women in part-time employment may have contributed towards Northern Ireland's low gender pay gap; however, there was no clear relationship between the two variables. There was also no clear relationship between occupational segregation and the gender pay gap, despite the data suggesting that women tend to be confined to lower paying jobs. The higher proportion of women working in the public sector in Northern Ireland appears to be a key explanation for its notably lower gender pay gap.

There were some limitations in the data that may have impacted the accuracy of this study. Discontinuities in gender pay gap statistics have made it difficult to determine any long-term trends within the nations. Furthermore, the unavailability of individual country data for some variables has limited the accuracy of conclusions. The unavailability of data for all variables across the whole comparison period has also limited this study. Further analysis of the pay gap for public and private sector employees, median weekly earnings and the percentage of part-time workers seeking full-time employment would be needed for each country in order to draw more accurate conclusions. Additionally, the gender pay gap by age in each country should be explored to assess whether the rate is constant across all ages, or whether it changes as individuals get older and acquire more human capital. Analysis of the disparities at a regional level may also help to understand the gender pay gap variation.

This study adds value by analysing human capital theory and the gender pay gap in the context of the UK. Previous literature focuses heavily on the US labour market. Furthermore, comparative case studies of the four nations within the UK are rare. It is useful to understand the differences between nations and why they persist. This study attempts to give an insight into the current situation. Policymakers need to understand the causes of any variations in the UK in order to implement effective policies.

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