NEVIN ECONOMIC RESEARCH INSTITUTE

Working Paper Series

How are we unequal?

The adjusted gender pay gap in Northern Ireland

Lisa Wilson
Ciara O'Gorman

NERI Working Paper Series No. 73
March 2023

For more information on the NERIworking paper series see:
www.NERInstitute.net

When citing this report, please use the following wording:

Wilson, L. and O'Gorman, C. (2023), *How are we unequal? The adjusted gender pay gap in Northern Ireland,* NERI Working Paper Series, NERI WP 2023/N0 73, Belfast: NERI.

The authors gratefully acknowledge helpful feedback from a number of reviewers. The usual disclaimer applies. All correspondence to lisa.wilson@nerinstitute.net.

This working paper and any associated materials are available online at:
www.nerinstitute.net

NERI

31/32 Parnell Square
Dublin 1
Phone +353 1 889 7722

45-47 Donegall Street
Belfast BT1 2FG
Phone + 44 28 902 46214

info@NERInstitute.net
www.NERInstitute.net

@NERI_research

HOW ARE WE UNEQUAL?
THE ADJUSTED GENDER PAY GAP IN NORTHERN IRELAND

Lisa Wilson (NERI) Nevin Economic Research Institute, Belfast.
Ciara O'Gorman (NERI) Nevin Economic Research Institute, Dublin.

Keywords:. : GPG, gender inequality, earnings, Northern Ireland, adjusted gender pay gap.
JEL Codes: J01, J16, D30, Z13.

ABSTRACT
The gender pay gap is an issue of continuing concern and debate within policy and academic circles. There is a limited number of empirical studies, however, which have been concerned with understanding the gender pay gap in Northern Ireland. It is this gap in knowledge which this paper is concerned. This paper follows on from a previous paper which examined the unadjusted (raw) gender pay gap in Northern Ireland and the Republic of Ireland (Wilson, 2020). It seeks to examine and explain the nature of the gender pay gap in Northern Ireland and the extent to which different personal/family and job-related characteristics *both* drive and reduce differences in the earnings of males and females.

Using data from the Understanding Society survey for Northern Ireland, regression and decomposition methods are used to estimate the relative contributions of explained and unexplained components to the overall gender wage gap. That is, to estimate separately (a) the extent to which differences in characteristics and (b) differences in returns to those characteristics contribute to gendered differences in pay. The results show that the explained gender wage gap is negative, indicating that women have better labour market characteristics than men, on average. This has an overall reducing effect on the gender pay gap. In contrast, the unexplained gender wage gap is substantially higher in magnitude and has a widening effect on the gender pay gap.

The results show that lower overall average earnings of females is exclusively to be found in the unexplained component. However, it would be imprecise to say that this is evidence of a substantive 'discrimination' effect. Rather, the results mean that despite the fact that we have controlled for a range of individual and job-related characteristics, which actually advantage female earnings compared to males, the continuing differential (and higher) returns for these same characteristics which males obtain in the labour market, alongside other unobserved characteristics mean that males earn more than females. The analysis points to the importance of occupation and education. Structural differences in educational attainment and in occupational allocation between males and females have a reducing effect on the gender pay gap. At the same time, however, the differential and higher returns to males for these two same characteristics, are significant contributory factors, to females earning less than males.
This version: 9th March 2023.

HOW ARE WE UNEQUAL?
THE ADJUSTED GENDER PAY GAP IN NORTHERN IRELAND

Lisa Wilson (NERI) Nevin Economic Research Institute, Belfast.
Ciara O'Gorman (NERI) Nevin Economic Research Institute, Dublin.

SECTION 1: INTRODUCTION

The gender pay gap (GPG) is an issue of continuing concern and debate within policy and academic circles. This is because (a) the empirical evidence continues to document persistent and sizeable gaps in the returns to male employment as compared to female employment across most advanced economies (OECD, 2019) and (b) reducing the GPG has become one of the key priorities of gender equality policies at international and national levels (Eurostat, 2018). Whilst the potential factors underlying the gap have been widely debated within the literature since the early 1970s a number of key contributors to the GPG have been confirmed across the academic literature, including career interruptions (Albrecht, *et al*, 2018, Kleven, Landais and Søgaard 2018), working hours flexibility (Goldin 2014) and occupational segregation (Olivetti and Petrongolo 2008). Comparisons across countries, however, reveal the differential relative importance of the institutional geography and different observable personal and employment-related characteristics in driving differences in both the magnitude of and explanations of the GPG across countries (Blau and Kahn, 2003; Eurostat, 2018). Furthermore, more recent empirical evidence shows that the gender gap is not constant across the wage distribution (Christofides *et al*, 2013) and as a result academics have turned to focus on examining driving factors to the GPG at different points of the wage distribution (See for example Doorley *et al,* 2021).

There are a limited number of empirical studies, however, which have been concerned with understanding the GPG in Northern Ireland, and it is this gap in knowledge which this paper is concerned. This paper follows on from a previous paper which examined the unadjusted GPG in Northern Ireland and the Republic of Ireland (Wilson, 2020) and seeks to shed light on the role of different factors in driving or reducing the GPG. This paper builds on the recently published paper by Jones and Kaya (2021) who examine the adjusted GPG in

Northern Ireland, in the context of comparing differences in driving factors to other regions of the United Kingdom.

Given the salience of the issue in public policy discussions in recent years, it may appear remarkable that so little empirical analyses have concerned itself with the GPG in Northern Ireland. This is particularly so, given that there exists annual estimates from the Office for National Statistics and Northern Ireland Statistic and Research Agency on the magnitude of the unadjusted GPG. However, it is argued that because these estimates of the GPG for Northern Ireland have consistently shown that the gap in earnings between males and females to be much smaller than comparable measures for the rest of the UK and that when the GPG is measured using median gross hourly pay among full-time employees that the gap is actually reversed (ONS, 2022) that it is often assumed that it is simply an issue not worthy of scrutiny.

This study, however, seeks to examine and explain the nature of the GPG in Northern Ireland and the extent to which different personal/family and job-related characteristics *both* drive and reduce differences in the earnings of males and females. Thus, using data from the Understanding Society survey established regression and decomposition methods are used to explore the determinants of the GPG in Northern Ireland.

The empirical analyses begins by applying ordinary least squares regression in order to provide an estimate of the adjusted gap in earnings between males and females. That is, the size of the gap in earnings between males and females when a range of different individual/family and job-related characteristics have been controlled. The paper then turns to examine the role of differences in male and female characteristics in determining male and female earnings. The paper sets out both the overall impact of differences in male and female characteristics for male and female earnings and also explains the specific contribution of each of these individual characteristics. It also sets out the extent to which we cannot explain differences in earnings between males and females either because of unexplained differences in returns to particular characteristics included in the model for

males and females or because of other factors which we do not account for in this study due to data limitations.

The results show that the labour market characteristics have a substantial impact in reducing differences in pay between males and females. This is because on average, females have more favourable observed labour market characteristics than males, and in particular have higher educational attainment or are occupationally located in jobs with higher average wages. In contrast, unexplained components – that is, differences either due to differences in returns to particular characteristics included for males and females or other factors which we do not account for in this study due to data limitations – have a substantial widening impact on the magnitude of the GPG. Taken together these results mean that the fact that females have lower average earnings overall is exclusively to be found in the unexplained component.

The remainder of this paper is structured as follows: Section 2 provides an overview of the current legal and policy context in Northern Ireland under which the study is being undertaken. Section 3 looks at the concept and measurement of the GPG and includes a critical discussion of unadjusted and adjusted estimates. Section 4 details international trends including that in the United Kingdom, by way of laying the context for examination of the GPG in Northern Ireland. Section 6 covers the literature and outlines existing knowledge on the driving factors and protective factors to the GPG. Section 7, 8 and 9 outlines the data, methodology and sample descriptives before Section 10 presents results on the adjusted GPG. Section 11 summarises and concludes the results.

SECTION 2: CURRENT LEGAL AND POLICY CONTEXT

In recent years the promotion of gender equality, in economic terms, has come to the forefront of discussions about what needs to be on the public policy agenda across most advanced economies. In this respect Northern Ireland is no different. There exist numerous different ongoing legal and policy interventions which identify the importance of the GPG in driving economic inequality between males and females and which seek to make or recommend a number of different legal and policy interventions which are aimed at

promoting gender equality and reducing gender gaps in pay. These include Gender Pay Transparency Legislation, the Gender Equality Strategy and the Integrated Early Years and Childcare Strategy. It must be said, however, that with lack of consistency in devolved Government it is unclear the extent to which there is or continues to be any policy progression on any of these initiatives.

2.1 Gender Pay Transparency Legislation

In Great Britain from 2017, if you are an employer who has a headcount of 250 or more on a 'snapshot date' of a year you must comply with regulations on GPG reporting. This requires employers to annually report and publish specific figures about their GPG. Under the regulations the information is what must be provided by employers:

1. percentage of men and women in each hourly pay quarter
2. mean (average) GPG using hourly pay
3. median GPG using hourly pay
4. percentage of men and women receiving bonus pay
5. mean (average) GPG using bonus pay
6. median GPG using bonus pay

In addition, employers may also publish a supporting narrative and an action plan in regard to their GPG.

In Northern Ireland, however, there as of early 2023 no comparative requirement on businesses to publish information on their GPG. In this respect, whilst the law in relation to GPG reporting is set out in section 19 of the Employment Act (Northern Ireland) 2016. Due to the collapse of the Northern Ireland Assembly in 2017, there has been neither draft regulations nor even a consultation on GPG reporting in Northern Ireland. The issue now forms part of the Department for Communities' wider gender equality strategy, which was due to be published by the end of 2021, subject to Executive Agreement. While the Expert Advisory Panel instituted into place to make recommendations on the themes and key actions the Strategy should address, there has been limited updates on any further action to developing a gender equality strategy.

2.2 Gender Equality Strategy

The Gender Equality Strategy Advisory Panel report includes recommendations in terms of the GPG. It makes specific recommendations in terms of the development of a monitoring and reporting framework that accurately captures the GPG (Department of Communities, 2021). The Advisory Panel report also states that GPG transparency regulations must be robust and include meaningful sanctions for employers who do not report, and for those who fail to take action to address their GPG. In addition, the report recommends that regulations should stipulate that employers must also share data on their GPGs, and that explanations and actions to address these should be made in discussions with the appropriate trade unions. Further to this, the gender equality strategy identifies the over-representation of women in part-time and low-paid sectors as central to the GPG and calls for these issues to be addressed in efforts to reduce the GPG.

2.3 Integrated Early Years and Childcare Strategy

There is also ongoing work to develop a new Executive Early Years and Childcare Strategy for Northern Ireland. Whilst the Assembly has collapsed, the Department of Education continues to work on the development of the wider strategy. In September 2022, Minister McIlveen provided an update on work which is ongoing to inform the development of the wider Strategy, which include:

- Invitations to participate in a new Stakeholder Engagement Forum will issue this week, with the first meeting expected to take place in October 2022.
- An independent Review of Childcare Services in Northern Ireland is currently underway and was due to report by the end of December 2022.
- A review of Department of Education targeted early years interventions, including consideration of how Sure Start services are currently targeted, was due to report by the end of November 2022.

The Department of Education continues to work on the development of the Strategy and costed options should be ready for consideration by the Executive by March 2023. A core component of this is a new proposal to offer every child in their pre-school year a minimum of 22.5 hours of pre-school education per week. This is in line with the commitments set out in the New Decade, New Approach agreement. Nonetheless, despite all of the dates in

terms of commitments above, again, it is unclear what is going on in respect of these policies.

SECTION 3: WHAT IS AND HOW DO WE MEASURE THE GPG?

The GPG is a metric that tells us about the difference in the earnings of males and females in the labour market and is one of the main mechanisms used to assess the extent of gender inequalities in the labour market. Specifically, the GPG captures the differential economic returns from paid work rewarded to females as compared to males. The GPG should not be confused with equal pay, which refers to paying men and women differently for doing the same work. This discriminatory practice was outlawed in the United Kingdom (UK) by the Equal Pay Act 1970.

There are, however, different ways of measuring the GPG, and the methodology used to estimate the GPG has a significant impact on the estimated magnitude of the GPG. There is, however, often little discussion across the literature about how we measure the GPG. Rather it is more common for different studies to simply state how they measure the GPG, with little to no critical appraisal as to how their measure compares with what measure other studies use - and ultimately how measurement decisions influence the estimated size of the GPG.

In broad terms, when comparing the earnings of males and females there are two overarching ways in which we can estimate the size of the GPG which include *unadjusted* and *adjusted* forms. When the GPG is calculated by simply comparing the pay of all males to that of all females the estimate is known as the unadjusted or 'raw' GPG. Calculated in this way, the GPG does not take into account all of the different factors or characteristics of males and females that may play a role in determining or explaining the differences, such as for example differences in education, occupation, sector of employed, hours worked etc. On the contrary, when the GPG is calculated after accounting or controlling for underlying differences in characteristics between males and females the estimate is known as the 'adjusted' GPG.

Whilst, Wilson (2020) provides a more detailed discussion of unadjusted measures and considerations required of any analyst in deciding how to calculate the unadjusted GPG these are not repeated here. Rather, given the focus of this paper this section further explains what is meant by and considerations to take into account in calculating and interpreting an 'adjusted' measure of the GPG.

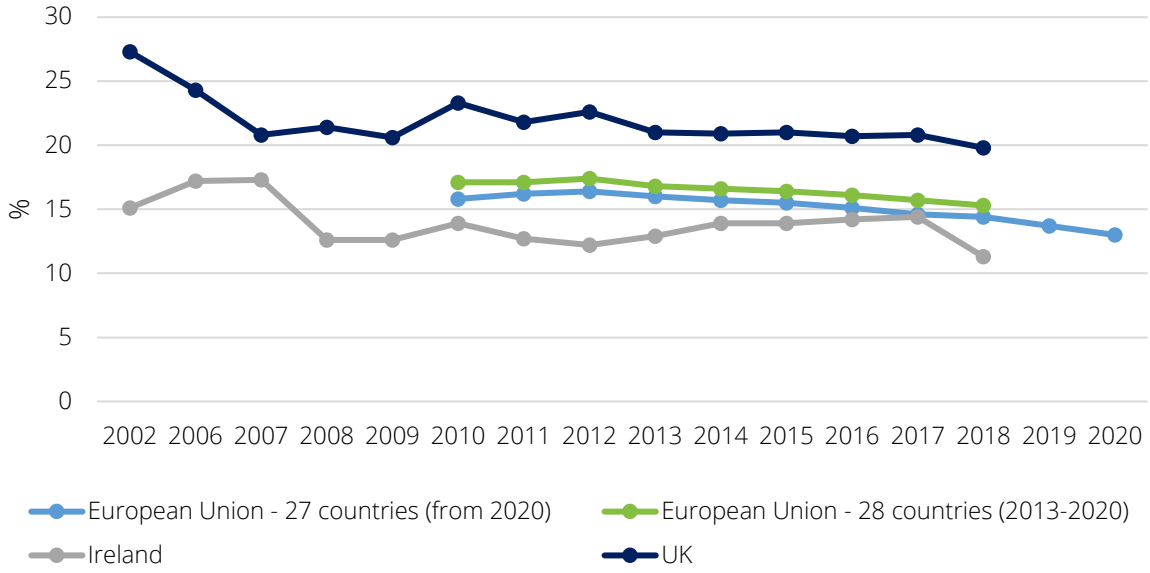
The adjusted GPG seeks to take into consideration differences in the average characteristics of male and female workers and so estimate how much of the gap in earnings remain after we account for differences in characteristics of males and females. In this way, the adjusted GPG allows us to determine how much of the GPG can be 'explained' by differences in characteristics and how much of the gap remains 'unexplained' by differences in returns to same characteristics. In this sense, the adjusted GPG allows us to get closer to an estimate of how much of the GPG is owing to 'unequal pay for equal work'. Nonetheless, it is important to point out that whilst the adjusted GPG, i.e. the proportion of the unadjusted gap that remains unexplained by the variation in the explanatory factors/characteristics considered between males and females, may reflect discrimination to some extent, one cannot simply assume that the entire unexplained component of the gap relates to pay discrimination. This is because the unexplained component of the adjusted GPG also includes all other factors that potentially influence the gap which are not included/investigated in the study due to data limitations. In addition, discrimination may influence the explained component of the GPG where it shapes the distribution of the explanatory characteristics between men and women which we investigate. Thus, while discrimination may well be a factor, its relative weight remains unknown.

SECTION 4: INTERNATIONAL TRENDS IN THE GENDER PAY GAP, INCLUDING TRENDS IN THE UNITED KINGDOM

Despite significant progress having been made in recent decades across the globe, the GPG remains persistent and females continue to earn less than males on average. This tends to be the case irrespective of which measure is utilised to compare the earnings of males versus females, although there are large differences in the size of the GPG across countries. For example, in the EU-28 in 2017, women earned 16.3% less than men when comparing the

mean gross hourly earnings of male and female employees as a percentage of male gross earnings (Eurostat, 2019). On average, women earned less than men in all EU member states, however, this GPG varies considerably between countries. The largest differences were observed in Estonia (25.6%), Czech Republic (21.1%), Germany (21%), and the United Kingdom (20.8%). In Ireland, the GPG was calculated as 13.9%. Whilst the OECD uses a different methodology to calculate the GPG, the persistence of female earnings being lower than male earnings remains (OECD, 2019).

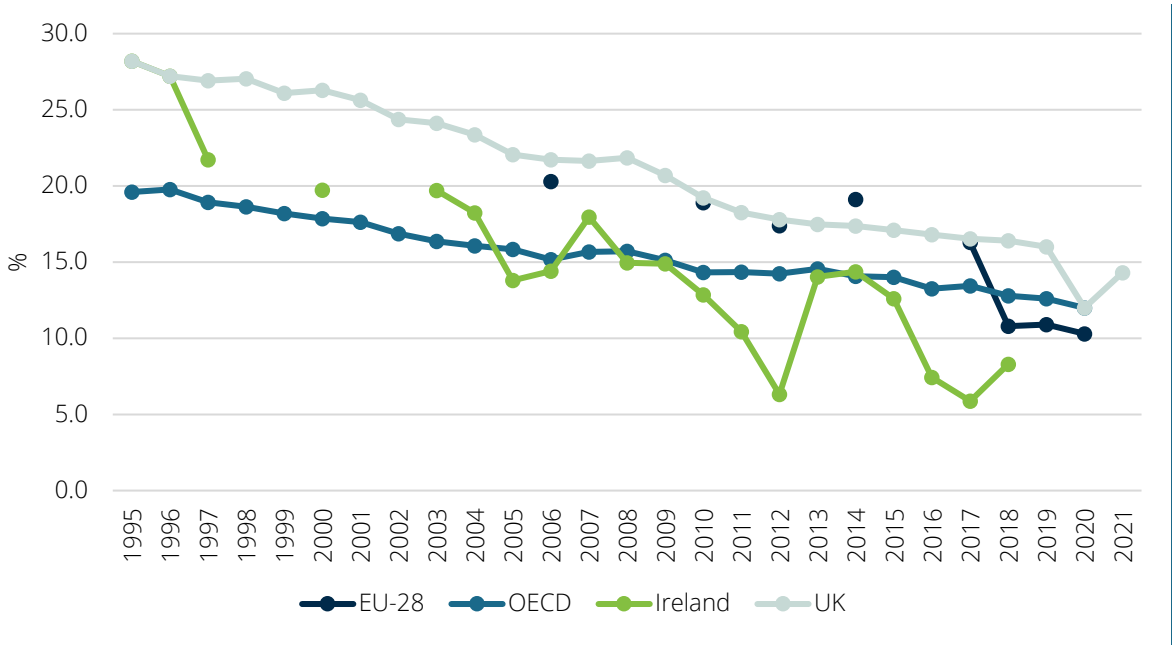
Figure 1: Trends overtime in the unadjusted gender pay gap in mean hourly earnings across countries



Source: Eurostat (2022) *Gender pay gap statistics*, Eurostat.

The OECD calculate the GPG by looking at the size of the gap between the median hourly earnings of full-time male employees versus the median hourly earnings of full-time female employees. The most common earnings pay reporting periods are weekly and monthly earnings of full-time employees, although some countries are based on annual earnings. For the UK, the analysis is based on weekly earnings. In 2017, the GPG across all OECD countries was estimated at 13.5%. At 16.4% the GPG in the United Kingdom is significantly higher than the OECD average GPG. In contrast, at 5.9% the GPG in the Republic of Ireland compares favourably to the OECD average (OECD, 2019).

Figure 2: Trends overtime in the unadjusted gender pay gap in median hourly earnings across countries



Source: EU-28, UK & Ireland data - OECD (2019) *Gender Wage Gap (indicator),* Paris: OECD. NI data -

Looking to trends over time the GPG has been narrowing across countries. Specifically, across OECD countries the GPG has narrowed by 6 percentage points since 1995 as shown in Figure 1 above, when the GPG was 19.6%. The GPG has also seen a similar narrowing across EU-28 member states, with a decline from 20.3% in 2006 to 16.3% by 2017. It is worth noting, however, that whilst the GPG has been closing in recent decades there has been a slowdown in progress in more recent years. Indeed, across OECD countries the GPG, has been closing at a much slower rate than it had between 1995 and 2006. Similarly, despite a considerable decline in the GPG across EU member states since the mid-2000s, more recent years have seen an almost halting of this progress, with only very small reductions occurring in recent times in the gap between male and female earnings.

This trend of a narrowing in the GPG overtime is a trend that is mirrored in the UK, including the more recent slowing of progress. Specifically, in 1995 the GPG in the median hourly earnings of full-time male employees versus the median hourly earnings of full-time female employees in the UK was just over 28%. By 2021, this gap in earnings, whilst still considerable, had narrowed to 14.3%. Nevertheless, as is clear from Figure 1, recent years have seen an

almost flattening in the narrowing of the gender pay. It does appear though that the pandemic has influenced the GPG, visible through the decline in the GPG through 2020 and the subsequent increase in 2021, although to a lower trend position than pre-pandemic.

By international standards, the UK has a relatively large GPG when measured via median hourly earnings, with the average gap in median earnings tending to sit above the EU and OECD average. Similar trends are found in terms of the position of the UK and Ireland when we assess international patterns in the GPG using Eurostat data capturing the gap in mean hourly earnings (See Figure 2 above). It is, however, worth pointing out a trend visible in the data, whereby there has been a general, albeit slow, downward trend in the GPG in mean hourly earnings across the EU-27 and EU-28 over the last decade or so. However, this trend has not been mirrored in the UK and Ireland where both appear to be experiencing a stall in overall trends.

SECTION 5: NORTHERN IRELAND OFFICIAL MEASUREMENT AND TRENDS IN THE UNADJUSTED GENDER PAY GAP

In recent years Northern Ireland Statistical Research Agency (NISRA) have dedicated a section of their Annual Survey of Hours and Earnings (ASHE) report to the GPG. In this they present the GPG as the gap which exists between males and females based on median hourly earnings excluding overtime and mean hourly earnings excluding overtime. They also, however, present estimates of the unadjusted GPG across other groups of employees as well and on an annual basis. The proceeding three charts give an overview of the most up-to-date official data capturing the GPG via a number of different measures, as well as trends in the GPG overtime.

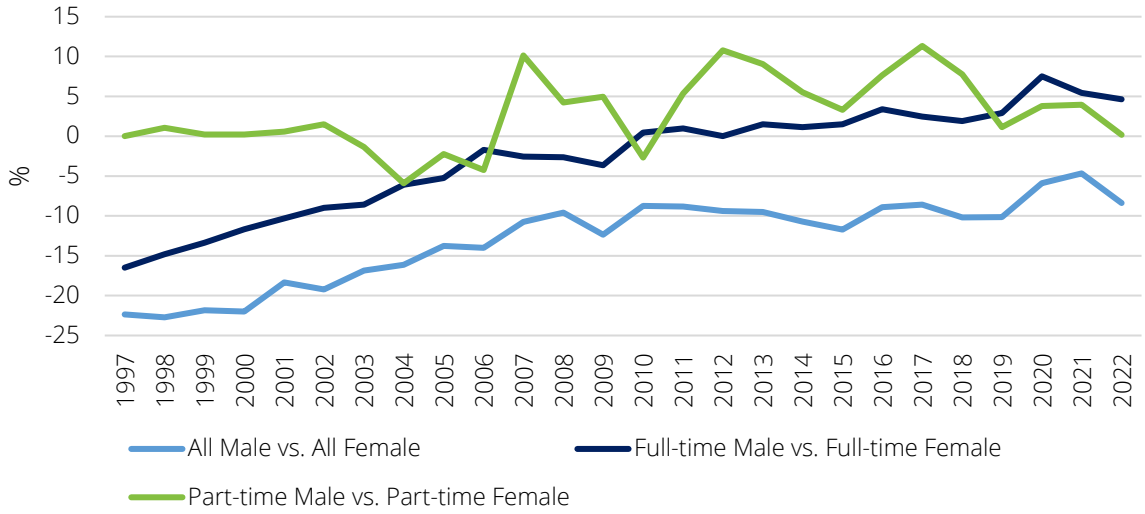
In examining the data for the year up until April 2022 the median hourly earnings excluding overtime of male employees were 8.4% below and mean hourly earnings excluding overtime were 7.2% below that of emale employees (NISRA, 2022). This compares to the UK whereby females earned 15% less than males when all employees are considered (consistent trend since 2020) (ONS, 2022). Indeed, despite the relatively common institutional and policy

context, the GPG in Northern Ireland has consistently been found to be far smaller than in the rest of the UK. In examining the reasons behind this Jones and Kaya (2021) conclude that it can largely be attributed to the superior productivity-related characteristics of women relative to men in Northern Ireland and to a lower level of wage inequality across the occupational distribution. Looking across the trend in both the median and mean hourly gap over the period 1997 to 2022 there has been a notable stagnation in the trend over the period, whereby the decline which had been occurring over the period since 1997 has slowed since the late 2000s.

Figure 3 and Figure 4 show trends in terms of full-time and part-time employees as presented. It is notable, and frequently commented upon, that there is a reverse GPG in full-time median hourly earnings excluding overtime. This is so because over the last decade the trend has been that the median hourly earnings excluding overtime of females employed full-time has been persistently higher than males. Furthermore, whilst there is much more variation in terms of the trend, the trend over the last decade has also been that median hourly earnings excluding overtime of females working part-time has been higher than those of males.

This apparent 'Simpsons Paradox' whereby when looking across all males and all females males earn more than females, despite the fact that females working full-time and females working part-time earn more than their counterpart males can be explained primarily by the larger proportion of males (85% compared with 60% of females) in full-time work, which has higher hourly rates of pay on average than part-time employment and proportionately fewer low-paid jobs.

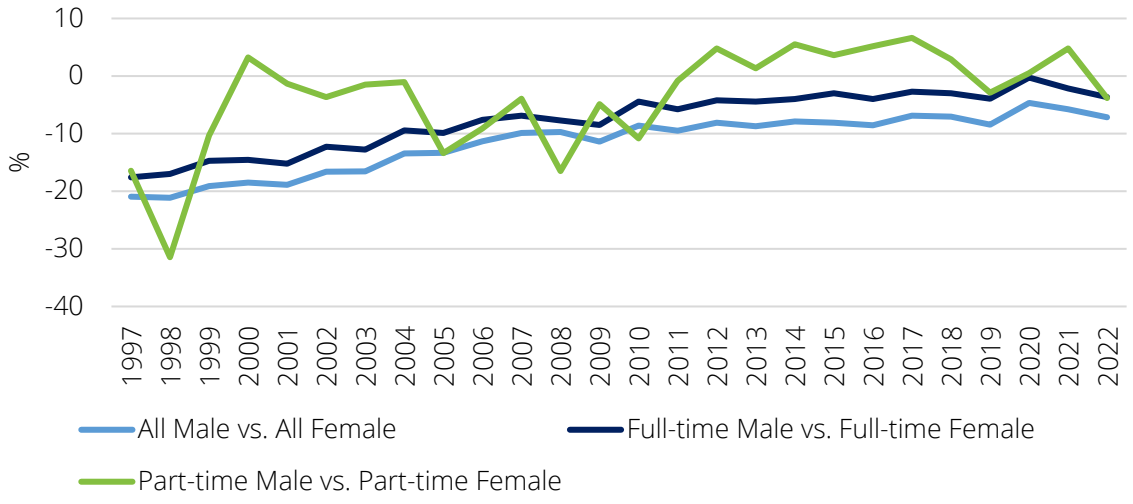
Figure 3: Gender pay gap in Median Hourly Earnings excluding overtime, 1997-2022



Source: NISRA, Employee earnings in 2022, ASHE 2022.

This trend is, however, not mirrored when we utilise mean hourly earnings to capture the gap in earnings, although the gap is significantly lower amongst full-time employees than it is across all employees (See Figure 4 below). Trends in terms of the GPG amongst part-time employees only show much more variation. For 8 out of the last 10 years there has been a reverse GPG amongst part-time employees. In the latest year (2022) of data however ASHE estimates that part-time female employees earn -3.8% less than part-time male employees.

Figure 4: Gender pay gap in Mean Hourly Earnings excluding overtime, 1997-2022

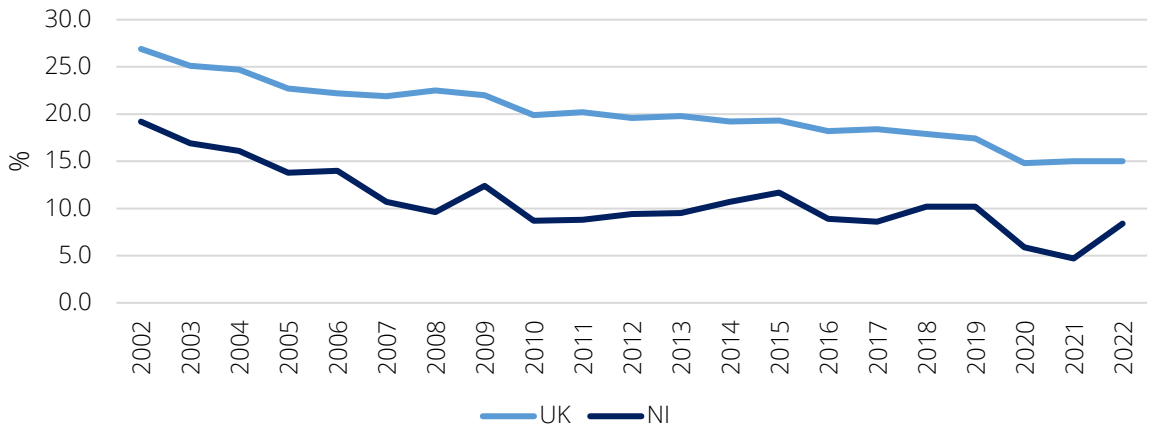


Source: NISRA, Employee earnings in 2022, ASHE 2022.

The difference in estimates of the GPG obtained using the different measures of central tendency above reflects not only the complex nature of the GPG, but also the limitations of relying solely on one indicator or measure of the GPG. What is most clear from the above analysis is how much the estimate of the size of the unadjusted GPG varies depending on the measure of earnings and the denominator and comparator used. This point, however, is not laboured enough across the literature or in estimates of the GPG which are presented by different international and national organisations. As such, the entire discussion and debate around the size of the GPG is muddied by this very fact. This is particularly the case for Northern Ireland, whereby because the GPG using median hourly earnings excluding overtime broken down by full-time and part-time shows/has shown a reverse GPG there has become a broad consensus in the public discussion that the GPG is not an issue of concern in Northern Ireland.

Nevertheless, when we compare the GPG of all males versus all females (using median hourly earnings excluding overtime) in Northern Ireland compared to the UK it is clear that the magnitude of the gap has consistently been significantly lower. The most recent data show that the GPG using median hourly earnings excluding overtime in Northern Ireland is just under half what it is in the UK. Indeed, despite the relatively common institutional and policy context, the GPG in Northern Ireland has consistently been found to be far smaller than in the rest of the UK. In examining the reasons behind this Jones and Kaya (2021) conclude that it can largely be attributed to the superior productivity-related characteristics of women relative to men in Northern Ireland and to a lower level of wage inequality across the occupational distribution.

Figure 5: Gender Pay Gap in Median Hourly Earnings excluding overtime NI & UK, 2002-2022



Source: NISRA, *Employee earnings in 2022*, ASHE 2022.

SECTION 6: WHAT FACTORS CONTRIBUTE TO THE GENDER PAY GAP?

The literature on the determinants of gender gaps in average payment has produced an extensive set of theories helping to explain the persistence of the phenomenon.

6.1 Human capital

Human capital, which includes education, skills and labour market experience, is often viewed as the most important determinant of wages whereby individual earnings and differences in earnings between males and females are determined by the amount of skills (referred to as human capital) acquired through both education, on-the-job skills development and length of experience. On average, studies of the GPG attribute a relatively large proportion of the gap to differences in accumulated levels of human capital between males and females. In this respect, previous research shows that part of the GPG can be explained by the fact that females tend to have, on average, lower amounts of human capital relative to their male counterparts. Across Europe we have seen a gradual reversal in the gender gap in educational attainment in favour of females because the proportion of young women going on to higher education has exceeded that for young men across many European countries, including the United Kingdom and the Republic of Ireland. Therefore, type/field of education/study remains an important determinant of gender differences in labour market outcomes, including pay. Beyond education, however, lower levels of on-the-job skills and experience possessed by females compared to males continues to be an important

determinant of the GPG (Costa-Dias *et al*, 2018; McGuinness *et al*, 2009; Weichselbaum and Winter-Ebner, 2005).

The reasons why females tend to build up less skills and labour market experience over the course of their working lives has been widely discussed in the literature. The three elements posited by the standard human capital model of the labour market is outlined well in McGuiness *et al* (2009) as follows. Firstly, as females tend to experience more career breaks because of family caring commitments such as for maternity leave, the amount of human capital built up will be lower. Second, time-out of the labour market can result in some depreciation of existing skills and may also mean that some females skills become outdated as a result of technological progress (skills-biased technical change) during periods when they are not engaged in the labour market. Third, females envisaging periods out of the labour market or envisaging only being able to engage on a part-time basis because of for example the burden of childcare will have a lower expected income stream from employment and, as a consequence, are assumed to invest in lower amounts of training.

6.2 Occupational and sectoral segregation

High level of segregation across occupations and sectors has been found to be responsible for inequalities in earnings between males and females, whereby males and females are disproportionately represented in particular occupations and sectors. Broadly speaking, this segregation breaks down sectorally such that females are more likely to be working in jobs involving caring, nurturing and service, while men monopolise manual and technical jobs associated with industry and in more recent decades technical and financial services (Boll *et al,* 2016). In terms of occupation, it is such that men dominate in higher paid occupations such as managerial and professional occupations, whereas women dominate in the 5 c's: cleaning, catering, clerical, cashiering and childcare which receive relatively low pay when compared with other occupations which has a consequent impact on the GPG (Boll *et al,* 2016). Beyond this vertical occupational and sectoral segregation, other theorists point to the importance of horizontal segregation in explaining the GPG (Reskin and Roos, 2009). Specifically, horizontal segregation refers to a situation whereby men are more likely to be

employed in higher grades and women in lower grades within the same occupations (see for example, Hakim, 1979; Blackburn *et al.* 2016).

6.3 Part-time penalty and part-time pay penalty

A body of evidence shows that the fact that large proportions of females work part-time compared to males is an important determinant of the unadjusted GPG even when assessed on an hourly basis by the fact that the returns to part-time work are significantly lower than the returns to full-time work. The literature identifies as important here differences in the characteristics of full-time and part-time workers and in particular the importance of sector and occupation in determining pay. The importance of human capital and in particular skills/experience accumulation is also identified. In simple terms, this finding relates to the impact of the amount and type of labour market experience that men and women in full-time versus part-time employment build up, and this experience affects the hourly wage levels they can command. However, recent research by the Institute for Fiscal Studies (2022) points to the differential impacts of experience on pay for those employed full-time, compared to those employed part-time. Specifically, in seeking to isolate the causal role of full-time and part-time experience in determining the wages of men and women. The authors find that extra experience in full-time work leads to higher hourly wages, whereas extra experience in part-time work does not. The authors refrain from drawing firm conclusions on the reasons behind these findings, although they point to a number of possibilities including less training provision, missing out on informal interactions and networking opportunities, and genuine constraints placed upon the build-up of skill by working fewer hours. Further research is needed in this area.

6.4 Motherhood Penalty

A voluminous body of research has found that mothers tend to receive lower wages than fathers and childless women (Cukrowska-Torzewska and Matysiak, 2020; Grimshaw and Rubery, 2015). The fact that mothers earn less than fathers and women with no children is a well-known phenomenon often referred to in the literature as the 'motherhood wage gap' or the 'motherhood pay penalty' (Cukrowska-Torzewska and Matysiak, 2020).

Some of the most recent OECD data looking at this issue has found that the overall GPG of 12.9% in median full-time earnings widens to 21.2% between males and females in families with children (OECD, 2015). For couples, with no children they found a gap of 11% (OECD, 2015). What is more, all else being equal, research shows that motherhood pay penalties vary significantly depending on the number of children and the age of the children, with the gap increasing the younger and more children that there are (OECD, 2012). In contrast, previous research suggests that similar fathers suffer no such pay penalty. Rather, the evidence suggests that fatherhood may actually have a positive effect on the earnings of fathers (Correll *et al*, 2007; Hodges and Budig, 2010). Further to this, OECD data shows the variation in the motherhood pay penalty across countries, with the cost of motherhood on pay being particularly high in the United Kingdom (OECD, 2015).

There are multiple competing and overlapping explanations for the motherhood pay gap, with the main reasons for the motherhood pay gap able to be located in one of three broad analytical frameworks, including: rationalist economics, sociological and comparative institutionalist explanations (See: Cukrowska-Torzewska and Matysiak. 2020; Grimshaw and Rubery, 2015).

In a meta-analysis of the empirical evidence exploring the mechanisms driving the motherhood pay penalty, Cukrowska-Torzewska and Matysiak (2020) found that while the gaps associated with the total number of children are mostly explained by the loss of mothers' human capital during child-related career breaks, the gaps associated with one child are predominantly driven by mothers' occupation and their tendency to be employed in occupations that pay less. Nevertheless, a comparison of wages experienced by mothers and non-mothers in different countries and regions reveals that whilst evidence of significant motherhood pay penalties is widespread the institutional framework and country social context matters greatly (Cukrowska-Torzewska and Matysiak, 2020; Davies and Pierre, 2005; Cukrowska-Torzewska and Matysiak, 2020). Specifically, they find the residual motherhood pay gap to be smallest in Nordic countries, where public policies actively support gender equality and reconciliation of work and family, and largest in Central and Eastern Europe, as well as in Anglo-Saxon countries.

A recent study published by the Institute for Fiscal Studies (Andrews *et al,* 2021) finds that most of the GPGs can be traced to 'child penalties', or parenthood for mothers. It finds the average earnings of men are almost completely unaffected by parenthood, but women's earnings fall sharply when they become parents and then stabilise at a much lower level with little growth. The IFS finds that seven years after the birth of a first child, women's earnings are on average less than half of men's which they explain is a result of the missing out on the accumulation of work experience and the progressing to higher paid jobs, as a result of time out to care for children.

6.5 Discrimination

Over and above the factors highlighted we cannot discount the fact that in some situations female earnings may be lower than male earnings simply as a result of direct or indirect discrimination. This is despite the fact that most countries now have some form of employment equality legislation that outlaws discrimination based on gender.

A recent study published by The Resolution Foundation looking at workplace discrimination examined people's experience of different forms of workplace discrimination in the last twelve months – for example, being turned down for a job or denied training – based on nine protected characteristics. These nine protected characteristics include the workers right not to be discriminated against at any stage of employment – from the recruitment process, through pay and benefits and training and promotion opportunities, to dismissal and redundancy – on the grounds of age, sex, ethnicity/race, disability, sexual orientation, religion/belief, being pregnant or on maternity leave, gender reassignment, or being married/in a civil partnership (what are known as the nine protected characteristics). In doing so, it found that 2.7 million workers said that they were discriminated on the grounds of sex in the previous year.

6.6 Labour Market Participation and Employment Rates

Selection effects refer to the processes that determine who enters and remains in the labour force. Since the labour force participation and nature of employment decisions of men and women tend to be very different, these selection effects can impact onto the GPG. This happens because if rates of labour force participation differ between genders, these may reflect unobserved differences that could also influence earnings. Thus, in comparing earnings between men and women it is often important to consider differential labour force participation. The decision to participate in the labour market will depend on certain observable characteristics (number of children, costs and access to childcare, household/spousal income) and unobservable characteristics which may relate to, for instance, preferences and/or views of child rearing etc. As a result, those females who are observed as active in the labour market are likely to be different from those who remain inactive. As a result, if it transpires that, for instance, the expected wages of female participants are, on average, greater than those of non-participating females, then the observed wage gap will be lower than in a study that included earnings data for all females. Or vice versa, if the expected wages of females are, on average, lower than those of non-participating females, then the observed wage gap will be higher than in a study that included earnings data for all females. This effect is termed sample selection bias.

Olivetti and Petrongolo (2008) demonstrate the critical role played by female labour force participation in explaining variation in the GPG between Anglo-Saxon countries and Southern Europe, with national GPGs being negatively correlated with gender gaps in employment, consistent with the theory that females are more likely than males to be positively selected into employment. That is, females with higher earnings potential are more likely to participate in the labour market than those with lower earnings potential. However, in countries with relatively high female employment rates, including the UK, they find limited impact of selection (see also Christofides et al., 2013).

SECTION 7: THE DATA

7.1 The Data Source: Understanding Society

For the empirical analyses for Northern Ireland this study utilised data from the Northern Ireland element of the Understanding Society survey (University of Essex *et al,* 2018). The Understanding Society survey is a longitudinal annual survey of households and is the principal panel household dataset in the UK. Despite being a longitudinal survey, this paper only utilises Wave 10 to carry out cross-sectional analyses. The Wave 10 Fieldwork sample was issued to field in 24 monthly batches, the first in January 2018 and the last in December 2019. The November and December 2019 sample months were still in field on 17th March 2020 when, due to the Covid-19 pandemic, a decision was taken to cease all face-to-face interviewing. At this point all active cases (adults without a final outcome) were sent a letter asking them to complete online. Interviewers also continued trying to contact and interview active cases by telephone. For the November sample this was mostly done by NatCen's telephone centre. For the December sample face-to-face interviewers from Kantar and NatCen conducted telephone interviews for the last few weeks of fieldwork (using the telephone version of the questionnaire).

The Northern Ireland sample of Understanding Society was based on an unclustered systematic random sample of addresses, selected from the Land and Property Services Agency list of domestic addresses. Interviews were carried out with 2395 addresses. Given, however, that this study is focused on estimating the size of the GPG for those in employment the sample was restricted to those aged 16 years or more and in employment. This results in a final sample of 1,106 individuals.

Weights are used in all analyses to adjust for unequal selection probabilities, differential non-response, and potential sampling error. In particular, the weight adjusts for the higher sampling fraction in Northern Ireland and for different probabilities of selection of an ethnic minority boost sample, as well as for differences in the response rate between subgroups of the sample. The variable used to weight the data in this study was "indpxui_xw", for which further details can be found in the technical report.

7.2 Technical details on the derived measure of earnings

The Understanding Society survey provides the necessary data required to assess the GPG in terms of hourly, weekly and annual pay. In particular, the following pay related variables were used from the Understanding Society survey data as obtained from the UK Data service:

Gross monthly pay: The Understanding Society dataset provided a derived measure of total gross monthly pay. This is the sum of three earnings components: net usual pay (_paynu_dv); net self-employment income (_seearnnet_dv); net pay in second job (w_j2paynet_dv), which is gross pay in second job (_j2pay_dv) [Variable name: _fimnlabgrs_dv].

Working hours: Respondents were asked to detail how many hours they normally work each week, excluding overtime and meal breaks [Variable name: _jbhrs].

Overtime working hours: Respondents were asked to detail the number of overtime hours they usually work in a normal week [Variable name: _jbot].

Paid overtime working hours: Respondents were asked to detail the number of paid overtime hours they usually work in a normal week [Variable name: _jbot_pd].

These data were then utilised to derive estimates of hourly pay, gross hourly pay, gross weekly pay and gross annual pay the technical method of which is detailed below. Respondents were asked to report their usual gross monthly pay. Subsequently, an estimate of weekly gross pay was derived from monthly pay by dividing it by 30 and multiplying it by 7. Similarly, an estimate of annual pay was derived from monthly pay by multiplying it by 12.

In order to derive an estimate of basic hourly pay, weekly pay was divided by working hours. Importantly, however, because weekly pay included income from overtime, and data on weekly working hours did not, in order to estimate gross hourly pay it was necessary to calculate the 21 total number of working hours (both basic hours and overtime hours) worked by a person and divide it by the total weekly pay including overtime. However, in order to estimate basic hourly earnings, it was necessary to remove overtime earnings from monthly pay. To do this, we utilised data which captured the number of paid overtime working hours a respondent usually worked, and multiplied this by their overtime hourly pay rate to obtain a weekly total of overtime pay. We then scaled this up to get an estimate of monthly overtime pay. From here, monthly overtime pay was subtracted from gross monthly

pay. An estimate of hourly pay was then derived by dividing gross monthly pay by normal working hours excluding overtime and meal breaks.

7.3 An overview of other characteristics used to study the extent and nature of the gender pay gap

Understanding Society contains a range of data which have been identified in previous research as important determinants of the GPG. Table 1 presents details of the available data utilised in the study to capture: worker characteristics, labour market experience/history, and job characteristics.

The literature shows that years of labour market experience is an important determinant of gender differences in pay whereby, the wage gap is increased both by lower levels of accumulated work experience among women as well as lower returns to that experience. Understanding Society does not collect data which directly enables us to capture labour market experience or time out of the labour market. However, we know from previous research that there are gendered differences in work experience histories and that at least part of the gender difference in work experience is due to women taking time-out for child care and other family responsibilities. Thus, in efforts to proxy the impact of labour market experience in this current study, number of children is used as a proxy.

Table 1: An overview of other characteristics used to study the extent and nature of the gender pay gap

Variable label	Variable definition	Variable name in dataset	Categories
Worker characteristics			
Gender	Gender of respondent	_sex	Male Female
Age	Age of respondent	_dvage	16-29 30-39 40-49 50-59 60+

Education	Highest educational qualification attained	_qfhigh_dv	Degree or higher Below Degree No Qualifications
Labour market history/Time out of the labour market			
Children	Number of dependent children in household under 16		Does not have children Has one child Has two or more children
Job characteristics			
Industry	Current industrial sector		Agriculture, Forestry, Fishing, Electricity, Water Manufacturing Construction Wholesale, Retail & Transportation Accommodation & Food Information, Communication, Financial, Insurance & Real Estate Professional, Technical, Scientific, Administration Public admin, Health, Education Arts, Entertainment Other service activities
Occupation	Current occupation (SOC 2000 classification)		Managerial, Directors, Senior Officials Professional Associate professional & technical Administrative & Secretarial Skilled trades Caring, Leisure & Other service Sales & Customer service

			Process, Plant & Machine Elementary
Sector of employment	Public/private sector	publicr	Public Private
Employment type	Current job: permanent or temporary	_jbterm1	Permanent Temporary
Working arrangements	Full-time or part-time	_jbft_dv	Full-time Part-time
Number employed at workplace	Number at workplace (employees)	_jbsize	0-24 25-99 100+

SECTION 8: METHODS AND ANALYTICAL TECHNIQUES

The econometric analysis in this paper begins by applying ordinary least squares regression in order to provide an estimate of the adjusted gap in earnings between males and females. Analysis seeking to calculate the adjusted GPG usually begins by using ordinary least square (OLS) regression to model earnings on a set of variables which are identified in the literature as determinants of the GPG. This standard OLS model is widely used in the analysis of GPGs in both national and international literature. However, it is widely acknowledged that getting to grips with the exact nature of the unadjusted GPG and the importance of different factors in driving the pay gap using only the OLS regression method is invariably limited by the information that can be obtained using this method. While OLS regression can provide information about the importance of gender and other individual characteristics in determining earnings, it also assumes that the return on other individual characteristics is the same for both males and females. In this respect, for example, whilst an OLS regression model can tell us if occupation is an important determinant of earnings holding all else equal, it cannot tell us if the returns on earnings from having the same occupation are different for males and females.

The OLS specification represents the foundation of any estimation of GPGs across the literature and it is for this reason it is used here. Quantile regression techniques have become common supplements to OLS estimates and have been utilised in much of the recent literature concerned with the GPG (Doorley *et al*, 2021; Van Kerm *et al*., 2016).

Quantile regression determines the median of a set of data across a distribution based on the variables within that distribution. Our regression and decomposition methods are based on estimation methods which primarily base predictions at the mean, not the median. Estimates at different points of the distribution, including the median will be considered in a future paper.

Following application of the OLS regression, an Oaxaca-Blinder decomposition is applied. The Oaxaca-Binder decomposition allow us to separate the difference between the average hourly earnings of men and women into explained and unexplained parts. The explained part is the difference between male and female earnings which is due to the differences in the average characteristics (sector, age, occupation, etc.) of male and female workers. The unexplained part measures the difference between the earnings of males and females with the same characteristics (Blinder, 1973; Oaxaca, 1973).

SECTION 9: CURRENT SAMPLE DESCRIPTIVES

The analysis begins here with a review of worker characteristics by gender. Looking firstly at age, what the results presented in Table 2 below show is that whilst there are some differences in the age structure of males and females in the labour market, the differences are not large. A larger proportion of male workers (22.5%) are aged between 16-29 than females (18.4%), whereas a larger proportion of females are aged between 30-49 (47.4% females vs. 40.1% male).

In terms of the gender breakdown by educational qualification the results show that females are more likely to be educated to degree level or above (41.7% female vs. 26.5% male) and less likely to be educated to below degree level (45.6% male vs. 36.8% female) and to have no qualifications (27.9% male vs. 21.5% female).

In terms of gendered differences in number of children across male and female workers, the results show that females in employment are more likely to have children than males. Closely approximate proportions of males and females in employment have 2 or more children, whereas higher proportions of females have one child (16% female vs. 10.3% male).

Table 2: Descriptive statistics on worker and household/family structure characteristics

	Male	Female
Age		
16-29	22.5	18.4
30-39	17.6	20.9
40-49	22.5	26.5
50-59	27.3	24.5
60+	10.2	9.7
Educational Qualifications		
Degree or above	26.5	41.7
Below degree	45.6	36.8
No qualifications	27.9	21.5
How Many children		
No children	68.1	61.3
One child	10.3	16
2+ children	21.6	22.7
Children		
Does not have children	68.5	61
Has children	31.5	39

We turn next to gender differences in the structure of employment based on job or workplace-based characteristics. In terms of sector, females are almost equally likely to be employed in the public sector as the private sector with approximately 50% employed in both. Whereas males are significantly more likely to be employed in the private sector, where 69.7% of all males are employed. Table 3 shows that males (41.4% vs. 30.9% female) are more likely to be employed in firms with 100+ employees, with females more likely than males to be employed in businesses with smaller workforces.

The results in terms of the distribution of males and females by occupation show a substantially different occupational allocation for males compared to females. In terms of occupation, the results show that females are significantly more likely than males to work in 'Professional' and 'Associate Professional and Technical' occupations, while males are slightly more likely as females to work in 'Managerial, Director and Senior Official' occupations.

Beyond this, males dominate in skilled trades occupations (22.6% male vs. 0.7% female); process, plant and machinery occupations (12.3% male versus 3.3% female) and elementary

occupations (14.2% male versus 11.3% female). In contrast, females dominate in 'Administrative and Secretarial occupations (16.7% versus 8.4%). 'Caring, leisure and other service' occupations (13.3% female versus 1.3% males), and 'Sales and customer service' occupations (11.3% female versus 6.5% male).

Looking at the gendered breakdown of employment by industry the results show the significantly different industrial allocation of males compared to females. In particular, the key difference is that over half of females (56.4%) are employed in the 'Public Administration, Health and Education' sectors compared to just under one-quarter of males (23.3%). 14.5% of females are employed in the 'Wholesale, retail and transport' sector, albeit this is a smaller proportion than it is for males (17.6%). The remainder of male employment is dominated across the 'Manufacturing' (14.5%) and Construction (14.5%) sectors.

Looking at the gendered breakdown of full-time and part-time employment the results show that whilst over one in three (34.9%) females in employment work part-time, less than one in ten males are employed part-time (9.3%).

Table 3: Descriptive statistics based on job/employment characteristics

	Male	Female
Sector of Employment		
Private	69.7	49.4
Public	30.3	50.6
Number of employees		
0-24	36.1	39.5
25-99	22.6	29.6
100+	41.4	30.9
Occupation		
Managerial/Directors/ Senior Officials	9.7	8.7
Professional	14.8	16
Associate Professional & Technical	10.3	18.7
Administrative & Secretarial	8.4	16.7
Skilled trades	22.6	0.7
Caring, Leisure, Other Services	1.3	13.3
Sales & Customer Service	6.5	11.3
Process Plant & Machine	12.3	3.3
Elementary	14.2	11.3
Industry		

Agriculture, forestry, fishing, electricity	6.9	0.6
Manufacturing	14.5	4.1
Construction	14.5	0.6
Wholesale, retail & transportation	17.6	14.5
Accommodation & Food	1.3	5.8
Information, Communication, Financial, Insurance, Real Estate	6.3	5.2
Professional, Technical, Scientific, Admin	8.8	6.4
Public Admin, Health & Education	23.3	56.4
Arts, Entertainment	5	3.5
Other Service	1.9	2.9
Full-time/Part-time		
Full-time	90.7	65.1
Part-time	9.3	34.9

Table 4 and Table 5 set out the mean and median wages across a range of personal, family and job characteristics across all workers as reported by the Understanding Society survey. It also separately presents mean and median hourly earnings for both males and females, as well as the estimate of the GPG across these characteristics. These analyses thus make what is known as a 'partial adjustment' to the overall raw unadjusted GPG. It is important to bear in mind in interpreting these results that each estimate represents only the raw gap in that it is made without controlling for differences in other characteristics.

In terms of age, it is clear from Table 4 below that the age distribution of males and females in the labour force is approximately similar. In general, earnings tend to increase with age as the worker builds up experience and seniority, although beyond age 60 earnings begin to decline. In terms of gendered differences in earnings by age, the first point to note is the general trend for females to earn less than males per hour as age increases. This may reflect the fact that male labour market careers tend to have fewer and shorter interruptions than females. Median hourly female earnings for those aged 16-29 are 1.37% higher per hour than males of the same age, whilst median female hourly earnings for those aged 30-39 are 19% lower per hour. However, in older age groups (40-49, 50-59, 60+) the results show that not only do males earn considerably more per hour than females, but the size of the pay gap is considerably larger. The largest GPG is amongst those aged 60+, whereby median hourly female earnings are 33.8% less per hour than males.

Table 4 shows that those with degree or above qualifications have significantly higher pay than those with below degree level qualifications who in turn have significantly higher pay than those with no qualifications and that this is true across both male and female populations. However, the results presented in Table 4 also show that there remains a substantial gap in hourly earnings between males and females at each educational level. Irrespective of level of educational attainment males earn more per hour than females. The greater likelihood of females to have degree or higher levels of education compared to males, as well as the higher returns they receive for such, would suggest that education and the higher levels of human capital amongst females play a key role in moderating the GPG in the Northern Ireland labour market. This will be examined in further detail when we turn to the econometric analysis in Section 10.

In terms of the impact of having children on male and female earnings the data presented in Table 4 shows that the median and mean hourly earnings of both males and females with dependent children are higher than the earnings of males and females with no children. Nevertheless, despite females with dependent children earning more per hour than females with no dependent children, the pay premium for having children is significantly larger for males. However, the results presented below show that this effect is moderated by number of children, whereby females with one child earn more than those with no children, but females with two children earn less than those with no children. The same is not true for males with two children who earn significantly more than those with no children or one child.

.

Table 4: Average hourly earnings data, by gender and partially adjusted gender pay gap across personal/family characteristics

	All		Male		Female			
	Median hourly earnings	Mean hourly earnings	Median hourly earnings	Mean hourly earning	Median hourly earnings	Mean hourly earnings	GPG median hourly pay	GPG mean hourly pay
Age								
16-29	7.96	9. 37	8	9.68	7.9	9.01	-1.27%	-7.44%
30-39	11.61	12.92	12.05	13.78	10.1	12.29	-19.31%	-12.12%
40-49	12.27	14.05	13.32	15.71	10.89	12.79	-22.31%	-22.83%
50-59	12.16	14.35	12.34	14.71	11.59	14.07	-6.47%	-4.55%
60+	10.72	13.45	13.65	15.88	10.2	11.94	-33.82%	-33.00%
Educational Qualifications								
Degree or above	14.62	16.07	16.71	17.59	13.03	15.07	-21.9%	-14.27
Below degree	8.75	10.3	9	11.07	8.69	9.28	-16.17%	-16.16
No qualifications	9.83	11.94	11.96	13.32	9.02	10.75	-19.23%	-24.58
How Many children								
No children	10.09	12.33	10.11	12.94	9.84	11.81	-2.74%	-9.57%
One child	11.2	12.38	12.71	13.12	11.23	11.99	-13.18%	-9.42%
2+ children	11.67	14.62	13.26	15.45	9.73	10.93	-36.28%	-41.35%
Children								
Does not have children	10.09	12.33	10.11	12.94	9.84	11.81	-2.74%	-9.57%
Has children	11.67	13.74	12.77	14.7	10.28	13.02	-24.22%	-12.90%

In terms of sector of employment, whilst the results show that controlling for no other characteristics public sector workers earn more than private sector workers across both median and mean hourly earnings. However, there exist significant gender differences in earnings within both sectors. Thus, whilst the partially adjusted GPG in the private sector is 29% in median terms and 18% when calculated based on the mean, public sector females do still earn considerably less than their male counterparts on average (See Table 5).

In terms of differences in pay by workplace size, the results show that average earnings are lowest in smaller firms and progressively get higher as the size of the workplace increases, so that average earnings are highest in firms with 100+ employees. However, the results also show that the gender pay in earnings is highest amongst those in workplaces with 100+ employees and narrowest in firms with between 0-24 employees.

In terms of differences in hourly pay for those in different occupations we see that those in 'Managerial' occupations have the highest average hourly earnings (both median and mean). This is closely followed by those in 'Professional' occupations (median hourly pay €27.41, mean hourly pay €30.45) and then those in 'Associate Professional and Technical' occupations (median hourly pay €21.49, mean hourly pay €24.76). Those in 'Elementary' occupations obtain the lowest average earnings, followed by those in 'Sales and Customer service' occupations. The results, however, show substantial gendered variations in pay across occupational categories. Indeed, whilst those in 'Managerial' occupations have the highest hourly pay on average (mean) across all workers, females in these occupations earn 44% less than males. In contrast, the results show a reverse GPG across 'Elementary' and 'Caring, Leisure and other service' occupations whereby female earnings are higher than male earnings on average.

Focusing on gendered differences in pay by industry the results show substantial differences in earnings in pay of males and females. When assessed via median earnings differences in pay are widest in the 'Other services' sector where females earn 90% less than males on average. When assessed via mean earnings the gap is widest amongst those employed in the 'Information and Communications' sector. There are also substantial differences in median

and mean earnings across a number of other sectors including the ‘Professional, Technical, Scientific, Admin’ and the ‘Manufacturing’ sector. Gendered gaps in earnings are narrowest in the ‘Public Administration, Health and Education’ sector.

Table 5: Average hourly earnings data, by gender and partially adjusted gender pay gap across personal/family characteristics

	All		Male		Female			
	Median hourly earnings	Mean hourly earnings	Median hourly earnings	Mean hourly earning	Median hourly earnings	Mean hourly earnings	GPG median hourly pay	GPG mean hourly pay
Sector of Employment								
Private	9.58	11.98	11.02	12.91	8.55	10.92	-28.89%	-18.22%
Public	12.52	14.09	13.48	15.06	12.01	13.61	-12.24%	-10.65%
Number of employees								
0-24	9.17	11.44	9.4	12.02	8.75	11.01	-7.43%	-9.17%
25-99	11.37	13.49	13.42	13.97	10.78	13.2	-24.49%	-5.83%
100+	12.16	13.84	12.42	14.64	11.36	12.95	-9.33%	-13.05%
Occupation								
Managerial/Directors/ Senior Officials	17.7	19.24	20.41	22.63	16.1	15.69	-26.77%	-44.23%
Professional	17.11	17.69	17.56	18.99	17.27	16.4	-1.68%	-15.79%
Associate Professional & Technical	15.55	16.82	14.55	14.82	17.04	17.89	14.61%	17.16%
Administration & Secretarial	10.12	11	11.99	11.5	9.89	10.74	-21.23%	-7.08%
Skilled trades	10.11	12.75	10.18	13.08	n/a	7.41		-76.52%
Caring, Leisure, Other Services	9.36	9.66	9.68	9.26	9.14	9.71	-5.91%	4.63%
Sales & Customer Service	7.95	8.81	8.16	9.05	7.92	8.67	-3.03%	-4.38%
Process Plant & Machine	10.8	10.35	11.26	10.74	8.55	9.16	-31.70%	-17.25%
Elementary	7.98	8.71	8.3	8.35	7.96	9.13	-4.27%	8.54%
Industry								
Agriculture, forestry, fishing, electricity	10.9	11.59	12.03	11.02	20.4	13.01	41.03%	15.30%
Manufacturing	11.1	12.44	11.93	12.75	8.6	11.45	-38.72%	-11.35%
Construction	9.7	11.55	9.86	11.78	12.7	9.16	22.36%	-28.60%

Wholesale, retail & transportation	8.87	9.86	10.39	10.85	8.44	8.81	-23.10%	-23.16%
Accommodation & Food	7.58	7.72	9.24	6.92	7.59	7.89	-21.74%	12.29%
Information, Communication, Financial, Insurance, Real Estate	15.48	16.96	20.39	20.19	11.87	13.52	-71.78%	-49.33%
Professional, Technical, Scientific, Admin	10.67	13.1	15.61	14.25	9.55	11.68	-63.46%	-22.00%
Public Admin, Health & Education	12.45	14.06	14.25	15.03	11.96	13.67	-19.15%	-9.95%
Arts, Entertainment	9.24	11.9	9.16	13.28	9.32	10.19	1.72%	-30.32%
Other Service	13.92	12.75	14.5	15.09	7.58	11.24	-91.29%	-34.25%
Full-time/Part-time								
Full-time	11.06	12.81	11.67	13.25	10.55	12.29		
Part-time	9.61	12.95	15.36	17.36	9.38	12.2		

SECTION 10: THE ADJUSTED GENDER PAY GAP IN NORTHERN IRELAND

We begin the econometric analysis of the adjusted GPG by estimating an Ordinary Least Squares (OLS) regression on log hourly earnings by gender across all workers. We follow this up by estimating four further models which regress gender on log hourly earnings, controlling for a range of individual and family/household structure characteristics. The dependent variable is the natural log of hourly wages excluding overtime. We repeat these same models for full-time workers only, and the results of this are also presented in Appendix 1 below. No discussion is given in the below text to the full-time only regression results, as the findings closely equate to those focused on all workers.

Model 1 in Table 6 below presents the results of the first model whereby gender is regressed on log hourly earnings. In doing so, we see that being female reduces log hourly earnings by 0.044, although the result is non-significant. This implies a gap in gross hourly earnings of around 9.5%, which is higher than the 8.4% gap in raw mean hourly earnings captured from ASHE in 2018. On this it is worth commenting that ASHE collects data from employees only and includes only those on the PAYE register, thus excluding many of the lowest paid workers. See Wilson, 2020 for a full assessment of estimates of the GPG using ASHE versus Understanding Society. In addition to this, we see that the adjusted r square is very small at 0.007, indicating that on its own gender has very little significant influence on hourly earnings.

Model 2 controls for a range of individual characteristics, including age and educational qualifications. In doing so, the model fit is improved significantly, with close to 30% of the variance in log hourly earnings being explained by these controls. Furthermore, the effect of introducing these variables into the regression is not only to increase the adjusted r square, but also to alter the influence of gender on earnings. In this regard, with the inclusion of control variables into the model the negative effect of being female almost doubles to -0.072 and becomes significant at the 0.01 level. In other words, the adjusted GPG in NI at 7.3 log per cent is double that of the raw log hourly GPG of 4.4 per cent.

In seeking to interpret these results, it would seem that it is not that gender has no effect on earnings as it would appear from the first model, but that the effects of gender on earnings

are influenced via the other characteristics included in the model, but that these characteristics on their own do not account for them. That is to say, it would appear that the gender wage gap is being primarily driven by differences *within* characteristics (i.e. differential returns for the same characteristics), rather than by differences in characteristics or differences in returns to different characteristics. In this case, the results from Model 2 suggest that the gender gap in wages is not best explained by differences in men and women's qualifications, but by gendered differences in the return to educational qualifications. In addition to the effect of gender on earnings, the results of Model 2 indicate the significant effect of other co-variates in the model. Having a degree has a significant positive influence on earnings, leading to a 0.166 increase in log hourly earnings, significant at the 0.001 level. In other words, all else being equal those with a degree earn 16% more than those with no qualifications.

Model 3 adds in number of children into the model, from which we see the coefficient for gender increase very slightly to -0.073 and remaining significant at the 0.01 level. This would suggest that gendered differences whether or not an employee has dependent children does not account for a small part of the GPG. We saw in Table 2 that 39% of females employed had dependent children, compared to under 32% of males. The adjusted r square decreases very slightly, indicating that the addition of this characteristic into the model does little to further explain variation in log hourly earnings, and that the previous model provided a better fit.

Model 4 introduces a number of different variables capturing working hours and contract of employment. In doing so there is a decrease in the model fit with the adjusted r square declining from 0.286 to 0.283. In terms of the focus of this paper on gender differences in pay, when these variables are added to the model there is only a small change in the coefficient for gender, which suggests that differences in working hours or working contract do not account for gender differences in pay. Looking at the coefficient for part-time work itself the results show that controlling for the other factors in the model, part-time work in and of itself has a small, albeit positive effect on log hourly earnings. This would suggest that the lower earnings which we see in raw terms amongst part-time workers, is explained via

other differences in personal/job characteristics of workers, rather than working part-time *per se*.

Model 5 adds into the model sector, industry and occupation. In so doing, we see that the gender coefficient increases to -0.085, and remains significant at the 0.001 level suggesting that segregation across these characteristics cannot explain differences in pay, but that rather it is gender segregation *within* these characteristics that contributes to gender differences in pay. In terms of sector, the results show a non-significant effect of being employed in the private sector on log hourly earnings, controlling for other factors and supports the findings of Jones and Kaya (2021). In terms of industrial sector the results show that those employed in the '*Wholesale, Retail, Accommodation & Food*' sectors have significantly lower earnings than those in the '*Financial, Insurance, Real estate, Professional, Technical, Scientific, Administratio*n' sectors, earning -0.0088 less per hour in log earnings. The coefficients of the other sectors included in the model are also negative, meaning their earnings are lower when compared to the reference category, although the results are not statistically significant. Occupational category also has a significant effect on earnings, with those in '*Clerical, sales and service'* occupations earning -0.126 less per hour and those in '*Production, Transport, Craft and Other manual*' occupations earning -0.129 less per hour in log hourly earnings.

Table 6: Regression Model of Log Gross Hourly Wage

	Model 1		Model 2		Model 3		Model 4		Model 5	
Constant	1.129	***	1.162	***	1.126	***	1.126	***	1.269	***
	(0.044)		(0.048)		(0.059)		(0.057)		(0.075)	
Gender										
Reference category: Male										
Female	-0.044	ns	-0.073	**	-0.073	**	-0.076	*	-0.085	**
	(0.025)		(0.024)		(0.024)		(0.025)		(0.025)	
Educational qualifications										
Reference category: No qualifications										
Degree			0.166	***	0.166	***	0.169	***	0.096	**
			(0.033)		(0.033)		(0.032)		(0.032)	
Below degree			-0.009	ns	-0.008	ns	-0.008	ns	-0.032	ns
			(0.034)		(0.034)		(0.033)		(0.031)	
Age										
Reference category: 40-49										
18-29			-0.154	***	-0.134	**	-0.132	**	-0.120	**
			(0.035)		(0.046)		(0.046)		(0.043)	
30-39			-0.047	ns	-0.045	ns	-0.046	ns	-0.042	ns
			(0.036)		(0.037)		(0.037)		(0.035)	
50-59			0.009	ns	0.027	ns	0.029	ns	0.015	ns
			(0.036)		(0.041)		(0.041)		(0.038)	
60 +			0.026	ns	0.048	ns	0.044	ns	0.011	ns
			(0.052)		(0.057)		(0.057)		(0.054)	
Children										

Reference category: No children						
One child	0.019 (0.041)	ns	0.022 (0.041)	ns	0.004 (0.039)	ns
Two or more children	0.037 (0.039)	ns	0.033 (0.039)	ns	0.028 (0.038)	ns
Full-time/Part-time						
Reference Category: Full-time			0.015 (0.031)	ns	0.031	ns
Part-time					(0.030)	
Contract of employment						
Reference category: Permanent						
Temporary			-0.050 (0.051)	ns	-0.039 (0.048)	ns
Sector of employment						
Reference category: Public						
Private					0.002 (0.03)	ns
Industry						
Reference category: Information, Communication, Financial, Insurance, Real estate, Professional, Technical, Scientific, Administration						
Agriculture & Industry					-0.045 (0.04)	ns

Wholesale, retail, accommodation & food				-0.088 (0.039)	**
Public administration, Health & Education				-0.030 (0.037)	ns
Arts, Entertainment & Other services				-0.103 (0.055)	ns
Occupation					
Reference category: Managerial, Professional & Associate Professionals					
Clerical, sales & service				-0.126 (0.028)	***
Production, Transport, Craft & Other manual				-0.129 (0.032)	***
Adjusted R square	0.007	0.289	0.286	0.283	0.387

In taking together the results for all the Models what we see is that when we control for the range of characteristics included in the model the gender gap in earnings widens and is larger than that suggested by the raw GPG. Specifically, as shown in Model 1, there is a -4.4% gap in raw log hourly earnings of males and females. However, when we control for a range of individual, household, and job characteristics this gap increases to -8.5%. This is because the characteristics of females, particularly regarding their educational qualifications and their occupational distribution mean that they should earn more than males, if men and women were paid equally within groups, all else being equal. However, because males within these groups continue to earn more for these characteristics than females the result is that the GPG widens when we take into account the characteristics of males and females.

Related to this point, it is worth commenting on the results in terms of the impact on earnings which show that no significant impact was found for the influence of children (proxy for labour market experience/time out of the labour market), part-time working, contract of employment or whether one was employed in the private sector on earnings. It is important to point out, however, that because these characteristics do not have their own significant impact on earnings, does not mean to say that they do not play in a role in explaining gender differences in pay. The next stage of analysis will illuminate the importance of differences in characteristics and differences in returns to characteristics in determining the GPG.

As mentioned in Section 8 Oaxaca-Blinder decomposition is the second stage of econometric analysis used in order to separate out the difference between the average hourly earnings of men and women into explained and unexplained parts. More specifically, using the Oaxaca-Blinder decomposition the mean difference between male and female earnings is decomposed, into a portion attributable to characteristics and portions attributable to differential returns to those characteristics, controlling for other factors included in the model.

The first panel of Table 7 below presents the estimated mean log wage for males and females and the gap between them. The estimated mean log wages for males are 1.084 and 1.040 for females, resulting in a gap in log hourly earnings of 0.44. The second panel of Table 7

displays the unadjusted GPGs split into the parts explained and unexplained by the different characteristics of male and female employees.

From this we see that the explained component of the GPG is negative. The negative explained gap indicates that women had, on average, better characteristics compared to men in the labour market. We also see from Table 8 that the unexplained component of the GPG is much larger than the explained component. At -0.349 the explained gap is less than one half of the magnitude of the unexplained gap of 0.079. This suggests that the observable data available do not account for gendered differences in earnings well and/or that a substantial amount of female disadvantage may exist. Or put differently, more of the gap is left unexplained, than is explained. Moreover, when we compare the magnitude of the explained and unexplained components to the raw GPG we see how the negative explained component of the adjustment partially cancels out the unexplained component of the GPG. Put another way, the labour market characteristics of females partially cancel out the overall impact of the differential (higher) returns for labour market characteristics which males obtain.

Table 7: Decomposition results

	Log wages
Predicted male	1.084
	(0.017)
Predicted female	1.040
	(0.014)
Gender pay gap	0.044
	(0.022)
Two-fold decomposition	
Explained	-0.0349
	(0.188)
Unexplained	0.0790
	(0.019)

After having presented the explained part, it is interesting to look more closely at the role of the different personal, family/household and job/work characteristics in explaining the differences in male and female earnings. Table 8 thus presents the detailed decomposition of the explained and unexplained gap, where the differential parts attributed to different groups of personal, family/household and employment-related characteristics are identified.

The results here suggest that gender differences in part-time employment, education and occupation make the largest (negative) contributions to the explained GPG in NI and thus work to narrow the unadjusted GPG. We have, however, to be careful in interpreting the finding in relation to the importance of part-time work, as the sample size for male part-time workers is small. This finding, however, would suggest to us that females are clustered in higher paid part-time employment on average, and this is consistent with the wider body of evidence on part-time employment in Northern Ireland. The results in terms of education and occupation are consistent with women having higher qualifications and a highly rewarded occupational allocation compared to men.

Gendered differences in the composition of employment amongst those with one children compared to those with no children, those in temporary employment, and those in the private sector serve to widen the gender pay gap.

Table 8: Detailed decomposition results

Explained	-0.0349 (0.018)
Education	
Reference category: No qualifications	
Below degree	-0.004 (0.003)
Degree	-0.011 (0.005)
Age	
Reference category: 40-49	
18-29	-0.006 (0.005)
30-39	0.001 (0.002)
50-59	-0.001 (0.001)
60+	-0.001 (0.001)
Number of children	
Reference category: zero children	
One child	0.001 (0.002)
Two plus children	-0.001 (0.001)
Full-time/Part-time	
Reference category: Full-time	
Part-time	-0.019 (0.008)
Permanency of employment	
Reference category: Permanent	
Temporary	0.001 (0.001)
Sector of employment	
Reference category: Public	

Private	0.001 (0.004)
Industry	
Reference category: Information, Communication, Financial, Insurance, Real estate, Professional, Technical, Scientific, Administration	
Agriculture & Industry	-0.012 (0.006)
Wholesale, retail, accommodation & food	0.004 (0.004)
Public administration, Health & Education	0.008 (0.007)
Arts, Entertainment & Other services	-0.001 (0.003)
Occupation	
Reference category: Managerial, Professional & Associate Professionals	
Clerical, sales & service	0.019 (0.009)
Production, Transport, Craft & Other manual	-0.319 (0.010)
Unexplained	0.079 (0.018)
Reference category: No qualifications	
Below degree	0.011 (0.018)
Degree	0.003 (0.016)
Age	
Reference category: 40-49	
18-29	-0.028 (0.017)
30-39	-0.003 (0,010)
50-59	-0.027 (0.011)
60+	0.001 (0.004)
Number of children	
Reference category: zero children	
One child	-0.009 (0.006)
Two plus children	-0.018 (0.011)
Full-time/Part-time	
Reference category: Full-time	
Part-time	0.202 (0.105)
Working hours	
Reference category: 31+ hours	
1-15	-0.002 (0.005)
16-30	-0.010 (0.011)
Permanency of employment	
Reference category: Permanent	
Temporary	0.002 (0.004)
Sector of employment	
Reference category: Public	
Private	0.009 (0.02)
Industry	
Reference category: Information, Communication, Financial, Insurance, Real estate, Professional, Technical, Scientific, Administration	
Agriculture & Industry	-0.006 (0.006)
Wholesale, retail, accommodation & food	-0.005 (0.008)
Public administration, Health & Education	-0.026 (0.020)
Arts, Entertainment & Other services	-0.004 (0.005)

Occupation	
Reference category: Managerial, Professional & Associate Professionals	
Clerical, sales & service	-0.008 (0.010)
Production, Transport, Craft & Other manual	-0.004 (0.010)
Constant	0.062 (0.116)

It is worth reflecting a bit more on the decomposition results to enable us fully understand reasons behind gender differences in pay between males and females in Northern Ireland. Focusing firstly on educational qualifications and to the particular importance of degree level or above level qualifications in explaining a reduction in the GPG, we saw in Table 2 that females in employment in Northern Ireland are significantly more likely to be educated to degree level or above compared to males, with 42% of females educated to degree level or above compared to 27% of males. We also saw that those with degree or above level qualifications earn a premium of £4.79 at the median and £4.10 at the mean over those with no qualifications. It is thus a combination of these factors which explain the importance of degree level or higher-level qualifications in reducing the overall GPG. At the same time, however, as can be seen in the detailed decomposition of the unexplained gap that, differences in returns to degree level of higher-level qualifications whereby males with degree level or higher-level qualifications earn more than females with same that results in this characteristic also having a widening effect on the GPG.

Turning next to the decomposition results for occupation whereby gendered differences in 'Production, Transport, Craft and Other Manual' occupations serve to narrow the GPG, whilst 'Clerical, sales and service' occupations serve to narrow it. In interpreting these results it is important to firstly bear in mind the reference category, namely 'Managerial, Professional and Associate Professional' occupations of whom have the highest pay when compared against the other occupations. Females are significantly more likely to be employed in these occupations compared to males whereby 43% of females are employed, compared to 34% of males. Females are also much less likely to be employed in "Production, Transport, Craft and Other Manual' occupations, where 16% of females are employed, compared to 49% of males. It is thus the dominance of females in the higher paid 'Managerial, Professional and Associate Professional' when compared against 'Production, Transport, Craft and Other Manual' occupations that explain its role in narrowing the GPG. However, it is because

females (42%) are significantly more likely to be employed in 'Clerical, sales and service' occupations compared to males (16%) and these roles are lower paid than the higher paid reference category 'Managerial, Professional and Associate Professional' occupations that explains this occupation's role in widening the GPG. Thus, in this respect, female occupational allocation into the highest paid and the lowest paid occupations has a dual role of both increasing and decreasing the GPG overall.

In terms of industry, the results show the narrowing influence of 'Agriculture and Industry' and 'Arts, Entertainment and other services' sectors on the GPG. In contrast, employment within the 'Wholesale, retail, accommodation and food services' sector and 'Public administration, Health and Education' sector has a widening effect on the GPG. In examining the reasons behind these results it is useful to draw on the descriptive statistics as presented in Table 3, whereby we see that females are more likely to be employed in the 'Wholesale, retail, accommodation and food services' and the 'Public administration, Health and Education' sector, where wages are lower (See Table 5) when compared to the reference category of those in the '*Information, Communication, Financial, Insurance, Real estate, Professional, Technical, Scientific, Administration'* sectors. In contrast, females dominate in the Wholesale, retail, accommodation and food services' sector and the 'Public administration, Health and Education' sectors where wages are also lower than in the reference category.

The results in terms of the impact of children on gendered differences in earnings are curious. They go against the dominant finding across much of the international literature which tends to find children, or rather the impact of children on labour market experience, to be one of the most significant explanators of gender gaps in pay. In the current study, as we have seen above, this is obviously not the case, and other characteristics provide more dominant explanations for gender differences in pay. It is unclear whether the weak relationship found for the impact of children on gender differences in pay is that number of children is a poor proxy for time out of the labour market. Thus it could be, a variable that one that more accurately captured experience or periods out of the labour market would find a different result. Unfortunately, however there were no more specific variables in the

dataset to test this hypothesis. On the other hand, the results can be interpreted as evidence that if it were it not for other factors, even women with children ought to be on a more level footing with men in terms of pay. The detailed decomposition of the unexplained results suggest however that number of children has a substantive impact on the size of the unexplained component. Having two children compared to having no children contributes about one fifth of the unexplained differences in pay between males and females.

It is also worth noting at this stage that the results show a higher likelihood of females in employment to have children compared to males and show the higher average earnings of those with children compared to those with no children (both for males and females). These findings would perhaps indicate that there may be positive selection effects into employment.

In examining this possibility, a Heckman selection model is used (Heckman, 1979) where, selection into our sample (relative to economic inactivity), is modelled with the following personal characteristics: age, highest qualification, occupation, sector, the number of dependent children. Following Mulligan and Rubinstein (2008) and Kaya and Jones (2021) number of dependent children is excluded from the earnings equation to provide identification – and thus acts as the instrumental variable. In doing so, however, no statistically significant evident effects of selection were found. This author cautions, however, not to infer from this that selection effects do not exist, but rather concludes that the available data is not suffice to be able to examine selection into employment. In particular, the absence of data capturing spousal income or total household income is noted by this author. Household/spousal income has been found to be important in identifying selection in other studies. In the continuing absence of this data, however, future studies could potentially utilise the same data source as the current study and seek to impute wage data for those economically inactive from existing variables as outlined in Eurostat (2009).

It should be noted, however, Jones and Kaya (2021) also found selection to have a non-significant impact on the GPG in Northern Ireland and concluded that differences in selection

into employment could not explain differences in the size of the GPG between Northern Ireland and the United Kingdom as a whole.

The smaller overall unadjusted gap is often explained as being the result of the 'higher proportion of women working in the public sector where pay rates for some jobs are higher than in the private sector.' However, the results in this study show no significant impact of private sector employment in determining log hourly wages, when all of the other characteristics are controlled for. Furthermore, the decomposition results show only a small impact of private sector employment in determining gender differences in pay. These findings support those of Jones and Kaya (2021) who similarly show no independent negative influence of private sector. Indeed, the results presented here support the conclusion arrived at by those authors who argue the importance of both the superior occupational allocation of females and lower levels of wage inequality across the occupational distribution as a whole for the lower GPG.

Finally, we explore the sensitivity of our regression analysis and decomposition results by testing to see if they hold up when we use a different sample, namely full-time employees only. The key findings in terms of the GPG and the importance of particular characteristics are robust.

SECTION 11: SUMMARY AND CONCLUSION

This paper estimates the adjusted GPG in Northern Ireland. Using Understanding Society survey data this paper shows an adjusted gap in log hourly earnings of -0.072 between males and females. That is, controlling for a range of individual, family/household and job characteristics log hourly earnings of females are 7.2 percent lower than male earnings and significant at the 0.001 level. That is to say, the adjusted GPG is double that of the non-statistically significant raw/unadjusted log hourly GPG of 4.4 per cent. In interpreting these results, this paper argues that it is not that gender has no effect on earnings as it would appear from the first regression model presented. Rather the results suggest that the effects of gender on earnings are influenced via other characteristics included in the model. That is to say, it would appear that the gender wage gap is being primarily driven by differences

within characteristics (i.e. differential returns for the same characteristics), rather than by differences in characteristics or differences in returns to different characteristics (wage inequality).

Digging further into this and to the importance of (a) differences in characteristics; (b) differences in returns to different characteristics; and (c) differences in returns to same characteristics the results of the decomposition show a negative explained GPG. This indicates that females have better labour market characteristics than males.

The results in terms of the reductive role of superior female labour market characteristics is an important finding. However, we need to be careful not to think that the solution to the GPG is to advance the labour market characteristics of females, as obviously the risk here is that what appears to be female advantage is simply masking male disadvantage and males inferior labour market characteristics. Further to this, the results of this study show that in any case this approach is likely to not prove fruitful. The results show the larger and ultimately fundamental importance of the higher returns to males for same characteristics in driving the GPG.

The results in terms of public sector require concluding. It is often commented that the smaller overall unadjusted gap in NI compared to the UK is due to the 'higher proportion of women working in the public sector where pay rates for some jobs are higher than in the private sector.' However, the results in this study show no significant impact of private sector employment in determining log hourly wages, when all of the other characteristics are controlled for. Furthermore, the decomposition results show only a small impact of private sector employment in determining gender differences in pay. These results suggest that further allocating females into the public sector is not necessarily going to have a reducing role on the GPG. To help appreciate these findings we might look to the results of the decomposition for occupation which showed that female occupational allocation into the highest paid and the lowest paid occupations has a dual role of both increasing and decreasing the GPG overall. Thus, it is not necessarily the case that allocation of females into

the public sector will reduce the GPG, what matters is what jobs within the public sector females are allocated.

REFERENCES

Albrecht, J., Bronson, M. A., Skogman Thoursie, P. and Vroman, S. (2018) *The career dynamics of high-skilled women and men: Evidence from Sweden,* Working Paper Series 2018:9, IFAU - Institute for Evaluation of Labour Market and Education Policy.

Anderson T., Forth, J., Metcalf, H., and Kirby, S. (2001) The GPG: Final Report to the Women and Equality Unit, Cabinet Office, Women and Equality Unit, London.

Andrew, A., Bandiera, O., Costa-Dias, M. and Landais , C. (2021) *Women and Men at work*, IFS Deaton Review of Inequalities, London: Institute for Fiscal Studies. Available online at: https://ifs.org.uk/inequality/women-and-men-at-work/ [Last accessed on: 20.12.2022].

Barrett, A., Callan, T., Doris, A., O'Neill, D., Russell, H., Sweetman, O. and McBride, J. (2000) *How Unequal? Men and Women in the Irish Labour Market*., Dublin: Oak Tree Press.

Becker, G.S. (1985) 'Human capital, effort, and the sexual division of labor', Journal of Labor Economics, 3(1): S33−S58.

Bettio, F. and Verashchagina, A. (2009) Gender segregation in the labour market: Root causes, implications and policy responses in the EU, Luxembourg: Publications Office of the European Union. Available online at: https://op.europa.eu/en/publication-detail/- /publication/39e67b83-852f-4f1e-b6a0-a8fbb599b256 [Last accessed on: 1.10.2020].

Black, D., Haviland, A.M., Sanders, S.G., and Taylor, L.J. (2008) 'Gender Wage Disparities Among the Highly Educated', *Journal of Human Resources*, 43(3): 630-659.

Blackburn, R.M., Brooks, B., Jarman, J., (2016) 'The vertical dimension of occupational segregation', *Work, Employment and Society*, 15(3): 511–538.

Blackwell, L. (2001) 'Occupational Sex Segregation and Part-time Work in Modern Britain', *Gender, Work and Organization,* 8(2): 146-163.

Blau, F.D. and Kahn, L.M. (2003) 'Understanding International Differences in the Gender Wage Gap', *Journal of Labour Economics*, 21(1): 106-144.

Blau, F.D. and Kahn, L.M. (2017) 'The Gender Wage Gap: Extent, Trends and Explanations', *Journal of Economic Literature*, 55(3): 789-86.

Blinder, A. (1973) 'Wage Discrimination: Reduced Forms and Structural Estimates', *Journal of Human Resources*, 8(4): 436-455.

Boll, C., Leppi, J. Rossen, A. and Wolf, A. (2016) *Magnitude and impact factors of the GPG in EU Countries,* European Commission: Publications Office.

Boll, C. and Lagemann, A. (2018) *GPG in EU countries based on SES (2014*), European Commission. Available online at: https://ec.europa.eu/info/sites/info/files/aid_development_cooperation_fundamental_rights/report-gender-pay-gap-eu-countries_october2018_en_0.pdf [Last accessed on: 19.10.2020].

Brynin, M. (2017) *The Gender Pay Gap,* Report 109, Manchester: Equality and Human Rights Commission, Research.

Budig, M.J. and England, P. (2001) 'The Wage Penalty for Motherhood', *American Sociological Review*, 66(2):204–25.

Callan, T. (1991) 'Male-Female Wage Differentials in Ireland', *Economic and Social Review,* 23(1).

Callan T. and Wren, A. (1994) *Male-Female Wage Differentials: Analysis and Policy Issues,* General Research Series, No. 163, Dublin: The Economic and Social Research Institute.

Christofides, L. N., Polycarpou, A. and Vrachimis, K. (2013) 'Gender wage gaps, 'sticky floors' and 'glass ceilings' in Europe', Labour Economics, 21: 86-102.

Correll, J. Benard, S., and Paik, I. (2007) 'Getting a job: Is there a motherhood penalty?', *American Journal of Sociology*, 112(5): 1297-1338.

Cukrowska-Torzewska E and Matysiak A. (2020) 'The motherhood wage penalty: A meta-analysis', *Social Science Research*, 88-89.

Davies, R. and Pierre, G. (2005) 'The family gap in pay in Europe: a cross-country study', *Labour Economics*, 12(4): 469-486.

Department of Children, Equality, Disability, Integration and Youth (2022) *What is the Gender Pay Gap Information Act 2021,* Department of Children, Equality, Disability, Integration and Youth, Available online at: https://www.gov.ie/en/publication/29606-what-is-the-gender-pay-gap-information-act-2021/ [Last accessed on: 15.12.2022].

Department for Communities (2021) *Report from the Gender Equality Strategy Expert Advisory Panel,* Available online at: https://www.communities-ni.gov.uk/publications/report-gender-equality-strategy-expert-advisory-panel [Last accessed on: 9.3.2023].

Doorley, K., Privalko, I. and Russell, H. and Tuda, D. (2021), *The Gender Pay Gap in Ireland from Austerity Through Recovery*. IZA Discussion Paper No. 14441. Available at http://dx.doi.org/10.2139/ssrn.3865466.

Leythienne, D. and Perez-Julian, M. (2021*) Gender pay gaps in the European Union – a statistical analysis,* Eurostat. Available online at: https://ec.europa.eu/eurostat/documents/3888793/14368632/KS-TC-22-002-EN-N.pdf/4951104b-f01d-0964-717a-be0ea3dfd9e4?t=1662728236409 [Last accessed on: 16.12.2022].

Eurostat (2009) *Development of econometric methods to evaluate the Gender pay gap using Structure of Earnings Survey data*, Luxembourg: Eurostat.

Eurostat (2018) *A decomposition of the unadjusted gender pay gap using Structure of Earnings Survey data,* Luxembourg: Eurostat. Available online at: https://ec.europa.eu/eurostat/web/products-tatistical-working-papers/-/ks-tc-18-003 [Last accessed on: 9.3.23].

Eurostat (2022) *Gender pay gap statistics*, Eurostat. Available online at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Gender_pay_gap_statistics [Last accessed on: 16.12.2022].

Goldin, C. (2014) 'A Grand Gender Convergence: Its Last Chapter', *American Economic Review,* 104(4), 1091-1119.

Grimshaw, D. and Rubery, J. (2015) *The motherhood pay gap : a review of the issues, theory and international evidence*, Geneva: International Labour Organisation.

Hakim, C. (1979) *`Occupational Segregation: A Comparative Study of the Degree and Pattern of the Differentiation between Men and Women's Work in Britain, the United States and Other Countries'*, Research Paper No. 9. London: Department of Employment.

Heckman, J. (1979) 'Sample selection bias as a specification error', *Econometrica,* 47, 153–61.

Hodges, M. and Budig, M. (2010) 'Who Gets the Daddy Bonus: Organizational Hegemonic Masculinity and the Impact of Fatherhood on Earnings', *Gender & Society,* 24: 71.

Jones, M. and Kaya, E. (2021) *The Gender Pay Gap: What can we learn from Northern Ireland?*, IZA Institute of Labour Economics Discussion paper series. IZA DP No. 13318. Available online at: https://www.iza.org/publications/dp/13318/the-gender-pay-gap-what-can-we-learn-from-northern-ireland [Last accessed on: 16.12.2022].

Kleven, H., Landais, C. and Søgaard, J. E. (2018) *Children and Gender Inequality: Evidence from Denmark,* CEPR Discussion Papers.

Manning, A. and Petrongolo, B. (2008) 'The Part-time Pay Penalty for Women in Britain', *The Economic Journal*, 28-52.

NI Executive (2020) *New Decade New Approach,* Available online at: 2020-01-08_a_new_decade__a_new_approach.pdf (publishing.service.gov.uk) [Last accessed on: 20.12.2022].

NISRA (2021) *Employee Earnings in Northern Ireland*, Belfast: NISRA. https://www.nisra.gov.uk/system/files/statistics/Employee-earnings-NI-2021.pdf [Last accessed on: 16.12.2022].

Oaxaca, R. (1973) 'Male-Female Wage Differentials in Urban Labor Markets', *International Economic Review,* 14(3)

Oaxaca, R. and Ransom, M. (1999) 'Identification in Detailed Wage Decompositions', *The Review of Economics and Statistics,* 81(1), 154-157.

OECD (2012) *Closing the gender gap,* Paris: OECD publishing.

OECD (2015) *Gender equality: An uphill battle*, Paris: OECD publishing.

OECD (2019) *Gender wage gap (indicator),* Paris: OECD. Available online at: https://data.oecd.org/earnwage/gender-wage-gap.htm

OECD (2020) *Gender Wage Gap (indicator) Employees: 1995-2019*, Paris: OECD. Available online at: https://data.oecd.org/earnwage/gender-wage-gap.htm#indicator-chart.

Office for National Statistics (2022) *Employee earnings in the UK: 2022*, London: Office for National Statistics. Available online at: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2022. [Last accessed on: 20.12.2022].

Olivetti, C. and Petrongolo, B. (2008) 'Unequal pay or unequal employment? A cross-country analysis of gender gaps', *Journal of Labor Economics*, 26(4):621–654.

Olsen, W. and Walby, S. (2004) *Modelling GPGs,* Working paper series no. 17, Equal Opportunities Commission.

McGuinness, S., Kelly, E., Callan, T., O'Connell, P.J. (2009) *The Gender Wage Gap in Ireland: Evidence from the National Employment Survey 2003*, Equality Research Series, Dublin: ESRI.

Mulligan, C.B. and Rubinstein, Y. (2008) Selection, Investment and Womens Relative Wages over time, *The Quarterly Journal of Economics*, 123(3): 1061-1110.

Reskin, B. F. and Roos, P. A. (2009) *Job queues, gender queues: Explaining women's inroads into male occupations,* Philadelphia, PA: Temple University Press.

Rubery, J. and Fagan, C. (1993) 'Occupational Segregation of Women and Men in the European Community', *Social Europe*, Supplement 3/93, Luxembourg: Publications Office of the European Union.

Russell, H. and B. Gannon (2002) *The Male/Female Wage Gap in Ireland, Impact Evaluation of the European Employment Strategy in Ireland*, Dublin: Department of Enterprise, Trade & Employment, https://www.esri.ie/publications/the-male-female-wage-gap-in-ireland

Scholes, M. and Stennett, A. (2020) *Northern Ireland GPG – 2020 update*, Northern Ireland Assembly, Research and Information Service. Available online at: https://www.assemblyresearchmatters.org/2020/03/06/northern-ireland-gender-paygap-2020-update/ [Last accessed on: 20.10.2020].

Slaughter, H. (2022) *Policing prejudice Enforcing anti-discrimination laws in the workplace,* London: Resolution Foundation, Available online at: https://www.resolutionfoundation.org/app/uploads/2022/11/Policing-prejudice.pdf [Last accessed on: 16.12.2022].

TUC (2016) *The Motherhood Pay Penalty, Key Findings from TUC/IPPR Research*, London: TUC.

University of Essex. Institute for Social and Economic Research, NatCen Social Research, Kantar Public (2018) *Understanding Society: Waves 1-8, 2009-2017 and Harmonised BHPS: Waves 1-18, 1991-2009*. 11th Edition, London: UK Data Service.

Van Kerm, P., Yu, S. and Choe, C. (2016) 'Decomposing Quantile Wage Gaps: A Conditional Likelihood Approach', *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, 65(4): 507-527.

Weichselbaumer, D. and Winter-Ebmer, R. (2005) 'A Meta-Analysis of the Gender Wage Gap', *Journal of Economic Surveys*, 9(3): 479-511.

White, N. (2022) *Gender Pay Gap in the UK: 2022*, London: ONS. Available online at: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/genderpaygapintheuk/2022#:~:text=The%20gender%20pay%20gap%20varies,%25)%20and%20Scotland%20(3.7%25). [Last accessed on: 5.1.2023].

Wilson, L. (2017) *The gendered nature of employment and insecure employment in Northern Ireland: A story of continuity and change*, NERI Working Paper Series NERI WP 2017/50, Belfast: NERI. Available online at: https://www.nerinstitute.net/download/pdf/changing_nature_of_womens_work_lw_final _draft.pdf [Last accessed on: 12.11.19].

Wilson, L. (2020) *How Unequal? The unadjusted gender pay gap in Northern Ireland and the Republic of Ireland,* Working Paper No, 69, Belfast: NERI. Available online at: https://www.nerinstitute.net/research/how-unequal-unadjusted-gender-pay-gap-earnings-northern-ireland-and-republic-ireland [Last accessed on: 15.12.2022]

RECENT NERI WORKING PAPERS

The following is a list of recent research working papers from the NERI. Papers are available to download from the NERI website: http://www.nerinstitute.net

Number	Title/Author(s)
2021	
72	The anatomy of employment in Ireland: How has the structure of employment changed from crisis to crisis - Paul Goldrick-Kelly, Esmé Sheridan, Ian Walsh and Lisa Wilson
2020	
71	Supporting people and place: Planning for a just transition in Northern Ireland – Aoife Ní Lochlainn
70	The Public-Private Sector Pay Gap in Northern Ireland - Paul Mac Flynn
69	How Unequal? The unadjusted gender pay gap in earnings in Northern Ireland and the Republic of Ireland - Lisa Wilson
68	Fiscal Powers in Northern Ireland: A New Settlement – Paul Mac Flynn
67	Reforming Tax and Spend in the United Kingdom and in the Republic of Ireland- Paul Goldrick-Kelly, Paul Mac Flynn and Tom McDonnell
66	The Impact of Collective Bargaining on pay in Northern Ireland - Paul Mac Flynn
2019	
65	Matching skills needs with skills reserves: Protecting workers and communities for a just transition – Ciarán Nugent and Paul Goldrick-Kelly
64	Precarious Work in the Republic of Ireland - Ciarán Nugent, Sinead Pembroke and Michael Taft
63	Taxing Property: Suggestions for Reform -Tom McDonnell
62	Labour Market Trends in the Republic of Ireland (2019) - Ciarán Nugent
61	Income Inequality in the Republic of Ireland (2004-2015) - Ciarán Nugent
60	The Future of Work: The impact of automation technologies for job quality in Northern Ireland - Paul Mac Flynn and Lisa Wilson
59	The Future of Work: The impact of automation technologies for employment in Northern Ireland - Sórcha Foster and Lisa Wilson
2018	
58	Innovation and Growth: Concepts and Policy Implications - Thomas A. McDonnell
57	Productivity on the island of Ireland - a tale of three economies - Paul Goldrick-Kelly and Paul Mac Flynn
56	Housing Affordability for Ireland's Young People in the Context of the Cost of Living: A Long-Term Assessment - Dara Turnbull
55	'Bad' jobs and productivity: The flexibility paradox - Paul Mac Flynn and LisaWilson
54	Equality in Irish Healthcare – Time for a New Deal - Paul Goldrick-Kelly and TomHealy

NERI

31/32 Parnell Square
Dublin 1

Phone +353 1 889 7722

45-47 Donegall Street
Belfast BT1 2FG

Phone + 44 28 902 46214

info@NERInstitute.net
www.NERInstitute.net

@NERI_research