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ABSTRACT

Minimum Wages and the Gender Gap in Pay: New Evidence from the UK and Ireland

Women are disproportionately in low paid work compared to men so, in the absence of rationing effects on their employment, they should benefit the most from minimum wage policies. This study examines the change in the gender wage gap around the introduction of minimum wages in Ireland and the United Kingdom. Using survey data for the two countries, we develop a decomposition of the change in the gender differences in wage distributions around the date of introduction of minimum wages. We separate out 'price' effects attributed to minimum wages from 'employment composition' effects. A significant reduction of the gender gap at low wages is observed after the introduction of the minimum wage in Ireland while there is hardly any change in the UK. Counterfactual simulations show that the difference between countries may be attributed to gender differences in non-compliance with the minimum wage legislation in the UK.

JEL Classification: C14, I2, J16

Keywords: gender wage gap, minimum wage, distribution regression

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1 Introduction

Recent research into the gender wage gap has increasingly focused on more global methods than the evaluation of gender wage differences at the mean. Gender gaps are often concentrated either at the bottom of the distribution ('sticky floors') or at the top ('glass ceilings'). This literature has benefited from the surge of methods extending Oaxaca-Blinder type decompositions to the whole wage distribution (see the surveys in Melly, 2006, Fortin, et al., 2011, Chernozhukov et al., 2013). Most directly relevant for policy makers, distributional analyses provide some insights into the intended or unintended effects of labour market policies on wage inequality and, in particular, gender wage gaps. This is particularly the case of policies like the national minimum wage (henceforth NMW) which, by design, affect workers at different positions of the wage distribution differently. NMW policies tend to compress the bottom of the wage distribution, where women are disproportionately represented. As a result, women should benefit the most from NMWs, at least in the absence of changes to their employment status. A (possibly unintended) consequence of the NMW is therefore a reduction of the gender wage gap.

Testing this prediction is usually complicated. At the macro level, it is difficult to control for all sources of cross-country differences beyond wage distributions and NMW policies. A successful attempt to do so is Blau and Kahn (2003), who check for a negative correlation between the gender gap and the 'bite' of NMWs (the NMW level as a proportion of the average wage). For Ireland, McGuinness et al. (2008) use the proportion of NMW workers in a firm to identify the wage disadvantage to men and women who are employed in low-paying firms. With micro data, time variations in NMWs are often too small to provide detectable effects. Studies close to ours have used changes in NMW legislation in the US (Blau and Kahn, 1997), in Ukraine (Ganguli and Terrell, 2005, 2009) and in Indonesia (Hallward-Driemeier et al, 2017) to check how gender gaps vary with NMW levels. In this study, we examine an even more radical policy event, namely the *introduction* of NMW legislation.

We focus on the introduction of a NMW in the UK in 1999 and in Ireland in 2000. Using the Living in Ireland survey (LII) and the British Household Panel Survey (BHPS), we employ a flexible model of wage distributions to construct counterfactual distributions of wages based on a fixed distribution of covariates for women in each country. We estimate gender differences in wage distributions before and after the introduction of the NMW separating out workers characteristics ('explained/composition') effects from residual ('unexplained/discriminatory') differentials. We can thus show how the gender wage gap at the bottom of the distribution evolved after the introduction of the NMW in each country, as well as measure possible 'spillover' effects further up in the distribution.

It is noteworthy that we focus on two neighbouring countries sharing a common past history, with highly centralized systems of collective wage bargaining and a similar high level of 'sticky floor' before the policy reform. Beyond these common initial conditions, the almost simultaneous introduction of a NMW in Ireland and the UK allows us to assess how much the impact may differ according to the level at which minimum wages are set (the 'bite' of the NMW) and to the degree of compliance.

Our results are as follows: A large reduction in the gender wage gap at the bottom of the distribution is found after the introduction of the NMW in Ireland while there is hardly any change in the UK. We perform several robustness checks that include holding employment composition constant using panel data, detrending the effects (a triple difference approach), checking the sensitivity of our results to the inclusion of occupation and industry variables, changing the reference group and accounting for selection into work. Our conclusions are stable. To explain contrasted results between Ireland and the UK, we suggest an extrapolation exercise that examines the counterfactual effect of introducing the same NMW compliance in the UK as in Ireland. We find that the absence of an effect in the UK may be due to the degree of non-compliance with NMW legislation.

2 Literature and Institutional Background

2.1 Gender Wage Gaps and Labour Market Policies

Gender gaps have been studied in the context of different career development patterns between men and women.[1] To explain sticky floors in particular, the literature has focused on factors that may affect wage inequality at the start of the career, including signaling and statistical discrimination (Belley et al. 2015). Closer to our focus, the role of labour market regulation affecting low-skilled workers is also emphasized. Countries with higher unionization rates tend to have lower wage dispersion (Blau and Kahn, 1996), possibly lowering the wage gap. Trade unions may be less likely to represent the interests of their female electorate because they may be perceived as having less attachment to the labour market (Booth and Francesconi, 2003). They may also be less sensitive to the interests of members at the low end of the wage distribution (Arulampalam et al., 2007).

More specifically, studies of the impact of NMW on the wage distribution usually find that such regulation compresses the bottom of the distribution, reducing the sticky floor effect.

[1] The role of child-related career interruption (Meurs et al., 2010), and specific discrimination that prevents women from achieving high wages and top positions are particularly important in explaining glass ceilings. Studying these entails accounting for firm-specific heterogeneity and the use of matched worker-firm data (Meng and Meurs, 2004; Nordman and Wolff, 2011).

Using variation in the number of NMW workers across firms in Ireland, McGuinness et al (2008) find that the part-time gender wage gap is decreased by the NMW. Ganguli and Terrell (2005, 2009) find that the doubling of the NMW between 1997 and 2003 contributed to the closing of the gender wage gap in Ukraine. Blau and Kahn (1997) also emphasize that the sharp decline in the NMW between 1979 and 1988 in the US is one of the important institutional factors explaining the widening gender gap during this period. Robinson (2002), using quantile regression methods, finds no evidence that the NMW in the UK affected the gender wage gap in the lower part of the wage distribution. Another study by Robinson (2005) finds some evidence of a narrowing of the gender pay gap by $1-2$ percentage points in regions where women comprise a relatively large share of the low paid, and where the regional bite is larger (like Scotland). Our study expands on this type of study by using a more appropriate distributional analysis, as described below, and by providing a comparative setting across two neighbouring countries with different wage distributions and NMW 'bites'.

2.2 Distributional Analyses

Departing from the standard decomposition method of Blinder (1973) and Oaxaca (1973), a number of decomposition methods for wage distributions have been proposed (such as Juhn et al., 1993, DiNardo et al., 1996, Gosling et al., 2000, Melly, 2006, Machado and Mata, 2005, among others). These methods have been applied in analyses of the gender gap in many different contexts and regions. Coverage includes Europe (Arulampalam et al., 2007, Beblo et al. 2003), Sweden (Albrecht et al., 2003), the UK (Blundell et al., 2007, Chzhen and Mumford, 2011), Spain (Gardeazabal and Ugidos, 2005, de la Rica et al., 2008), Ukraine (Ganguli and Terrell, 2005) and the US (Olivetti and Petrongolo, 2008, Weinberger and Kuhn, 2010). Such an approach is suitable here since NMW policies are targeted at low wages, so that looking at the evolution of *mean* wage differences between men and women before and after the introduction of the NMW may not capture the impact of the policy well.

Various alternative methods have been put forward for such distributional analyses (see the survey of Fortin et al., 2011). The most popular quantile-regression-based methods *à la* Machado and Mata (2005) are less than ideal in our context because the discontinuity in wages around the minimum wage is not easily captured by quantile regressions. On the contrary, the 'distribution regression' (DR) approach proposed in Foresi and Peracchi (1995), and recently extended by Chernozhukov et al. (2013), is particularly well-suited. By modeling the distribution function directly (rather than its inverse, the quantile function), this approach is not affected by the bunching of data around the minimum wage. Given our focus on the bottom of the wage distribution, this aspect is rather critical. Al-

though the two approaches are theoretically equivalent (Koenker et al., 2013), empirical evidence suggests that DR generally provides better fit to wage distribution data than quantile regression (Rothe and Wied, 2013, Van Kerm et al., 2016).

2.3 Gender Gaps and Labour Policies in Ireland and the UK

Gender Wage Gaps. Ireland is a country with a history of gender inequality on the labour market due to a combination of cultural and religious ideals, a traditionally unequal gender division of labour and a relatively weak economy until the Celtic Tiger years in the 1990s. Despite the rapid catching up of female labour market participation during this period and extensive equality legislation (Anti-Discrimination (Pay) Act 1974 and the Employment Equality Act 1998), the Irish gender wage gap has remained substantial. In the UK, attention was given relatively early to the issue of equal pay as, during the two World Wars, women took up typically male jobs. The Equal Pay Act of 1970 legislated for equal pay and conditions for men and women. However, the modification of job titles often allowed employers to continue discriminatory practices and, over four decades later, there still exists an unexplained gender wage gap.

Using harmonized micro data for Europe, panel A in Figure 1 shows the evolution of the *raw* gender wage gap in the UK, Ireland and in the EU-27 during the period studied. Between 1997 and 2001, the gap was similar and relatively stable in both countries, with men earning, on average, $20-24\%$ more than women. This was, however, higher than the EU average of 16%. At the beginning of this century, the Irish gender wage gap decreased relative to the UK one.

Panel B in Figure 1 shows that this gap was not uniform across the wage distribution. Until the NMW was introduced, the raw gender wage gap in Ireland was larger at the bottom and in the middle of the wage distribution than at the top. After the introduction of the NMW, the raw gender wage gap at the bottom of the wage distribution fell sharply. The raw gender wage gap in the UK was more similar across the wage distribution with no sharp changes visible around the introduction of the NMW. Results from Arulampalam et al. (2007) corroborate this observation: they report a raw gender wage gap in the first decile of earnings of 25% in Ireland and 24% in the UK, while the gender gap in the top decile of earnings was more contrasted (13% and 25% respectively). While these are raw gaps, the adjusted wage gaps (i.e. corrected for gender differences in skills and other characteristics) exhibit similar patterns in Arulampalam et al. (2007). Both countries display high gender inequality in the lower part of the distribution (while Ireland may have less of a 'glass ceiling' prior to the introduction of the NMW than the UK). Similar intensities of 'sticky floors' in the two neighbouring countries provide an interesting common set-up. Panel B of Figure 1 also shows that trends in the gender wage gaps across

the wage distribution were relatively similar and generally declining in the run up to the introduction of the NMW in both countries.

Figure 1 around here

National Minimum Wages. NMWs were introduced almost simultaneously in the UK and Ireland. The British industry-based Wages Council system that regulated pay in many sectors was abolished in 1993 amid arguments that it reduced employment, although there was little evidence that the system had cost jobs (Machin and Manning, 1994). In April 1999, a NMW of £3.60 per hour for those aged 22 or older was introduced, as well as a youth rate of £3 per hour for those aged 18 to 21. One of the stated aims of this legislation was actually to tackle the gender pay gap. Another one was to precede the increased generosity of the Working Family Tax Credit (WFTC), in order to reduce the possibility of firms being able to appropriate some of the benefits of the subsidy to reduce their gross wage bill. About 6% of workers' wages were raised up to the minimum (Dickens and Manning, 2003) and prominent among these were part-time female workers (Metcalf, 1999). In 1999 in Ireland, the newly created Minimum Wage Commission recommended an initial rate of IE£4.40 per hour (equivalent to £3.40 as shown in Table 1), representing two thirds of median earnings (O'Neill et al, 2006). Prior to this, industry specific NMWs in Ireland were set by Joint Labour Committees. However the wages specified in these agreements were often low and badly enforced and covered less than a quarter of the workforce. Official figures suggest that the NMW directly benefited approximately 13.5% of the total workforce, comprising 17% of female workers and 11% of male workers. There is little evidence in the literature relating to the effectiveness of the Irish NMW in tackling the gender wage gap (an exception is McGuinness et al. (2008) who find that the Irish NMW wage improved the relative position of part-time women only).

3 Empirical Approach

3.1 Data

We use two panel datasets, the Living in Ireland Survey (LII) and the British Household Panel Survey (BHPS). The fact that the same set of households is interviewed each year means that it is possible to study changes in the characteristics and circumstances of particular individuals over time. We restrict our main sample to people observed in 1999 and 2001 in Ireland and 1998 and 2000 in the UK. The original sample size for the two years of interest is $12,604$ in Ireland and $20,274$ in the UK. We further restrict our sample to those aged $22-64$ (those under 22 year olds are not eligible for the NMW in the UK)

and drop those still in education. Of these, we observe 4,563 workers in Ireland and 7,732 workers in the UK over the two years in question. This constitutes our baseline sample (Sample 1). Appendix Table A.1 shows how these observations are split between men and women and the pre- and post-NMW periods.

Hourly wages are constructed from the current gross weekly wage and usual hours per week in LII and gross monthly pay (including overtime), standard weekly hours and paid overtime hours per week in BHPS. We normalise hourly wages to their level during the year of the introduction of the NMW (2000 in Ireland, 1999 in the UK), using Consumer Price Indices. The main changes observed in the sample composition between the pre- and post-NMW periods are an increased hourly wage and an increase in the average age of the population.

Alternative sample selections are described in Appendix Table A.2. These will be used in robustness checks in Section 4.3. An issue specific to the Irish data is the 'refreshment' sample of 1,515 households that was added to the survey in 2000 to redress attrition over the life of the survey. To tackle this issue, we shall present alternative results without this refreshment sample for Ireland (Sample 1a). A final selection used in our sensitivity analysis (Sample 2) consists of all those who are observed both before and after the introduction of the NMW and who work at least part-time (≥ 15 hours per week) in both periods.

3.2 Preliminary Statistics and Checks

'Bite'of the National Minimum Wages. We provide preliminary statistics about NMWs and labour markets in Ireland and the UK. Table 1 first shows the NMW level and 'bite' in each country. The bite of the NMW is around 10% higher in Ireland than in the UK when expressed in terms of median wage and 15% higher as a fraction of the mean. Table 2 shows the employment rate and proportion of workers earning less that the NMW in each country and for the year before $(t-1)$ and after $(t+1)$ its introduction. Employment rates for men are similar in the two countries ($80-85\%$ over the time period examined) although employment rates for women are much lower (though rising) in Ireland than in the UK. There were more people earning less than the NMW in Ireland (12%) than in the UK (9%) in $t-1$ and, in both countries, the vast majority of these are women. This is in line with official statistics, giving us confidence in the chosen datasets. However, although there was a large drop in the number of women earning less than the NMW in $t+1$ in Ireland, the corresponding proportional drop was much lower in the UK. Beyond measurement errors, which are likely to be similar in the two datasets used,

possible explanations include informal labour markets and ineffective NMW enforcement.[2] The latter explanation seems most likely to support the diverging effects of the NMW in the two countries, as we demonstrate in Section 4.4.

Table 1 around here

Table 2 around here

Potential Employment Effects. While we focus on the change in the gender wage gap after the introduction of a NMW, the NMW may also affect the employment of low skilled workers, and possibly does so differently for men and women. The literature on this topic is mixed (see Neumark and Wascher, 2007 for a comprehensive overview). Stewart (2004), Metcalf (2008) and Dolton et al (2012) report evidence of little or no employment effect of the introduction of the British NMW. O'Neill et al (2006) find that the NMW may have had a negative effect on employment for firms with a high proportion of low wage workers but the size of these effects is modest. Table 3 shows the rate of entry to and exit from the labour market of men and women whose earnings are in the vicinity of the NMW in the year before its introduction or in the year after its introduction. In both countries, entry and exit rates are larger for those earning less than the NMW than for those earning over the NMW, an indication of the high turnover rate for low-skilled jobs.

In Ireland, male exit rates are higher in 2001 than in 1999. This is true for all categories of wages but the difference is small and only statistically significant for those earning more than the NMW. Female exit rates in Ireland are not significantly different before or after the introduction of the NMW. Both male and female entry rates in Ireland are actually higher in 2001 than in 1999 for those earning up to the NMW and this difference is statistically significant. Entry rates for higher earners change less over the two year period with a decrease noticeable for men earning between 1.25 and 1.5 times the NMW and a decrease of a similar magnitude noted for women earning over 1.5 times the NMW.

In the UK, the exit rates of males earning less than the NMW are not statistically different from each other in 2000 and in 1998. At higher wage levels, the exit rate of males is lower in 2000 than in 1998. There is little change in female exit rates over this period. Looking at entry rates, there is a decrease in the entry rate of females to jobs paying up to

[2]The presence of apprentices (who are paid below the NMW) may also contribute as these are not identified in the data. However, apprenticeships made up a tiny proportion of employment contracts in both the UK and Ireland - 0.3% of male contracts and 0.4% of female contracts in the UK and 1.1% of male contracts and 0.5% of female contracts in Ireland (Eurostat, 2002). Additionally, most apprentices are younger than the age cut-off of 22 which we impose in our empirical specification so this is unlikely to be an issue.

the NMW. Other than that, there is no change to entry rates of men or women between the two periods.

These statistics show that women do not appear to be disproportionately affected by possible employment effects. We do not, therefore, expect that gender differentials in the employment effects of the NMW will drive our findings relating to the effect of the NMW on the gender wage gap. Note that existing evidence points to little or no employment effect of the introduction of the NMW in the UK (Metcalf, 2008; Dolton et al, 2012) and Ireland (O'Neill et al. 2006). However, in order to ensure that this is not the case, we shall account for potential employment composition effects in our decomposition, perform robustness checks which limit the sample of interest to all those employed before and after the introduction of the NMW, and control for selection into employment.

Table 3 around here

Other Institutions and Policies. Union density was stable, at around 30%, in the UK during the period in question although it decreased from 41.5% to 36.6% in Ireland between 1998 and 2001 (Blanchflower, 2006). The period 1997–2001 was one of generous budgets in both countries, notably with increased levels of transfers to working poor families (the Family Income Supplement increased in 1998 and 2000 in Ireland while the WFTC was introduced to replace the Family Credit in October 1999 in the UK). In Ireland, the Lone Parent Allowance and Child Benefit were also increased while income tax rates were decreased in both the higher and lower brackets, as well as an increased tax free allowance for all household types. In the UK, 'New Deals' measures were introduced in 1998 to help vulnerable groups, notably lone parents and young people, to find jobs or to increase their hours of work. These policies should not affect our results directly however since they affect net income, not gross wages as used in our estimations.[3] Another channel to consider is the indirect effect of policy changes on labour supply. For example, the WFTC reform may have incited adults in previously workless families to move into work and adults in previously two-worker families to move out of work (Brewer and Browne, 2006). Again, distinguishing between pure price effects and composition effects in our analysis will allow us to assess any such effect of these policies. Also, a robustness check in which we control for selection into employment will be performed.

[3]One exception may be the introduction of the WFTC in the UK. If it has actually incited firms to lower wages for low-earners who receive this top-up, our estimates of the NMW effect on the gender wage gap can be interpreted as a lower bound in the UK, as the effect of the WFTC on wages may have worked in the opposite direction.

3.3 Distribution Regression

We suggest an original application of Foresi and Peracchi (1995) and Chernozhukov et al. (2013), who recently formalized procedures for inferring how policy interventions affect the entire marginal distribution of an outcome of interest. We extend the typical application of distribution regression methods to a 'before-after' setup where we examine the *change* in the difference in wage distributions between men and women, so we are able to pinpoint the gender wage gap before and after the introduction of the NMW at every point in the wage distribution.

In a nutshell, this technique involves running a series of binary choice regression models in order to estimate the entire cumulative distribution function of wages. In each model, the dependent variable takes the value of 1 if an individual i in the sample has an hourly wage below w, and 0 otherwise, and this is repeated for a series of distinct w values to estimate $F(w) = \Pr[w_i \leq w]$ on a fine grid covering possible wage levels $w \in [w_{min}, w_{max}]$. After estimating (probit) models separately for men and women and for each time period (*before* and *after* introduction of the NMW), and controlling for a number of workers characteristics, we predict the probability that an individual has a wage below any value w in the distribution or what this probability would be if the individual belonged to a different gender group or time period. The marginal wage distributions of men and women before and after the introduction of the NMW can therefore be decomposed to identify the extent of the wage gaps in each time period and how they changed in the *after* period, all else held constant.

More formally, we are interested in the change in the distribution of wages for men and women observed before and after the introduction of the NMW, given explanatory variables such as job and human capital characteristics, holding the marginal distribution of these covariates constant. Marginal wage distributions are directly derived by integration of the conditional distributions over these variables:

$$F^{s,t}_{s',t'}(w) = \int_{\Omega_h} \int_{\Omega_j} F^{s,t}(w|x,c)\, h_{s',t'}(x,c)\; d\, dx \tag{1}$$

where $F^{s,t}(\cdot|x,c)$ is the conditional wage distribution function given human capital characteristics x and job characteristics c in gender group s at period t, and $h_{s',t'}$ is the density distribution of human capital and job characteristics in gender group s' at period t'. The separation of conditional wage distributions and the distribution of characteristics offers a straightforward way to create counterfactual marginal wage distributions: $F^{s,t}_{s',t'}(w)$ can either be an observed or a counterfactual marginal wage distribution where the superscript refers to the conditional wage distribution and the subscript refers to the covariate distribution. The conditional wage distribution can be that of women ($s = f$) or men

$(s = m)$ before $(t = b)$ or after $(t = a)$ the introduction of the NMW and the covariate distribution can also relate to women or men before or after the introduction of the NMW. For example, $F_{f,b}^{f,b}(w)$ is the marginal wage distribution of *female* workers *before* the reform, which is given by integrating the conditional distributions of *female* workers *before* the reform over the *female* characteristics *before* the introduction of the NMW.

In the DR approach, sample estimates of (1) are obtained by (i) replacing $F^{s,t}(w|x,c)$ by estimates $\hat{F}^{s,t}(w|x,c)$ derived from predictions based on probit model parameters at w estimated in the sample of gender s at time period t, and (ii) by averaging the predictions over the sample of $N_{s',t'}$ workers of gender s' at time t':[4]

$$\hat{F}_{s',t'}^{s,t}(w) = \frac{1}{N_{s',t'}} \sum_{i=1}^{N_{s',t'}} \hat{F}^{s,t}(w|x_i, c_i). \tag{2}$$

For example, the female wage distribution before the introduction of the NMW is given by

$$\hat{F}_{f,b}^{f,b}(w) = \frac{1}{N_{f,b}} \sum_{i=1}^{N_{f,b}} \hat{F}^{f,b}(w|x_i, c_i) \tag{3}$$

while

$$\hat{F}_{f,b}^{m,b}(w) = \frac{1}{N_{f,b}} \sum_{i=1}^{N_{f,b}} \hat{F}^{m,b}(w|x_i, c_i) \tag{4}$$

is a counterfactual for the distribution that would be observed among female workers before NMW introduction if the conditional wage distributions among male workers had prevailed over the female distributions. In the counterfactual distribution, predictions are based on probit model parameters estimated in the *male pre-reform* sample but with predictions averaged over the *female pre-reform* sample. The gender gap in pay before NMW introduction is captured by the difference between those two distributions:

$$\begin{aligned} \hat{DF}^{b}(w) &= \hat{F}_{f,b}^{f,b}(w) - \hat{F}_{f,b}^{m,b}(w) \\ &= \frac{1}{N_{f,b}} \sum_{i=1}^{N_{f,b}} \left(\hat{F}^{f,b}(w|x_i, c_i) - \hat{F}^{m,b}(w|x_i, c_i) \right). \end{aligned} \tag{5}$$

The gender gap in pay after introduction of the NMW can be written analogously as

$$\begin{aligned} \hat{DF}^{a}(w) &= \hat{F}_{f,a}^{f,a}(w) - \hat{F}_{f,a}^{m,a}(w) \\ &= \frac{1}{N_{f,a}} \sum_{i=1}^{N_{f,a}} \left(\hat{F}^{f,a}(w|x_i, c_i) - \hat{F}^{m,a}(w|x_i, c_i) \right). \end{aligned} \tag{6}$$

[4]Individual sampling weights are omitted from this expression for notational clarity, but they are used at all estimation stages.

The time change in the gender gap observed before and after NMW implementations is then given by

$$D\hat{D}F(w) = \hat{DF}^{b}(w) - \hat{DF}^{a}(w). \tag{7}$$

One issue with this approach is that the NMW (or other policies such as those described in Section 2.3) may have had side-effects on female employment on top of effects on wages, and hence may have affected the composition and characteristics of women employed after the NMW. Hence, we further factorize $D\hat{D}F(w)$ into a 'price' effect that reflects changes in the relative compensation of men and women, and a 'composition' effect, capturing the role of changes in the characteristics and employment structure of women. To do so, we construct additional counterfactual marginal distributions that would be observed if the 'prices' after introduction of the NMW were applied to the sample of women with job and human capital characteristics before the NMW:

$$\begin{aligned}\hat{F}^{m,a}_{f,b}(w) &= \frac{1}{N_{f,b}}\sum_{i=1}^{N_{f,b}} \hat{F}^{m,a}(w|x_i, c_i) \\ \hat{F}^{f,a}_{f,b}(w) &= \frac{1}{N_{f,b}}\sum_{i=1}^{N_{f,b}} \hat{F}^{f,a}(w|x_i, c_i).\end{aligned} \tag{8}$$

We then decompose the total change as:

$$\begin{aligned} D\hat{D}F(w) &= P\hat{D}F(w) + E\hat{D}F(w) \\ &= \underbrace{\left[\left(\hat{F}^{f,b}_{f,b}(w) - \hat{F}^{m,b}_{f,b}(w)\right) - \left(\hat{F}^{f,a}_{f,b}(w) - \hat{F}^{m,a}_{f,b}(w)\right)\right]}_{P\hat{D}F(w)} \\ &+ \underbrace{\left[\left(\hat{F}^{f,a}_{f,b}(w) - \hat{F}^{m,a}_{f,b}(w)\right) - \left(\hat{F}^{f,a}_{f,a}(w) - \hat{F}^{m,a}_{f,a}(w)\right)\right]}_{E\hat{D}F(w)}. \end{aligned} \tag{9}$$

The first term, $P\hat{D}F(w)$, captures the time change in the price effect, i.e. the change in returns or unexplained factors, conditional on holding all characteristics at the *female before* levels. This is our measure of interest to interpret the possible impact of NMW's on the gender gap through its effect on wages. The second term, $E\hat{D}F(w)$, captures an employment/composition effect for the female sample, i.e. how the gender gap may change due to time changes in female characteristics. Purging the total change in gender wage gaps from this second component should clean it from potential effect of policies on female work hours or occupations.[5]

[5] A related source of concern pertains to potential selection into employment, which we shall address in a sensitivity analysis in the next section.

4 Results

4.1 Distribution Regression Results

To start with, we plot the predicted distribution of wages for men and women in each time period against the actual distribution and find an excellent fit for our model (see Figures A.1 and A.2 in the appendix). Table A.3 in the Appendix shows the coefficients on the explanatory variables at four points in the wage distribution: the NMW and the 25th, 50th and 75th percentiles. For example, the negative coefficient on age at the 25th percentile of the *female before* group in Ireland indicates that, as age increases, women are less likely to be located in the lower quartile of the distribution in the year before the NMW. Following Arulampalam et al. (2007), we omit occupation and industry dummies as they may be endogenous if individuals choose them based on earning prospects. We introduce these variables to the model in a robustness check in Section 4.3.

We show, in Figure 2, three sets of distributions for each country and year. We label the curves $STS'T'$ as shorthand notation for $F^{s,t}_{s',t'}(w)$ and show the wage distribution using the coefficients of women or men ($s = f, m$) before or after the NMW ($t = b, a$) and the characteristics of women or men ($s' = f, m$) before or after the NMW ($t' = b, a$).

Figure 2 around here

We first show actual distributions in the left panel ($FBFB, FAFA, MBMB$ and $MAMA$). At each period, the CDF for female wages lies above that for male wages, indicating that men are (unconditionally) paid better than women. Additionally, the CDF's for men and women *before* lie above those for men and women *after*, reflecting wage growth. This is more pronounced at the bottom of the wage distribution for women in Ireland.

In the middle panel, we depict distributions where covariates are set to '*female*' characteristics (i.e. actual female wage distributions $FBFB$ and $FAFA$ and two counterfactual distributions $MBFB$ and $MAFA$). The difference between the solid lines ($FBFB$ and $MBFB$) captures the gender pay gap *before*, while the difference between dashed lines ($FAFA$ and $MAFA$) captures the gender pay gap *after*. Adjusting for characteristics does not account for the whole difference in unconditional gender differences observed in the left panel – there *is* an 'unexplained' wage gap. In order to freeze time changes in characteristics (and, hence, to control for effect of the NMW on the composition of the workforce), we plot distributions where covariates are fixed to '*female before*' characteristics in the right panel (i.e. actual $FBFB$ and three counterfactuals $FAFB$, $MBFB$ and $MAFB$). This seems to make little difference compared to the middle panel, suggesting that composition effects are small.

While these graphs provide the basic decomposition blocks, we now represent the simple and double differences that allow us to visualize the evolution of the gender gap after introduction of the NWM. We start with equation (7). The left panels of Figure 3 depict the components of this equation, the gender wage gaps before and after the introduction of NMW's, and the resulting time difference in gender gaps, $D\hat{D}F(w)$ (a value of 1 indicates that there is a 1 ppt reduction in the difference between a woman's and a man's probability of being paid below w, i.e. a reduction in the gender wage gap). Focusing on the wage levels around the NMWs (indicated by vertical red lines), we observe a gender pay gap in both countries before the reform. It is about twice as large in Ireland in this early period. Strikingly, however, it is twice as small in Ireland *after* the introduction of NMWs, and very close to zero. In contrast, the gender gap around the NMW hardly changes over time in the UK.

Next, we explore the effects defined in equation (9). The middle panel represents the (time change in) price effect $P\hat{D}F$ while holding characteristics constant at *female after* levels. Again, patterns are very similar to those in the first panel, indicating that there are no substantial employment composition effects that may affect our interpretation. This is confirmed in the right hand panels, where the $E\hat{D}F$ and its components are depicted. This residual effect, capturing the possible impact of composition effects on the gender gap measure is close to zero for both countries. That is, the $D\hat{D}F$ and $P\hat{D}F$ point to the same conclusion: there is around 8 ppt reduction in the difference between a woman's and a man's probability of being paid below the NMW in Ireland, while no such effect is observed in the UK. A small or zero effect in the UK, with no spillover effects, is confirmed by other results from Robinson (2002, 2005) and Stewart (2012).

Figure 3 around here

Figure 4 shows the $D\hat{D}F$, $P\hat{D}F$ and $E\hat{D}F$ with 95% bootstrapped confidence intervals. It confirms that a significant reduction of the gender gap occurred in Ireland, after the implementation of the NMW, while no effect can be detected in the UK. In Ireland, confidence intervals point to a reduction in the gender gap of $5-15$ ppt around the NMW level (recall that the gap is defined as the difference between a man and a woman's probability of earning below a certain wage). Additionally, there is a small spillover as the decline in the gender gap is statistically significant up to 1.6 in logs, which corresponds to almost IE£5 (14% above the NMW of IE£4.40). There is also an increase in the gender gap further up in the wage distribution (i.e. at around 2.4 in logs or IE£11). There are plausible theoretical reasons why we might observe a spillover of this type. The introduction of the NMW could reduce the wages of workers further up in the wage distribtuion as institutions attempt to cope with the increased wage bill, Conversely, the

introduction of the NMW could increase the wage expectations of people located above the NMW in the wage distribution as their relative position worsens. If either of these mechanisms occur in a systematically more important way for men than for women or if men are better at wage bargaining than women, this might increase the gender wage gap in the middle of the wage distribution after the introduction of the NMW. The literature relating to the likely size and direction of these effects is mixed (Stewart, 2012; Aeberhardt, Givord and Marbot, 2016; Dittrich, Knabe and Leipold, 2011). However, as the spillover effect observed in Figure 4 becomes smaller and non-significant or even nonexistent in a number of sensitivity checks (see Section 4.3) while the large decrease in the gender wage gap around the NMW remains, we refrain from drawing any conclusions in this regard.

Figure 4 around here

4.2 De-trending the Effect

To address the concern that our results may be driven by possible pre-existing trends in the gender gap, we present here a set of results which 'de-trend' the change in the gender wage gap between the pre- and post-NMW period (even though there is no indication of clear pre-existing trends in Figure 1). We use the change in the gender wage gap over a two-year period preceding the NMW implementation. Let us take the UK as an example. The NMW was introduced in 1999. Hence, we subtract the change in the gender wage gap between 1996 and 1998 from the change in the gender wage gap over 1998-2000, depicted in Figure 4, to calculate the *de-trended* change in the gender wage gap due to the introduction of the NMW. Figure 4 essentially showed a difference-in-difference (difference between male and female wages in 2000 subtracted from this difference in 1998). By analogy, this de-trended effect can be thought of as a *triple difference*, with the *change* in the gender wage gap between 1996 and 1998 subtracted from the *change* in the gender wage gap between 1998 and 2000. Results are shown in Figure 5. We find that the decrease in the *de-trended* gender wage gap at the bottom of the wage distribution in Ireland is similar to the baseline effect observed in Figure 4 although the confidence intervals are a little larger. In the UK, we again observe a statistically insignificant change in the gender wage gap across the wage distribution after the introduction of the NMW.

Figure 5 around here

4.3 Additional Results and Robustness Checks

To ensure that our results are not sensitive to differences in before/after samples or the model specification, we conducted a number of robustness checks. The main results are

summarized here while more detailed explanations and corresponding figures are reported in Appendix C.

Quantifying the Gender Gap. For completeness and comparison with standard analysis of gender gaps in mean wages, we show, in Appendix B, the implications of our distribution function estimates on percentage differences in wage levels, both at the mean and different points of the distribution. Results in Table B.1 show that an apparently stable gender gap at the mean in Ireland hides a very large decrease at the 10th percentile (the gender gap before was over four times as high as the gender gap after) and small increases higher up in the wage distribution.

Alternative Samples. We first use alternative sample definitions, as described in the data section (summary statistics in Table A.2). We experiment with excluding the Irish refreshment sample (Sample 1a). The results, in Figure C.1, show that the magnitude of the time change in the gender gap is almost unchanged. We then restrict the sample for both countries to a balanced panel of people working both before and after the introduction of the NMW (Sample 2). The change in the gender wage gap after the introduction of the NMW is detailed in Figures C.2 and C.3. For the Irish case, we find larger reductions in the gender wage gap in the bottom half of the distribution while no increase is registered further up in the distribution. The small positive spillover effect just above the NMW persists while the negative effect further up in the distribution is smaller and not statistically significant. The zero price effect observed in the UK is robust to this check.

Adding Occupation and Industry. In our baseline model, we follow standard practice in omitting occupation and industry dummies, which may be endogenous to earning prospects. In a further check, we incorporate these variables into the model. The Irish results, shown in Figure C.4, indicate that controlling for industry and occupation type leads to a similar correction of the gender wage gap at the bottom of the distribution. The increase in the gender wage gap we previously observed further up in the wage distribution becomes smaller and is not statistically significant in this case. For the UK (Figure C.5), previous conclusions are unchanged.

Changing the Reference Group The baseline results measure the gender wage gap as the difference between the distribution of female and male wages. This wage gap is decomposed into a price effect (the difference between the distribution of female wages and female wages if they were paid according to the male wage structure) and a composition effect (the difference between the distribution of female wages if they were paid according to the male wage structure and male wages), giving us the change in the gender wage

gap. We also compute results based on an alternative decomposition, using men as the reference groups. Details of this alternative decomposition are provided in Section C.3 in the Appendix and are in line with results from the rest of the paper. A closing of the gender wage gap by 5-10 ppt in Ireland is observed and this effect is purely a price effect and is concentrated around the minimum wage level. No change in the gender wage gap is observed in the UK.

Selection into Employment. We finally add a control for selection into employment to our DR model. We adapt the DR method by running a sequence of Heckman-type binary selection models, rather than a sequence of probit models. The exclusion restrictions used are the standard ones in this literature: non-labour income and the presence and number of children. In Ireland, we find that correcting for endogenous selection gives a similar gender wage gap correction around the NMW (Figure C.8). The results for the UK still show no sign of any change in the gender wage gap affect across the distribution after the introduction of a NMW (Figure C.9).

4.4 Country Comparisons

We found no significant change in the gender wage gap after the introduction of the British NMW. Yet, with the same method and with the introduction of a NMW at about the same time, we find an almost closing of the gap in neighbouring Ireland. To explain this difference, we zoom on the wage CDFs at the lowest wage levels in Figure 6. We observe that there was a sizable shift in the Irish wage distribution around the NMW. Both male and female wage distributions shift downwards. In contrast, while the year after the introduction of the British NMW saw very few men earning less than the NMW, there was still a disproportionate number of women earning below the legal limit. So while $FAFA$ has shifted downwards around the NMW level in the UK, it has not done so to the extent that it has in Ireland, nor indeed to the extent that we might expect, given the new wage legislation.

Compliance with or enforcement of the NMW for women's wages (or female dominated professions) may have been less effective than for men's wages in the UK. This would explain why the gender wage gap decreased after the introduction of the NMW in Ireland but not in the UK.[6] This suggested result seems to find support in official reports for both countries. First, we note that the overall degree of non-compliance does not differ much between countries. The Office for National Statistics (ONS) in the UK estimated that

[6]Note that this is not an unprecedented result: previous work by Ferreira et al (2017) using Brazilian data showed that, during a period of time when the NMW was increasing in Brazil, income inequality did not decrease as expected because of decreasing compliance with the NMW.

around 1% of employees were earning less than the NMW in the year after its introduction. This figure is below our estimate[7] and the ONS also acknowledges that its estimation is likely to be a lower bound due to the method of data collection. Recent estimates point to larger figures, up to 4%, depending on the data-source used (Low Pay Commission, 2017).[8] As for Ireland, official measure of non-compliance oscillate between no obvious problem at the time of introduction (O'Neill et al, 2006) to a small degree of non-compliance (around 5%) according to more recent estimates (Low Pay Commission, 2016), which is similar to what we observe for the year 2000 from Figure 6. Most importantly for the interpretation of our results is that a gender difference in compliance seems to be found only in the UK. For the UK, the pattern of low pay between our data and the ONS data is consistent: more than twice as many women as men were earning less than the NMW after its introduction. Contrary to this picture, the right hand panel of Figure 6 shows no large discrepancy between the proportion of men and the proportion of women paid less than the NMW in Ireland. This is in line with Irish official reports, which do not point to gender differences in compliance with NMW regulation. To conclude, it seems that our results are not driven by differences in overall levels of compliance with the NMW between countries, rather to gender differences in compliance in the UK.[9]

Figure 6 around here

Finally, we check how the gender wage gap in the UK would have changed if the British wage distribution had shifted in a similar manner to the Irish wage distribution after the introduction of the NMW, i.e. if UK compliance had been similar to Irish compliance. We perform an extrapolation exercise similar to Chernozhukov et al. (2013) in constructing the new counterfactual distributions of wages after the hypothetical implementation of a more *effective* NMW in the UK in 1999. In short, we take the proportion by which the conditional distribution of wages in Ireland is reduced at the Irish NMW after its introduction, and then reduce the conditional distribution of British wages before the

[7]Recall that we find 5% of employees earning less than the NMW after its introduction, based on BHPS data. Robinson (2002) found a similarly high proportion of sub-NMW workers using Labour Force Survey data so we conclude that this is not due to specific problems with the dataset that we use.

[8]Discrepancies between early ONS estimates and our data are also likely to be due to the fact that the ONS figures do not include overtime work while our defiinition of hourly wages does. Recent work which investigates the effect of the introduction of a NMW in Germany in 2015 finds that one of the short-term effects is an increase in upaid overtime hours, so this seems important to account for (Caliendo et al, 2017).

[9]Figure A.4 in Appendix A gives an overview of which occupations sub-NMW workers are most represented in before and after the introduction of the NMW in each country. Not surprisingly, the largest share of sub-NMW workers are to be found in sales, elementary and service occupations. There is no immediately obvious pattern of differences between the UK and Ireland in this respect.

introduction of the NMW by that same factor, up to the British NMW level. We do this separately for men and women and construct the same summary measures for the estimation of the change in the gender wage gap as before. Denote m^{uk} and m^{ie} the British and Irish NMW's. We disregard the sub- and superscripts elaborated in equation (1) in order to generalize, except for $t = b, a$ which indicates which sample (before or after) is in question. The new counterfactual marginal wage distributions are constructed as follows for men and women separately:

$$F_a^{uk*}(w) = F_a^{uk}(w) \text{ if } w \geq m^{uk} \tag{10}$$

$$F_a^{uk*}(w) = F_b^{uk}(w)\frac{P_a^{ie}(w < m^{ie})}{F_b^{ie}(m^{ie})} \text{ if } w \leq m^{uk}. \tag{11}$$

Figure 7 shows that hypothetically increasing compliance with the British NMW to the level of compliance with the Irish NMW results in a narrowing of the gender wage gap of up to 5 ppt, around the level of the NMW. At the mean, this increased effectiveness would decrease the unexplained gender wage gap after the introduction of the NMW from the 16% observed in Table B.1 to 15%. This suggests that the negligible change in the British gender wage gap after the introduction of the NMW may be partly attributable to the disproportionate number of women still earning less than the legal threshold after its introduction in the UK.

Figure 7 around here

5 Conclusion

National minimum wages can be controversial tools for redistribution due to their potential negative effects on employment and wages further up in the distribution. To contribute to the debate surrounding the NMW, we look at an indirect effect of its introduction on another key labour market indicator, the gender gap in pay. Using recently developed distribution regression methods, we find evidence that the gender wage gap at the bottom of the wage distribution may be effectively reduced by a NMW. This is the case for Ireland where the gap was eliminated at very low levels of wage after the introduction of the NMW. On the whole, this had a limited effect on the average wage gap, however. On the contrary, we do not observe such an effect in the United Kingdom following the introduction of the NMW.

Despite cultural proximity, similarities in labour market regulations and similar degrees of 'sticky floors' before 1999, Ireland and the UK also present interesting differences that can explain the contrasted results. Our analysis suggests this has much to do with relatively

limited (and gender-biased) compliance. We derive from counterfactual simulations that more compliance could close the gender wage gap at the bottom of the wage distribution in the UK too.

We also show the importance of distributional analyses of this type. In particular for Ireland, while the gender wage gap almost closes at the bottom of the distribution after the introduction of the NMW, there is little change in the mean gap. Replicating this type of distributional analysis for different countries and periods around major labour market shocks therefore seems crucial to better understand how policies versus market wage setting affect inequality in general and gender inequality in particular. Distribution regression methods of the type presented in this paper are fit for purpose in this respect: they are flexible and provide accurate predictions around the minimum wage, require very few (parametric) modeling assumptions and are easy to implement.

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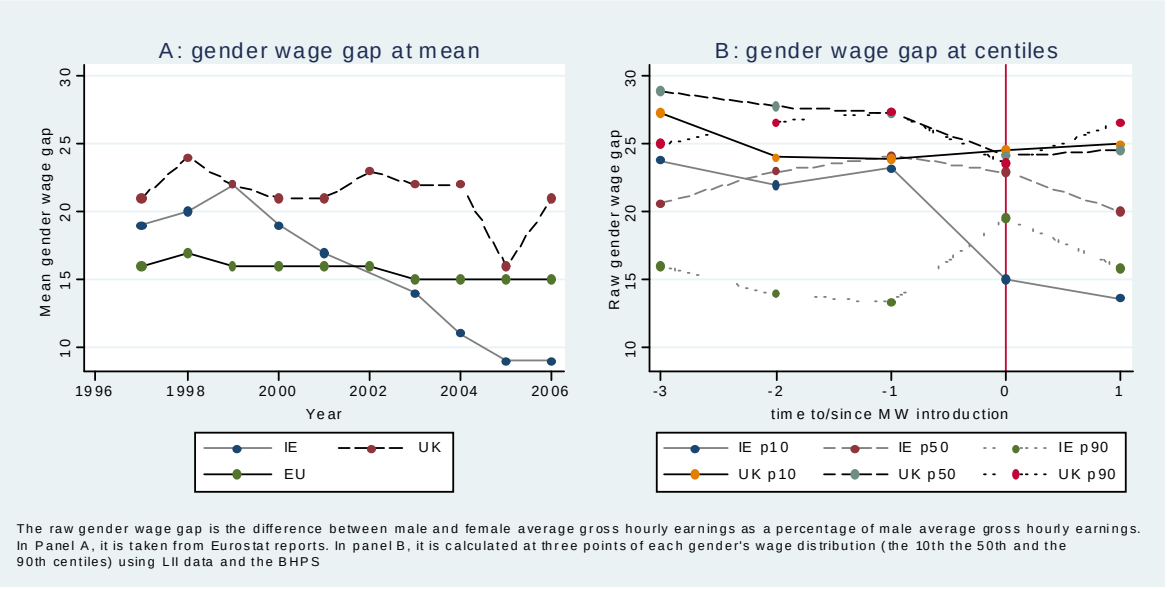


The raw gender wage gap is the difference between male and female average gross hourly earnings as a percentage of male average gross hourly earnings. In Panel A, it is taken from Eurostat reports. In panel B, it is calculated at three points of each gender's wage distribution (the 10th the 50th and the 90th centiles) using LII data and the BHPS

Figure 1: The Evolution of the Raw Gender Wage Gap in the UK and Ireland

Table 1: The "bite" of the MW in the UK and Ireland

	Ireland 2000	UK 1999
National Minimum Wage (NMW)	3.40	3.60
Median wage in (t-1)	5.95	6.99
Mean wage in (t-1)	7.05	8.55
Bite of the NMW		
NMW / median wage (t-1)	0.57	0.52
NMW / mean wage (t-1)	0.48	0.42

Figures, all expressed in Sterling pounds for the current year, are from own calculations using the population of 22-65 year olds from the Living in Ireland Survey and British Household Panel Survey.

Table 2: Employment rate and proportion of workers earning less than the MW

	Ireland		UK	
	t-1	t+1	t-1	t+1
Employment rate				
All	66%	70%	76%	76%
Male	81%	83%	84%	85%
Female	52%	57%	69%	68%
Workers below NMW				
All	11.8%	6.0%	8.0%	4.8%
Male	7.0%	4.4%	3.4%	1.6%
Female	17.6%	7.9%	12.2%	7.9%
Full-time	9.8%	5.0%	5.2%	3.5%
Part-time	24.9%	14.4%	24.5%	13.2%

Figures from own calculations using the population of 22-65 year olds from the Living in Ireland Survey and British Household Panel Survey. Time period t is 1999 in the UK and 2000 in Ireland

Table 3: Rate of entry to and exit from the labour market for different wage levels

	Men				Women			
	Exit rates		Entry rates		Exit rates		Entry rates	
Ireland	**1999**	**2001**	**1999**	**2001**	**1999**	**2001**	**1999**	**2001**
wage < NMW	0.08	0.13	0.08	0.19	0.17	0.21	0.16	0.24
	(0.03)	(0.04)	(0.03)	(0.06)	(0.03)	(0.04)	(0.03)	(0.05)
NMW < wage < 1.25 x NMW	0.03	0.07	0.11	0.10	0.13	0.13	0.16	0.15
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1.25 x NMW < wage < 1.5 x NMW	0.04	0.06	0.08	0.02	0.07	0.08	0.10	0.10
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
wage > 1.5 x NMW	0.03	0.04	0.02	0.02	0.09	0.09	0.08	0.04
	(0.01)	(0.01)	(0.01)	(0.00)	(0.02)	(0.01)	(0.02)	(0.01)
UK	**1998**	**2000**	**1998**	**2000**	**1998**	**2000**	**1998**	**2000**
wage < NMW	0.08	0.13	0.22	0.14	0.12	0.13	0.18	0.10
	(0.03)	(0.05)	(0.06)	(0.07)	(0.02)	(0.03)	(0.03)	(0.02)
NMW < wage < 1.25 x NMW	0.06	0.03	0.07	0.05	0.06	0.08	0.08	0.08
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
1.25 x NMW < wage < 1.5 x NMW	0.02	0.03	0.02	0.02	0.04	0.05	0.03	0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
wage > 1.5 x NMW	0.03	0.02	0.02	0.02	0.06	0.06	0.05	0.04
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)

Exit rates document the proportion of people working in time t-1 who are no longer working in time t (1999 or 2001 in Ireland, 1998 or 2000 in UK). Entry rates document the proportion of people working in time t who were not working in time t-1. The wage position relative to the minimum wage is according to wage at time t-1 for exit rates and time t for entry rates. Standard errors are in parentheses. Figures from own calculations using the population of 22-65 year olds from the Living in Ireland Survey and British Household Panel Survey.

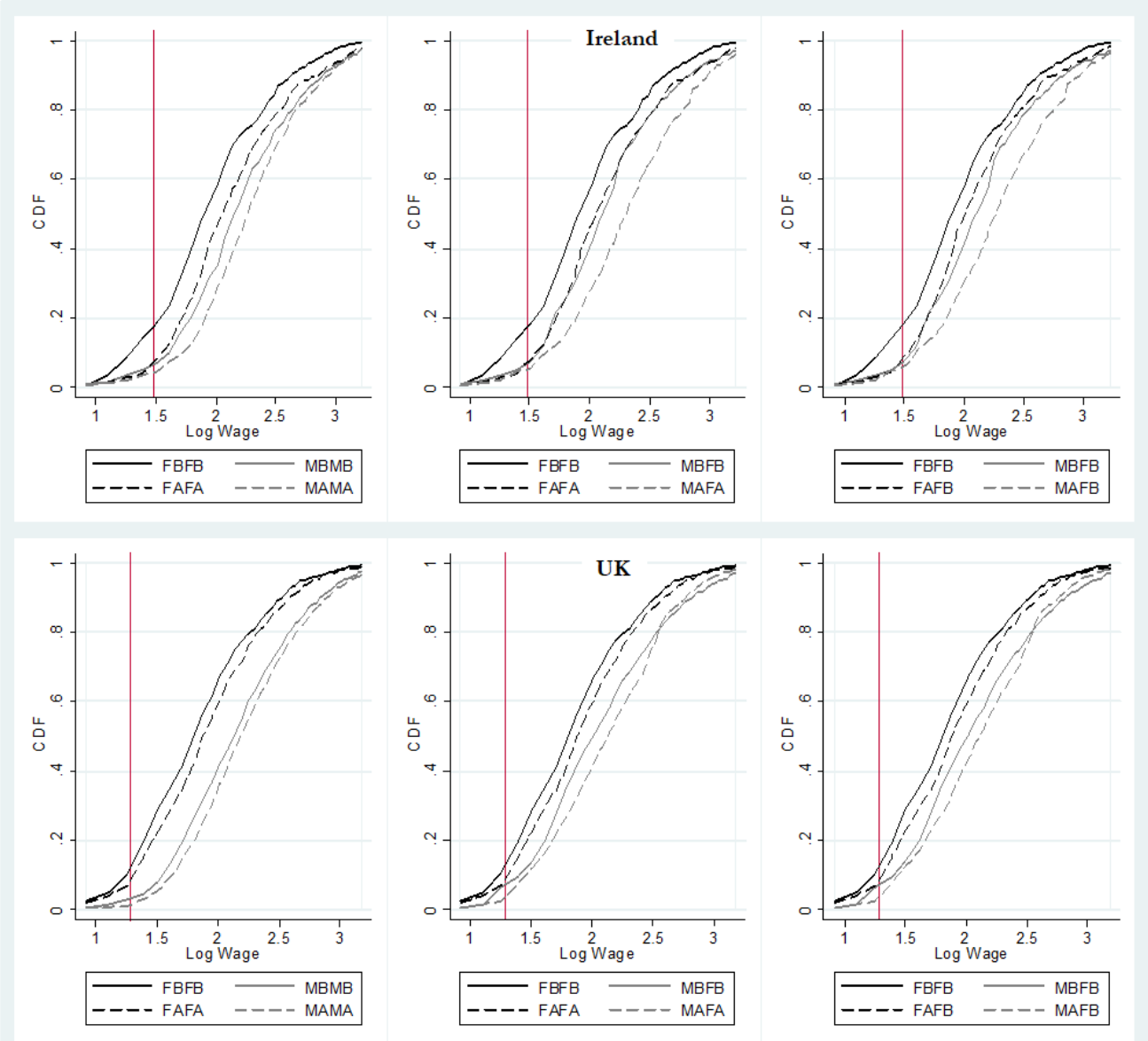


Figure 2: Predicted and Counterfactual Wage CDF's Before and After the NMW in Ireland and the UK.

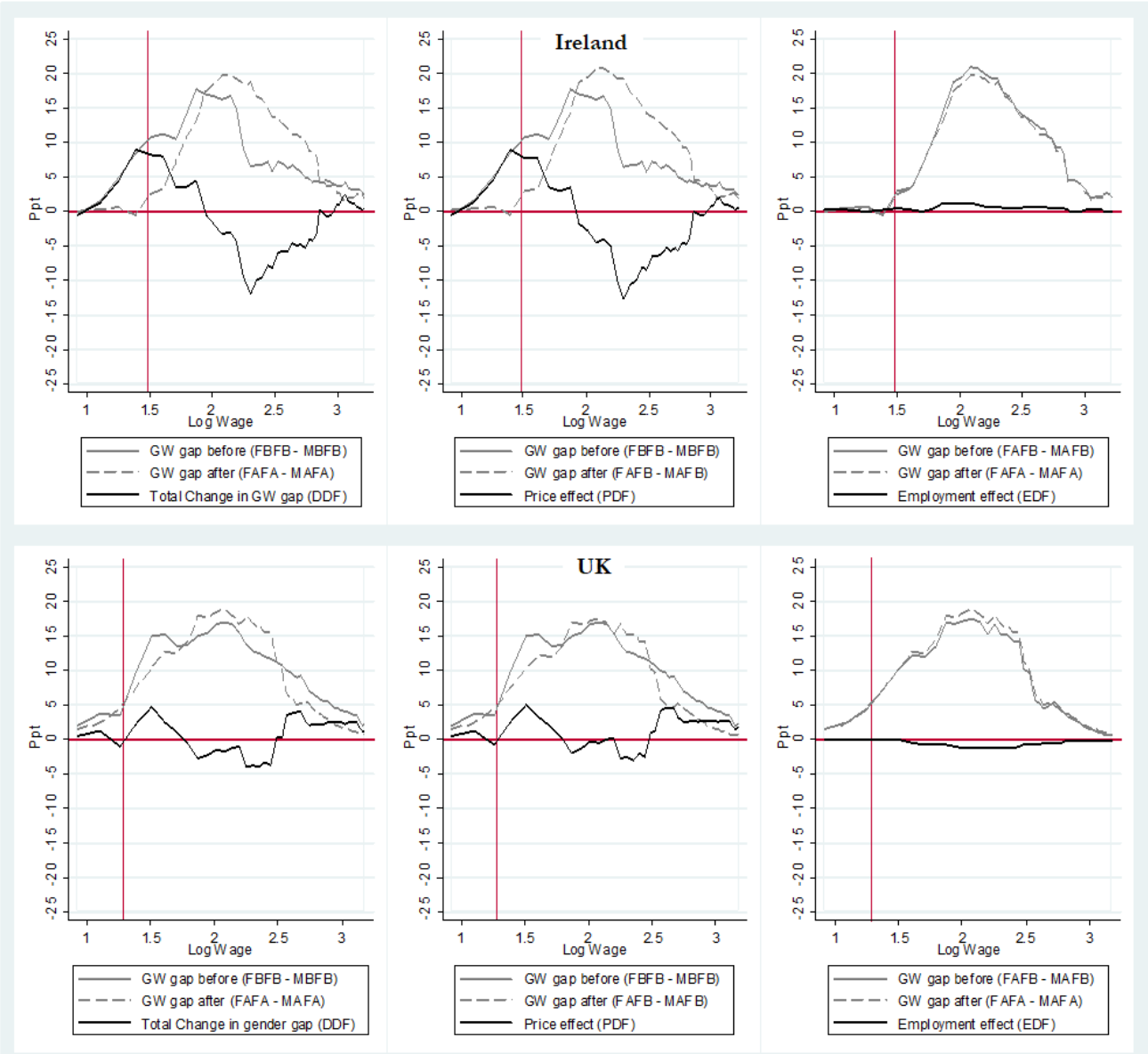


Figure 3: Gender Wage Gap and Change over Time in Ireland and the UK

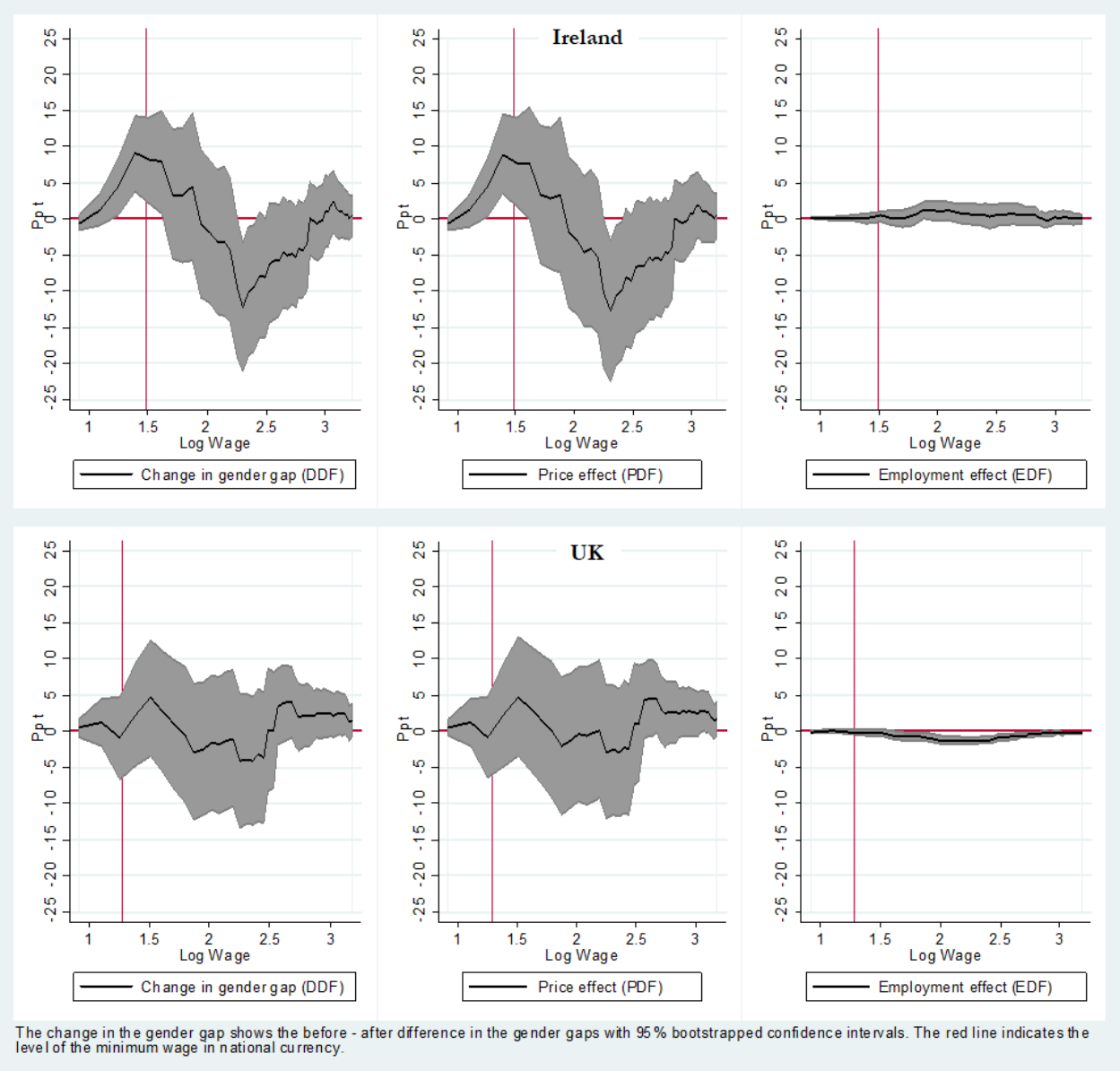


Figure 4: Change in the Gender Wage Gap over Time in Ireland and the UK

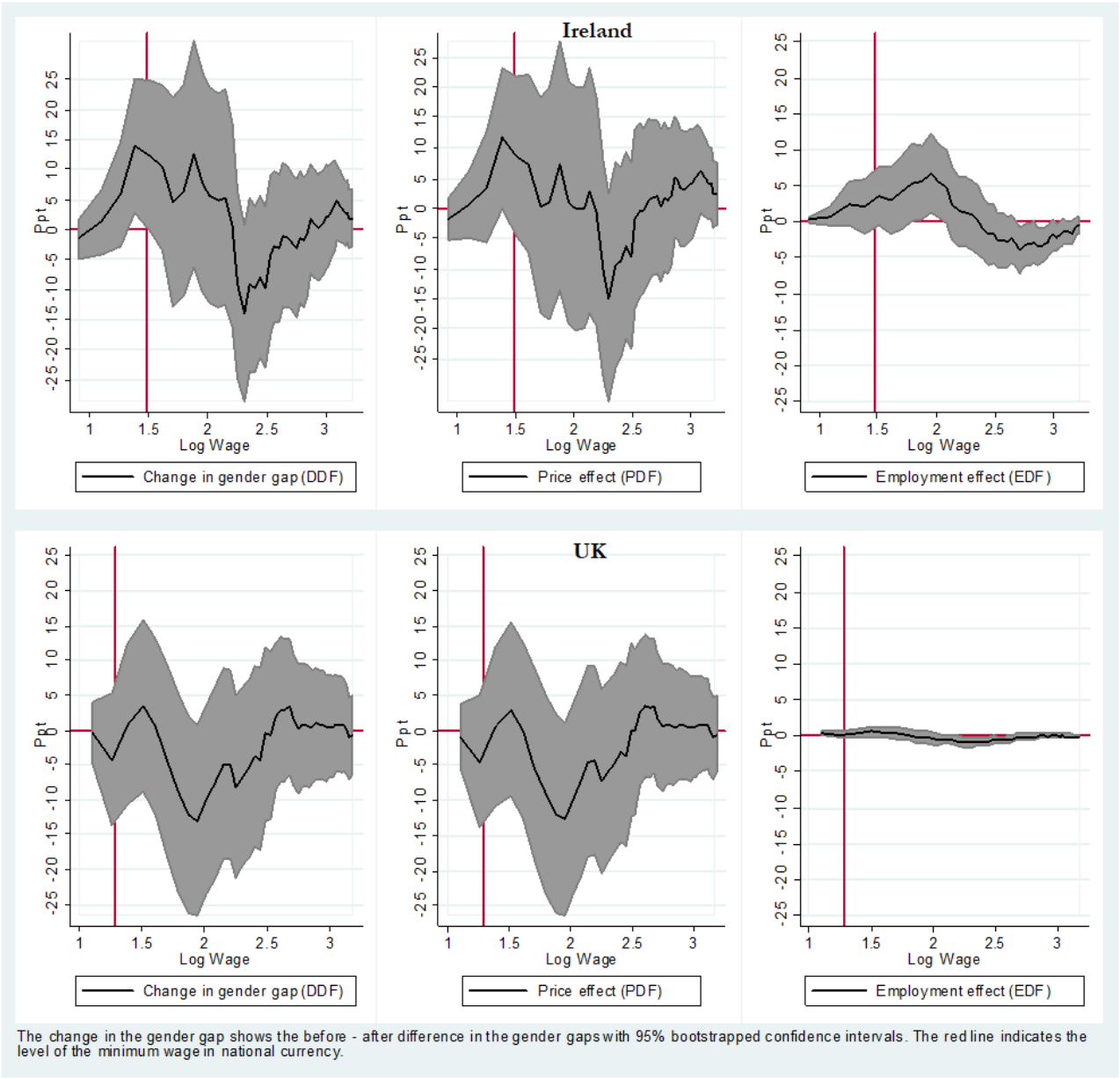
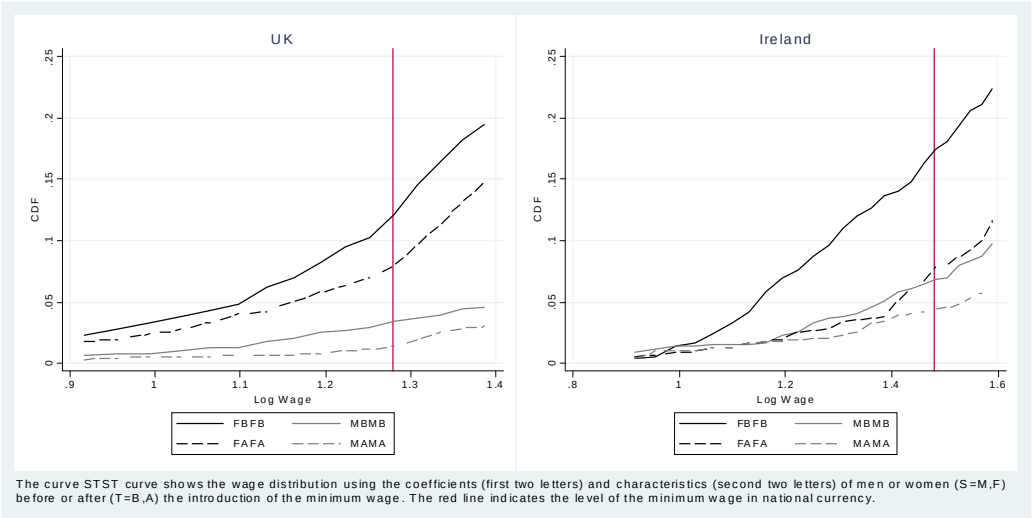
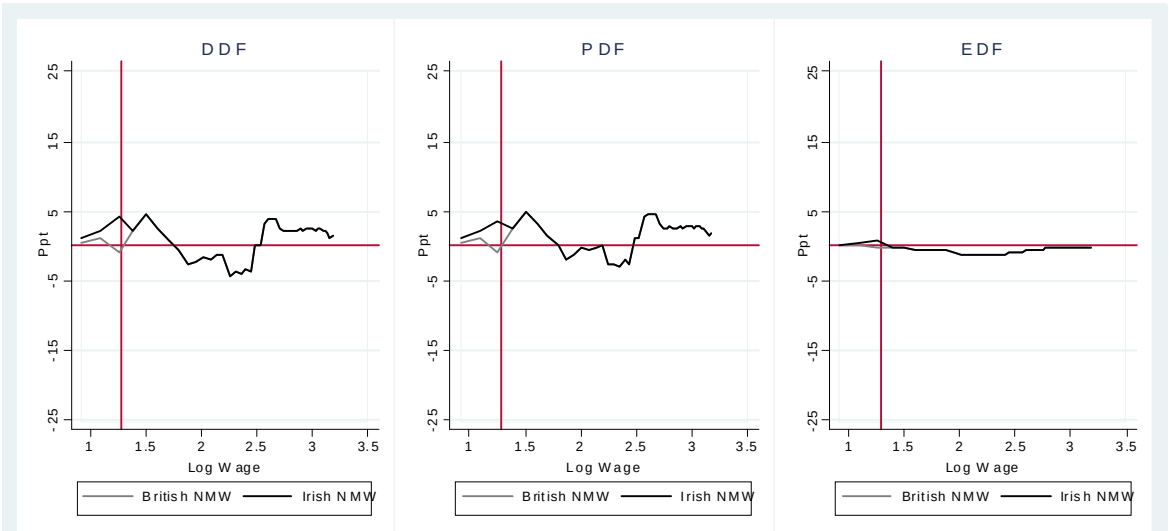


Figure 5: Change in the Gender Wage Gap in Ireland and the UK (De-trended Effects)



The curve STST curve shows the wage distribution using the coefficients (first two letters) and characteristics (second two letters) of men or women (S=M,F) before or after (T=B,A) the introduction of the minimum wage. The red line indicates the level of the minimum wage in national currency.

Figure 6: Predicted Wage CDF's in the UK and Ireland before and after NMW



The DDF/PDF and EDF graphs show the before - after change in the gender gap where effectiveness is unchanged (British NMW) or is modified to reflect the Irish case (Irish NMW). The DDF represents the total change while the PDF and EDF decompose the DDF into a price and employment component.

Figure 7: Effect of British and Irish NMW's on Wage Distributions in the UK

A Appendix A: Statistics and Estimates

Table A.1: Descriptive Statistics: Sample 1 for Ireland and the UK

	Ireland						UK					
	Men			Women			Men			Women		
	Before	After	Diff.	Before	After	Diff.	Before	After	Diff.	Before	After	Diff.
Hourly wage	10.38	11.46	1.09***	8.31	9.29	0.98***	9.87	10.28	0.41*	7.17	7.78	0.61***
Hours	40.97	40.80	-0.17	31.42	30.96	-0.45	42.37	42.32	-0.05	30.11	30.48	0.37
Age	39.65	40.38	0.73	37.79	39.23	1.44***	39.83	40.62	0.79**	40.42	41.16	0.74**
University	0.16	0.16	0.00	0.18	0.17	-0.00	0.25	0.26	0.01	0.19	0.20	0.01
No education	0.46	0.42	-0.03*	0.30	0.31	0.01	0.48	0.47	-0.00	0.59	0.57	-0.02
Married	0.64	0.64	0.00	0.59	0.58	-0.02	0.65	0.64	-0.01	0.64	0.64	-0.00
Temporary job ‡	0.10	0.07	-0.03**	0.17	0.14	-0.03**	0.04	0.03	-0.02**	0.07	0.05	-0.02**
Part-time job ‡	0.04	0.04	-0.01	0.25	0.24	-0.00	0.02	0.02	-0.01	0.25	0.24	-0.01
Manual ‡	0.55	0.52	-0.03	0.38	0.37	-0.01	0.45	0.46	0.01	0.29	0.27	-0.02
Public sector ‡	0.31	0.30	-0.00	0.36	0.37	0.01	0.20	0.19	-0.01	0.38	0.40	0.02
Tertiary sector ‡	0.57	0.57	-0.00	0.82	0.84	0.02	0.58	0.59	0.01	0.85	0.86	0.01
# observations	1112	1323		914	1214		1904	1860		2023	1945	

Selection from the Living in Ireland Survey and the British Household Survey: workers between 22 and 65 and not in education. The before period is 1999 in Ireland and 1998 in the UK while the after period is 2001 in Ireland and 2000 in the UK. Significance levels are represented by * p<0.1 ** p<0.05 *** p<0.01. ‡ as a proportion of those working.

Table A.2: Descriptive Statistics: Alternative Selections

	Ireland: Sample 1a (without Refreshment)						Ireland: Sample 2 (Balanced Panel)						UK: Sample 2 (Balanced Panel)					
	Men			Women			Men			Women			Men			Women		
	Before	After	Diff.	Before	After	Diff.	Before	After	Diff.	Before	After	Diff.	Before	After	Diff.	Before	After	Diff.
Hourly wage	10.38	12.00	1.63***	8.31	9.35	1.03***	10.74	12.01	1.27***	8.42	10.01	1.59***	9.84	10.77	0.93***	7.34	8.09	0.75***
Hours	40.97	40.59	-0.38	31.42	30.30	-1.11**	41.35	41.15	-0.21	33.39	33.03	-0.36	42.48	42.16	-0.32	32.86	33.14	0.28
Age	39.65	42.10	2.46***	37.79	40.47	2.68***	39.93	42.00	2.06***	37.54	39.57	2.03***	39.59	41.59	2.00***	40.08	42.08	2.00***
University	0.16	0.15	-0.01	0.18	0.16	-0.01	0.16	0.16	0.00	0.19	0.19	0.00	0.25	0.26	0.00	0.20	0.20	0.00
No education	0.46	0.46	0.00	0.30	0.36	0.05**	0.46	0.44	-0.01	0.27	0.29	0.01	0.47	0.46	-0.01	0.57	0.56	-0.01
Married	0.64	0.71	0.07***	0.59	0.62	0.03	0.69	0.72	0.03	0.58	0.60	0.02	0.66	0.69	0.03*	0.62	0.65	0.03*
Temporary job ‡	0.10	0.06	-0.04***	0.17	0.12	-0.05***	0.08	0.05	-0.03**	0.16	0.11	-0.05**	0.03	0.02	-0.01**	0.05	0.03	-0.02**
Part-time job ‡	0.04	0.04	-0.00	0.25	0.25	0.01	0.03	0.02	-0.00	0.17	0.15	-0.02	0.01	0.01	-0.00	0.14	0.13	-0.01
Manual ‡	0.55	0.54	-0.01	0.38	0.38	0.01	0.55	0.52	-0.03	0.34	0.31	-0.03	0.45	0.44	-0.00	0.24	0.23	-0.01
Public sector ‡	0.31	0.32	0.01	0.36	0.37	0.01	0.33	0.33	0.00	0.37	0.39	0.02	0.21	0.20	-0.01	0.41	0.42	0.00
Tertiary sector ‡	0.57	0.57	0.00	0.82	0.84	0.01	0.56	0.57	0.01	0.82	0.83	0.01	0.58	0.59	0.01	0.84	0.85	0.00
# observations	1112	716		914	649		639	639		497	497		1517	1517		1423	1423	

Selection from the Living in Ireland Survey and the British Household Survey: workers between 22 and 65 and not in education. The national minimum wage was introduced in 1999 in the UK and 2000 in Ireland. The refreshment sample was added to the Irish data in 2000. Sample 2 is a balanced panel of those who work at least 15 hours per week in both periods. Significance levels are represented by * p<0.1 ** p<0.05 *** p<0.01. ‡ as a proportion of those working

Table A.3: Coefficients of Distribution Regression of Hourly Wage Rates

	Ireland							
	NMW	p25	p50	p75	NMW	p25	p50	p75
	Female sample before introduction of the NMW (FBFB)				Female sample after introduction of the NMW (FAFA)			
Age	-0.22 ***	-0.24 ***	-0.27 ***	-0.27 ***	-0.03	-0.11 **	-0.17 ***	-0.15 **
Age2	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00	0.00 **	0.00 ***	0.00 **
Low education	0.58 ***	0.73 ***	1.18 ***	1.44 ***	0.37 *	0.64 ***	0.95 ***	1.39 ***
High education	-0.56 *	-0.84 ***	-1.14 ***	-1.82 ***	-0.30	-0.71 ***	-1.18 ***	-1.32 ***
Married	0.20	0.10	0.04	-0.23	-0.17	0.16	-0.12	-0.22
Temporary	0.76 ***	0.39 **	0.18	0.68 ***	0.38 *	0.48 ***	0.30	0.24
Part-time	0.29	0.66 ***	0.52 ***	0.34	0.39 **	0.67 ***	0.48 ***	0.15
Constant	2.37 **	4.17 ***	5.96 ***	7.24 ***	-1.06	1.03	3.72 ***	4.39 ***
# observations	914				1214			
	Male sample before introduction of the NMW (MBMB)				Male sample after introduction of the NMW (MAMA)			
Age	-0.10 *	-0.01	-0.14 ***	-0.13 **	0.04	0.08	-0.09 **	-0.15 ***
Age2	0.00 *	0.00	0.00 **	0.00 *	-0.00	-0.00	0.00 *	0.00 ***
Low education	0.26	0.33 **	0.71 ***	0.82 ***	0.18	0.51 ***	0.68 ***	0.93 ***
High education	-0.18	-0.73 ***	-1.08 ***	-1.25 ***	-0.92 ***	-0.64 **	-0.76 ***	-1.05 ***
Married	-0.44 **	-0.65 ***	-0.47 ***	-0.44 **	-0.99 ***	-0.72 ***	-0.35 **	-0.41 **
Temporary	0.36	0.23	0.43	0.57 *	0.67 **	0.68 ***	0.61 ***	0.29
Part-time	0.01	0.76 **	0.49	0.78 ***	0.33	0.53 *	0.11	-0.20
Constant	0.57	-0.24	3.03 ***	3.89 ***	-2.43 **	-2.38 ***	1.75 **	4.00 ***
# observations	1112				1323			
	UK							
	NMW	p25	p50	p75	NMW	p25	p50	p75
	Female sample before introduction of the NMW (FBFB)				Female sample after introduction of the NMW (FAFA)			
Age	-0.02	-0.05 **	-0.15 ***	-0.19 ***	-0.05	-0.05 *	-0.09 ***	-0.19 ***
Age2	0.00	0.00 **	0.00 ***	0.00 ***	0.00	0.00 *	0.00 ***	0.00 ***
High education	-0.40 **	-0.84 ***	-1.01 ***	-1.07 ***	-1.29 ***	-1.03 ***	-1.11 ***	-1.11 ***
Low education	0.43 ***	0.37 ***	0.34 ***	0.39 ***	0.24 **	0.44 ***	0.37 ***	0.34 ***
Married	-0.18 **	-0.14 **	-0.14 **	-0.03	0.01	-0.00	-0.05	0.06
Wales	0.06	0.22	0.06	0.23	0.36 **	0.28 **	0.08	0.18
Scotland	-0.02	-0.11	-0.05	0.11	0.07	0.06	0.03	0.21
N. Ireland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
London	-0.65 ***	-0.67 ***	-0.76 ***	-0.45 ***	-0.44 **	-0.61 ***	-0.71 ***	-0.66 ***
Temporary	0.10	0.10	-0.05	0.08	0.23	0.28 *	0.20	0.16
Part-time	0.60 ***	0.68 ***	0.45 ***	0.24 **	0.35 ***	0.71 ***	0.52 ***	0.36 ***
Constant	-1.09 *	0.51	3.29 ***	5.04 ***	-0.70	0.18	1.91 ***	4.84 ***
# observations	2023				1945			
	Male sample before introduction of the NMW (MBMB)				Male sample after introduction of the NMW (MAMA)			
Age	-0.14 ***	-0.16 ***	-0.19 ***	-0.21 ***	-0.10 *	-0.15 ***	-0.21 ***	-0.28 ***
Age2	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 **	0.00 ***	0.00 ***	0.00 ***
High education	-0.46 *	-0.46 ***	-0.71 ***	-0.99 ***	0.23	-0.20	-0.63 ***	-0.95 ***
Low education	0.37 **	0.35 ***	0.44 ***	0.34 ***	0.64 ***	0.46 ***	0.48 ***	0.40 ***
Married	-0.17	-0.23 ***	-0.21 ***	-0.27 ***	-0.55 ***	-0.34 ***	-0.39 ***	-0.30 ***
Wales	0.15	0.28 *	0.15	0.34 **	0.50 *	0.27	0.23	0.18
Scotland	0.09	0.18	0.14	0.26 *	0.38	0.26 *	0.16	0.28 **
N. Ireland	0.00	0.09	0.00	0.00	0.00	0.78	0.00	0.00
London	-0.22	-0.33 **	-0.55 ***	-0.43 ***	0.09	-0.28 *	-0.52 ***	-0.40 ***
Temporary	0.94 ***	0.91 ***	0.61 ***	0.29	0.37	0.70 ***	0.52 ***	0.30
Part-time	0.98 ***	0.91 ***	0.64 ***	-0.02	0.83 **	0.60 **	0.30	0.10
Constant	0.69	2.29 ***	3.89 ***	5.26 ***	-0.56	1.82 ***	3.92 ***	6.45 ***
# observations	1904				1860			

Coefficients from a distribution regressions of hourly wage rates at the four points of the distribution (NMW level, 25th, 50th and 75th percentiles), using Sample 1 (workers in LII and BHPS data aged 22-65 and not in education). Statistical significance at the 1%, 5%, 10% levels are indicated by ***, ** and *

Table A.4: Proportion of workers by occupation earning less then the NMW before and after its introduction

	UK				Ireland			
	FB	FA	MB	MA	FB	FA	MB	MA
Managers & administrators	0.02	0.02	0.01	0.00	0.03	0.02	0.04	0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.03)	(0.02)	(0.02)	(0.00)
Professional occupations	0.02	0.01	0.01	0.00	0.05	0.02	0.07	0.01
	(0.01)	(0.01)	(0.01)	(0.00)	(0.02)	(0.01)	(0.02)	(0.02)
Associate professional and technical occupations	0.00	0.00	0.00	0.01	0.02	0.03	0.00	0.05
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.02)	(0.00)	(0.10)
Clerical & secretarial occupations	0.05	0.04	0.02	0.03	0.09	0.06	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.05)
Personal & protective service occupationa	0.22	0.14	0.13	0.06	0.29	0.13	0.13	0.01
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.04)	(0.04)
Plant & machinery operatives	0.22	0.12	0.04	0.01	0.13	0.04	0.01	0.02
	(0.05)	(0.05)	(0.01)	(0.01)	(0.05)	(0.02)	(0.01)	(0.05)
Crafts and related occupations	0.13	0.07	0.03	0.01				
	(0.05)	(0.04)	(0.01)	(0.00)				
Sales occupations	0.28	0.21	0.09	0.04				
	(0.04)	(0.04)	(0.04)	(0.03)				
Skilled agricultural/fishery workers					0.36	0.00	0.20	0.33
					(0.48)	-	(0.10)	(0.48)
Skilled craft/trades workers					0.09	0.00	0.05	0.04
					(0.08)	(0.00)	(0.02)	(0.09)
Elementary occupations					0.59	0.25	0.21	0.17
					(0.06)	(0.05)	(0.03)	(0.27)
Other	0.36	0.22	0.11	0.06	0.38	0.17	0.00	0.11
	(0.04)	(0.04)	(0.03)	(0.03)	(0.06)	(0.04)	(0.00)	(0.19)

Proportion of each occupation paid at the NMW or unde for women (F) and men (M) before (B) and after (A) the introduction of the NMW. Standard errors are in parentheses. Occupations are classified using ISCO for Ireland and SOC (1990) for the UK. Figures from own calculations using the population of 22-65 year olds from the Living in Ireland Survey and British Household Panel Survey.

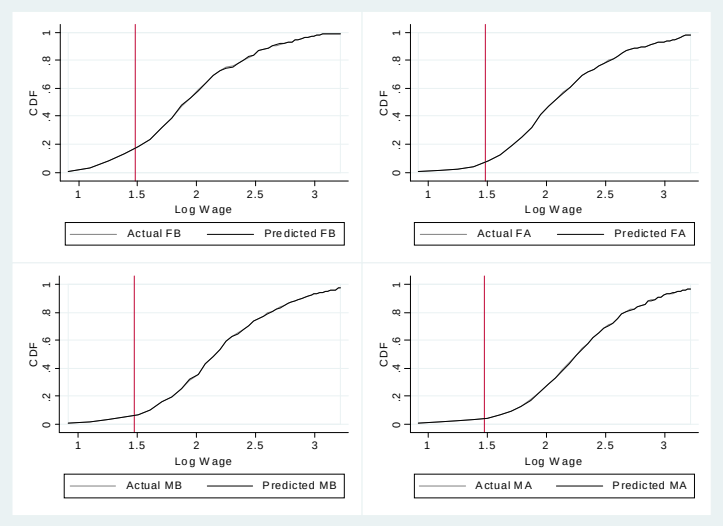


Figure A.1: Actual vs predicted CDF's of hourly wages (Ireland)

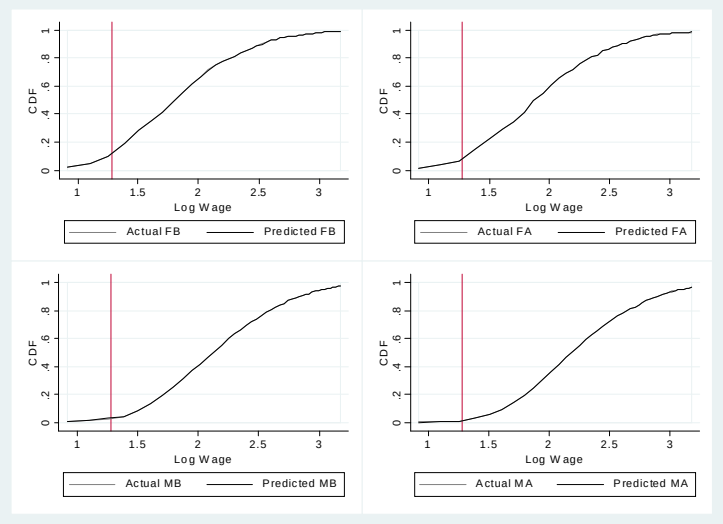


Figure A.2: Actual vs predicted CDF's of hourly wages (UK)

B Appendix B: Mean and Percentile Effects

It is possible to assess how DR results compare with a standard Oaxaca-Blinder decomposition at the mean. Using the DR framework, we can summarize the effects identified at specific levels of w on mean wages, as is more traditionally looked at. Mean wages and counterfactual mean wages are recovered easily from marginal distributions and everything follows from there, for example:

$$\mu_{f,b}^{f,b} = \mu(F_{f,b}^{f,b}) = \int_0^\infty w dF_{f,b}^{f,b} \tag{12}$$

This can be estimated from the marginal distribution estimates by numerical integration

$$\hat{\mu}_{f,b}^{f,b} = \sum_{g=1}^{K} \frac{1}{2}(\omega^g + \omega^{g-1})(\hat{F}_{f,b}^{f,b}(\omega^g) - \hat{F}_{f,b}^{f,b}(\omega^{g-1})) \tag{13}$$

where $\{\omega^1, \ldots, \omega^K\}$ is a grid of points on the domain of definition of wages at which we evaluate the marginal distributions[10], and $\omega^0 = 0$ (where $\hat{F}_{f,b}^{f,b}(\omega^0) = 0$). Results, in Table B.1, show that the overall gender wage gaps at the mean, as well as the explained and unexplained components are roughly the same whether we use DR or the standard Oaxaca-Blinder decomposition at the mean. The mean unexplained gender wage gap remains stable in Ireland ($15 - 16\%$) and slightly decreases (from 19 to 16%) in the UK over the period.

We can also invert the estimated distribution function to obtain counterfactual quantiles. Consider $Q_{s,t,\tau}^{s,t}$ the τth quantile of the counterfactual distribution $F_{s,t}^{s,t}$. The estimated counterfactual quantile is:

$$Q_{s,t,\tau}^{s,t} = \{\widehat{F}_{s,t}^{s,t}(\tau)\}^{-1} \tag{14}$$

We can therefore look at the gender wage gaps at a number of other points in the distribution ($p10, p25, p50$, $p75$ and $p90$) for comparison with the mean. Results in Table B.1 show that the small decrease in average unexplained gap in the UK is largely due to a decrease in the glass ceiling at $p90$ of the wage distribution. In Ireland, the apparently stable gender gap at the mean hides a very large decrease at $p10$ (our main result) and a smaller increase higher up (and in particular at $p75$). These results highlight the importance of analyzing the entire distribution of wages in a study such as this.

[10] To ease computation, we start the grid at approximately 2.5 in national currency in each country and stop it at 25. This encompasses over 95% of the wage distribution in each country.

Table B.1: Decomposition of the Gender Wage Gap at the Mean and at Percentiles

		Standard Mean Decomposition		Distribution Regressions											
				Mean Decomposition		P10		P25		P50		P75		P90	
		national currency	% of male wage	national currency	% of male wage	national currency	% of male wage	national currency	% of male wage	national currency	% of male wage	national currency	% of male wage	national currency	% of male wage
Ireland Before	Wage gap	2.07	21%	2.07	21%	1.40	28%	1.30	20%	1.90	22%	2.50	20%	3.60	21%
	Explained	0.61	6%	0.70	7%	0.20	4%	0.50	8%	0.60	7%	1.10	9%	1.60	9%
	Unexplained	1.46	**15%**	1.37	**14%**	1.20	**24%**	0.80	**12%**	1.30	**15%**	1.40	**11%**	2.00	**11%**
Ireland After	Wage gap	1.43	13%	1.39	13%	0.80	14%	1.20	17%	1.80	19%	2.20	17%	1.60	9%
	Explained	0.27	3%	-0.32	-3%	0.50	9%	0.10	1%	-0.20	-2%	-0.60	-5%	-0.80	-4%
	Unexplained	1.70	**16%**	1.71	**16%**	0.30	**5%**	1.10	**15%**	2.00	**21%**	2.80	**21%**	2.40	**13%**
UK Before	Wage gap	2.37	25%	2.36	25%	1.20	25%	1.60	27%	2.20	26%	3.40	28%	4.10	25%
	Explained	0.58	6%	0.58	6%	0.70	15%	0.70	12%	0.90	11%	0.70	6%	0.40	2%
	Unexplained	1.79	**19%**	1.78	**19%**	0.50	**10%**	0.90	**15%**	1.30	**15%**	2.70	**23%**	3.70	**22%**
UK After	Wage gap	2.29	23%	2.26	23%	1.20	24%	1.70	26%	2.10	24%	3.10	25%	3.60	21%
	Explained	0.67	7%	0.71	7%	0.80	16%	0.70	11%	0.50	6%	0.50	4%	1.30	8%
	Unexplained	1.63	**16%**	1.55	**16%**	0.40	**8%**	1.00	**15%**	1.60	**18%**	2.60	**21%**	2.30	**14%**

Selection from the Living in Ireland survey and the British Household Panel Survey: those aged 22-65 and not in education. Hourly wage gaps expressed in national currency and as a proportion of male wages.

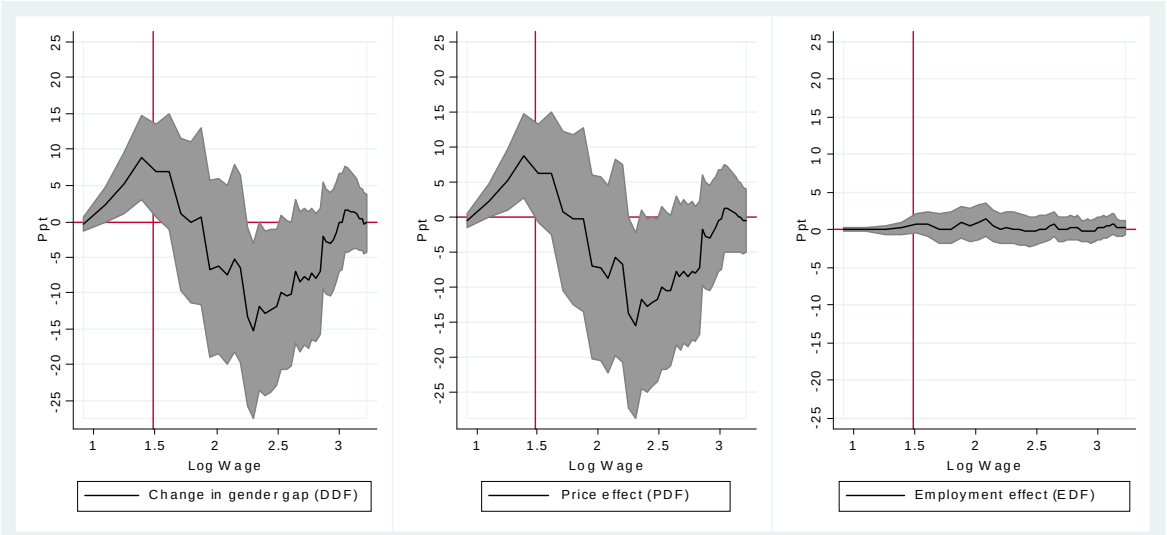
C Appendix C: Robustness Checks

C.1 Alternative Sample Definitions

This section presents the robustness analyses discussed in the main text. We first use alternative sample definitions (summary statistics in Table A.2). To deal with the issue of the refreshment sample detailed in section 3.1, we restrict the Irish data to those who are not part of this boost sample (Sample 1a). Results are presented in Figure C.1. Sample 2 restricts the analysis to those observed both before and after the introduction of the NMW and who work at least 15 hours per week in both periods. The change in the gender wage gap after the introduction of the NMW is detailed in Figures C.2 and C.3 for Ireland and the UK respectively.

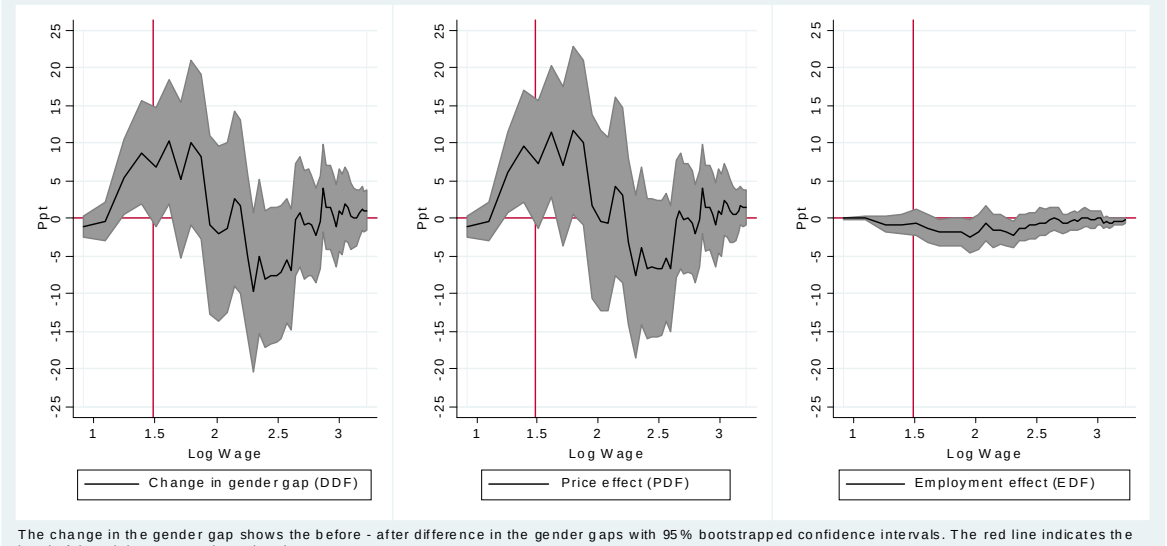
C.2 Adding Occupation and Industry Dummies

Our baseline model follows standard practice in omitting occupation and industry dummies, as they may be endogenous if individuals choose them based on earning prospects. Here, we present results which incorporate these variables into the model as a robustness check. We introduce a dummy variable for working in a manual job, for working in the public sector and for working in the tertiary (services) industry compared to the



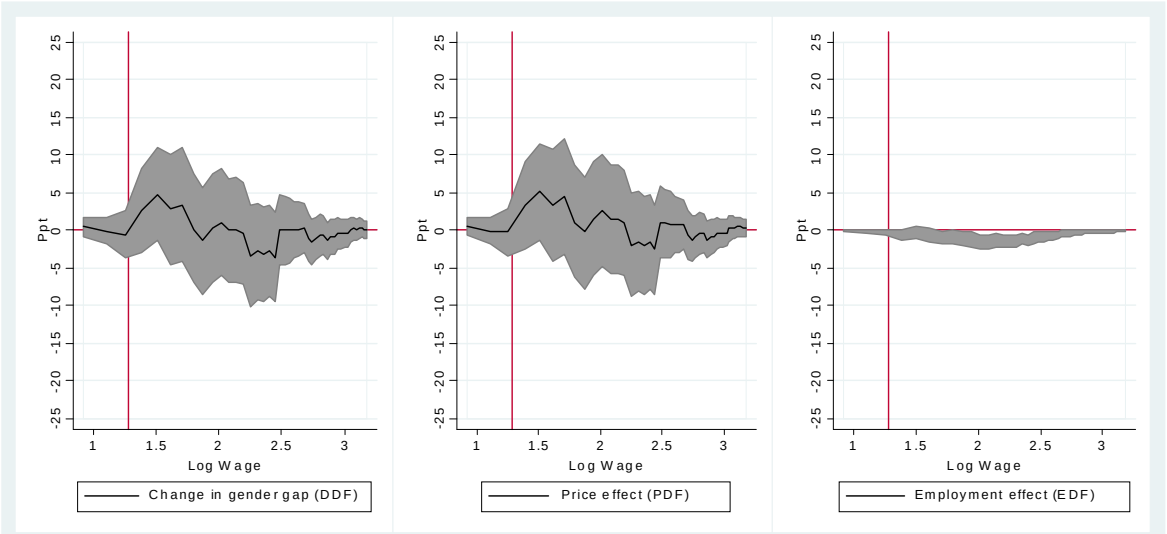
The change in the gender gap shows the before - after difference in the gender gaps with 95% bootstrapped confidence intervals. The red line indicates the level of the minimum wage in national currency.

Figure C.1: Change in the Gender Wage Gap (Sample 1a, Ireland)



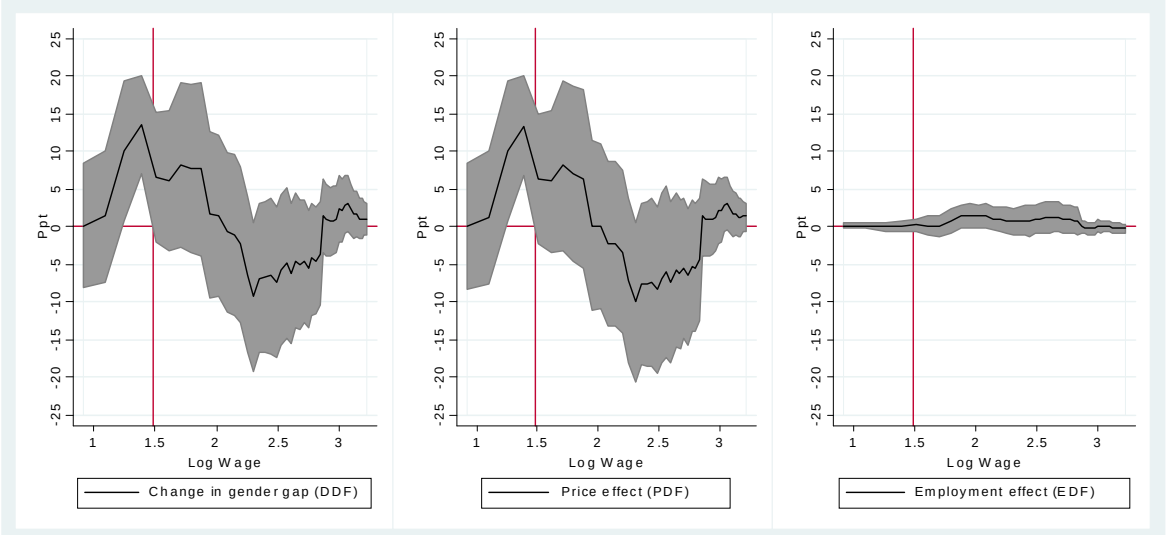
The change in the gender gap shows the before - after difference in the gender gaps with 95% bootstrapped confidence intervals. The red line indicates the level of the minimum wage in national currency.

Figure C.2: Change in the Gender Wage Gap (Sample 2, Ireland)



The change in the gender gap shows the before - after difference in the gender gaps with 95% bootstrapped confidence intervals. The red line indicates the level of the minimum wage in national currency.

Figure C.3: Change in the Gender Wage Gap (Sample 2, UK)



The change in the gender gap shows the before - after difference in the gender gaps with 95% bootstrapped confidence intervals. The red line indicates the level of the minimum wage in national currency.

Figure C.4: Change in the Gender Wage Gap (Including Occupations and Industries, Ireland)

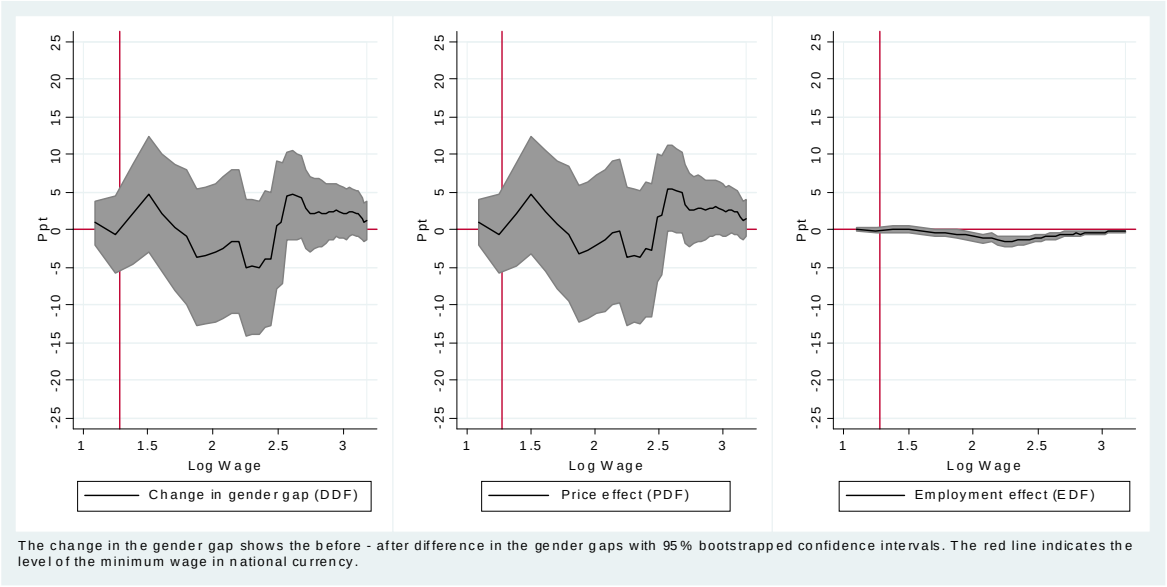


Figure C.5: Change in the Gender Wage Gap (Including Occupations and Industries, UK)

primary/secondary industries (see Table A.1 for summary statistics relating to these variables).[11] The results from this broader model of wages are presented in Figures C.4 and C.5. The Irish results indicate that controlling for industry and occupation type leads to a similar correction of the gender wage gap at the bottom of the distribution, which peaks at 13 ppt. The increase in the gender wage gap observed further up in the wage distribution in Figure 4 becomes smaller and is not statistically significant. The UK results are similarly ambiguous across the wage distribution, regardless of whether industry or occupational characteristics are accounted for.

C.3 Changing the reference group

We outline here an alternative decomposition which uses men as the reference group. The price effect is the difference between the distribution of male wages if they were paid according to the structure of female wages and the distribution of male wages. The composition effect is the difference between the distribution of male wages if they were paid according to the female wage structure and the distribution of female wages. This gives us the change in the gender wage gap as follows:

[11] Model coefficients are available from authors on request.

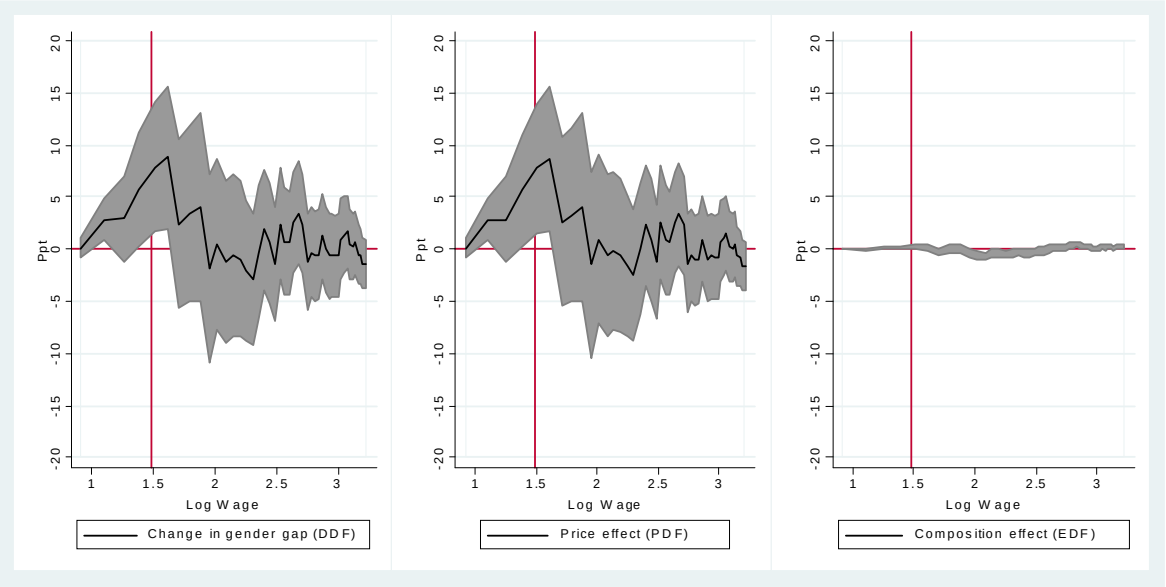


Figure C.6: Change in the Gender Wage Gap over Time (Ireland) - male as the reference group

$$
\begin{aligned}
D\hat{D}F(w) &= P\hat{D}F(w) + E\hat{D}F(w) \qquad (15)\\
&= \underbrace{\left[\left(\hat{F}^{f,b}_{m,b}(w) - \hat{F}^{m,b}_{m,b}(w)\right) - \left(\hat{F}^{f,a}_{m,b}(w) - \hat{F}^{m,a}_{m,b}(w)\right)\right]}_{P\hat{D}F(w)}\\
&+ \underbrace{\left[\left(\hat{F}^{f,a}_{m,b}(w) - \hat{F}^{m,a}_{m,b}(w)\right) - \left(\hat{F}^{f,a}_{m,a}(w) - \hat{F}^{m,a}_{m,a}(w)\right)\right]}_{E\hat{D}F(w)}.
\end{aligned}
$$

The results for this decomposition are displayed in Figures C.6 and C.7 below. They are in line with the baseline and other results in the paper: a closing of the gender wage gap by 5-10 ppt in Ireland is observed and this effect is purely a price effect and is concentrated around the minimum wage level. No change in the gender wage gap is observed in the UK.

C.4 Sample Selection Correction

The possibility of a relationship between the probability of women working and their having characteristics associated with higher wages has been long recognised in the literature on wage inequality and the gender wage gap. Olivetti and Petrongolo (2008) explore the non random presentation of women into employment and gender wage gaps but for the

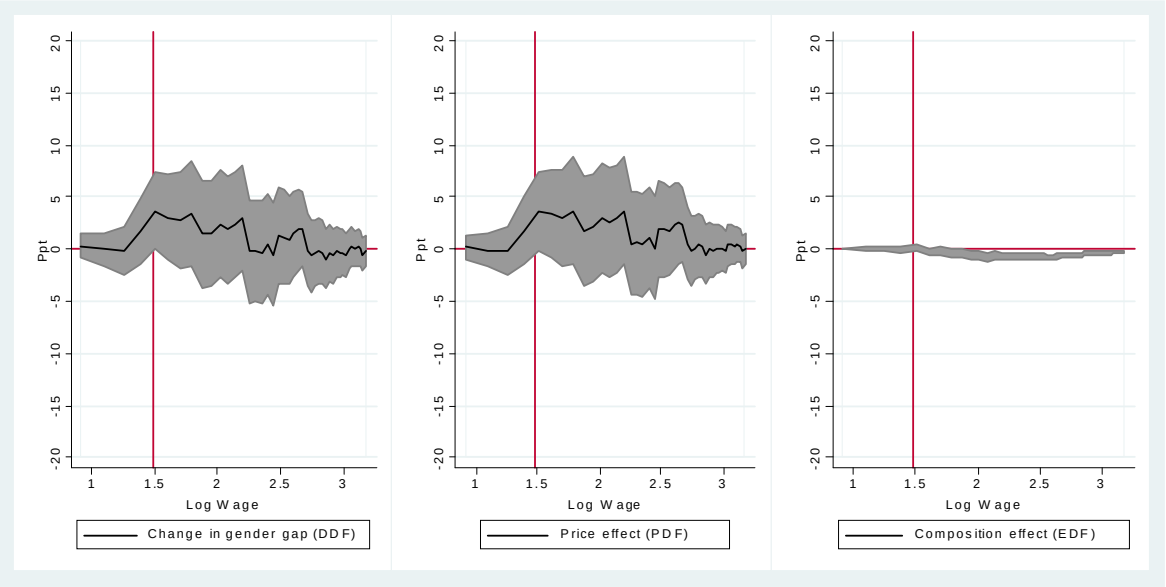


Figure C.7: Change in the Gender Wage Gap over Time (UK) - male as the reference group

median of the distribution only. Blundell et al. (2007) allow for the impact of nonrandom selection into work by using Manski bounds to the latent wage distribution which are progressively tightened using restrictions motivated by economic theory, following the procedure proposed. For direct selection correction in QR, Buchinsky (1998) suggests an additive approach that has been adapted by Albrecht et al. (2009) and Garcia et al. (2001) to correct for selection in gender wage gap estimations. However, this method has recently been called into question by Huber (2014) and Huber and Melly (2011) due to the assumption required for consistency that the errors are independent of the regressors, implying that all quantile and mean functions should be parallel.[12]

DR allows for a simpler, more intuitive selection correction. To account for any selection bias engendered by the decision to select into work, we suggest a simple correction technique. We adapt the DR method by running a sequence of Heckman-type binary selection models, rather than a sequence of probit models. The exclusion restrictions used are the standard ones in this literature: non-labour income and the presence and number

[12]It is also difficult to specify a data-generating process that is consistent with this approach (see Albrecht et al., 2009). Note that in the context of gender gap estimations, other approaches have been used. Mussida and Picchio (2014) follow the approach of Donald et al. (2000), whereby a flexible wage hazard function is estimated to recover the corresponding conditional wage distribution from the estimated parameters, and introduce selection correction. Van Kerm (2013) suggests distributionally sensitive summary measures of wage differentials with a copula-based selection model.

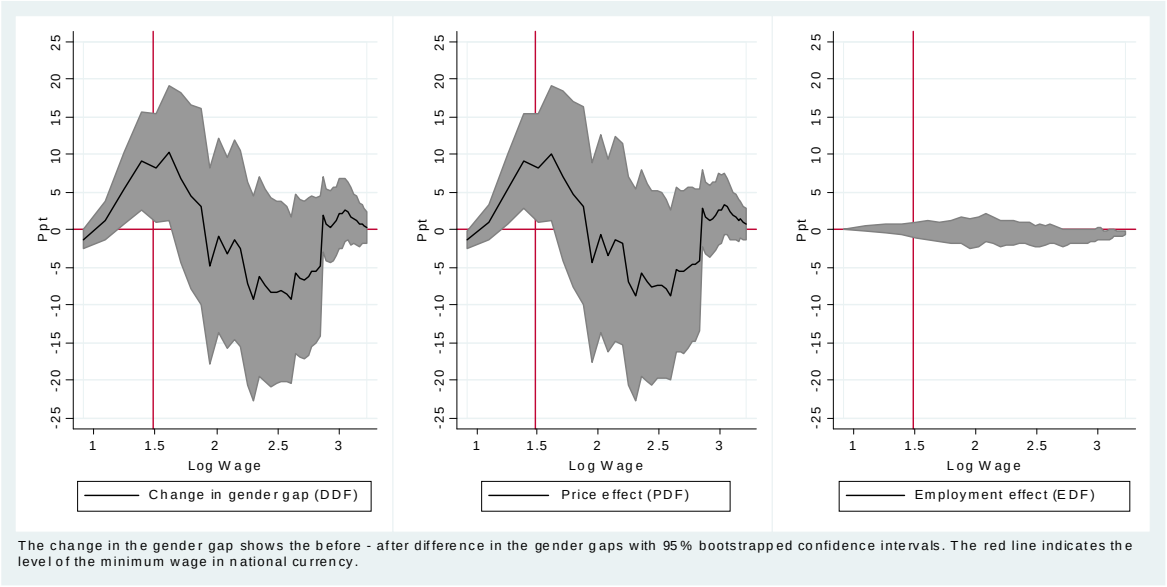


Figure C.8: Change in the Gender Wage Gap (Accounting for Selection into Employment, Ireland)

of children. The coefficients from the wage and selection equations at four points in the wage distribution, namely at the NMW, the 25th, 50th and 75th percentiles, are shown in Table C.1. The magnitude and sign of the coefficients in the wage equation are comparable to those observed without selection correction in Tables A.3 and the coefficients on the exclusion restrictions are of the expected sign with at least one statistically significant in each specification. In Ireland, we find that correcting for selection bias gives a similar gender wage gap correction around the NMW, of up to 10 ppt (Figure C.8) The results for the UK are similarly ambiguous across the wage distibution with and without correction for selection bias (Figure C.9).

Table C.1: Coefficients of Selection-Corrected Distribution Regressions of Hourly Wages

	Ireland															
	NMW		p25		p50		p75		NMW		p25		p50		p75	
	Female sample before introduction of the NMW (FBFB)						# obs.: 1782		Female sample after introduction of the NMW (FAFA)						# obs.: 2139	
	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection
Age	-0.10	0.17 ***	-0.11 *	0.17 ***	-0.13 **	0.16 ***	-0.19 **	0.17 ***	-0.03	0.08 **	-0.08	0.08 **	-0.13 *	0.08 **	-0.10	0.07 **
Age2	0.00	-0.00 ***	0.00	-0.00 ***	0.00	-0.00 ***	0.00	-0.00 ***	0.00	-0.00 ***	0.00	-0.00 ***	0.00	-0.00 ***	0.00	-0.00 ***
Low education	0.31 *	-0.63 ***	0.36 **	-0.63 ***	0.58 **	-0.63 ***	1.01 **	-0.63 ***	0.48	-0.57 ***	0.43	-0.57 ***	0.74 ***	-0.57 ***	1.20 ***	-0.57 ***
High education	-0.36	0.55 ***	-0.49 **	0.54 ***	-0.80 ***	0.51 ***	-1.58 ***	0.55 ***	-0.31	0.62 ***	-0.57 **	0.63 ***	-1.02 ***	0.63 ***	-1.07 ***	0.62 ***
Married	0.10	-0.40 ***	-0.02	-0.39 ***	-0.13	-0.38 ***	-0.34	-0.39 ***	-0.11	-0.27 **	0.09	-0.28 **	-0.18	-0.27 **	-0.30 *	-0.27 **
Temporary	0.68 ***		0.36 **		0.12		0.61 **		0.41 **		0.47 ***		0.30		0.19	
Part-time	0.10		0.49 ***		0.45 **		0.40		0.31		0.49 **		0.34 **		0.16	
Child		0.42		0.32		0.21		0.32		-0.26		-0.30		-0.25		-0.30
Other income		0.00		0.00		0.00		-0.00		-0.00		-0.00		-0.00		-0.00
No. of children		-0.19 ***		-0.18 ***		-0.18 ***		-0.18 ***		-0.08 **		-0.07 **	0.00	-0.08 **		-0.08
Constant	0.39	-2.10 ***	1.46	-1.99 ***	3.08 **	-1.77 **	5.40 ***	-1.92 **	-1.04	-0.05	0.40	0.03	2.79 **	0.02	3.24 **	0.10
	Male sample before introduction of the NMW (MBMB)						# obs.: 1418		Male sample after introduction of the NMW (MAMA)						# obs.: 1669	
	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection
Age	-0.07	0.04	-0.03	0.04	-0.17 ***	0.02	-0.17 ***	0.03	0.05	0.04	0.06	0.04	-0.07	0.04	-0.15 ***	0.04
Age2	0.00	-0.00 **	0.00	-0.00 **	0.00 ***	-0.00 *	0.00 ***	-0.00 **	-0.00	-0.00 **	-0.00	-0.00 **	0.00	-0.00 **	0.00 ***	-0.00 **
Low education	0.14	-0.49 ***	0.36 *	-0.52 ***	0.71 ***	-0.51 ***	0.90 ***	-0.50 ***	0.18	-0.64 ***	0.42 **	-0.63 ***	0.57 ***	-0.63 ***	0.97 ***	-0.64 ***
High education	-0.08	0.67 ***	-0.77 ***	0.66 ***	-1.10 ***	0.61 **	-1.26 ***	0.62 ***	-0.92 ***	0.19	-0.64 **	0.19	-0.70 ***	0.16	-1.01 ***	0.18
Married	-0.26	1.03 ***	-0.74 ***	1.04 ***	-0.71 ***	1.03 ***	-0.60 ***	1.04 ***	-1.03 ***	1.15 ***	-0.60 ***	1.15 ***	-0.23	1.17 ***	-0.59 **	1.14 ***
Temporary	0.30		0.23		0.36		0.51		0.69 **		0.69 ***		0.56 ***		0.23	
Part-time	-0.06		0.79 **		0.40		0.89 ***		0.20		0.57		0.12		-0.10	
Child		-0.17		-0.26		-0.36		-0.33		-0.35		-0.34		-0.32		-0.40
Other income		-0.00 ***		-0.01		-0.00		-0.01		-0.00 **		-0.00 *		-0.00 *		-0.00 **
No. of children		-0.12 ***		-0.10 **		-0.10 ***		-0.11 ***		-0.01		-0.01		-0.02		-0.00
Constant	0.09	-0.12 ***	0.05	-0.10 **	3.55 ***	-0.10 ***	4.66 ***	-0.11 ***	-2.62 **	-0.01	0.57	-0.01	1.27	-0.02	3.99 ***	-0.00
	UK															
	NMW		p25		p50		p75		NMW		p25		p50		p75	
	Female sample before introduction of the NMW (FBFB)						# obs.: 2999		Female sample after introduction of the NMW (FAFA)						# obs.: 2908	
Variable	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection
Age	-0.01	0.19 ***	-0.05 **	0.19 ***	-0.17 ***	0.19 ***	-0.20 ***	0.19 ***	-0.03	0.22 ***	-0.05 *	0.22 ***	-0.11 ***	0.22 ***	-0.19 ***	0.22 ***
Age2	0.00	-0.00 ***	0.00 **	-0.00 ***	0.00 ***	-0.00 ***	0.00 ***	-0.00 ***	0.00	-0.00 ***	0.00 *	-0.00 ***	0.00 ***	-0.00 ***	0.00 ***	-0.00 ***
High education	-0.38 **	0.20 **	-0.87 ***	0.20 **	-1.02 ***	0.20 **	-1.10 ***	0.19 **	-1.27 ***	0.20 **	-1.05 ***	0.19 **	-1.14 ***	0.19 **	-1.11 ***	0.19 **
Low education	0.42 ***	-0.12 *	0.35 ***	-0.12 *	0.38 ***	-0.12 *	0.38 ***	-0.13 *	0.22 **	-0.13 **	0.41 ***	-0.13 **	0.37 ***	-0.13 **	0.33 ***	-0.14 **
Married	-0.18 **	-0.11 *	-0.13 **	-0.11 *	-0.09	-0.11 *	0.01	-0.12 **	0.01	-0.12 *	0.03	-0.12 **	-0.04	-0.12 **	0.07	-0.12 **
Temporary	0.09		0.08		-0.04		0.12		0.22		0.25 *		0.15		0.13	
Part-time	0.57 ***		0.64 ***		0.43 ***		0.27 ***		0.33 ***		0.72 ***		0.54 ***		0.40 ***	
Child		0.02		0.02		0.01		0.02		-0.16		-0.17		-0.16		-0.16
Other income		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***
No. of children		-0.31 ***		-0.31 ***		-0.30 ***		-0.30 ***		-0.25 ***		-0.24 ***		-0.24 ***		-0.24 ***
Constant	-1.39 **	-1.95 ***	0.58	-1.95 ***	3.92 ***	-1.94 ***	5.39 ***	-1.94 ***	-0.99	-2.63 ***	0.32	-2.63 ***	2.34 ***	-2.63 ***	5.02 ***	-2.64 ***
	Male sample before introduction of the NMW (MBMB)						# obs.: 2351		Male sample after introduction of the NMW (MAMA)						# obs.: 2271	
	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection
Age	-0.12 ***	0.13 ***	-0.16 ***	0.13 ***	-0.19 ***	0.13 ***	-0.21 ***	0.13 ***	-0.11 *	0.13 ***	-0.14 ***	0.13 ***	-0.21 ***	0.13 ***	-0.28 ***	0.13 ***
Age2	0.00 ***	-0.00 ***	0.00 ***	-0.00 ***	0.00 ***	-0.00 ***	0.00 ***	-0.00 ***	0.00 **	-0.00 ***	0.00 ***	-0.00 ***	0.00 ***	-0.00 ***	0.00 ***	-0.00 ***
High education	-0.44 *	0.60 ***	-0.53 ***	0.60 ***	-0.80 ***	0.60 ***	-1.00 ***	0.60 ***	0.21	0.51 ***	-0.29 **	0.51 ***	-0.70 ***	0.51 ***	-0.96 ***	0.51 ***
Low education	0.36 **	-0.03	0.35 ***	-0.03	0.44 ***	-0.03	0.35 ***	-0.03	0.64 ***	-0.06	0.44 ***	-0.06	0.44 ***	-0.06	0.38 ***	-0.06
Married	-0.14	0.60 ***	-0.24 ***	0.60 ***	-0.27 ***	0.60 ***	-0.28 ***	0.59 ***	-0.57 ***	0.50 ***	-0.32 ***	0.50 ***	-0.40 ***	0.50 ***	-0.35 ***	0.50 ***
Temporary	0.94 ***		0.92 ***		0.61 ***		0.30 *		0.38		0.61 ***		0.59 ***		0.27	
Part-time	0.94 ***		0.83 ***		0.66 ***		0.06		0.84 **		0.69 ***		0.27		0.10	
Child		0.03		0.01		0.01		0.01		0.19		0.20		0.19		0.18
Other income		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***		-0.00 ***
No. of children		-0.18 ***		-0.17 ***		-0.17 ***		-0.17 ***		-0.16 **		-0.16 **		-0.16 **		-0.15 **
Constant	0.48	-0.98 *	2.31 ***	-0.99 *	3.97 ***	-1.01 **	5.45 ***	-1.05 **	-0.37	-0.92	1.85 ***	-0.92	4.12 ***	-0.92	6.62 ***	-0.91

Coefficients from a selection-corrected distribution regressions of hourly wage rates at the four points of the distribution (NMW level, 25th, 50th and 75th percentiles), using Sample 1 (workers in LII and BHPS data aged 22-65 and not in education). Equations control for regions. Statistical significance at the 1%, 5%, 10% levels are indicated by ***, ** and * respectively.

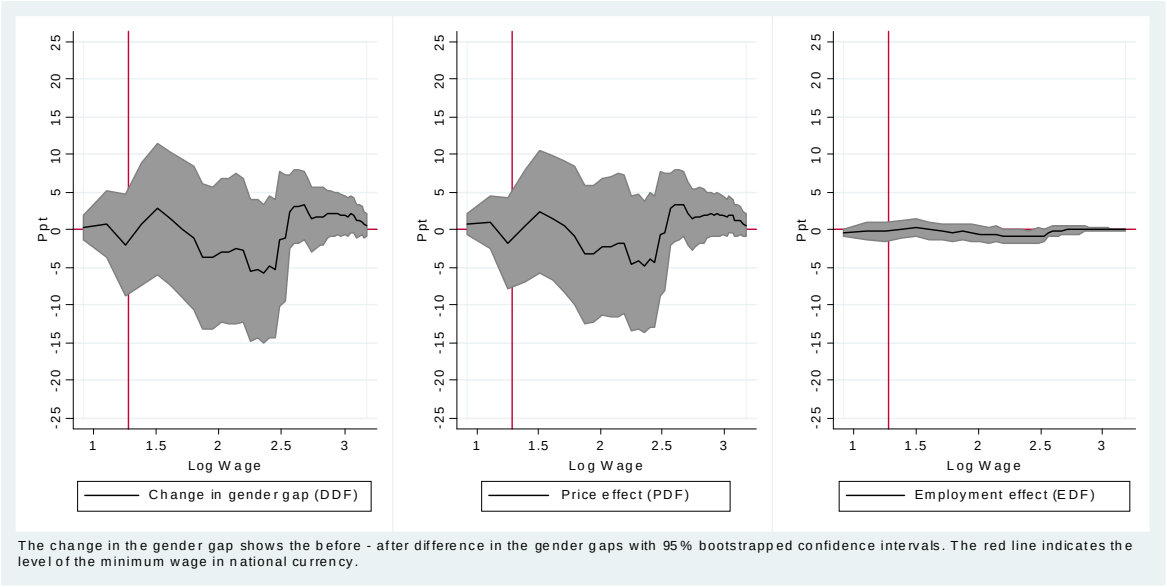


Figure C.9: Change in the Gender Wage Gap (Accounting for Selection into Employment, UK)

C.5 Additional References in the Appendix

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