



Gendered Divergence in the Impact of Parenthood on Wages: The Role of Family Size, Human Capital and Working Time

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Abstract

While gender pay disparity is a frequently researched area, few have focused on how parenthood and family size impact the wages of mothers and fathers together. The purpose of this study is therefore to take a broader view of this pivotal topic, one which has continued relevance as governments and organisations seek to advance gender equality. The findings show clear gendered divergence in the impact of parenthood on wages, with ‘motherhood wage penalties’ and ‘fatherhood wage premiums’ in both annual and hourly wage. The widest gap in earnings between women and men occurs at three or more children even when human capital and labour market selectivity factors are controlled for. For women, the largest penalty occurs at one and three or more children while for men, having two children represents the peak point in terms of wage gains to parenthood. Accounting for working time through hourly wage estimations narrows but does not eliminate parental wage gaps, pointing to other factors such as occupational segregation.

Keywords Parenthood · Earnings · Family · Gender

Introduction

Parenthood and its associated changes to labour market behaviour is the primary factor known to contribute to gender pay gaps with average pay falling for women and rising for men after the birth of children (Costa-Dias et al., 2021a; Gonalons-Pons et al., 2021; Fuller & Cooke, 2018; Harkness, 2018; Harkness & Waldfogel, 2003; Hodges & Budig, 2010; Molina & Montuenga, 2009). While earnings across the lifespan tend to rise with human capital accumulation (the interrelated accrual of age, experience and education), its effect on women with children is reduced relative to those with no children because of constraints on their time, energy, altered preferences and in some cases discrimination (Becker, 1985; Cukrowska-Torzewska & Matysiak, 2020; Gallen, 2018; Grimshaw & Rubery, 2015; Hakim, 2000; Mincer & Polachek, 1974; Polachek, 2004). Men meanwhile can benefit from these factors unencumbered by unpaid caring work and tend to increase their working time or intensity on average relative to their childless peers or, if they do not,

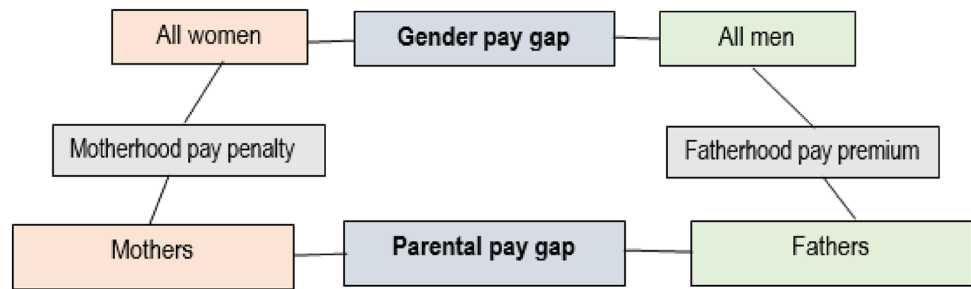
may benefit from signalling effects associated with that role (Eggebeen & Knoester, 2001; Hodges & Budig, 2010; Yu & Hara, 2021). These diverging effects are known as ‘motherhood pay gaps’ or ‘penalties’ and ‘fatherhood pay premiums’ or ‘bonuses’ and together, I use the term ‘parental pay gap’. The parental pay gap therefore represents the largest average difference in income between women and men; that between mothers and fathers. Figure 1 illustrates the relationship between the parental pay gap and the broader gender pay gap.

Despite rapid increases in women’s labour market participation, education, professional experience and skills, parenthood continues to have a negative impact on women’s earnings both in the medium term and longer term across their life course (England et al., 2016; Grimshaw & Rubery, 2015; Hodges & Budig, 2010; Van Winkle & Fasang, 2020). While gender role attitudes, public discourse and policy have been more inclusive of father’s role within the home, parenthood has either no effect on average or, in many studies, a positive one on men’s earnings (Harkness, 2018; Hodges & Budig, 2010; Mari, 2019; Yu & Hara, 2021). The reasons behind the persistence of motherhood and fatherhood wage gaps and premiums are complex and vary according to institutional context and study methodology. Yet continued focus on this area is crucial because if parenthood continues to impact the

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Fig. 1 How the parental pay gap and gender pay gap are linked



wages of men and women in diverging ways then gender pay gaps cannot be eliminated. The persisting phenomenon of gendered financial outcomes to parenthood also highlights broader sociological, cultural, and microeconomic factors such as the continued relevance of male breadwinner household task allocation, structural constraints to labour market mobility for women as well as altered preferences for men and women following childbirth. This research contributes to the literature by examining the financial effects of children and family size on both men and women together, including human capital factors and both annual and hourly wage estimations, thereby taking a more holistic view of topics often covered separately.

There has been a great deal of policy focus on the gender pay gap and gender equality in Ireland in recent years. This has occurred alongside significant cultural shifts in gender role attitudes around men's caring roles, increasing legislative provisions for shared parental leave and the reporting of pay inequality in the workplace (Barry, 2007; Fine-Davis, 2015; IBEC, 2020; O'Sullivan, 2012; Turner et al., 2020; Wilson, 2020). However, there is to date a dearth of focus on the specific effects of parenthood on wages in Ireland. This is despite Ireland possessing a number of characteristics which would render an exploration of this topic both necessary and relevant such as a highly educated and skilled female population, relatively high fertility rate in a European context, changes to normative household structures, the legacy of a male breadwinner culture, and issues around the cost and availability of childcare (Eurostat, 2022; Fine-Davis, 2015; OECD, 2022; O'Hagan, 2015; O'Sullivan, 2012). Ireland ranks eighth highest in the EU in the Gender Equality Index which rates factors like health, representation, money and work, and female participation in the labour market as well as in public life more broadly has increased dramatically in the last thirty years. There remains however a 'glass ceiling' effect for women in Ireland as despite rapidly rising levels of education and professional experience, they grapple with inequalities that occur following the birth of children (CSO, 2019). While Ireland has a high proportion of its male and female labour force in professional, managerial and semi-professional occupations, average wages for women within these occupations are lower than both their

male counterparts and the EU average (Nugent & Fitzsimmons, 2022). Levels of human capital in Ireland are high, but Irish women do not receive the same returns to their educational and professional investment as men, due in large part to the effects of parenthood on women's labour market behaviour (World Bank, 2020). The employment rate for women with no children is 88% compared to 67% for those with children aged 4 plus while the employment rate for men stays the same at 92% regardless of the presence of children (IBEC, 2022).

Parental pay gaps are known to be influenced by economic and social factors such as the extent of parental leave, gender role attitudes and the availability and relative cost of flexible working (Goldin, 2021; Harkness & Waldfogel, 2003; Hoon et al, 2017). In this sense we might expect patterns similar to other 'liberal' or Anglo-Saxon welfare jurisdictions such as the UK, Australia and, to some extent, the US where female labour force participation rates are high and yet state spending on public services such as childcare is relatively low (Epsing-Anderson, 1990).

Theoretical Concepts and Methodological Issues in Estimating Parental Pay Gap

Parental pay gaps and gender pay gaps of which they are a component are often explained using a human capital theoretical framework (Polachek & Xiang, 2014). The rational choice paradigm from which human capital theory derives attributes financial divergence following the birth of children to choices made by individuals and households about the most efficient allocation of time between paid and unpaid pursuits (Becker, 1985; Gallen, 2018; Polachek, 2004;). A crucial factor in this decision is the level of human capital and thus earning capacity of the decision maker (Mincer & Polachek, 1978). Earnings gaps can be explained either through differences in experiential human capital, with mothers accumulating less due to time out of the labour market or reduced hours compared to non-mothers and fathers (Cukrowska-Torzewska & Matysiak, 2020; Datta-Gupta & Smith, 2001; Waldfogel, 1997). The classic human capital wage function is applied with a view to highlighting whether

education and professional experience would narrow gender pay differentials upon parenthood (Cukrowska-Torzewska & Matysiak, 2020; Polachek, 2004). This rational choice-based approach is naturally concerned with hourly wage, as income gaps attributed to differences in working time across longer timeframes are viewed as the natural consequences of individual preference (Budig & England, 2001; Gash, 2009; Staff & Mortimer, 2012; Waldfogel, 1997). This ties into the rational choice viewpoint which sees that if women work fewer hours than men after parenthood then this ought reasonably to equate to lower wages and, indeed, adjustments to working time and arrangements following the birth of children have been found to account for varying amounts of gender pay differences (see Boll & Lagemann, 2019 for EU; Costa-Dias et al., 2021b for the UK; Felfe, 2012 for Germany).

An alternative perspective through which to view parental pay gaps is a structural one, centred around social, cultural, and institutional inequalities such as the unequal sharing of unpaid labour between men and women and male-dominated normative working arrangements (Budig & England, 2001; Goldin, 2021; Grimshaw & Rubery, 2015). Within this framework, families are ‘economic systems involving the appropriation of women’s unpaid labour and interlocking in complex ways with other economic systems involving paid work’ (Fraser, 2013, p. 30). The motherhood wage penalty and the fatherhood wage bonus are, in this sense, deeply connected—mothers taking the lion’s share of unpaid work allows fathers to progress in their careers. This applies outside of the nuclear family, with single mothers taking on the bulk of the caring role and allowing fathers time free to pursue their working lives (Murphy et al, 2008; Waldfogel, 1998). This theoretical perspective is concerned not as much with the specific causes of gender pay gaps but how their existence reflects divisions of labour which are gendered, and which leave women, particularly women with children or caring roles, at a financial disadvantage. As such, wage gaps that accrue across a wider timeframe are just as important if not more so than hourly differentials because they reflect divergence in hours worked or labour market attachment due to divisions of labour after parenthood or time out for maternity or other leave. It is with this theoretical perspective in mind that annual wage gaps are estimated.

Human capital theory tends to position children, or numbers of children, as commodities or consumer goods within modern families: the higher the income, the more children a couple might both desire and be able to afford (Becker, 1960). Income gaps that accrue on parenthood and upon increased family size are reflective of relative differences in experiential or other forms of human capital between mothers and fathers and divisions of labour decisions made within families as a result. On the other hand, a social constraints approach might view increased family size as posing a

barrier to women’s participation in public life, including the labour market and, once carrying the load of unpaid labour, men are free to continue their careers unimpeded (Fraser, 2013; Waldfogel, 1998).

In practical terms, human capital or constraints-based perspectives are not mutually exclusive, nor can they each be captured in the methodology in distinct ways. Most often, human capital or rational choice forms the default theoretical framework for income inequality analysis while the interpretation of results may take a more structural view (Goldthorp, 1996a; Mincer, 1974, 1958). In other words, the analysis of human capital factors often draws out what are essentially social conclusions and so ‘the challenge for both disciplines lies not in showing that gender is linked to employment outcomes, but in explaining the associations’ (Reskin & Bielby, 2005). Leaning on a social or structural constraints-based theoretical framework means viewing the existence of parental pay gaps as indicative of labour market inequality in and of itself (Folbre, 2021; Fraser, 2013; Goldin, 2021; Mies, 2014).

The Motherhood Pay Penalty

Motherhood wage penalties are almost universally shown across jurisdictions but there are variations in the size of the gaps reported, which category of women receive the largest penalty and under what circumstances (Anderson et al., 2002; Grimshaw & Rubery, 2015; Petreski & Petreski, 2018). According to a review of international studies in the area carried out by Grimshaw and Rubery (2015), low-income or less-developed countries show the largest unadjusted motherhood pay penalty averaging 42% in daily wages. Penalties are significantly lower in high-income countries; 2% for married and 12% for unmarried mothers in the United States (Budig & England, 2001), 13% in hourly wage in Germany (Felfe, 2012) and either no penalty or a positive impact in Denmark and France (Davis & Pierre, 2005). Motherhood penalties in Spain have been estimated at 6% for one child, 14% two children and 15% for three children (Molina & Monteunga, 2009). However, comparing these results is problematic ‘due to country differences in data, workforce composition, measures, and definitions’ (Grimshaw & Rubery, 2015). Furthermore, mothers labour market behaviour and earnings are impacted by social policies and cultural norms which support paid or unpaid work (Budig & Boeckmann, 2012). Work family policies in a given jurisdiction ‘work in concert with gendered cultural norms about the role and responsibility of mothers’ and this has an effect on earnings (Budig & Boeckmann, 2012). Budig and Boeckmann (2012) comparative study found that the average motherhood penalty for continental Europe was 21% in annual earnings, 23% for Anglo Saxon-type

jurisdictions (UK, US, Ireland, Canada, and Australia) while for Eastern Europe it was 10%. Scandinavian countries had the lowest motherhood pay penalty at 2%. Importantly, associations were found between cultural attitudes, national policies and maternal wages and countries under study were categorised according to weeks of parental leave, opinions on care, parenting and the male breadwinner and the female employment rate (Budig & Boeckmann, 2012).

As Cukrowska-Torzewska and Matysiak (2020) point out, ‘reconciliation between work and family are difficult in Anglo-Saxon countries’ such as the UK, US, and Australia, where public childcare provision tends to be low (Cukrowska-Torzewska & Matysiak, 2020). As a broadly ‘Anglo Saxon’ welfare model, Ireland has similarities with these jurisdictions in terms of childcare and public service provision leading to labour market constraints for women (Dukelow & Heins, 2017; Epsing-Anderson, 1990). Yet it also has its own unique cultural and social characteristics that have a bearing on how people manage their work and home lives. Until relatively recently, the role of women in Irish society was ‘firmly embedded in the home as a homemaker’ (Sheehan et al, 2017). With social developments from the 1970’s onwards and rapid economic growth from the mid-1990s, women’s labour market participation increased as legal and cultural barriers to paid work for married and single women were removed (Canavan, 2012; Duvery & Finn, 2014; O’Connor, 2007; Turner et al, 2020). Thereafter, while women’s employment rates continued to rise, reaching a peak of 61% compared to 78% for men in 2007, it was the presence of children rather than marriage, education or legal barriers that became the pivotal factor impacting women’s participation in paid work (Fahey & FitzGerald, 1997; McGinnity et al., 2009). For women in Ireland, ‘the presence and number of children influences both whether they engage in paid work at all, for how many hours, and when they do work, which jobs they do (Russell et al., 2017). High childcare costs and school scheduling often incompatible with standard working hours act as disincentives for women to continue full-time paid work after the birth of children (McGinnity & Russell, 2008; O’Hagan, 2015; Russell et al., 2017). As a result, women in Ireland are more likely than men to seek flexible working arrangements and part-time work or to leave the labour market to accommodate dual labour market and childcare roles (Callaghan et al, 2018). Furthermore, as Turner et al. (2020) show, despite rapid and significant increases in education among women in Ireland to levels that exceed men on average, they retain lower earnings across all occupational groups (Turner et al, 2020).

With these factors in mind, I hypothesise that:

H1.A There is a motherhood pay penalty among employed women in Ireland.

H1.B The motherhood pay penalty will increase with each additional child.

H1.C The motherhood pay penalty will be robust to ‘human capital’ characteristics.

The Fatherhood Wage Bonus

The tendency for fathers to earn higher wages than non-fathers on average is slightly more complex and with greater variation in size and contributing factors than is the case with motherhood pay penalties (Bonn Magnusson & Nermo, 2017; Hodges & Budig, 2010; Killewald & Gough, 2013; Mari, 2019; Yu & Hara, 2021). Household specialisation and divisions of labour where women undertake more unpaid caring and domestic work than men may explain gender pay gaps among parents but does not explain wage gains fathers receive relative to their childless male peers (Killewald & Gough, 2013). The traditional explanation is fathers assume a ‘breadwinner’ role and increase working hours, labour market attachment and work intensity following parenthood in a way not done by those without these additional responsibilities (Becker, 1981; Kaufman & Uhlenberg, 2000; Killewald & Gough, 2013). Fatherhood wage premiums are not always found or, if they are, tend to be smaller in size than the equivalent penalty felt on average by female workers (Fuller & Cooke, 2018; Hodges & Budig, 2010; Mari, 2019). Studies focused mainly on wage rates measured by hourly pay do not capture the aspect of working time or are less concerned with it, while those which explore productivity or work intensity vary in the measures used to capture these effects (Glauber, 2018; Killewald & Gough, 2013; Korenman & Neumark, 1992).

Signalling effects associated with actual or assumed breadwinner roles are considered an important aspect of fatherhood wage premiums, with employers perceiving fathers as more committed or reliable than their childless peers (Correll et al, 2007; Hodges & Budig, 2010; Kmec, 2011). Capturing these signalling effects is also problematic, however, and fatherhood wage premiums are impacted by a range of factors within and outside of organisations such as education level, occupation, employment relations and the working patterns of spouses or partners (Fuller & Cooke, 2018; Killewald & Gough, 2013). Hodges & Budig’s, 2010 study into the fatherhood wage premium in the US found that professional, managerial or ‘white collar’ jobs and those which emphasise cognitive skills receive the largest fatherhood wage premiums (Hodges & Budig, 2010). It might reasonably be considered that these signalling effects would be more pronounced in cultures where a male breadwinner structure is the norm, although data on whether this is in fact the case is mixed (Mari, 2019). It might also be considered

that the factors associated with male-breadwinner signalling, work patterns or intensity might be strengthened with numbers of children. Baranowska-Rataj and Matysiak (2022) found that having a larger family is positively associated with increases in a fathers share of paid work as well as with employment security and promotion (Baranowska-Rataj & Matysiak, 2022). What is difficult to disentangle are selection effects however, with men with better jobs or more money being more likely to marry and have children and vice versa (Mari, 2019). What is clear, though, is both society and employers 'different views of parenthood and job compatibility for women and men {which} have implications for the employment outcomes and job rewards of mothers and fathers' (Kmec, 2011, p.444).

Ireland's strong male-breadwinner legacy means that Irish fathers working lives tend to be less impacted by parenthood or, if they are impacted, it is through a stronger labour market attachment, longer working hours and less opportunity for, or propensity towards, flexible working (Drew & Daverth, 2014; McGinnity et al., 2009; McGinnity & Russell, 2007, 2008). While there have been recent policy shifts towards individualization of tax, shared (unpaid) parental leave and the right for parents to request flexible working, women are still seen as society's carers and fathers are much less likely to take up their share of parental leave or seek flexible work (Drew & Daverth, 2014; Duvvury & Finn, 2014). Almost half of all fathers do not take up their two weeks paid paternity leave after the birth of children, and take-up of parental leave by fathers is likely to be lower still¹ (CSO, 2020). This points either to a male-breadwinner arrangements whereby the household cannot afford to forfeit the wages of the higher-earning father or to a reluctance on the part of fathers to be seen to be taking time off for family related reasons (Hogan, 2019; Kelland et al., 2022).

Fathers in general should experience a sharper wage growth that accrues with age, experience, and human capital than men without children as they fulfil this breadwinner role, increase work intensity and signal reliability to employers (Hodges & Budig, 2010). Following the idea of hegemonic masculinity in certain occupational cultures put forward by Hodges and Budig (2010) we expect that in professional, managerial technical and 'white collar' sectors and occupations and among the more highly educated, fatherhood wage bonuses might accrue. Therefore:

H2.A There is a fatherhood pay bonus among employed men in Ireland.

H2.B The fatherhood pay bonus will increase with each additional child.

H2.C The fatherhood pay bonus will be robust to 'human capital' characteristics.

Data and Sample

The analysis here is based on the Survey on Income and Living Conditions (SILC) for Ireland 2020, carried out by the Irish Central Statistics Office (CSO, 2020). The SILC provides measures of earnings as well as individual characteristics such as age, education, sector, occupation, parental and household status. The survey was completed by 4243 households and 10,683 individuals in 2020 and is designed to be representative of the population of the Republic of Ireland.² This research is concerned with a sub-section of that sample: those 1681 women and 1841 men receiving income from some form of waged employment.³ This sample of employed individuals naturally excludes from the analysis all those who are inactive and is therefore not a comparison of all mothers and non-mothers or fathers and non-fathers, only those who are in current employment. In this sense it may underestimate the extent of the motherhood pay penalty, because women's lower earnings over the lifespan would be linked with periods of inactivity or time in domestic or caring work. Therefore, it is with the intention of moving away from the econometric focus on wage rates and towards a broader view of gendered financial impacts that both annual earnings and hourly wages are estimated. Part-time work, short periods out of the labour market for maternity leave and other aspects of intermittent employment are captured through annual earnings rather than hourly wage rates.

The cross-sectional nature of the analysis does have limitations, crucially that it does not track the income of the same men and women before and after parenthood. Selection bias is an important consideration in any wage estimation: high wage women may be less likely to have children or have fewer and differences in marriage market selection impact individual's choices and opportunities following the birth of children (Machado, 2012). Because many of these factors are unobservable, wage estimations can be distorted (Blau et al., 2021). To account for at least some unobserved heterogeneity, Heckman correction techniques are applied to OLS wage models (Heckman, 1979).

¹ No figures are currently available on numbers of fathers taking up unpaid parental leave, which is a statutory entitlement used by many as a form of reduced working time.

² Standard SILC weighting to population totals is applied to the sample prior to analysis, once adequate sample sizing is considered.

³ In addition, the sample size reflects men and women in work for whom data on family size is available.

Variables of Interest

The dependent variables of interest are annual and hourly gross employee earnings with the latter variable constructed using weekly working hours variables applied to weekly and then annual wage data.⁴ The primary independent variable of interest is parental status and family size. Since the number of children under 18 in a household is not available in the SILC, a proxy for family size is constructed using the variable for non-means tested non-contributory child-related allowance. This payment of €140 per month per child is paid to every family in Ireland regardless of income or wealth. Dividing these values by the annual amount of child allowance received for each child gives a reasonable approximation of number of children.⁵ Human capital and labour-related factors that impact income are included as controls in multivariate models. Education is a factor known to impact labour market behaviour, gender pay gaps and parental attachment to work and careers (Becker, 1985; Livanos & Núñez, 2012; Russell, & O'Connell, 2010). Occupational status (ISCO-08) is a hierarchical classification that allows jobs to be classified according to skill level and specialisation, giving an approximation of professional or, in some cases, socio-economic position (Fujishiro et al., 2010). The industry variable uses the NACE-Rev. 2 classification of economic activities in the European Union. This is included to capture pay differentials that exist between sectors and within-group gender pay gaps that are known to be wider in certain industries (Eurofound, 2021). Marital status is included in Heckman models as a factor known to impact the labour market participation. Age is available in the SILC only in grouped categories of 18–34, 35–49, 50–64 therefore in this analysis the younger age group act as the reference category. Clearly, age is an important factor correlated with parenthood, number of children, human capital accumulation and earnings. For example, fatherhood wage bonuses are likely to be connected to fathers being on average older than non-fathers and therefore likely to have more educational and experiential human capital and thus income. The real difference here is in terms of comparison with those young cohorts, so with average age of first-time

parenthood in Ireland being thirty-five for men and thirty-three for women we can account for these effects sufficiently through using the 18–34 cohort as a reference category (Williams et al., 2012).

Finally, household income can impact labour market behaviour (Harkness et al., 1997; Yavorsky et al., 2019). A measure for household income is therefore created using the log of gross household income minus individual income. While income is not a full reflection of total household wealth, money coming into the household through the earnings of its members would be likely to affect the preference or necessity towards individuals—particularly women with children—to maintain labour market attachment or take time out. Table 1, Appendix 1 displays percent distributions of main variables for women and men per number of children.

Analytic Approach

Descriptive statistics, ordinary least squares regression (OLS) and Heckman's (1979) two-stage sample selection model are used to estimate parental pay gaps in annual and hourly wage. This follows the approach taken in several studies including Harkness and Waldfogel (2003) and Budig and Boeckmann (2012) using both standard OLS and Heckman models to compare results before and after unobserved heterogeneity is controlled for. All analyses are run using the design weighting applied by the CSO to match to population totals. Two types of multivariate analysis are applied to test the hypotheses relating to parental pay gaps and, the effect of human capital and working time on parameter estimates. First, basic ordinary least squares regression (OLS) models are estimated to show the effect of parenthood and family size on wages for women and men. The following log-linear regression is assumed based on Mincer and Polachek's (1974) human capital earnings function:

$$\ln W_{yi} = \alpha + \beta 1 \text{Parent } y + \sum X'_{it} + \epsilon_{it}$$

Where $\ln W_{yi}$ is the log of hourly or annual wage for women or men; parent represents dummy variables for one child, two children and three children or more compared to the reference of having no children. In standard models it is possible that unobserved differences may bias parameter estimates. The sample of waged employees may not be random as any number of factors might influence why an individual participates in the labour market, many of which are unobservable here. Consequently, the coefficients in standard OLS models may be biased by unobserved heterogeneity. For this reason, a second set of regressions uses a Heckmann correction (Heckman, 1979). A probit model first estimates the probability of an individual being employed at a given time, conditional on a set of personal characteristics:

⁴ Weekly working hours * 52/gross income from employment. This assumes that an individual works throughout the year and therefore gives an approximation of hourly wage rates only.

⁵ This is not a perfectly constructed variable, but an approximation. Uneven amounts of child benefit could reflect children born or turning 18 during a given year. Here those values are rounded to the nearest whole number. In lone parent families, child benefit is paid to the primary carer; likely to be the mother. This could result in the female sample appearing to have slightly more children on average than the male, however this will not impact frequencies or regression coefficients.

Table 1 Percent distributions of main variables for women & men per number of children + mean weekly working time + mean and median annual and hourly wage

	Women 1681				Men 1841			
	0 children	1 child	2 children	3 children +	0 children	1 child	2 children	3 + children
% with each family size (children < 18)	57%	16%	17%	10%	60%	13%	16%	11%
Sample size (n)	833	275	336	237	939	244	352	306
Age								
18–34	28	25	15	12	29	22	11	6
35–49	27	47	73	81	26	42	70	76
50–64	45	28	12	8	45	36	19	18
Marital status								
Single	46	31	11	11	47	21	8	10
Married	44	56	81	84	45	75	91	89
Widowed/Divorced/Separated	10	13	8	5	7	4	1	1
Education								
Higher secondary or less	23	22	15	16	34	39	25	29
Post-secondary, tertiary	23	26	23	24	24	17	24	22
Degree-level	33	36	37	39	28	29	33	33
Post-graduate	21	17	26	22	14	15	17	15
Mean weekly working hours	35	32	30	28	39	38	40	41
Professional status								
Professional, manager	37	34	40	43	32	32	34	38
Semi-professional, technical	12	11	14	11	13	13	16	14
Service and manual level occupations	21	22	18	16	34	37	34	30
Skilled trades, craft	30	32	27	29	21	18	15	19
Sector/Industry								
Manufacturing/Construction	7	8	8	11	26	35	31	35
Services	34	34	31	27	37	33	38	38
Professions/Science/Technology/Finance	16	19	16	14	20	21	17	17
Health/Education/Social Work	43	39	45	48	17	12	13	11
Median annual earnings €	31,800	25,000	27,070	24,080	32,180	33,080	37,660	34,150
Median hourly wage €	17	15	18	17	16	16	18	16
Mean annual earnings €	34,424	30,366	32,000	30,673	37,568	41,740	44,444	48,348
Mean hourly wage €	20	17	19	19	22	21	21	22

Sample all labour-active individuals aged 18–64

Source: survey on income and living conditions

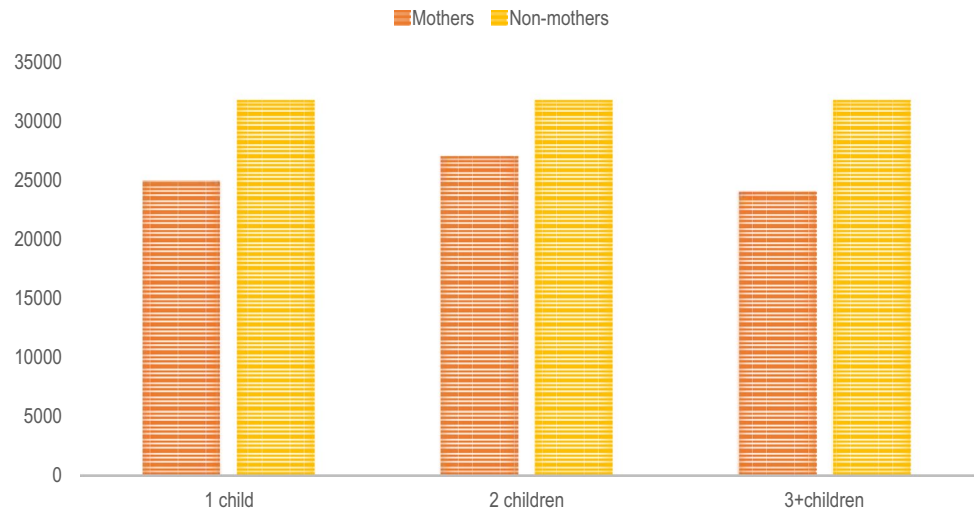
$$U_i = \gamma \text{ married} + \sum X' t + \mu_i t$$

Where U_i denotes labour market participation compared to non-participation for individual i t and the predictors include a dummy variable for marriage (not included in wage estimations) and $\sum X' t$ represents two age dummies, three education dummies and a log of other net household income. An Inverse Mills Ratio (IMR) or 'non selection hazard' can then be constructed from the coefficients on this model and included in the second, OLS wage estimation:

$$\ln W y_i = \alpha + \beta_1 \text{ Parent} + \beta \lambda \sum X' t + \varepsilon_i t$$

Where $\beta \lambda$ is the coefficient representing the Heckman correction factor or error term on the selection equation. The log-linear functional form was used in order to remove some of the positive skewness in the distribution of wages, and to enable the coefficient estimates to be interpreted as an approximate percentage effect. I expect that numbers of children would be negatively associated with women's income from waged employment and positive for men. I expect that this would hold when controlling for age and classic human capital factors and would be reduced, but not eliminated, when accounting for working time.

Fig. 2 Motherhood pay penalty per number of children: annual €



Descriptive Results

Table 1, below, shows percent distributions of demographic and labour characteristics used in the analysis broken down by sex and family size. Summarising these to give an overview of the sample, we can see that, as would be expected, increased numbers of children are associated with slightly older age cohorts. The female group show higher overall levels of educational attainment which increase with family size. Following a similar trend, proportions of women in higher-level professional, managerial, and associate professional occupational levels increase with number of children. These preliminary trends are likely reflective of the connection between age and family size but may also highlight a phenomenon identified in international research showing—somewhat counterintuitively—highly educated women having larger numbers of children (Hazan & Zoabi, 2015; Livingstone, 2015). The extent to which that might be the case would be a topic for further research. The male sample shows a similar trend in terms of education, although not as pronounced. From the data on sector or industry, women in Ireland regardless of parental status are heavily concentrated in the health, education and social work sectors, areas of the economy which are likely to be in the public or state sector.

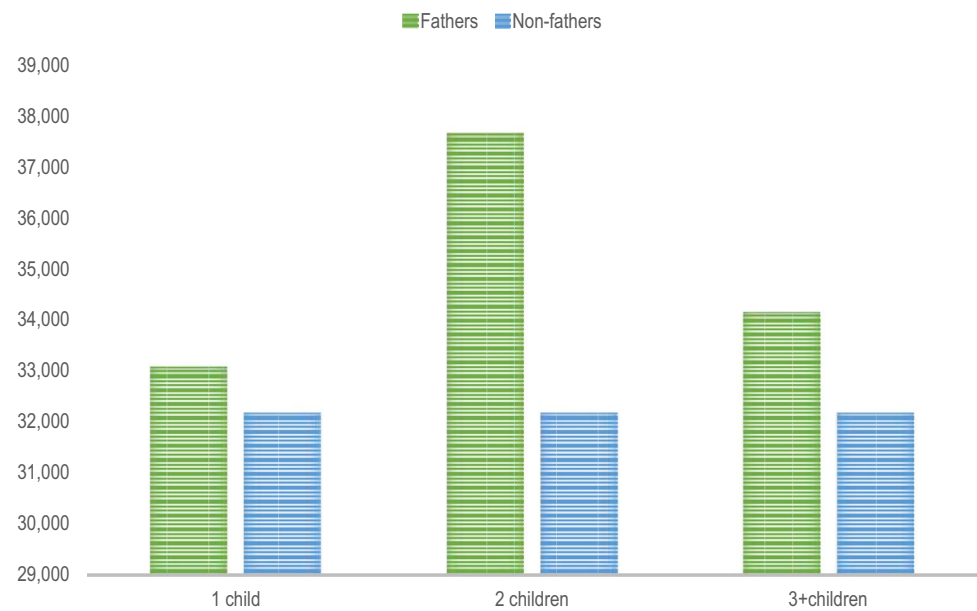
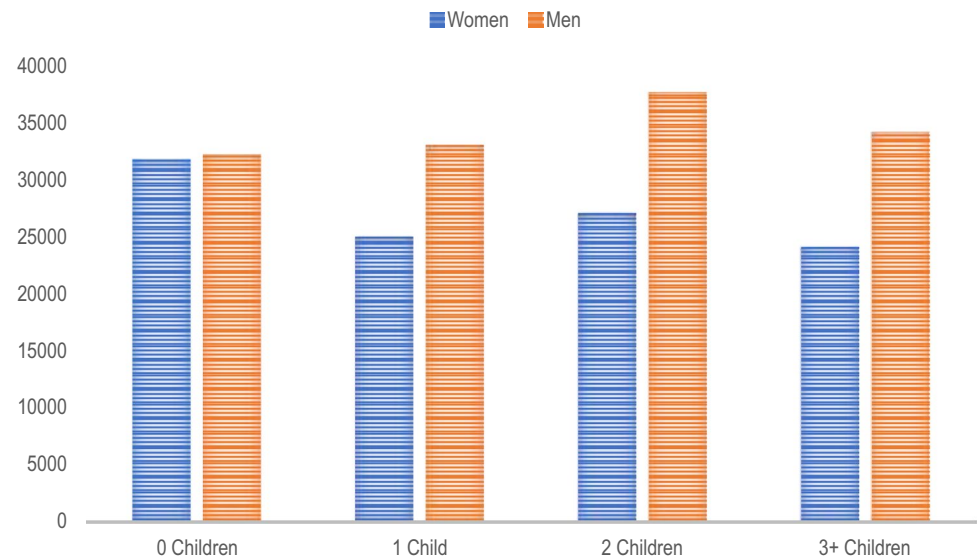
We can see that average weekly working time for women reduced with each additional child, which is mirrored in the male sample by increased working time for men with two or more children. The data on hourly wage, which is the measure used to control or account for working time, are conflicted according to the point estimate applied. Mean hourly wage reduces for women with additional numbers of children and increases for men, something which would suggest that working time does not account for the entirety of the gendered wage

differentials on parenthood. Median estimates show a more mixed picture.

The following series of charts display information relating to gendered wage differentials in a number of different ways. Figures 2 and 3 show the motherhood wage penalty and the fatherhood wage bonus in annual median pay according to numbers of children. Figure 4 shows the gender gap in annual pay per number of children, which is the difference in earnings between women and men. Finally, Fig. 5 shows the parental pay gap, which is the difference between mothers and fathers per number of children expressed in percent terms.

Figure 2 shows that the sharpest motherhood pay penalty occurs with one and three or more children, with some levelling out at two children. This may reflect a situation in which human capital accumulation with age increases average earnings for women between one and two children and the effects peter out or are reduced with additional children. Mirroring this, we can see in Fig. 3 that the sharpest fatherhood pay premium occurs at two children. Gender earnings gaps in Fig. 4 display this information in a different way to highlight the almost negligible earnings difference between women and men with no children, rising in that slight inverted U-shape peaking at two children. Overall parental pay gaps in these unadjusted median annual estimates in Fig. 5 show that in percent terms the widest earnings gap between women and men occurs at three or more children, representing the combined effect of a 6% increase in average annual wage for men and a 27% decrease in annual wage for women relative to their childless peers.

These results on descriptive point estimates of annual earnings do not account for other factors that impact wages. Therefore, the next analytical stage uses a series of regression models that attempt to control for human capital and other wage-influencing factors as well as selectivity into the labour market. Table 2 presents the coefficients, in

Fig. 3 Fatherhood wage gap per number of children: annual €**Fig. 4** Gender gap per numbers of children: annual €

percentage age change form, of these regression models: (1) OLS to estimate the effect of parenthood and family size on the annual earnings of women and men, (2) using Heckman models where a control accounting for selection into the labour market is included alongside standard human capital controls as outlined, (3) Heckman models with controls for the impact of parenthood on hourly wages, to account for the effect of working time on pay differentials. Full results are included in Table 3, Appendix 1.

In the basic OLS models with no controls, we can see a motherhood earnings penalty of 21% on one child, 12% for two children and 23% for three or more children. These figures mirror those of the descriptive analysis to a large extent. The next question is whether this can be explained through factors other than parenthood, such as

age differences between mothers and non-mothers, education levels, occupation or work in particular sectors. Further factors unobserved by standard OLS models that impact whether an individual is employed or not may also be relevant. Therefore, Model 1b is a Heckman model with controls which estimates the effect of numbers of children on the annual earnings of women. For women with one or two children, roughly half of the negative impact on earnings is explained through differences in human capital, age, and labour market selection. For those with three children or more however, the gap is slightly larger, pointing to the possibly strengthening effects of the control variables on the motherhood wage penalty. These estimates indicate that parenthood and family size have significant negative impacts on annual earnings for women regardless

Fig. 5 The parental pay gap per number of children: annual €**Table 2** Coefficients from Heckman selection models expressed as % effects for numbers of children on the natural log of annual and hourly income for women and men

	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c
	Motherhood penalty (OLS) annual wage	Motherhood penalty (Heckman + human capital controls)	Motherhood penalty (Heckman + human capital controls + working time)	Fatherhood wage premium (OLS)	Fatherhood wage bonus (Heckman + human capital controls)	Fatherhood wage bonus (Heckman + human capital controls + working time)
DV	Log annual wage	Log annual wage	Log hourly wage	Log annual wage	Log annual wage	Log hourly wage
0 child	Ref	Ref	Ref	Ref	Ref	Ref
1 child	- 21%	- 11%	- 5%	+ 5%	+ 17%	+ 14%
2 children	- 12%	- 11%	- 3%	+ 38%	+ 24%	+ 20%
3 + children	- 23%	- 27%	- 13%	+ 15%	+ 19%	+ 16%

Sample all labour-active individuals aged 18–64

% Estimations based on $e^{\beta*100/1}$ with β being the regression coefficient

Ref = reference category in regression

Heckman sample selection criteria = age, education (post-secondary, tertiary, degree-level, post-graduate), marital status, household income

Human capital and other controls: age, education, occupation (professional, manager, semi-professional, technical), sector (professions, science, technology, finance, health, education & social work), household income

of their age, education, work experience or sector. Model 3a presents percentage effects from Heckman models with human capital controls for hourly wage for women. As expected, the motherhood pay penalty is reduced but not eliminated when working time is accounted for. The negative impact on hourly wages reduced slightly from 5 to 3% for mothers of two children, likely reflecting a levelling-out effect whereby the sharpest effect is going from no children to one child rather than from one child to two. However, for mothers of three or more children, their hourly wage rate is on average 13% less than their childless peers regardless of human capital.

In the male sample, OLS estimates of the effect of parenthood and family size on annual earning show an inverse U-shape, with a small positive impact for fathers of one child (5%) rising to 38% positive impact for fathers of two

children and falling slightly to 15% for fathers of three or more children. In Model 2b, when Heckman and human capital controls are included, the impact on annual earnings is increased for fathers of one child, to a positive effect of 19%, again rising for fathers of two children to 21% and falling slightly for fathers of three or more children at 17%. In the Heckman regressions on hourly wage, the coefficients show that fathers of one child earn on average 17% more than their childless peers per hour, 15% for fathers of two children and 12% for fathers of three or more. The results show that a significant fatherhood wage premium exists among men when age, human capital, labour market self-selection factors and working time are considered. By way of summary, Fig. 6, below, displays the results of Heckman models of the impact of numbers of children on annual and hourly wage for women and men with control factors.

The key findings of this paper can be summarised as follows:

- i. There is a large and significant motherhood wage penalty in annual earnings that follows a slight inverted-U shape; widest at one and three children.
- ii. For mothers of one or two children, the difference in earnings between mothers and non-mothers is roughly halved when human capital characteristics relating to education, sector, and occupation as well as self-selection into the labour market are considered.
- iii. For mothers of three or more children, human capital controls appear to sharpen the negative impact on annual earnings relative to childless women.
- iv. A motherhood wage penalty of 13% for women with three or more children remains when accounting for working time through hourly wage estimates, human capital, and labour factors.
- v. There is a large and significant fatherhood wage premium in annual earnings that follows a slight inverse U-shape, rising to 21% for fathers of two children when human capital and other factors are accounted for and falling slightly for fathers of three or more children.
- vi. For fathers, human capital characteristics appear to significantly increase the positive impacts on earnings for one child; a premium which is largely robust to working time factors. For two children, the picture is reversed, with human capital factors and labour market self-selection factors reducing the positive effect. For fathers of three or more children there is a positive impact on wages of between 12 and 15%.
- vii. Hourly wage estimations for parents compared to non-parents in multivariate Heckman regression models show that working time does not fully explain either the penalties experienced by women, or the premiums experienced by men. However, in median point estimates from descriptive or ‘raw’ data, hourly wages appear negatively associated with parenthood for mothers of one child and unrelated to parental status or family size for men.

Discussion and Conclusion

This goal of this study was to provide a broad overview of parental pay gaps with family size, taking into consideration classic explanations for such gaps: human capital and working time. By analysing motherhood penalties and fatherhood premiums together it presented a full picture of the diverging impacts that having children has on the income of women and men. Including annual earnings allowed for a more complete snapshot of earnings differences upon parenthood, one

which considers how women adjust their working lives to suit the demands of caring roles not felt by men to the same extent (Budig & England, 2001; Goldin, 2021; Grimshaw & Rubery, 2015).

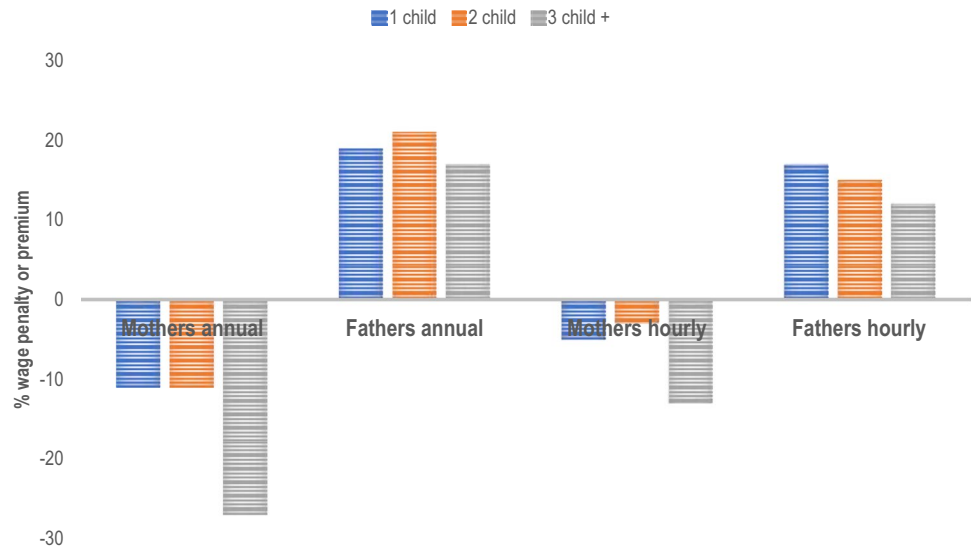
Diverging trends in the impact of parenthood and family size on annual income were notable, both between men and women with children and between mother and fathers compared to their childless peers. While care must be taken in making comparisons across studies due to differences in methodology, the motherhood penalty in annual earnings here (between 11 and 27% depending on family size and whether human capital and labour-related factors are included) is higher than the average of 10% for the ‘non-European’ group consisting of Anglo-Saxon welfare states (with Israel included) in Budig and Boeckmann (2012) study. The residual pay gap in hourly wage of 5% for mothers of one child, rising to 13% for mothers of three children is similar to that found in other Anglo-Saxon welfare states (see Budig & England, 2001 for US; Livermore et al., 2011 for Australia; Viitanen, 2014 for UK) although, again, comparisons are difficult to draw when different samples are employed. What this shows clearly is that despite rapid increases in labour market participation of women in recent years, heavy policy attention on gender pay gaps and gender equality, employed women in Ireland experience a negative impact of parenthood on their income which increases with family size. The wage penalty when human capital and labour factors are included is still substantial, at either 11% for mothers of two children or 27% for mothers of three children or more, compared to women without children.

Hourly wage gaps are smaller, pointing to the importance of working time factors, however for mothers of three or more children, a significant hourly wage penalty of 13% remains and suggest that factors exogenous to the model are impacting the wages of women with larger families. While occupational and industry differences are accounted for to some extent in regression models through the use of control variables, there are likely to be within-industry variation or segregation into lower paid jobs within occupations (Bonioli et al., 2019; Hedija, 2017). A sociological interpretation of these findings would question why—in the twenty-first century—women’s financial gains to human capital ought to be so restricted by motherhood, why there is a cost to flexible working or why jobs and sectors where women tend to be overrepresented tend to pay less (Fraser, 2013; Goldin, 2021; Grimshaw & Rubery, 2015; Howard, 2020).

The fatherhood wage premium uncovered here is larger here than that found in other studies, at between 5 and 38% in annual income and 12% and 17% in hourly income (see Hodges & Budig, 2010; Yu & Hara, 2021 for the US; Mari, 2019 for UK and Germany).⁶ The addition of labour market

⁶ Already stated limitations to comparability apply.

Fig. 6 Motherhood & fatherhood wage gaps: annual & hourly €. Results from Heckman regressions with human capital controls



selection and human capital factors appears to have varying effects on the fatherhood wage premium depending on the number of children and further research would be needed to explore why, or the extent to which, this is the case, as well as the specific effects of marriage, time in caring or domestic labour or household task specialisation. Working time does not eliminate the fatherhood wage premium, showing that increased work hours after fatherhood do not fully explain the higher wages of fathers compared to non-fathers. Rather, factors unobserved by the model such as the signalling effects of fatherhood to employers, the nature of workplaces such as the likelihood of performance or bonus pay, work intensity or a more secure attachment to the labour market for fathers relative to their childless peers may all play a part (Correll et al., 2007; Fuller & Cooke, 2018; Hodges & Budig, 2010; Killewald & Gough, 2013).

Results show a pattern of fatherhood wage premiums rising at two children and falling slightly or tapering off after three children, suggesting either that there are factors associated with having larger families that impact earnings for men or that the gains to fatherhood have a limited rather than continuous upward trajectory. The inverse-U shape of the wage premium in annual wage suggests that family sizes of two children represent the peak point at which wage gains to fatherhood are felt. While many of these findings require further exploration, what we can say is that a fatherhood wage premium exists in Ireland and is notable. Viewed alongside the clear and persistent motherhood pay gap, fatherhood wage premiums point to the continued relevance of the male breadwinner model whether through household divisions of labour or workplace policies or practices that advertently or inadvertently favour fathers.

This study was not intended to be a forensic investigation into the causes of parental pay gaps nor decomposition of

the precise contributions of specific factors. Rather, it was to explore the oft researched but continually relevant topic of gender and pay from the specific perspective of parenthood. The aim was to apply the two primary theories of human capital and structural or social constraint to the data and to provide a broad-brush institutional and contextual analysis of parental pay gaps in Ireland, something which has not to date been studied. As such there are limitations to the methodologies employed, most importantly the unobserved heterogeneity and self-selection issues not fully accounted for through Heckman models based on cross-sectional data. We cannot tell, for example, the selection effects of assortative mating, selection into parenthood or family size and there are likely to be correlations between the propensity to have larger families and work choices that cannot be estimated here. Further research examining these aspects in the Irish context, and particularly that which would provide a cross-country comparison would be useful.

Finally, it is notable that this investigation into parental pay gaps took place in 2020: a year when COVID-19 created labour market disruption as well as changes to working arrangements many of which were gendered (Abendroth et al., 2022; Cook & Grimshaw, 2021; Queisser, 2021). Data for the Survey on Income and Living Conditions is collected between January and June, but the income reference period is the previous year. Therefore, while it is possible that some working patterns were beginning to be disrupted at the time of data collection, the financial impact would not be seen until the 2021 data was collected. Future research should closely examine parental pay gaps before and after the pandemic, compare the extent of motherhood pay gaps within different sectors impacted by COVID-19 restrictions and explore how factors like remote working and greater access to flexible working arrangements are bearing upon the financial effects of having children.

Appendix

See Table 3.

Table 3 Full results for OLS and Heckman selection models of the effects of numbers of children on wages for women and men

DV	Women			Men		
	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c
	Motherhood penalty (OLS) annual wage	Motherhood penalty (Heckman + human capital controls)	Motherhood penalty (Heckman + human capital controls + working time)	Fatherhood premium (OLS)	Fatherhood premium (Heckman + human capital controls)	Fatherhood premium (Heckman + human capital controls + working time)
	Log annual wage	Log annual wage	Log hourly wage	Log annual wage	Log annual wage	Log hourly wage
0 Children	Ref	Ref	Ref	Ref	Ref	Ref
1 child	– .232** (.003)	– .120** (.058)	– .059 (.050)	.054** (.075)	.178** (.064)	.159** (.054)
2 children	– .129** (.003)	– .121** (.046)	– .028 (.303** (.062)	.195** (.056)	.144** (.043)
3 + children	– .261** (.002)	– .321** (.054)	– .143** (.044)	.138* (.059)	.164** (.111)	.122* (.046)
Age						
18–34		Ref	Ref		Ref	Ref
35–49		.350** (.061)	.313** (.066)		– .359** (.046)	.499** (.060)
50–64		.262** (.062)	.472** (.067)		– .564** (.036)	.796** (.059)
Education						
Secondary level		Ref	Ref		Ref	Ref
Post-secondary/tertiary		.193** (.087)	.391 (.191)		– .057 (.062)	– .073 (.066)
Degree		.412** (.104)	.730* (.313)		– .117 (.062)	– .061 (.068)
Post-graduate		.532** (.128)	.948** (.017)		– .101 (.082)	.073 (.086)
Professional status		– .023 (.243)	– .080			
Professional/manager		.480** (.064)	.397** (.056)		.479** (.049)	.416** (.049)
Semi-professional/technical		.364** (.082)	.280** (.071)		.322** (.056)	.291** (.59)
Service/manual		Ref	Ref		Ref	Ref
Skilled trade		.036 (.080)	.036**		.425** (.062)	.565** (.020)
Industry/Sector						
Manufacturing, construction		– .347** (.070)	– .258** (.058)		– .185** (.053)	– .184** (.037)
Services		Ref	Ref		Ref	Ref
Professional, science, technology, finance		– .087 (.125)	.017 (.050)		– .134** (.056)	.465** (.043)
Health, education, social work		.557** (.120)	.383** (.100)		– .497** (.158)	– .322** (.007)
Household income			– .058 (.067)		.083** (.023)	.170** (.025)
n	1681	3036	3036	1841	2794	2794
R ²	.014			.021		

Sample: For probit side of selection models: all women and men aged 18–64. For OLS models: all employed women and men aged 18–64

Source: Survey on Income and Living Conditions 2020

Ref = reference category in regression analysis

**significance at 99% confidence

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Declarations

Conflict of interest Author report that she has no conflict of interests.

Consent participant No participation consent was required as all data was secondary data sources accessed via the Irish Social Science Data Archive.

Consent for publication All authors have approved the manuscript and agreed with its submission to the journal.

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