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ABSTRACT

Taxation, Work and Gender Equality in Ireland*

In most developed countries, economies are facing population ageing, falling fertility rates and stagnating labour force participation. The ability of governments to fund future pension and health-care expenditure relies to a large extent on income tax and social security receipts from workers. Policymakers are generally in agreement that increasing the labour force participation of women, without reducing the fertility rate, is needed. In the year 2000, with the aim of increasing women's labour market participation, a partial individualisation of the Irish income tax system was initiated. Using the Living in Ireland survey and a difference-in-differences framework, I investigate whether this reform had any effect on female labour supply and caring duties. I find that the labour force participation rate of married women increased by 5-6 percentage points in the wake of the reform, hours of work increased by two per week and hours of unpaid childcare decreased by approximately the same margin.

JEL Classification: J08, J20, H31
Keywords: individual taxation, labour supply, Ireland

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1. Introduction

The importance of removing barriers to work for all those who are willing and able to work is fast becoming a policy objective for governments. In most developed countries, economies are facing population ageing, falling fertility rates and stagnating labour force participation. The ability of governments to fund future pension and health-care expenditure relies to a large extent on income tax and social security receipts from workers. Research by Dolls et al (2017) has shown that projected demographic change over the next two decades will lead to fiscal stress in most European countries, including Ireland. Among other measures, policymakers are generally in agreement that an examination of which policy instruments to use to increase the labour force participation of women, without reducing the fertility rate, is needed.

The female employment rate in Ireland is 64%. This places Ireland somewhere around the EU median. Sweden, for example, has a female employment rate close to 80%. At the other end of the spectrum, southern European countries such as Greece and Italy have female employment rates around 50%. Although the gender pay gap has been improving, men still earn approximately one-sixth more than women in Ireland. Gender inequality persists in retirement as elderly men also have higher income than elderly women.[1] This is at least partly due to lower pension entitlements of women who have, on average, shorter and less well-paid careers.

Over the last few decades, the general trend in European Union countries has been a move from joint towards individual taxation. However, joint taxation is still present in the US as well as a handful of EU countries, including Ireland. Also, many countries with "individualised" taxation still retain some elements of joint taxation. In 2000, with the aim of increasing women's labour market participation, a plan to phase in individual income taxation for couples in Ireland was put forward. It met with considerable opposition as it was considered to penalise women who chose to stay at home in a caring role. The proposal was shelved and a somewhat hybrid system was introduced between 2000 and 2002, and remains in place to this day.

A shift from this hybrid system to full individual taxation, which would equalise the marginal tax rates of the primary and secondary earner, is a potential policy route to take from the perspective of increasing female labour supply and reducing gender disparities in the burden of household production in Ireland. A move by the Irish government to introduce individual taxation would also be in line with a new initiative by the European Commission, the *Work-Life Balance Package*, which combines legal and policy measures, including removing fiscal disincentives for secondary earners, to support the work-life balance. Apart from its potential incentive effects on the labour supply of women, there are broader societal benefits of individualised taxation systems and the dual-earner, dual-carer model. By removing barriers to women's employment, the interrelated issues of the gender wage and earning gap and the gender pension gap are partially addressed. Women's increased economic independence can also reduce female poverty (Findlay & Wright, 1996) and reduce the risk of victimisation and violence (Bowlus & Seitz, 2006).

This paper makes a number of contributions to the literature. First, I document the historical shift in female labour market attachment in Ireland over the last couple of decades and show how the partial individualisation of the income tax system in 2000 changed financial

[1] Figures from Eurostat, 2016. Employment figures for 20-64 year olds.

incentives to work for married women. Using the Living in Ireland (LII) survey in a Difference-in-Differences framework, I then investigate whether the partial individualisation of the Irish income taxation system which began in 2000 had any effect on female labour supply or related outcomes, such as the time spent caring for children. These results will then be discussed in the context of a hypothetical, fully individualised income taxation system for Ireland and policy conclusions will be drawn.

2. Related literature

The literature indicates that income tax influences the decision of individuals to work. Joint income taxation, which splits or aggregates the income of a couple in determining the income tax liability, is a feature of the Irish tax-benefit system and one which imposes higher marginal tax rates on the lower or secondary earner in a couple, which is usually the woman. This is because the primary earner can use the secondary earners tax allowances, credits and bands so that, typically, if a secondary earner joins the labour market, they pay higher average and marginal rates of taxation than if they were unmarried. This means that secondary earners in Ireland have less financial incentive than their European counterparts to either join the labour market or to increase their hours of work if they are already working part-time.

One of the groups most responsive to changes in income tax is women, particularly those with children (Blundell, 2014).[2] Bargain et al (2013) estimate that the labour supply elasticity of married women in Ireland, which measures how much extra labour is provided in response to an increased financial return to that labour, is around 0.4 (almost twice the EU average), compared to 0.2 for married men. Given the relatively high responsiveness of female labour supply to financial incentives in Ireland, it seems counterintuitive for the Irish taxation model to impose higher marginal tax rates on women. The disincentives for labour force participation become particularly apparent if we compare market work (yielding highly taxed earned income) with non-market work in the household (yielding household goods which are not burdened by any tax). It is not surprising, therefore, that many women substitute their market work by non-market work, taking advantage of the favourable tax treatment of household good production (Kabátek et al, 2014).

Recent work by Bick and Fuchs-Schündeln (2017), which studies the US and 17 EU countries, finds large disincentive effects of joint taxation on the hours worked of married women. At individual country level, previous empirical research has also evaluated the ex-ante labour market effect of a proposed shift from joint to individual taxation in Ireland (Callan et al, 2009), France (Kabátek et al, 2014), Germany (Decoster and Haan, 2011) and Luxembourg (Doorley, 2016), finding that the participation rate of married women can be expected to increase by around 1-9%. There have also been studies which have evaluated the incentive effects of individual taxation in a natural experiment framework in the UK (Roantree, 2018); the US (Lalumia, 2008); Sweden (Selin, 2014) and Canada (Crossley and Jeon, 2007). In each case, individual taxation is found to result in substantially higher labour market participation by women.

[2] The young and the old are also particularly responsive to fiscal incentives

3. Background

3.1 Gender differences in labour market behaviour in Ireland

The activity and employment rates of Irish women have been rising over the last couple of decades but remain low compared to our European counterparts. In 2016, around 64% of Irish women were employed, compared to 77% of Irish men. Comparable figures from the UK were 72% (women) and 83% (men) and from the EU-28 were 65% (women) and 77% (men).[3] The average hours of work of Irish women is similar to that of women in the UK (around 32 hours per week) but less than that of women in the EU as a whole (around 34 hours per week). The result of these discrepancies is that Irish women are less likely to have market income and, for those women who do receive market income, they receive less.

Seemingly in contrast to these facts, the raw Irish gender pay gap, measured as the percentage difference between average male and female earnings is relatively low, at around 14% in 2014, compared to 21% in the UK and the EU average of 16%. However, interpretation of this result requires some nuance. Because Irish female labour force participation is low, it is comprised of a relatively better educated female workforce compared to countries with higher labour force participation. An adjusted measure of the gender wage gap, which accounts for the characteristics of the population, puts the Irish gender wage gap closer to 17% and the UK gender wage gap at around 12% (Christofides et al, 2013).

Table 1 Selected labour market statistics for Ireland, the UK and the EU-28

	IE	UK	EU
Labour Force Participation Rate of women	0.64	0.72	0.65
Incidence of Full-time work	0.70	0.61	0.70
Incidence of part-time work	0.30	0.39	0.30
Average weekly hours of work	32	32	34
Unadjusted gender pay gap	14	21	17
Adjusted gender pay gap	17	12	-
Marginal Effective Tax Rate (METR) of secondary earners with young children	43	33	33
Female/male income ratio of elderly	0.84	0.84	0.84
Labour supply elasticities of married women	0.40	0.11	0.27

METR for 2012 taken from Rastrigina & Verashchagina (2015). Adjusted gender pay gap comes from Christofides et al (2013). Labour supply elasticities for 1998-2005 period from Bargain et al (2013). Unadjusted gender pay gap for 2014 from Eurostat. All other statistics for 2016 from Eurostat.

[3] Pre-crisis figures from 2007 tell a similar story. The employment rate of women in Ireland (65%) was lower than that of women in the UK (68%) but slightly higher than the EU-28 average (63%) while male employment rates were comparable at 83% in Ireland, 82% in the UK and 78% in the EU.

3.2 Barriers to secondary work in Ireland

The historical role of women in Irish society and the Irish labour market is likely to be at least partly responsible for the relatively low attachment of Irish women to the labour force today.[4] The 1937 Constitution of the Republic of Ireland provided a legal basis for excluding women from the labour market and confining them to the home. The marriage bar of 1932, which prevented married women from working in the civil service, was not repealed until 1973. By contrast, in the UK, attention was given relatively early to the issue of equality in the labour market as, during the two World Wars, women took up typically male jobs. The British marriage bar was lifted in 1944, decades earlier than the Irish marriage bar. The Equal Pay Act of 1970 legislated for equal pay and conditions for men and women in the UK. The European Union drove the implementation of equality legislation in Ireland in 1974 (Anti-Discrimination (Pay) Act and 1998 (the Employment Equality Act 1998).

Low financial incentives to work discourage women, in particular, from working or from working full-time. Typically, these financial incentives fall under two headings: the payoff from going to work (labour income minus taxation minus withdrawn benefits) and the fixed costs of going to work (the cost of childcare, of care of elderly relatives, commuting costs, etc.). This paper focuses on the former incentive, that is, the financial return to working through earnings and the tax and benefit system. The disincentives stemming from fixed costs of work will be discussed in the concluding section.

The incentive to work is often measured using the Participation Tax Rate (PTR) and the Marginal Effective Tax Rate (METR). The PTR measures the proportion of additional earnings that is paid over when a person joins the labour force due to the increase in taxes or benefit withdrawal. The average Irish PTR for female entrants to the labour market was estimated to be 14-35 per cent in 2012 (Rastrigina & Verashchagina, 2015). These figures are comparable to the corresponding range of 15 – 25 per cent in the UK.[5] However, once out-of-pocket childcare costs, one of the fixed costs of work which act as an implicit tax for women with children, are taken into account in this measurement, the Irish female PTR can reach 94%, the second highest in the EU, behind the UK at 120%.[6]

The METR, which captures the amount of each euro of additional earnings that would have to be paid over in tax, social security contributions or in forgone benefits is also used to measure financial incentives to work. The average METR of female secondary earners is higher in Ireland, at 40%, than in most other European countries. In addition, 36% of female secondary earners faced METRs above 50% in 2012. This is the second highest proportion in the EU. By comparison, the UK has an average METR of 30% for female secondary earners and just 5% of British female secondary earners face a METR above 50% (Rastrigina & Verashchagina, 2015).

3.3 Partial individualisation of income tax 2000-2002

There are two commonly used systems for the joint taxation of couples. Aggregation combines the incomes of the two spouses and taxes the total income according to the same rates and bands as single individuals. This system financially penalises marriage and is

[4] See Russell et al (2017) for a comprehensive overview of how gender equality in the Irish labour market has evolved over the last 50 years.

[5] Callan et al (2016) estimate PTRs for all out-of-work individuals rather than just women and also find that these are generally higher in Ireland than the UK

[6] It should be kept in mind that secondary earners who choose not to join the labour market may be constrained by caring duties for elderly relatives as well as for children.

usually accompanied by a couple's allowance or tax credit. Income splitting adds the incomes of spouses but then splits the total so that each spouse is taxed as if they had earned half of the total income. This system financially rewards marriage by allowing full transferability of rates and bands. Between 1980 and 1999, Ireland operated a system of income splitting, whereby married couples could reduce their tax bill compared to cohabiting couples by sharing allowances and rate bands between partners.

Before the income tax reform in 2000, the taxation system in Ireland was structured as follows (see also Table 2). There were two tax bands. Up to €17,800, taxation was applied at 24%. Any additional income was taxed at 46%. There was an annual personal tax credit of €5,333, allowable at the standard rate of taxation. There was also an employee tax credit of €1,270, allowable at the standard rate of taxation. The tax system provided an option for married couples living together to be jointly assessed with double the entitlements of a single person. This meant that the standard tax band was €35,600 for a married couple (double the amount for a single person) and the annual tax credit was €10,666. Only the employee tax credit was individual so that a married couple with one earner could only benefit from it once. The majority of married couples opted for joint taxation as, because of the transferability of reliefs between them, it was more advantageous to them than treatment as two single persons.

On December 1st 1999, the Minister for Finance announced the "radical change of moving to individualisation of the standard rate band over this and the next two Budgets." Between 1999 and 2000, the standard rate bands for a single person and a two earner couple were increased by 21% with no corresponding increase in the standard rate band for one-earner couples. In nominal terms, the situation of one earner couples was unchanged. However, in real terms, their standard rate band was frozen at its pre-reform level while those of singles and two-earner couples increased. The opportunity cost of remaining a one-earner couple rather than a two-earner couple therefore increased.[7]

In 2001, the standard rate bands for single individuals and two-earner couples were increased by a further 15% more than the standard rate band for one earner couples. A final reform in this direction took place in 2002 when the standard rate bands for singles and two-earner couples were increased by 10% more than the standard rate band for one earner couples. The result of this was that Ireland went from a system of 100% transferability of the standard rate band in 1999 to 65% transferability in 2000, 45% transferability in 2001 and 32% transferability in 2002. This ratio has remained relatively stable since 2002.

Other taxation reforms accompanied this partial individualisation of the standard rate band in 2000. The personal tax credit was increased by €635 (£500) for singles and €1,270 (£1,000) for married couples. This tax credit was still fully transferable between spouses and allowable only at the standard rate of taxation. Furthermore, the standard rate of taxation was reduced from 24% to 22% while the top rate of taxation was reduced from 46% to 44%.

[7] In response to public pressure, the government also introduced a Home Carer's tax credit of €840. Its value was £3,000, allowable at the standard rate of taxation in 2000 of 22%. A couple whose combined taxable income exceeded the standard rate band for a one earner married couple could opt for either the Home Carers Allowance or the extra standard rate band

Table 2 Major changes to the Irish taxation system between 1999 and 2002

	1999	2000	2001	2002
Standard tax rate	24%	22%	20%	20%
Top tax rate	46%	44%	42%	42%
Standard rate band for singles	17,800	21,600	25,395	28,000
Standard rate band for one earner couples	35,600	35,600	36,822	37,000
Standard rate band for two earner couples	35,600	43,200	50,790	56,000
Personal tax credit (standard rate) -transferable	1,280	1,313	1,397	1,520
Employee tax credit (standard rate) - non-transferable	305	279	508	660

Source: www.revenue.ie and budget.gov.ie. Monetary values in €

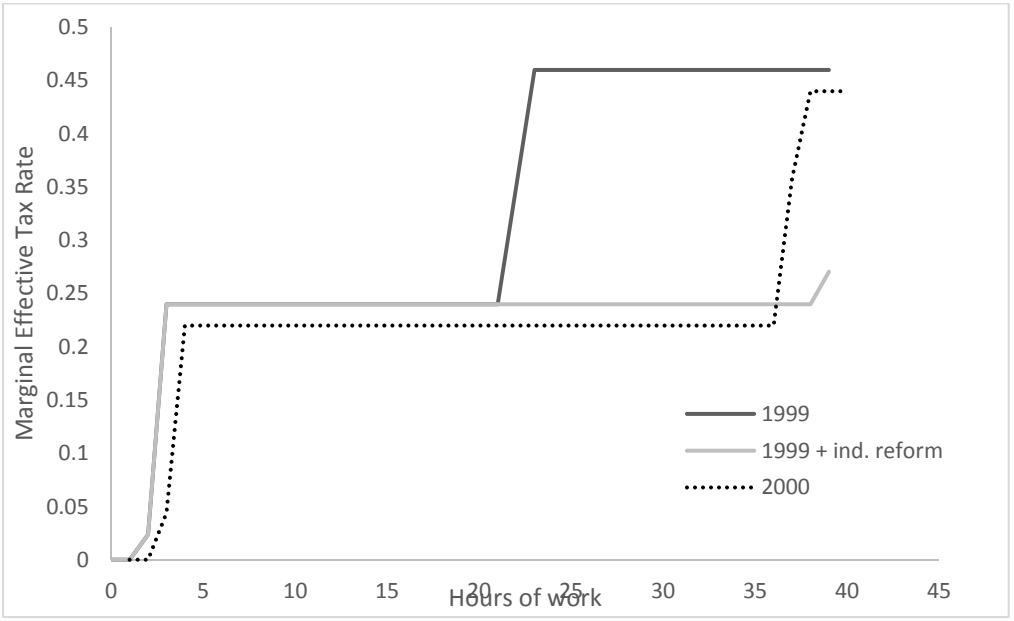
The effect of this move towards individualisation of the tax-benefit system can be visualised by estimating the METR and the PTR of the secondary earner before and after the reform. In addition to showing these schedules for the 1999 and 2000 taxation systems, I define one counterfactual system for 1999. This is simply the baseline 1999 system with the addition of partial individualisation of the standard rate band. Comparing the 1999 baseline system to this counterfactual 1999 system, as well as to the 2000 system, will give an idea of how the magnitude of changes observed between 1999 and 2000 is split between individualisation of the standard rate band and other reforms such as the reduction in the taxation rate and the increase in the personal tax credit.

I take an example of a household in which the primary earner (likely to be the husband) earns the median potential male wage in 1999 of €12.38 per hour and works 40 hours per week (i.e. a gross income of €25,750 per year). The secondary earner (likely the wife) can earn €8.42 per hour, the median potential female wage in 1999 and can work 0-40 hours per week.[8]

Figure 1 shows the marginal effective tax rate (METR) of the secondary earner in the three taxation regimes as she increases her weekly hours of work. Recall that the METR estimates the amount of each extra euro of gross earnings that is foregone through taxes or withdrawn benefits. In our example, there are no withdrawn benefits as the household is not eligible for anything apart from child benefit, which is universal. Social security contributions (PRSI) are not modelled for ease of interpretation. Therefore, the METR in Figure 1 depicts the proportion of additional earnings paid by the secondary earner through taxation. In 1999 (black line), the METR of the secondary earner in our example jumped almost immediately to 24%, i.e. the standard rate of taxation (once the employee tax credit was exhausted). The METR remains at this level until the secondary earner is working longer than 23 hours per week. At this point, the amount of each additional euro of earnings paid in taxation increases 46%, i.e. the higher rate of taxation.

[8] The modelling of hourly wages is discussed in the Appendix

Figure 1 Marginal effective tax rates of a secondary earner in Ireland in alternative tax-benefit systems

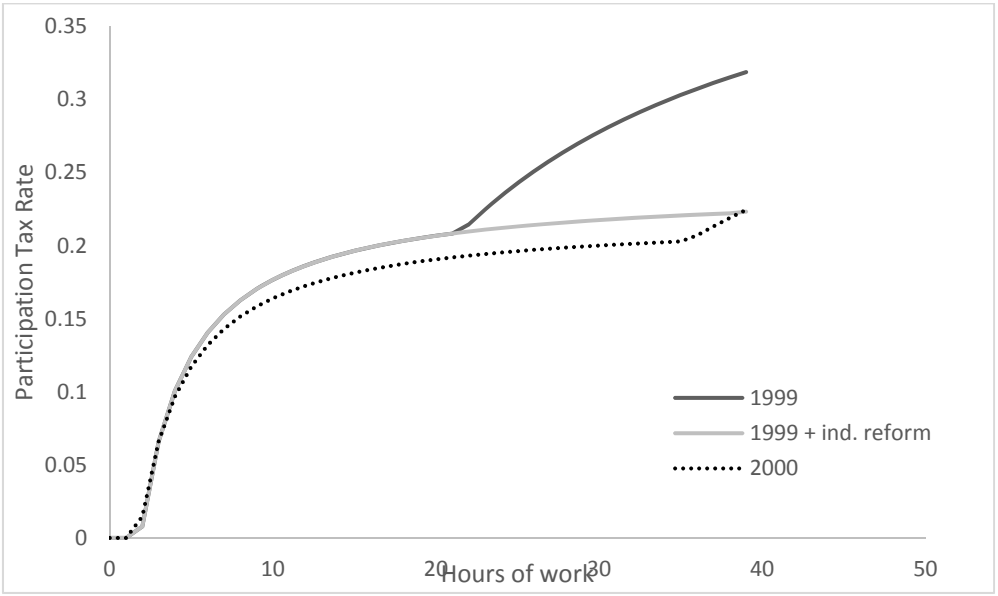


Note: Marginal effective tax rate of secondary earner in a simplified tax-benefit system in Ireland in 1999; in a counterfactual 1999 system with partial individualisation of the standard rate band and in 2000. Primary earner works 40 hours per week and earns the year-specific median male hourly wage. Secondary earner works 0-40 hours per week and earns the year-specific median female hourly wage.

In the hypothetical 1999 taxation system with partial individualisation of the standard band (gray line), the METR is identical to that in the baseline 1999 system until 23 hours of work. In the partially individualised system, the METR remains at 24% until close to 40 hours of work, rather than jumping to 46% when the secondary earner works longer than part-time. This is because the secondary earner has access to a non-transferable standard rate band in addition to the part of the joint standard rate band leftover from the primary earner. The incentive for the secondary earner to work more is, therefore, larger than in the joint taxation system.

The black dotted line shows the METR of the secondary earner in 2000 once partial individualisation has occurred and once the other changes to tax credits and rates (discussed in the previous section) have also taken place. The shape of the METR schedule for the secondary earner in 2000 is slightly lower (but otherwise similar) to that depicted in the hypothetical 1999 system due to the 2 percentage point decrease in the standard and higher rate of taxation.

Figure 2 Participation tax rates of a secondary earner in Ireland in alternative tax-benefit systems



Note: Participation tax rate of secondary earner in a simplified tax-benefit system in Ireland in 1999; in a counterfactual 1999 system with partial individualisation of the standard rate band and in 2000. Primary earner works 40 hours per week and earns the year-specific median male hourly wage. Secondary earner works 0-40 hours per week and earns the year-specific median female hourly wage.

Figure 2 shows the PTR of the secondary earner when they transition from 0-1; 0-2;…0-40 hours of work. In 1999 this was 0 for very low hours of work (black line), as the secondary earner offsets their tax against their employee tax credit. Once this is exhausted, the PTR increases steadily until it reaches 20% around part-time work. It then begins to climb at an even steeper rate as the secondary earner begins to pay tax at the top rate.

In the hypothetical 1999 system in which partial individualisation is introduced (gray line), the PTR follows the same path with the exception of the last steep rise. As the secondary earner in this system doesn't hit the top rate of tax until they are close to full-time work, the PTR remains reasonably steady around 20-24% between part-time and full-time work. The PTR in 2000, depicted by the black dotted line lies slightly below the PTR in the individualised 1999 system due the simple fact that the standard rate band was also cut by 2 percentage points in 2000. It rises steeply as the secondary earner approaches full-time work as, because median wages are higher in 2000 than in 1999, the secondary earner hits the top tax rate a little earlier in the 2000 system than in the individualised 1999 system.

This analysis indicates that the incentive to work for the secondary increased substantially after the tax reforms enacted in 2000 and that individualisation of the standard rate band was the driving force behind this change.

4. Data and Model

In the next section, I show how this individual tax reform affected female labour supply and caring duties. To do this, I use the Living in Ireland Survey (LII), the Irish component of the European Community Household Panel (ECHP), which ran from 1994 to 2001. LII provides harmonised cross-sectional surveys for each year in which the survey is conducted,

as well as longitudinal data. I use data from 1995-2001 in the analysis, that is, five years preceding the reform and two years after.[9] Although full individualisation of the standard rate band was planned over three years (and was never fully completed), the announcement of full-individualisation of the standard rate band in December 1999 may have encouraged those affected by the reform to alter their behaviour immediately in anticipation of the full reform. It is therefore plausible that much of the behavioural effect triggered by the reform took place immediately after its announcement.

To evaluate this, I compare outcomes for those affected by the reforms (the treatment group) to outcomes of those who are not affected by the reforms (the control group). In my baseline specification, the treatment group is composed of married women of working age (20-60 years old). Prior to the reform, married women could transfer their entire standard rate band to their husband. Immediately after the 2000 reform, one-third of the standard rate band became non-transferable and, by 2002, two-thirds of the standard rate band was non-transferable. This figure has remained relatively stable since then.

A number of potential control groups are available. Single women, for whom the tax rules are unchanged after the reform, are an obvious choice. I also consider married men. It is possible that married men may also change their labour market behaviour in response to the reform. This could occur because their wage increases while their standard rate band remains fixed, leading to an increased average tax rate. They may also change their labour supply simply because their wives changed their own labour market behaviour. However, own and cross labour supply elasticities of married men are generally found to be close to zero (Bargain et al, 2014) so it is likely that any such effects will be minimal.

I estimate a Difference-in-Differences model, which identifies the difference between the change in outcomes for married women after the reform and the change in outcomes for the control group after the reform (single women or married men). The general model is as follows:

$$Y_{it} = \beta_1 + \beta_2 Treat_i + \beta_3 Post_t + \beta_4 (Treat * Post)_{it} + \delta X_i + \gamma T_t + \varepsilon \qquad (1)$$

Where Y_{it} represents the outcome of interest for individual i in year t, $Post_t$ is a dummy variable equal to one in the post-reform period (2000 and 2001), $Treat_i$ is a dummy variable which defines the treated group, $X_i$is a vector of observable characteristics (age, education level, number and age of children, predicted wage) and $T_t$is a vector of year dummies.

For validity, Difference-in-Differences models require that the pre-treatment trends of the treatment and control group are similar. I check and verify this graphically in the next section. They also require that no other policy or other change that differentially affects the treatment and control group occurs at the same time as the reform under investigation. This assumption will be discussed in more detail and some robustness checks will be performed in Section 6.

Table A1 in the Appendix shows descriptive statistics for the pre-reform and post-reform period for men and women separately. The sample retained for analysis, which is also the

[9] Data from 1994 is not used as childcare hours are not available in this wave of data. The LII survey was discontinued after 2001 and replaced by the Survey of Income and Living Conditions (SILC) in 2003

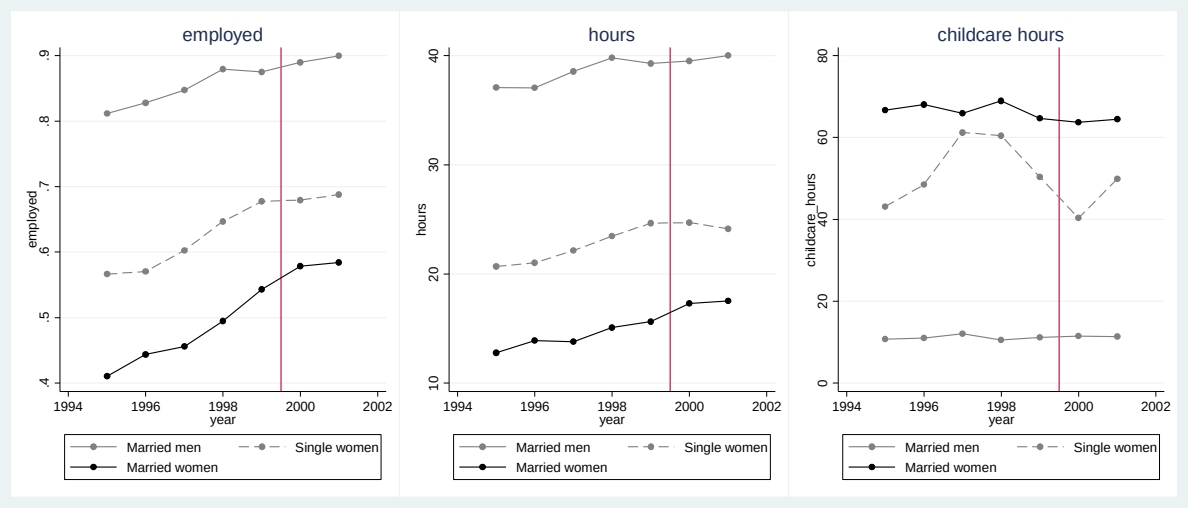
estimation sample used in the next section, is the working age population, defined as those aged between 20 and 60.

5. The labour force effects of the move to individualisation

5.1 Graphical results

I first present a number of graphs which show the evolution of three outcomes of interest for the treatment group and two control groups. As discussed in Section 4, the treatment group is married women aged 20-60. The control groups are married men aged 20-60 and single women aged 20-60. Outcome variables are plotted over time for each group.

Figure 3 The evolution of employment, hours of work and hours of unpaid childcare in Ireland between 1995 and 2001



Source: own calculations based on 20-60 year-old population from Living in Ireland data

The left-hand panel of Figure 3 shows how employment rates evolved between 1995 and 2001. The employment rates of married men, single women and married women increased steadily and in a similar manner between 1995 and 1998. After this point, employment rates of single women and married women increased between 1998 and 1999. After 1999, the employment rates of married men and single women flattened out while the employment rate of married women continued to increase. This convergence between the employment rates of married women and the control groups coincided with the partial individualisation of the taxation system in the year 2000.

The centre panel of Figure 3 shows the evolution of hours of work (including zeros) between 1995 and 2001. Once again, the pre-reform trend in this measure for the two control groups is similar to that of the treatment group of married women. There was a steady increase in weekly hours of work in all samples but the strongest increase occurs for married women between 1999 and 2000.

The right-hand panel of Figure 3 shows the evolution of the time spent caring for children without pay by the three groups. In this panel, I show only those with children. That is, married women, married men and single women without children are excluded. This ensures that the groups are more comparable in terms of their childcare hours. Even so, single women with children do not represent a good control group for evaluating the effect of the tax reform

on childcare hours. The trend in childcare hours for single women is noisy and dissimilar to the other two groups during the time period in question. Therefore, in what follows, we consider only married men with children as a control group to evaluate the effect of the tax reform on childcare.

The number of hours spent caring for children is much higher for married women with children compared to married men with children. Married women spent an average of almost 70 hours per week caring for children in 1995 and this figure remained stable over the years that followed. A small decrease is observed in 1999 and another in 2000. The number of hours that married men spent caring for children was stable during this time period at around 12 per week. There is, therefore, some convergence in the figures for men and women around the years 1999-2000.

Overall, Figure 3 shows suggestive evidence that married women were more likely to work or to work more after the partial individualisation of the taxation system. Married men and, in particular, single women appear to be good control groups for a Difference-in-Differences style analysis of labour supply behaviour as the pre-reform trends in employment and hours of work are similar for all three groups. Evaluating the effect of the tax reform on hours of childcare will rely on estimating Difference-in-Differences between married women with children and married men with children as the group of single women with children does not appear to be a good control group.

5.2 Difference-in-Differences results

This section presents the baseline results from a Difference-in-Differences model for the three outcomes of interest: employment; hours of work and hours of unpaid childcare for those with children. I use two control groups in the main analysis and a further set of treatment and control groups will be identified and tested in a sensitivity analysis in the next section.

Starting with employment outcomes, I estimate equation 1 using a linear probability model with robust standard errors.[10] Column (1) in Table 3 shows estimates for equation 1 without additional controls or a time trend. In column (2), I add individual level controls (age, age squared, post-secondary qualification, no. of children, any children under 12 and predicted wage) and, in column (3), I add a time trend. The "treatment effect" identified in Table 3 corresponds to the coefficient, β_4, from equation 1. It gives the treatment effect on the treated, i.e., the effect of the partial individualisation of the taxation system in Ireland on the labour supply of married women immediately after the reform. Panel A shows the effect of the reform when married women are compared to the control group of single women while Panel B shows the effect of the reform when married women are compared to the control group of married men.

[10] Although the employment outcome is dichotomous, it is still advisable to use a linear probability model in this Difference-in-Differences setting rather than a logit or probit as comparisons of effects across groups are much more difficult with logit than with OLS. As the treatment effect is dichotomous in the Difference-in-Differences model, interpreting its coefficient is not problematic even if a linear probability model is used. The interpretation of other coefficients on continuous variables in the model should, however, be treated with caution (Angrist, 2001).

Table 3 The effect of the individual taxation reform in Ireland in 2000 on employment and hours of work of married women

	(1)		(2)		(3)	
A. Treatment group = married women. Control group = single women.						
Employment						
Treatment effect	0.04		0.07	***	0.06	***
	(0.03)		(0.03)		(0.03)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.025*		*0.185*		*0.189*	
N	*17,448*		*17,448*		*17,448*	
Hours of work						
Treatment effect	1.26		2.11	**	2.07	**
	(1.07)		(0.96)		(0.96)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.048*		*0.223*		*0.225*	
N	*17,448*		*17,448*		*17,448*	
B. Treatment group = married women. Control group = married men						
Employment						
Treatment effect	0.07	***	0.06	***	0.06	***
	(0.02)		(0.02)		(0.02)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.154*		*0.256*		*0.259*	
N	*22,231*		*22,231*		*22,231*	
Hours of work						
Treatment effect	1.79	**	1.77	**	1.77	**
	(0.79)		(0.76)		(0.76)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.293*		*0.357*		*0.358*	
N	*22,231*		*22,231*		*22,231*	

*Sample is aged between 20-60. The treatment effect is equivalent to β4 in equation 1. Marital status is self-defined. Extra controls include age, age squared, post-secondary qualification, no. of children, any children under 12 and predicted wage. The time trend is a series of year dummies. Statistical significance is indicated by * p<0.1 ** p<0.05 *** p<0.01"*

The effect of the reform on employment probabilities is positive and statistically significant in all but one specification. Most estimates are in the region of 6 percentage points indicating that the employment probability of married women increased by 6 percentage points after the reform. This reflects the fact that, while the employment rate of married men and of single women was stable over the reform period, the employment rate of married women increased steeply around the reform period (see Figure 3).

The effect of the reform on hours of work is also positive and statistically significant in all specifications but one. Married women are found to have increased their hours of work by around two per week after the reform. These estimates are similar regardless of the control group considered.

Table 4 The effect of the individual taxation reform in Ireland in 2000 on hours of unpaid childcare performed by married women with children

	(1)	(2)		(3)	
Treatment group = married women with children. Control group = married men with children.					
Employment					
Treatment effect	-3.11	-3.23	*	-3.24	*
	(1.98)	(1.87)		(1.87)	
Controls	No	Yes		Yes	
Time trend	No	No		Yes	
R squared	*0.3578*	*0.4285*		*0.4288*	
N	*15,122*	*15,122*		*15,122*	

*Sample is aged between 20-60. The treatment effect is equivalent to β4 in equation 1. Marital status is self-defined. Extra controls include age, age2 squared, post-secondary qualification, no. of children, any children under 12 and predicted wage. The time trend is a series of year dummies. Statistical significance is indicated by * p<0.1 ** p<0.05 *** p<0.01"*

Table 4 shows the same results for a further outcome: hours of unpaid childcare performed by those with children. As discussed in the previous section, I consider just married men with children as a control group for this outcome variable as the group of single women with children does not have a similar pre-reform trend to the group of married women with children. I find that the hours of unpaid childcare performed by married women decreased, by around 3 per week, after the reform. This magnitude is comparable to the estimated increase in hours of work by married women.

6. Sensitivity analysis

6.1 Alternative treatment and control group

In this section, I re-estimate the Difference-in-Differences model outlined in equation 1 using an alternative treatment and control group. As women are typically the secondary earners in a couple, the results from the previous section compared their outcomes to those of married men or single women. In this section, I redefine the treatment group as the group of secondary earners. Secondary earner status is determined as follows. Wages are modelled for

all workers, with separate models run for males and females separately.[11] Wages are then predicted for all individuals in the sample, whether they work or not. In this way, I create a "potential" wage variable for non-workers which can be used to determine if they are likely to be the primary or secondary earner in the couple. I discard couples in which potential earnings are similar for both members of the couple as, in these couples, it is not clear who the primary and secondary earner are. I define a primary earner as an individual whose predicted hourly wage rate is at least 1.2 times their spouse's predicted hourly wage rate. A secondary earner is an individual whose predicted hourly wage is less than 0.8 times their spouse's predicted hourly wage rate (see Table A1 for summary statistics relating to predicted wages and primary and secondary earner status). [12] Results from the Difference-in-Differences model using these alternative treatment and control groups (available from author on request) are very similar to the baseline results. Employment probabilities of married women increase by 5-6 percentage points after the reform, hours of work of married women decrease by around 2 per week and hours of unpaid childcare of married women decrease by around 4 per week.

6.2 Other policies

As discussed in Section 4, Difference-in-Differences analysis assumes that there are no other reforms around the treatment period which might affect the outcomes of the treatment and control group differently. That is, any policy or other change that happened around the same time as the partial individualisation of the taxation system should not affect married women differently to single women or to married men.

The late nineties and early noughties were years of strong economic growth and generous budgets in Ireland. Chief among the new measures was an increased level of transfers to working poor families with the Family Income Supplement increasing in 1998 and 2000. As well as the move to individualisation, income tax rates decreased in both the higher and lower brackets and an increased tax-free allowance was also introduced for all households. Perhaps the biggest policy change of the period, apart from the individualisation of taxation, was the introduction of a National Minimum Wage (NMW) of £4.40 in Ireland in April 2000.

In Section 3, I show that the change in income tax rates and in tax free allowances had marginal incentive effects for secondary earners when compared to the individual tax reform. However, the increased FIS and the introduction of the NMW could plausibly have had different impacts on married women compared to single women or married men. This is because both the FIS and the NMW may have provided financial incentives for those with lower earnings potential (such as women) to join the labour market or to increase their labour supply. However, the magnitude of these effects is likely to be small. Bargain & Doorley (2011) show that the FIS policy in 2001 had virtually no effect on the labour supply of married women or married men.[13]

[11] Further details of the wage model are given in the Appendix

[12] Changing these limits to 1.1 and 0.9 does not substantially alter results

[13] The FIS was found to slightly increase the labour supply of single women. The differential effect of the FIS on married women and single women works in the opposite direction to what we have found for the individualised taxation policy so, if anything, the findings relating to individual taxation with single women as the control group are lower bounds of the actual effect.

Table 5 The effect of the individual taxation reform in Ireland in 2000 on employment, hours of work and unpaid childcare hours of married women whose potential wage > €7 per hour.

	(1)		(2)		(3)	
A. Treatment group = married women. Control group = single women.						
Employment						
Treatment effect	0.08	**	0.06	**	0.06	*
	(0.03)		(0.03)		(0.03)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.04*		*0.18*		*0.18*	
N	*13497*		*13497*		*13497*	
Hours of work						
Treatment effect	2.88	**	2.29	**	2.18	*
	(1.25)		(1.16)		(1.16)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.08*		*0.23*		*0.23*	
N	*13497*		*13497*		*13497*	
B. Treatment group = married women. Control group = married men						
Employment						
Treatment effect	0.04	**	0.05	***	0.05	***
	(0.02)		(0.02)		(0.02)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.14*		*0.23*		*0.24*	
N	*20793*		*20793*		*20793*	
Hours of work						
Treatment effect	1.06		1.46	*	1.48	**
	(0.81)		(0.77)		(0.77)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.28*		*0.34*		*0.34*	
N	*20793*		*20793*		*20793*	
Childcare hours						
Treatment effect	-2.58		-3.26	*	-3.28	*
	(2.02)		(1.91)		(1.91)	
Controls	No		Yes		Yes	
Time trend	No		No		Yes	
R squared	*0.36*		*0.43*		*0.43*	
N	*14274*		*14274*		*14274*	

*Sample is aged between 20-60 with a predicted hourly wage in excess of €7 (£5.50) in 2000 prices. The treatment effect is equivalent to β4 in equation 1. Marital status is self-defined. Extra controls include age, age squared, post-secondary qualification, no. of children, any children under 12 and predicted wage. The time trend is a series of year dummies. The treatment group for the childcare hours model is married women with children and the control group is married men with children. Statistical significance is indicated by * p<0.1 ** p<0.05 *** p<0.01"*

As women tend to be overrepresented at the bottom of the wage distribution, the introduction of the NMW in 2000 increased the wages of low earning women by relatively more than the wages of low earning men (Bargain et al, 2016). This may have provided extra financial incentive for low earning women to join the labour market or to work more than low earning men. However, the Irish NMW has been found to have negligible employment effects (O'Neill et al, 2006) for either gender. To ensure that the effect that I identify is not partly related to the introduction of the NMW, I conduct a sensitivity analysis in which I restrict both the treatment and control samples to those individuals whose potential earnings are well above the level of the NMW. As the NMW was set at £4.40 (€5.60) in 2000, I restrict the sample to those with predicted hourly wages in excess of £5.50 (€7) in year 2000 prices. Results are displayed in Table 5. Panel A shows results for employment outcomes using single women as the control group while Panel B shows results for both employment outcomes and childcare using the control group of married men.[14]

Employment effects are positive and statistically significant for this restricted group of married women with predicted wages well above the level of the minimum wage. Employment rates increase by 5-6 percentage points after the reform in the most flexible specifications while hours of work increase by 1-2 per week. These results are comparable to the baseline results in Tables 3 and 4. Hours of unpaid childcare decrease for married women and the magnitude of this change is also comparable to previous results at around 3 hours per week. These results suggest that any effect that the NMW may have had on employment or caring duties is not driving the results identified in this paper.

7. Conclusion

This paper has focused on the ability of tax policy to influence the labour market behaviour of women in Ireland. Exploiting the partial individualisation of the income taxation system in 2000, which increased incentives for secondary earners to work, I show that the employment rate of married women increased by around 5-6 percentage points in response to the reform while average hours of work increased by around 2 per week. The magnitude of this effect is not statistically different from predictions of an employment increase of 2-3 percentage points made by Callan et al (2009) in an ex post analysis of a similar reform using Irish data from 1994. It is also well within the range of effects found in similar ex post studies in other countries. For example, Crossley & Jeon (2007) find that the labour force participation rate of married women increased by up to 10 percentage points in response to a similar reform in Canada while much of the 17 percentage point increase in the labour force participation of married women between 1969 and 1975 in Sweden was attributed to the introduction of individual taxation in 1971 (Selin, 2014).

I also find evidence that the hours of unpaid childcare engaged in by married women decreases by around 3 per week in response to the reform. This could simply reflect the reduced time available to married women to take care of children, given that the opportunity cost of engaging in taxable work outside the home has changed relative to engaging in non-taxable work inside the home. It could also indicate a change in bargaining power between the two spouses although the framework for analysis has assumed (based on graphical evidence) that there is no corresponding increase in the hours of childcare performed by men.

[14] In the model for childcare hours the treatment group is married women with children and the control group is married men with children. Recall that, from Figure 3, it is apparent that single women with children do not have similar pre-treatment childcare trends to married women with children.

The European Commission's *Work-Life Balance Package* strongly recommends removing fiscal disincentives for secondary earners, to support the work-life balance. Key among the measures proposed is complete individualisation of the income taxation system in countries where this is not already in place.[15] In this paper, I have shown that the partial individualisation of the taxation system in 2000 did improve incentives to work for secondary earners and that this translated into increased labour force participation for this group. It is difficult, from this type of ex post study, to extrapolate the findings to more general situations which, in this case, could include the full individualisation of the income taxation system. An ex ante study of such a system using microsimulation in conjunction with a structural labour supply model could be used to further inform this debate. Other potentially important consequences of this policy reform such as its implications for the income distribution have not been discussed in this paper but could also be estimated using such a method.

It is widely acknowledged that, for taxation reform to remove barriers to work for secondary earners, a package of accompanying measures to facilitate women who wish to combine family and professional life is also important. This ensures that removing barriers to work for secondary earners offers them a financially viable choice between working and engaging in home duties. These measures relate to affordable child and elderly care, parental leave for both parents and tax relief for employing domestic help. Recent initiatives in Ireland, such as the introduction of a Single Affordable Childcare Scheme, which provides both a means-tested and a universal subsidy for childcare, represent a step in this direction.

[15] Within Europe, just Sweden and Finland have fully individualised taxation systems.

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Appendix

Table A1 Summary statistics for women and men in Ireland before and after the individual taxation reform in 2000

Women	Before	After	Difference	
Employed	0.50	0.58	0.08	***
Weekly hours of work (incl. zeros)	16.17	18.49	2.32	***
Weekly hours of childcare (incl. zeros)	35.18	30.72	-4.46	***
Part-time employment	0.18	0.21	0.03	***
Full-time employment	0.33	0.37	0.04	***
Age	38.66	39.71	1.05	***
Post-secondary qualification	0.32	0.35	0.03	***
No. of children	1.21	1.04	-0.17	***
Children under 12 (0/1)	0.43	0.39	-0.04	***
Hourly wage of workers	7.61	8.58	0.97	***
Predicted hourly wage for all	7.13	8.17	1.04	***
Married	0.68	0.67	-0.01	
Primary earner (married individuals)	0.04	0.03	-0.01	***
Secondary earner (married individuals)	0.69	0.67	-0.02	***
Observations	13009	5424		
Men				
Employed	0.65	0.66	0.01	
Weekly hours of work (incl. zeros)	29.11	29.06	-0.05	
Weekly hours of childcare (incl. zeros)	3.74	3.72	-0.02	
Part-time employment	0.05	0.04	-0.01	***
Full-time employment	0.60	0.62	0.02	***
Age	36.62	37.52	0.9	***
Post-secondary qualification	0.26	0.28	0.02	***
No. of children	1.03	0.87	-0.16	***
Children under 12 (0/1)	0.35	0.31	-0.04	***
Hourly wage of workers	9.26	10.49	1.23	***
Predicted hourly wage for all	9.07	10.35	1.28	***
Married	0.60	0.60	0	
Primary earner (married individuals)	0.73	0.73	0	
Secondary earner (married individuals)	0.03	0.03	0	
Observations	15385	6324		

*Sample is aged 20-60 and statistics are weighted using individual weights. The before period is years 1995-1999. The After period is years 2000-2001. Statistical significance is indicated by * p<0.1 ** p<0.05 *** p<0.01"*

Table A1 shows that the employment rate of women has increased by 8 percentage points between the pre-reform (1995-1999) and post-reform (2000-2001) period. This is accompanied by an increase in hours of work (2 per week) and a decrease in unpaid childcare (-4.5 per week).[16] There have also been increases in the incidence of both part-time (defined as working fewer than 30 hours per week) and full-time work (defined as working 30 or more hours per week) among women. On average, the post-reform female sample is older. This is unsurprising given the rotating panel nature of the data. The female sample is more likely to have a post-secondary qualification, has fewer children and is less likely to have a child under 12 years of age after the reform compared to before the reform.

Real hourly wages for women increased by around £1 per hour between the pre-and post-reform period.[17] Using the reported hourly wage for the sample of workers, I use a simple regression model to predict the hourly wage of the entire population in the sample and find that this has increased by a similar magnitude. [18] The probability of being married is unchanged for women in the sample between the pre- and post-reform periods. I define a primary and a secondary earner status variable for married individuals. A married individual is considered to be a secondary earner if the predicted hourly wage of the individual is less than 0.8 times the predicted hourly wage of their spouse. A married individual is considered to be a primary earner if the predicted hourly wage of the individual is more than 1.2 times the predicted hourly wage of their spouse. Most married women in the sample are potential secondary earners by this definition (almost 70%) compared to just 3% of married men.

Men's employment probability is much higher than women's both before and after the reform but does not change over this period. Hours of work and hours of childcare are also unchanged but there is a slight decrease in the incidence of part-time work and a slight increase in the incidence of full-time work. Like women, the men in the post-reform sample are older; more educated and have fewer children. The hourly wage of male workers increases over time, as does the predicted hourly wage for the whole sample. There is no change in the probability of marriage or in the likelihood of being a primary or secondary earner.

[16] The variable "unpaid childcare hours" is derived from the following questions: Apart from a job or business, your daily activities may include other tasks such as looking after children. Do your present daily activities include looking after children (whether your own or someone else's) without pay? Roughly how many hours per week would you spend looking after children?

[17] Real hourly wages are calculated by dividing the weekly wage by weekly hours and expressing the result in monetary terms for the year 2000 using Consumer Price Indices from the Central Statistics Office (CSO),

[18] Hourly wages are modelled as a function of age, detailed education categories, marital status, number of children and existence of children under 12 years of age and a time trend. This model is estimated by OLS for men and women separately and predictions for the entire working age population are then made.