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The Wage Penalty for Motherhood in Spain (2009–2017): The Role of the Male Partner's Job Characteristics

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1. Introduction

In the last decades, achieving gender equality has been a prominent issue in the agenda of governments and international and national institutions. Despite improvements in this regard, the OECD (2017) has called for caution when interpreting the encouraging results that gender gaps in the labour market, and more specifically in employment rates, have substantially decreased in three quarters of the organisation's members since 2012. Women continue to earn less than men and their propensity to work full time and reach management and executive levels is much lower. In the case of Spain, Conde-Ruiz and Marra de Artíñano (2016) underlined that, in spite of the substantial progress made in the last twenty years, the gender gap remains large in a wide number of areas such as wages, temporary employment, undesired part-time work, and over-qualification. One of the most difficult gaps to close is the gender wage gap. In 2018, women's unadjusted gross hourly earnings were, on average, 11.9% below that of men in Spain (Eurostat), and in a recent study based on data from the Structure of Earnings Survey, Anghel *et al*. (2019) estimated a gender wage gap of 12.7% in 2014.

Difficulties to reconcile work and family occupy a central role in theoretical explanations for the observed gender gaps in the labour market. In some cases, the intense dedication that having children requires may be incompatible with the demands of an increasingly competitive labour market, and many women experience career interruptions after childbirth due to the difficulties to achieve a good work-family balance, which leads to a depreciation of women's human capital (Mincer and Polachek, 1974; Mincer and Ofek, 1982). However, while motherhood exerts a clear influence on women's professional careers (England, 2005),

the empirical evidence shows that having children does not negatively affect men's working conditions (Kleven *et al*., 2019a, 2019b; Glauber, 2018; Correll *et al*., 2007, among many others). As a result, many women decide to delay having children in order to achieve better working conditions (see, Taniguchi, 1999; Gustafsson, 2001; Joshi, 2002; Amuedo-Dorantes and Kimmel, 2005; Miller, 2011), which explains the widespread postponement and decrease in fertility observed in developed countries in recent decades (Gustafsson, 2001; O'Donoghue *et al*., 2011; Miller, 2011). Indeed, if the impact of childbearing decisions on women's professional careers were not so significant, the total fertility rate (TFR) would likely increase. Some authors have reported that countries where there is greater childcare capacity, lower direct costs of children, more opportunities for part-time work, and longer parental leaves present a higher TFR (Lalive and Zweimüller, 2009; Björklund, 2006; Mills *et al*., 2011; D'Addio and d'Ercole, 2005).

This paper aims to analyse the motherhood wage penalty in Spain in recent years (2009-2017). The investigation is of interest for a number of reasons. First, labour market gender gaps are a phenomenon of international relevance and many labour policies in developed countries aspire to achieve gender equality. Given that the motherhood wage penalty is a main source of this gender wage gap—as suggested by the OECD (2017)—policymakers are strongly committed to measuring the problem, understanding its determinants, and designing more accurate policies to achieve gender equality in the labour market. Although the relationship between motherhood and wages is a widely explored topic in the international literature and still growing (see the recent meta-analysis of Cukrowska-Torzewska and Matysiak, 2020), studies focusing on Spain remain scarce. This scarcity of empirical analyses may be explained in part by the lack of specific datasets that combine information on wages with household characteristics for the country. However, there are some exceptions that deserve attention, such as Molina and Montuenga (2009), who estimated a minimum

motherhood wage penalty of 6% for the period 1994–2001, or Fernández-Kranz *et al*. (2013), who found a wage gap of 2.3% among mothers and non-mothers for the period 1996–2006.

Second, it is worth mentioning that penalties on women's labour market conditions have effects on their motherhood decisions and result in lower fertility rates. This is of special relevance for Spain where in just 40 years the average number of children per women has declined notably from 2.77 in 1975 to 1.31 in 2017. The problem of an ageing population in Spanish society and its negative impact on the future of the pension system should also be highlighted. Thus, the confluence of these factors makes the study of the motherhood wage gap in Spain of particular relevance.

An interesting aspect of this research that differs from previous studies for the Spanish case is that our analysis of the motherhood wage penalty pays especial attention to the role that the male partner's job characteristics could have on this wage penalty. As Mincer (1962) originally pointed out, the relative characteristics of partners' employment have an important effect on women's decisions regarding their labour market participation. If the labour conditions of the male partner are unfavourable, this could have a negative effect on women's labour market performance. In this respect, we consider male partners' education, but we also analyse the influence of some covariates related to the existence of restrictions on the time that partners can dedicate to household production and childcare. In particular, we consider the number of weekly working hours and professional status.

For the aim of this paper, we use microdata from the Living Conditions Survey for Spain (*Encuesta de condiciones de vida*, ECV). The methodology is based on the estimation of wage equations for the gross annual wage and the gross hourly wage. As we exploit observational data, the sample of mothers and childless women is not a random sample of the total population, which implies that women with children could have different characteristics than childless women. In order to control for the bias that the imbalance between the

characteristics of mothers and non-mothers could have on the motherhood wage penalty estimations, we use the coarsened exact matching (CEM) algorithm to construct a control group of women without children who display identical observable characteristics to those of women with children.

Our estimates indicate that mothers with children of an early age (0–3 years) in Spain have suffered a wage penalty of around 4.2% in their hourly wages over the period 2009–2017, as these are the ages when children require more parental attention and care. In contrast, we do not find a wage penalty for mothers with children over the age of three. However, the women who most suffer wage penalties due to motherhood are highly educated women working in medium and large firms, for whom the wage penalty is approximately 8.4%. Moreover, we also find evidence of a significant increase in the motherhood wage penalty for women with young children whose partner is self-employed and therefore less available to cooperate in childcare tasks. These results suggest that the motherhood wage penalty might be due to the impossibility of devoting the necessary time to young children without modifying the working day. Hence, policies aimed at promoting more flexible working schedules for male and female workers, equalising parental leaves among fathers and mothers, and facilitating access to public or subsidised early childhood education from 0 to 3 years could help to alleviate the motherhood wage penalty.

The paper is structured as follows. The next section reviews the literature on the effects of motherhood on women's wages, with a special focus on the Spanish case. Section 3 describes the database and explains the econometric strategy. Section 4 provides the empirical analysis of the effect of motherhood on women's wages, emphasising how the male partner's personal and job characteristics influence the motherhood wage penalty. Finally, the main conclusions and a discussion on policy implications are presented in section 5.

2. The motherhood wage penalty: background

Many authors have studied the so-called motherhood wage penalty or family gap in pay, that is, the wage gap between mothers and childless women (see, among many others, Waldfogel, 1997, 1998a, 1998b; Harkness and Waldfogel, 2003; Albrecht *et al*., 1999; Anderson *et al.*, 2002; Napari, 2010; Pal and Waldfogel, 2016; Glauber, 2018; Jee *et al*., 2019; Nielsen *et al*., 2004). In general terms, this literature has demonstrated the existence of a negative effect of motherhood on women's wages and opportunities for career advancement. Work interruptions, shifting into part-time work, or mothers' choices to enter lower-paying jobs and occupations are among the explanatory factors.

Nonetheless, the findings vary across countries, which could be explained by countries' institutional differences, especially concerning work-family policies. The meta-analysis of Cukrowska-Torzewska and Matysiak (2020) based on more than 200 studies pointed out that the Nordic countries experienced the smallest gaps due to their generous public policies to support gender equality and promote the reconciliation of work and family. In a study of eight Western industrialised countries, Sigle-Rushton and Waldfogel (2007) also reported that mothers in the Nordic countries experienced the smallest earnings differentials compared to non-mothers and men, while the continental European group and the Anglo-American countries exhibit the largest motherhood wage penalties. Despite that, some authors have cautioned that although the Nordic model has been successful in boosting women's employment, extensive work-family policies such as long paid maternal leaves have adverse effects on women's wages (Datta Gupta *et al*., 2008). Gender norms are also a potential source of wage penalties for mothers. In this respect, Kleven *et al*. (2019b) found that countries that feature larger penalties for mothers are also characterised by much more gender-conservative views.

The motherhood wage penalty could also vary with educational attainment and skills. A common hypothesis is that the penalty would be higher for the most educated women, as the loss of human capital associated with career interruptions would be more intense for this group. In this line, Anderson *et al*. (2002) found a motherhood wage gap of about 5–7% among white American women and determined that female college graduates clearly suffer the highest penalties. England *et al*. (2016) exploited data from the National Longitudinal Survey of Youth and found that women with high skills and high wages experience the highest motherhood penalties. For European countries, Napari (2010) identified higher penalties at the top of the wage distribution among female workers in the Finnish private sector. In contrast, some investigations indicate that most educated mothers do not suffer motherhood wage penalties because they choose jobs in female-friendly firms which offer greater opportunities for advancement (Amuedo-Dorantes and Kimmel, 2005), while others have found that the effect of children on wages does not differ significantly by educational attainment (Halldén *et al*., 2015; Sigle-Rushton and Waldfogel, 2007).

As we mentioned previously, the research on the motherhood wage gap in Spain is scarcer due to the lack of appropriate datasets combining wages and family characteristics. To the best of our knowledge, the work of Molina and Montuenga (2009) is the first single-country study providing evidence of the motherhood wage penalty for Spanish women. The authors exploited data from the Spanish sample of the European Community Household Panel (ECHP) for the period 1994–2001 and by means of fixed-effects methods found clear evidence of a wage penalty for Spanish working women with children comparable to the Anglo-Saxon countries and greater than Continental European countries. Specifically, they found an almost 9% penalty in hourly wages if there is a birth in the family during a specific year, a 6% penalty if there is one child living in the household, almost 14% if there are two, and more than 15% if there are three or more.

The work of Fernández-Kranz *et al*. (2013) also deserves mention. The authors used longitudinal data from the 2006 wave of the Continuous Sample of Working Lives (MCVL) to analyse employment histories from 1996 to 2006 and estimated a motherhood wage penalty on yearly earnings[1] ranging from an unconditional estimation of 9.1% to a penalty of 2.3%, after considering a wide set of controls. Likewise, multi-country studies based on the ECHP for the period 1994–2001 have provided evidence of a motherhood wage penalty in Spain. In particular, Davies and Pierre (2005) estimated a wage penalty of around 5–6% for women with one child that rose to 8% for those with three or more children, while Halldén *et al.* (2015) found a motherhood wage penalty of around 1.3%.

In a recent paper based on the MCVL for the 2005 to 2018 waves and using the specification proposed by Kleven *et al*. (2019a), De Quinto *et al*. (2020) estimated child penalties rather than the motherhood wage penalty, that is, the percentage by which women's earnings fall behind men's as a result of having children at a specific event time. The authors determined that mothers' annual earnings drop by 11.4% the year after the first child is born, while men's remain unaffected, and observed that women's earnings never return to levels prior to maternity.

Other papers for the Spanish case have focused on the gender wage gap. In this respect, the research of Anghel *et al*. (2019) for the period 2002–2014 noted that the gender wage gap increases with individuals' age from 5% for workers younger than 30 years to over 15% for those above 50 years old. The authors underline that the wage gap widens with age probably because of motherhood. Exploiting data from the MCVL for the period 2005–2010, Cebrián and Moreno (2015) observed that employment interruptions have a negative effect on wages and that women experience more interruptions than men.

[1] The MCVL does not include information on hours worked and hence, it is not possible to compute hourly wages.

Studies on the motherhood wage gap for the Spanish case have highlighted several underlying explanations for the observed motherhood wage penalty. First, women reduce their working time after the first childbirth (Fernández-Kranz *et al*., 2013; De Quinto *et al*., 2020). In particular, Fernández-Kranz *et al*. (2013) found that part-time employment status is the main explanatory factor of the motherhood wage gap and narrows the unconditional gap in yearly wages by two-thirds.

Second, work interruptions negatively affect the accumulation of work experience (Cebrián and Moreno, 2015; Fernández-Kranz *et al*., 2013; De Quinto *et al*., 2020). In this regard, Fernández-Kranz *et al*. (2013) showed that experience decreases the motherhood wage penalty by 12%, and Cebrián and Moreno (2015) demonstrated that employment interruptions explain more than 7% of the daily gender wage differential.

A specific and differential characteristic of Spain compared to other countries that some authors underline as a source of the motherhood wage penalty is the high and persistent duality of the Spanish labour market, which has the highest rate of fixed-term contracts in Europe. Fernández-Kranz *et al*. (2013) indicated that the motherhood wage gap dips for mothers with permanent contracts, while De Quinto *et al*. (2020) highlighted that mothers' higher likelihood to work under a fixed-term contract is beyond the channels thorough which mothers present a lower earnings profile.

Gender differences in the time devoted to household production and childcare is another source of wage penalty for mothers (García-Mainar *et al*., 2011). These authors observed for the period 1994–2001 that fathers in Spain dedicated less time to childcare than their counterparts in other European countries, and even less than half the time of fathers in Denmark. In a similar vein, Molina and Montuenga (2009) suggested that the motherhood wage penalty observed in Spain may be interpreted as a specific feature of a probable Mediterranean model in which mothers' employment has been discouraged due to the

existence of a traditional gender division in paid and unpaid work. Fernández-Kranz *et al*. (2013) also argued that Spain is not a family-friendly country for working parents as the maternity leave is shorter than in most European countries and the use of formal childcare arrangements for three-year-olds is much less frequent than in European countries.

Summing up, although the position of women in the labour market has improved significantly in recent decades in Spain, the empirical evidence shows that penalties arising from parenthood that affect women's working conditions still remain.

3. Data and empirical model

3.1. Data

Our empirical analysis of the motherhood wage penalty is based on microdata from the ECV, which is the Spanish sample of the EU Statistics on Income and Living Conditions (EU-SILC). The dataset offers the usual individual sociodemographic information and data about household characteristics. This information is essential to identify which individuals in the sample have children and also allow us to consider the characteristics of the rest of the family members. The ECV is conducted annually among about 13,000 households, collects information from all family members (about 35,000 individuals), and offers longitudinal and cross-sectional data. Given the greater richness of cross-sectional data in terms of both the number and level of detail of the variables, in this research we exploit a pool of cross-sections from 2009 to 2017.

Our sample consists of female salaried workers aged 25–45 years old cohabiting with their spouses/partners. The motherhood wage penalty is closely related to the way that the members of a couple reallocate their time among paid work and family tasks after the birth of children (García-Mainar *et al*., 2011). In married/cohabiting couples, the burden of childcare falls mainly on mothers who cannot adequately balance work and family and therefore have

to reduce their involvement in work, resulting in a slower wage growth for women with children than for those without children. Nonetheless, if the male partner is unemployed or inactive, and thus the main family income comes from the mother's job, having children may not exert a negative effect on women's wages. On the one hand, as the breadwinner of the household, the mother will increase her time in paid work to avoid the risk of employment (and income) loss, while on the other, the male partner will increase the time devoted to childcare as he does not work in the marketplace. Hence, in order to ensure that there is another wage income in the household, we restrict our sample to households in which the male partner is employed. The final sample comprises 8,580 women, of which 76.1% have at least one child. Table 1 displays the main characteristics of the sample.

[Insert Table 1]

As can be seen, the mean age of our sample is 38 years with a difference of four years between mothers (39 years old) and childless women (35 years old). The majority of individuals have higher education (60.7%), but it should be noted that mothers present lower educational levels than non-mothers. In our sample, 91% of the women are Spanish and 76.8% are full-time workers, while the percentage of women working part-time is three times higher among mothers (27%) than among women without children (12%).

3.2. Methodology and empirical model

The empirical analysis is based on the estimation of wage equations where the dependent variable is the natural logarithm of the gross annual wage and the gross hourly wage.[2] Thus, the wage equation is defined by Equation 1:

$$\ln(w_i) = M3_i\beta^{M3} + M4_i\beta^{M4} + X_i\beta^X + P_j\beta^P + \varepsilon_i \qquad [1]$$

[2] See the Appendix for the explanation of the procedure used to calculate hourly wages.

where $M3_i$ and $M4_i$ are dummy variables that indicate if woman i has children or not and take into account the children's age. These two variables allow us to distinguish between women with very young children (0–3 years old) and women with children over three years old. In particular, $M3_i$ takes the value of 1 if the woman has children and the age of the youngest child is three years or less and zero otherwise, and $M4_i$ takes the value of 1 if the woman has children and the age of the youngest child is four years or older (and zero otherwise). Hence, the reference category is childless women, and parameters β^{M3} and β^{M4} capture the motherhood wage penalty. Vector X_i comprises a set of explanatory variables for each individual i and includes sociodemographic characteristics (age, education, nationality), as well as labour and the firm's characteristics (work experience, part-time indicator, type of contract, occupation,[3] an indicator variable of having supervisory tasks, number of hours usually worked per week, firm size, and firm's economic activity). The estimations also include the degree of urbanisation of the area where the household is located. Additionally, we include the annual employment growth rate in NUTS-2 regions (autonomous regions) in order to control for the economic cycle. Given that the period of analysis covers the deepest economic crisis in the recent history of the Spanish economy (2009–2013) and a period of economic recovery (2014–2017), we also include a dummy that takes the value of 1 for the years 2014 to 2017 and 0 for the previous period.

An interesting feature of this research is that due to the richness of the household characteristics collected by the ECV, it is possible to analyse the effect that partners' characteristics could have on women's wages. A priori, it could be rational to expect a positive relationship between the educational level of the male partner and the female partner's wages, as more educated individuals tend to be more committed to gender equality and hence more cooperative with family tasks (Gracia, 2014; Altintas, 2015).

[3] National Classification of Occupations 1994 (2009–2010), National Classification of Occupations 2011 (2011–2017).

Likewise, the male's working day intensity could also influence his wife's/partner's wages, since if the male's available time for household tasks is scarce, the corresponding family tasks would transfer to the woman (Pleck, 1993), who would have to reduce her involvement in paid work and hence her earnings. In this line, Legazpe and Davia (2019) observed that the job loss of many men in Spain during the Great Recession was accompanied by less use of informal childcare, which they suggest could be related to father' greater involvement in childcare as they have more available time during unemployment.

Fathers' availability of childcare time could also be influenced by their professional status. Meil *et al*. (2017) exploited data from the 2012 Survey on the Social Use of Parental Leave and observed that the percentage of fathers who take paternity leave is much lower among self-employed than salaried workers. In order to take these factors into account, vector P_j in equation 1 includes three variables: a continuous variable that captures the male partner's number of weekly working hours, a dummy that indicates if the partner has higher education, and a dummy indicator of being self-employed.

To test if the male partner's characteristics have a differential effect on the motherhood wage penalty, we estimate a second set of regressions where we include the maternity variables $M3_i$ and $M4_i$, the vectors X_i and P_j, and the interaction term between the maternity variables and the male's characteristics included in vector P_j, as stated in Equation 2:

$$\ln(w_i) = M3_i\beta^{M3} + M4_i\beta^{M4} + X_i\beta^{X} + P_j\beta^{P} + M3_i * P_j\beta^{M3P} + M4_i * P_j\beta^{M4P} + \varepsilon_i \quad [2]$$

Finally, both equations include region fixed effects and an error term (ε_i) that is assumed to be independent, with a null average and a constant variance.

The estimation of the effect of having children on working mothers' labour conditions involves several methodological difficulties when using observational data, as the sample of mothers and childless women is not a random sample of the total population. In other words,

women with children have different characteristics than childless women. This imbalance between mothers and non-mothers' characteristics could produce estimation biases, thus making it difficult to obtain accurate estimations of the motherhood wage penalty.

In order to control for this bias, we use a methodology based on the construction of a control group of women without children who display identical observable characteristics to those of women with children. For each woman with children in the sample, we search for a "twin" woman whose only difference is that she does not have children and subsequently compare their wages. The underlying idea is that we attempt to replicate what would be a random experiment where the treatment group (mothers) and the control group (non-mothers) have the same covariate distributions to ensure that the groups are comparable (Stuart, 2010).

When analysing data from non-randomised observational studies, matching procedures appear to reduce the estimation bias in treatment effects. The most commonly used matching method is propensity score matching (PSM). The PSM first summarises the vector of covariate values for an observation by the scalar propensity score, which is the probability of being treated given the estimated vector of covariates, and then matches each treated unit to the control units by matching those units whose propensity scores are as close as possible (see Stuart, 2010). Nonetheless, as suggested by Iacus *et al*. (2012), PSM does not guarantee any level of imbalance reduction in any given data set. Moreover, their properties only hold on average across samples and under a set of normally unverifiable assumptions about the data generation process. Similarly, King and Nielsen (2019) stated in a recent article that, contrary to its goal, PSM increases imbalance, inefficiency, model dependence, and bias. They argue that the weakness of PSM stems from the fact that PSM applies a single model to produce an unbiased estimate.

In this research, we apply the CEM algorithm proposed by Iacus *et al*. (2009, 2012) and Blackwell *et al*. (2009). The CEM is a matching procedure designed to improve causal

inference by reducing imbalance between the treated and control groups regarding a set of pre-treatment control variables and by grouping observations into categories. Unlike the PSM, the CEM procedure ensures that there are no differences in relevant variables between the treatment and control units. In fact, there is evidence showing that CEM has a greater capacity than commonly used matching methods in terms of its ability to reduce imbalance, model dependence, estimation error, bias, variance, mean square error, and other criteria (see Blackwell *et al*., 2009; Iacus *et al*., 2009, 2012, and King *et al*., 2011).

Briefly, the method consists first of coarsening the explanatory variables into subgroups and then identifying strata. Individuals within the same stratum have identical values for all the coarsened covariates. The greater the number of variables used to define the strata, as well as the greater the number of subcategories within each variable, the more precise the control group will be, but also the more difficult it will be to find a sufficient sample of childless women who belong to the same stratum. A key issue is to achieve a balance that allows refining the definition of the control group as much as possible while obtaining a sufficient percentage of women who meet the required characteristics. The variables selected in this paper to define the strata are: age (4 groups: 25–29, 30–34, 35–39, and 40–45 years), educational level (4 groups: primary education or less, secondary education [first stage], secondary education [second stage], and higher education), weekly hours worked (5 groups: 1–15, 16–24, 25–34, 35–40, >40), having supervisory tasks (yes/no), firm size (5 groups: 1–5, 6–10, 11–19, 20–49, ≥ 50 employees), having a partner with higher education (yes/no), and degree of urbanisation of the local area of residence (3 groups: densely-populated area, intermediate area, thinly-populated area). This combination of variables allows identifying 1,717 strata and obtaining a matching rate of 67% of total women in the sample. The regressions are estimated by ordinary least squares and standard errors are robust.

4. Results

We start by presenting the results of the estimates for Model 1 in Table 2, that is, we do not include any interaction between the variables so that the coefficients associated with the motherhood variables *M3* and *M4* reflect the differences between the wages of mothers and childless women (Model 1-A). Table 2 also displays the results of Model 1 but includes the interaction effect between the part-time indicator and the motherhood variables to test whether there are significant differences in the motherhood wage penalty between full-time and part-time workers (Model 1-B). For each model specification, two blocks of estimates are displayed: the first block includes the estimates of the relationship between motherhood and wages considering the whole sample, whereas the second block focuses on the subsample of women after selecting the treatment and the control group using the CEM procedure explained in Section 3. For all estimations, two coefficients are presented: one for the (natural logarithm) of the gross annual wage as a dependent variable that includes the number of hours worked among the explanatory variables and another one for the (natural logarithm) of the gross hourly wage. To simplify the results, we only present the coefficients corresponding to the motherhood variables, the characteristics of the husband/partner (educational level, weekly hours worked, and professional status), the main personal and labour characteristics of the woman, and the economic cycle dummy variable. Robust standard errors are shown in parentheses.

As might be expected, the results indicate that wages increase with a higher educational level, more work experience, when the job involves tasks of greater responsibility (supervision of other workers), and larger firm size.

Focusing on the main variables of interest (first two rows in Table 2, Model 1-A), the estimates show a motherhood wage penalty in Spain for the period 2009–2017. However, the gap is only statistically significant for women with children of early ages (0–3 years) and not

for women with children aged 4 years or older. This result suggests that the wage penalty associated with childbearing in Spain is related to the intensity of time required for childcare, which is in turn closely linked to children's age, since younger children require more parental attention and care.

[Insert Table 2]

In view of the results and focusing on the estimates for the entire sample (first two columns in Table 2), women with children under three years of age have an annual salary that is approximately 3.22%[4] lower than that of women without children. A similar figure, 3.27%, is estimated in terms of salary per hour worked. However, as noted above, these estimates could be biased because mothers and non-mothers have different characteristics. When looking at the results based on the comparison of the treatment group (mothers) and the control group (non-mothers), we find a slightly higher wage penalty. Specifically, there is a 3.87% difference in the annual salary of women with children 0–3 years old compared to those without children; a penalty that increases to around 4.24% when the estimates are based on the hourly wage. These figures indicate that the wage penalty for mothers with young children in Spain is in line with the meta-analysis by Cukrowska-Torzewska and Matysiak (2020) who reported an average motherhood wage gap of around 3.7%. Compared to the estimates by Molina and Montuenga (2009) for the period 1994–2001 with data from the ECHP,[5] and although both statistics are not directly comparable, our estimates for the period 2009–2017 suggest a lower motherhood wage penalty in Spain.

Since we only find empirical evidence of a motherhood wage penalty for mothers of children under three years of age, increasing early childhood enrolment rates by reducing childcare costs seems to be an appropriate mechanism to narrow the motherhood wage gap in

[4] As is often done in empirical studies, for ease of reading the tables, the approximate percentage change deduced from the estimated log points is used when interpreting the numerical results (β*100) rather than the exact calculation [exp(β)-1]*100.

[5] The National Statistics Institute of Spain (INE) decided to substitute the PHOGUE for the Living Conditions Survey from 2002 onwards.

Spain. There is evidence for the Spanish case showing the favourable effects that these policies have on women's labour outcomes. For example, using data from the Spanish Time Use Survey, Borra (2010) found that mothers' labour force participation is very elastic to changes in childcare costs. Additionally, Carrasco and Domínguez (2011) stated that the scarcity of places in public nurseries and the high price of sending children to both public and private nurseries prevent low-income households from using these services, thus reducing the time that low income women can dedicate to work in the marketplace.

Our results also reflect a notable and very significant difference between the wages of women who work part time and those working full time (about 21–23% less in the case of part-time workers). The second block of estimates in Table 2 (Model 1-B) includes the interaction between the part-time indicator and the two children dummies. In this case, the motherhood wage penalty for women with young children working full time amounts to around 4.38% in the annual wage and 4.44% in the hourly wage (columns 7 and 8, Table 2). For women working part time, the hourly wage penalty is reduced by almost half (column 8, Table 2), although the interaction between the part-time dummy and the children's variables is not statistically significant in any of the estimates.[6] Nevertheless, it should be noted that one of the main factors that lead women to work part time is precisely the fact of having children (Kleven *et al*., 2019b, Mumford and Smith, 2009; Connolly and Gregory, 2008), which in itself implies some kind of penalty as it results in a reduction in income compared to both childless women and men due to the lower number of hours worked. According to the EPA, in 2019, around 30,000 men working part time claimed to do so in order to "care for children or sick, disabled, or elderly adults", while the figure was nearly 300,000 for women. In the particular case of our sample, 26.8% of mothers work part time, while only 11.7% of childless women choose this type of workday (see Table 1).

[6] We have run separate estimations for the subsample of women working full time and the subsample of women working part time and found no evidence of a motherhood wage penalty in any of the estimations for the subsample of part-time workers. For reasons of space, the results are not shown but are available upon request.

[Insert Table 3]

Additionally, we find that women whose male partners have higher education earn approximately 6–8% more than those with less educated partners. This could be explained by the theory of positive assortative matching which postulates that individuals with similar socioeconomic characteristics tend to marry each other (Becker, 1973). Nevertheless, the greater propensity of people with higher education towards co-responsibility within the household is an additional plausible explanation. Table 3 displays the results when the interaction effects between the children variables and the husband/partners' characteristics are included. Despite the positive relationship between partners' education and women's wages mentioned above, the interaction term between the partner's educational level and having young children (0–3 years) is not statistically significant in any of the estimates shown in Table 3. Therefore, we cannot conclude that the greater 'presupposed' childcare involvement of higher educated fathers is helping to narrow the motherhood wage penalty in Spain.

In contrast, the interaction with the indicator of having children over three years of age is positive and significant (at a 10% level of significance) for all the estimates based on the treatment control subsample, suggesting that women whose partners have only secondary or primary education experience motherhood wage gaps regardless of their children's ages. This result is of special relevance since it could be indicating that at least part of the motherhood wage penalty in Spain is associated with cultural factors and gender norms related to the distribution of family tasks within the household, thus reinforcing the need to promote the co-responsibility of parents in childcare, especially in the case of the less educated. The paternity leave established in Spain in 2007[7] was precisely intended to encourage the reconciliation of family and work life by promoting the involvement of fathers in childcare. Meil *et al*. (2017)

[7] Organic Law 3/2007 of 22 March for the effective equality of men and women recognised for the first time the individual and exclusive right of fathers to enjoy thirteen days of paternity leave, which may be extended in the event of multiple births for a further two days per additional child. As of 2017, paternity leaves have been gradually extended to four weeks (2017), five weeks (July 2018), eight weeks (April 2019), and twelve weeks (January 2020). In January 2021, paternity leave will be equal to maternity leave (sixteen weeks).

pointed out that this measure proved to be very effective, since 75% of fathers made use of paternity leaves, but with a lower propensity among low-educated fathers.

With regard to the interaction effect between the partner's workday and the motherhood variables, we find that the motherhood wage gap for women with young children increases when the husband's workday exceeds the average (42 hours per week), but the coefficient is not significant.

In the second block of estimates in Table 3 (Model 2–B), the partner's professional status is also included among the explanatory variables as a dummy indicator of being self-employed, as well as its interaction with the children variables. In this case, we observe that the motherhood wage penalty for women with young children widens considerably when the partner is self-employed. Specifically, the penalty in the annual and the hourly wage increases by around 12 percentage points (pp) (see columns 7 and 8 in Table 3). The dedication required of the self-employed is, in most cases, particularly demanding, since the personal involvement to ensure the good performance of the business is much greater. Hence, self-employed workers are not able to take advantage of reconciliation policies such as paternity leave as easily (even though they are entitled by law to the same weeks as employees). According to Eurostat data for 2010, male employees in Spain spent 1 hour and 47 minutes daily on household and family care activities, while the figure decreases by around 30 minutes for the self-employed. Our estimates suggest that, in the case of couples with children in which the father is self-employed, childcare may fall more heavily on the mother.

The last block of estimates (Model 2–C in Table 3) tries to capture the difference between the period of economic crisis (2009–2013) and the subsequent period of economic recovery (2014–2017) by including a dummy that takes the value of 1 for the recovery period and the corresponding interaction terms with the two motherhood variables. The coefficient associated with the recovery dummy reflects the reduction in wages observed after the Great

Recession (Cuadrado and Tagliati, 2018). Furthermore, its interaction with the two children variables on the treatment control subsample shows a reduction in the motherhood wage penalty during the recovery period, with the difference between both periods being statistically significant (columns 11 and 12 in Table 3). Apparently, this result could be indicating that, at least during the period 2014–2017, the motherhood wage penalty may have decreased. However, given that the heavy job destruction during the economic crisis affected the most disadvantaged groups most intensely (see López-Andreu and Verd, 2016; Verd *et al*., 2019), the most vulnerable women (those whose jobs made it more difficult to reconcile work and family life and those with more precarious employment and hence lower salaries) may have been affected more intensely by the job losses, thus making the wage penalty during the recovery period less severe and no longer statistically significant.[8] Finally, due to the high level of job insecurity with unemployment rates of around 20% even during the recovery period, all workers—independently if they had children or not—may have strengthened their job commitment and relied on other external support for childcare (from family members to hiring nannies, day-care centres, etc.). Although all these factors could be influencing the differential results from one period to the next, the empirical analysis carried out in this article does not allow us to draw conclusions in one direction or another. How the Great Recession has affected the motherhood wage penalty is an interesting question for further research but is beyond the scope of this paper.

A key characteristic that must be considered when studying workers' labour market outcomes is their human capital. In Table 4 we present the results of separate estimates for two groups: women with tertiary education (university and higher vocational education) and women with primary or secondary education. For reasons of space, Table 4 only displays the estimates for the hourly wage for Model 1-A (without any interaction terms) and Model 2-C

[8] Separate regressions for both periods show a lower motherhood wage penalty during the economic recovery period, but the penalty is not statistically significant. For reasons of space, the results are not shown in the paper but are available upon request.

(including all the interaction terms). Focusing on the whole sample of women (columns 1 and 5 in Table 4), it seems that the motherhood wage penalty exists only for women with middle or lower education (approximately 6.36% for mothers with children 0–3 years of age). However, when we correct the bias associated with the imbalance in the characteristics of mothers and childless women (columns 2 and 4 in Table 4), we find, similarly to Anderson *et al*. (2002) and England *et al*. (2016) for American women, that the motherhood wage penalty occurs only among women with higher education, with an estimated hourly wage penalty of around 4.1% for women with children 0-3 years old. The human capital depreciation that arises if women withdraw from the labour market or reduce working hours after childbirth does not occur with the same intensity across jobs and occupations, with the effects being much stronger for women working in high-qualified jobs. Hence, the opportunity cost of reducing the intensity of the workday or the level of commitment to employment is much higher for more highly educated women, since this hinders their chances of promotion and their salary earnings (Goldin and Katz, 2008, 2011; England *et al*., 2016).

Nonetheless, our estimates indicate that women with tertiary education who have children over three years old earn higher hourly wages than childless women (column 6 in Table 4). The usual explanation for the higher wages of fathers than non-fathers could apply in this case, as children over three years old no longer need as much dedication, but they still represent an additional cost to the family that requires more income from the parents.

[Insert Table 4]

The results also indicate that, for both groups of women, the motherhood wage penalty is reduced if they work part time (the interaction is always positive), thus reinforcing the hypothesis that when the hourly availability to devote time to the family is greater, the motherhood wage penalty tends to disappear. Nonetheless, the difference between the

motherhood wage penalty for women who work full time and those who work part time is not statistically significant in any of the estimates (columns 3-4 and 7-8, Table 4).

Our estimates reveal that several dimensions of the husband/partners' characteristics exert a non-negligible influence on the motherhood wage gap, especially in the case of women with secondary or primary education. In particular, the motherhood wage penalty for full-time female workers with young children and medium/low education seems to decrease if the partner has higher education (column 4 in Table 4), thus reinforcing the previous result which suggested that policies aimed at promoting co-responsibility within the household could be advisable for the least educated population. Moreover, the motherhood wage penalty increases notably for medium/low-educated women when the partner is self-employed.

However, in the sample of women with tertiary education, none of the interactions between the children variables and the partners' characteristics is statistically significant. Hence, the type of measures required by high-educated women should not be designed so much to promote the co-responsibility of fathers—who in most cases also have higher education and therefore their level of involvement in childcare is probably significant (see Gracia, 2014; Altintas, 2015, among others)—but rather to maintain women's human capital after becoming mothers by avoiding interruptions in their professional careers.

Finally, it is of interest to study whether or not certain firm characteristics influence the motherhood wage penalty. In order to test these differences, we ran the previous estimates for two subsamples: firms with less than 50 workers and firms with 50 or more workers. Tables 5 and 6 display the estimated coefficients for the gross hourly wages in both types of firms, respectively, taking into account women's education. The results point in the same direction as previously seen: the motherhood wage penalty is only significant for high-educated women, but only for mothers who work in medium and large firms (Table 6). Although the estimations include occupation fixed effects, management positions, which are generally

occupied by workers with higher education, are much broader in large firms where there are managers with different levels of responsibility and significant earnings differences. The fact that we find a greater motherhood wage penalty for women with higher education in large firms is a reflection of the greater difficulties women face in accessing high-level decision-making positions. In other words, it suggests that mothers with young children are affected more intensely by glass ceilings. From these latter results, it can also be inferred that the motherhood wage gap is significantly higher than previously estimated, since the hourly wage penalty associated with motherhood for women with tertiary education is approximately 8.42% (column 6 in Table 6).

[Insert Table 5]

[Insert Table 6]

It should be remarked that, although the professional status of the male partner did not initially seem to affect the motherhood wage penalty of high-educated women, the regressions on the subsample of women working in medium and large firms reveal, as in the case of medium/low-educated women, a much stronger motherhood wage penalty for mothers whose partners are self-employed (column 7 and 8, Table 6). The high competitiveness characterising large firms and the subsequent possibilities of job (and earnings) promotion mean that higher educated women whose partners are self-employed[9] suffer to a greater extent the costs derived from the difficulties their partners face to devote more time to childcare.

5. Conclusions and policy issues

In this paper, we have studied the motherhood wage penalty in Spain in recent years taking into account how it may be affected by the male partner's characteristics. With this intention, we have exploited cross-sectional microdata for the period 2009–2017 drawn from

[9] See Gustafsson and Kjulin (1994), Bell and La Valle (2003), and Gutiérrez-Domènech (2010).

the ECV for a sample of salaried women aged 25–45 years old. Applying the CEM algorithm to construct a sample of mothers and childless women with the same observable characteristics, we find that mothers of children of early ages (0–3 years) have experienced a motherhood wage penalty of approximately 3.9% and 4.2% in their annual and hourly wages, respectively. In contrast, we do not find any penalty for mothers of children over three years old.

We observe differences in the motherhood wage penalty according to women's educational level. In particular, once the bias associated with the imbalance in the characteristics of mothers and childless women is corrected, the motherhood wage gap is only significant for women with tertiary education, for whom the hourly wage penalty is estimated to be around 4.1% if they have young children (0–3 years). Furthermore, the penalty is only significant for those high-educated women working in medium and large firms, for whom the motherhood wage penalty increases to around 8.4%.

However, several dimensions of the male partner's characteristics exert a significant influence on the motherhood wage penalty of women with medium or low education. Hence, the partners' characteristics should be taken into account when designing policy measures that aim to reduce the penalty for this group of women. In particular, we find that if the male partner has only secondary or primary education, the wage penalty observed for highly educated mothers is extended to medium- and low-educated women. This result indicates that, for medium/low-educated women, the motherhood wage penalty is somehow related to a lack of co-responsibility between parents regarding childcare issues, as their human capital is not so vulnerable to career interruptions. Policies aiming to increase fathers' involvement in household tasks would be especially necessary in this case. The literature in this regard highlights that promoting and extending parental leaves seems to be very effective to encourage co-responsibility within households (see Farré, 2016). As the usage rates of

parental leaves are lower for less educated fathers, implementing economic incentives to foster fathers' use of parental leaves could be especially beneficial in this case (Conde-Ruiz and Marra de Artíñano, 2016).

In our data, the influence of the male partner's professional status is much more remarkable (and very significant). Medium- and low-educated mothers whose husband/partner is self-employed experience wage penalties even if their children have passed the critical age of three years. Considering that the lack of co-responsibility and the scarce use of parental leaves are also characteristic of self-employed men, similar policy recommendations would also apply to their case.

In contrast to medium- and low-educated women, partners' education does not seem to have any influence on the motherhood wage penalty for high-educated women, suggesting that the wage penalty suffered by these women is mostly associated with career interruptions and the consequent difficulty to maintain their human capital after becoming mothers. However, high-educated women working in medium and large firms—where the level of competitiveness is much higher than in small firms—also suffer greater motherhood wage penalties when their partner is self-employed.

Overall, for high-educated women, measures intended to provide work flexibility and to promote access to part-time jobs for fathers and mothers might be a good mechanism to maintain their work pace after childbirth. Flexible and compressed working time schedules or voluntary part-time work would result in less work-family conflict and greater well-being for families, especially during the early stages of parenthood.

Teleworking also provides a chance to better combine work and family domains and to devote the time otherwise spent on commuting, to childcare and/or work. According to the European Labour Force Survey, 8.3% of workers in Spain worked remotely in 2019. While this figure is lower than that of the EU-28 (16.1%), the percentage of workers who work from

home at least occasionally is growing steadily in Spain. However, accessing this type of work arrangement strongly depends on workers' educational levels and occupations, as not all activities can be performed remotely. Only 15% of workers who worked occasionally from home in 2019 had a less than high school education, while 57% had tertiary education. Moreover, only 0.9% of those who worked remotely were engaged in elementary occupations, while scientific and intellectual technicians and professionals accounted for 40% (Anghel *et al*., 2020). These authors estimate that 30% of employed people in Spain could work remotely, as the recent COVID-19 pandemic has demonstrated. In sum, more flexible work arrangements help to reconcile the work obligations and personal life of high-educated women and significantly reduce the need to interrupt their careers, thus narrowing the motherhood pay gap for this subgroup of females. Nevertheless, it is important to note that these flexibility measures must go hand in hand with policies aimed to promote their usage by men in order to increase father's involvement in childcare and domestic work as facilitating fathers' dedication to childcare by making their working schedules more flexible increases women's career perspectives (Langner, 2018).

Lastly, since we only find evidence of a motherhood wage penalty for mothers of children under three years of age, our results suggest—in line with the recommendation of the European Commission (2015) in its "Strategic engagement for gender equality 2016-2019"—the need to increase affordable and accessible provision of childcare services, particularly for young children (for instance, through public provision or publicly subsidised private sector provision). Moreover, unlike other policy measures, such as parental leave arrangements that might end up producing negative consequences if they are too generous (Gangl and Ziefle, 2009), childcare provision seems to exert a clear positive effect on mothers' wages. While the enrolment rate in early childhood education and care services for children under three years

old in Spain increased from 14.9% in 2005 to 36.4% in 2017,[10] there is still ample room for manoeuvring in this respect as the figure is far from the (more than) 50% observed in other countries such as France, the Netherlands, Norway, and Belgium, among others.

All in all, it is worth noting that promoting a work-family balance would not only contribute to improving the labour market conditions of women, narrowing the motherhood wage gap, increasing gender equality, and improving individuals' well-being, but also to increase fertility rates. In Spain, where the population is ageing at a faster pace than in other European Union countries, these measures seem necessary to put an end to this problem.

[10] OECD Family Database 2019

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Table 1. Sample characteristics

	Total	Childless women	Mothers
Total	8,580	2,049	6,531
%	100%	23.9%	76.1%
Average age (years)	38	35	39
Primary education or less	2.7%	1.5%	3.0%
Secondary education (1st stage)	15.9%	12.7%	16.9%
Secondary education (2nd stage)	20.8%	17.4%	21.9%
Tertiary education (higher vocational education + higher education)	60.7%	68.4%	58.2%
Spanish	91.0%	91.1%	90.9%
Full-time worker	76.8%	88.3%	73.2%
Work experience (years)	14.8	11.8	15.7
Permanent contract	86.7%	83.9%	87.5%
Firm size: 1-5 workers	20.4%	21.3%	20.2%
6-10 workers	11.7%	11.8%	11.7%
11-19 workers	12.0%	12.2%	11.9%
20-49 workers	18.6%	18.2%	18.7%
≥50 workers	37.3%	36.5%	37.6%

Source: Own elaboration (ECV cross-sectional microdata, waves 2009 to 2017, Base 2013).

Table 2. Motherhood wage penalty. OLS

	Model 1-A				Model 1-B			
	Total sample		Treatment control (CEM)		Total sample		Treatment control (CEM)	
	Annual wage	Hourly wage	Annual wage	Hourly wage	Annual wage	Hourly wage	Annual wage	Hourly wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
M3-Children 0-3	-0.0322**	-0.0327**	-0.0387**	-0.0424**	-0.0350**	-0.0339**	-0.0438**	-0.0444**
	(0.013)	(0.013)	(0.017)	(0.017)	(0.014)	(0.014)	(0.017)	(0.017)
M4-Children > 3	0.0131	0.0109	0.0157	0.0133	0.0102	0.009	0.012	0.0113
	(0.012)	(0.012)	(0.016)	(0.016)	(0.013)	(0.013)	(0.016)	(0.016)
Part-time	-0.2105***	-0.2337***	-0.2250***	-0.2294***	-0.2299***	-0.2449***	-0.2563***	-0.2437***
	(0.019)	(0.019)	(0.034)	(0.036)	(0.037)	(0.037)	(0.062)	(0.070)
Part-time*M3	-	-	-	-	0.0219	0.0112	0.0462	0.0182
					(0.040)	(0.040)	(0.066)	(0.072)
Part-time*M4	-	-	-	-	0.022	0.0138	0.0349	0.0183
					(0.036)	(0.036)	(0.058)	(0.064)
Age	-0.0209	-0.0209	-0.0169	-0.0124	-0.0217	-0.0215	-0.0169	-0.0125
	(0.015)	(0.015)	(0.022)	(0.022)	(0.015)	(0.015)	(0.022)	(0.022)
Age squared	0.0004**	0.0004**	0.0004	0.0003	0.0004**	0.0004**	0.0004	0.0003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
1st stg secondary	0.0451	0.0374	0.0688	0.0605	0.0448	0.0372	0.0688	0.0604
	(0.029)	(0.029)	(0.044)	(0.045)	(0.029)	(0.029)	(0.044)	(0.045)
2nd stg secondary	0.0739**	0.0708**	0.1049**	0.0958**	0.0741**	0.0709**	0.1051**	0.0959**
	(0.030)	(0.029)	(0.044)	(0.045)	(0.030)	(0.029)	(0.044)	(0.045)
Tertiary	0.1554***	0.1522***	0.1971***	0.1844***	0.1558***	0.1524***	0.1970***	0.1844***
	(0.030)	(0.030)	(0.046)	(0.046)	(0.030)	(0.030)	(0.045)	(0.046)
Male partner's characteristics								
Tertiary educ.	0.0641***	0.0627***	0.0806***	0.0810***	0.0642***	0.0628***	0.0805***	0.0810***
	(0.009)	(0.009)	(0.013)	(0.013)	(0.009)	(0.009)	(0.013)	(0.013)
Work hours (a)	-0.0019***	-0.0018***	-0.0019**	-0.0021**	-0.0019***	-0.0018***	-0.0019**	-0.0021**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Self-employed	-0.0197	-0.0197	-0.0024	-0.0033	-0.0196	-0.0196	-0.0022	-0.0032
	(0.014)	(0.014)	(0.019)	(0.019)	(0.014)	(0.014)	(0.019)	(0.019)
Recovery period	-0.1007***	-0.1047***	-0.1023***	-0.1038***	-0.1007***	-0.1047***	-0.1023***	-0.1039***
	(0.014)	(0.015)	(0.019)	(0.019)	(0.014)	(0.015)	(0.019)	(0.019)
Experience	0.0257***	0.0241***	0.0200***	0.0192***	0.0258***	0.0241***	0.0199***	0.0192***
	(0.004)	(0.004)	(0.006)	(0.006)	(0.004)	(0.004)	(0.006)	(0.006)
Experience sqr.	-0.0007***	-0.0006***	-0.0005***	-0.0005***	-0.0007***	-0.0006***	-0.0005***	-0.0005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Supervise	0.1204***	0.1174***	0.1288***	0.1287***	0.1202***	0.1173***	0.1290***	0.1288***
	(0.011)	(0.011)	(0.015)	(0.015)	(0.011)	(0.011)	(0.015)	(0.015)
Firm size: 6-10	0.0735***	0.0737***	0.0548**	0.0540**	0.0735***	0.0737***	0.0545**	0.0539**
	(0.016)	(0.016)	(0.026)	(0.026)	(0.016)	(0.016)	(0.026)	(0.026)
11-19 workers	0.0892***	0.0904***	0.1073***	0.1095***	0.0892***	0.0903***	0.1076***	0.1096***
	(0.016)	(0.016)	(0.023)	(0.023)	(0.016)	(0.016)	(0.023)	(0.023)
20-49 workers	0.1854***	0.1843***	0.1872***	0.1866***	0.1854***	0.1842***	0.1874***	0.1867***
	(0.015)	(0.015)	(0.021)	(0.021)	(0.015)	(0.015)	(0.021)	(0.021)
≥50 workers	0.2482***	0.2459***	0.2558***	0.2557***	0.2481***	0.2459***	0.2561***	0.2559***
	(0.013)	(0.013)	(0.019)	(0.019)	(0.013)	(0.013)	(0.019)	(0.019)
N	8,580	8,580	5,886	5,886	8,580	8,580	5,886	5,886
R2	0.64	0.50	0.61	0.51	0.64	0.50	0.61	0.51

Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses.

(a) Evaluated at the mean value of the partner's workday (42 hours per week).

Other controls: nationality, type of contract, workday (weekly hours), occupation (24 dummies), economic sector (12 dummies), residence's degree of urbanisation (3 dummies), annual employment growth rate in NUTS-2 regions (autonomous regions).

Source: Own elaboration (ECV cross-sectional microdata, waves 2009 to 2017, Base 2013).

Table 3. Male partner's characteristics and the motherhood wage penalty. OLS

	Model 2-A				Model 2-B				Model 2-C			
	Total sample		Treatment control (CEM)		Total sample		Treatment control (CEM)		Total sample		Treatment control (CEM)	
	Annual wage	Hourly Wage	Annual Wage	Hourly Wage	Annual Wage	Hourly Wage	Annual Wage	Hourly Wage	Annual Wage	Hourly Wage	Annual Wage	Hourly Wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
M3: Children 0-3	-0.0423**	-0.0418**	-0.0507**	-0.0515**	-0.0275	-0.0272	-0.0344	-0.0352	-0.0321	-0.0318	-0.0644**	-0.0678**
	(0.019)	(0.019)	(0.026)	(0.026)	(0.019)	(0.019)	(0.026)	(0.026)	(0.022)	(0.022)	(0.029)	(0.029)
M4: Children > 3	-0.0049	-0.0062	-0.0148	-0.0154	0.0014	-0.0006	-0.0049	-0.0056	0.0103	0.0066	-0.0105	-0.0136
	(0.016)	(0.016)	(0.023)	(0.023)	(0.017)	(0.017)	(0.024)	(0.024)	(0.019)	(0.019)	(0.026)	(0.026)
Part-time	-0.2298***	-0.2454***	-0.2601***	-0.2478***	-0.2334***	-0.2488***	-0.2621***	-0.2497***	-0.2343***	-0.2494***	-0.2604***	-0.2479***
	(0.037)	(0.037)	(0.061)	(0.07)	(0.037)	(0.037)	(0.061)	(0.07)	(0.037)	(0.037)	(0.061)	(0.07)
Part-time*M3	0.0209	0.0108	0.0489	0.0213	0.0246	0.0144	0.051	0.0233	0.0268	0.0163	0.0541	0.0264
	(0.04)	(0.04)	(0.065)	(0.071)	(0.041)	(0.04)	(0.065)	(0.071)	(0.041)	(0.04)	(0.065)	(0.071)
Part-time*M4	0.0227	0.0149	0.0443	0.0279	0.0254	0.0174	0.0455	0.029	0.0268	0.0185	0.0454	0.0287
	(0.036)	(0.036)	(0.057)	(0.063)	(0.036)	(0.036)	(0.057)	(0.063)	(0.036)	(0.036)	(0.057)	(0.063)
Male partner's characteristics												
Tertiary educ.	0.0458***	0.0438**	0.0535**	0.0538**	0.0482***	0.0461***	0.0542**	0.0545**	0.0482***	0.0461***	0.0549**	0.0553**
	(0.017)	(0.017)	(0.026)	(0.026)	(0.017)	(0.017)	(0.026)	(0.026)	(0.017)	(0.017)	(0.026)	(0.026)
Tertiary educ*M3	0.0134	0.0148	0.0114	0.012	0.0098	0.0114	0.0086	0.0093	0.0088	0.0105	0.004	0.0043
	(0.025)	(0.025)	(0.034)	(0.034)	(0.025)	(0.025)	(0.034)	(0.034)	(0.025)	(0.025)	(0.034)	(0.034)
Tertiary educ*M4	0.0307	0.0309	0.0535*	0.0535*	0.0285	0.029	0.0525*	0.0525*	0.0285	0.029	0.0520*	0.0519*
	(0.021)	(0.021)	(0.03)	(0.03)	(0.021)	(0.021)	(0.03)	(0.03)	(0.021)	(0.021)	(0.03)	(0.03)
Work hours (a)	-0.0008	-0.0013	0.0000	-0.0004	-0.0014	-0.0018	-0.0007	-0.0011	-0.0014	-0.0018	-0.0007	-0.0011
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Work hours*M3	-0.0025	-0.0017	-0.0046*	-0.0042	-0.0011	-0.0004	-0.0031	-0.0028	-0.0011	-0.0003	-0.003	-0.0026
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
Work hours*M4	-0.0009	-0.0003	-0.0019	-0.0017	-0.0004	0.0001	-0.001	-0.0008	-0.0005	0.0001	-0.001	-0.0009
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Self-employed	-0.0195	-0.0197	-0.0011	-0.0021	0.0323	0.0292	0.06	0.0586	0.0322	0.0292	0.0601	0.0588
	(0.014)	(0.014)	(0.019)	(0.019)	(0.028)	(0.028)	(0.039)	(0.04)	(0.028)	(0.028)	(0.039)	(0.039)
Self-employed*M3					-0.1166***	-0.1158***	-0.1195**	-0.1198**	-0.1171***	-0.1162***	-0.1217**	-0.1221**
					(0.044)	(0.044)	(0.058)	(0.059)	(0.044)	(0.044)	(0.058)	(0.058)
Self-employed*M4					-0.0473	-0.0424	-0.07	-0.0691	-0.0474	-0.0425	-0.0701	-0.0692
					(0.033)	(0.033)	(0.046)	(0.046)	(0.033)	(0.033)	(0.045)	(0.046)
Recovery	-0.1009***	-0.1048***	-0.1025***	-0.1041***	-0.1004***	-0.1043***	-0.1020***	-0.1036***	-0.0928***	-0.0988***	-0.1265***	-0.1320***
	(0.014)	(0.015)	(0.019)	(0.019)	(0.014)	(0.015)	(0.019)	(0.019)	(0.021)	(0.021)	(0.03)	(0.03)
Recovery*M3									0.0095	0.0099	0.0697**	0.0757**
									(0.025)	(0.026)	(0.035)	(0.035)
Recovery*M4									-0.0205	-0.0165	0.0111	0.0161
									(0.021)	(0.021)	(0.03)	(0.031)
N	8,580	8,580	5,886	5,886	8,580	8,580	5,886	5,886	8,580	8,580	5,886	5,886
R2	0.64	0.50	0.61	0.51	0.64	0.50	0.61	0.51	0.64	0.50	0.61	0.51

Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses.
(a) Evaluated at the mean value of the partner's workday (42 hours per week).
Other controls: age, age squared, nationality, supervisory tasks, type of contract, years of work experience, workday (weekly hours), firm size (5 dummies), occupation (24 dummies), economic sector (12 dummies), residence's degree of urbanisation (3 dummies), annual employment growth rate in NUTS-2 regions (autonomous regions).
Source: Own elaboration (ECV cross-sectional microdata, waves 2009 to 2017, Base 2013).

Table 4. Motherhood wage penalty by women's educational level. OLS

	Primary or secondary education				Tertiary education			
	Model 1-A		Model 2-C		Model 1-A		Model 2-C	
	Hourly wage		Hourly wage		Hourly wage		Hourly wage	
	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
M3: Children 0-3	-0.0636***	-0.0392	-0.0619*	-0.0998**	-0.022	-0.0413**	-0.0142	-0.0538
	(0.0218)	(0.0348)	(0.032)	(0.0436)	(0.0165)	(0.0188)	(0.0301)	(0.0364)
M4: Children > 3	-0.0284	-0.0215	-0.0172	-0.0464	0.0270*	0.0351*	0.02	0.0211
	(0.0188)	(0.032)	(0.0266)	(0.0375)	(0.0162)	(0.0183)	(0.0269)	(0.0332)
Part-time	-0.2573***	-0.2665***	-0.2949***	-0.3078***	-0.2135***	-0.2103***	-0.2199***	-0.2410***
	(0.0272)	(0.0568)	(0.058)	(0.1059)	(0.0273)	(0.0403)	(0.0496)	(0.0742)
Part-time*M3			0.0294	0.0685			0.0157	0.0409
			(0.0636)	(0.1155)			(0.0532)	(0.0773)
Part-time*M4			0.047	0.0396			0.0012	0.0448
			(0.0564)	(0.1017)			(0.048)	(0.0711)
Male partner's characteristics								
Tertiary educ.	0.0296*	0.0790***	0.028	0.0183	0.0675***	0.0727***	0.0505**	0.0624**
	(0.0156)	(0.0262)	(0.0317)	(0.0505)	(0.0118)	(0.0149)	(0.0216)	(0.0307)
Tertiary educ*M3			0.0543	0.1543*			-0.0027	-0.0166
			(0.048)	(0.0787)			(0.0314)	(0.0401)
Tertiary educ*M4			-0.0194	0.0395			0.0399	0.033
			(0.0377)	(0.0606)			(0.0268)	(0.0357)
Work hours (a)	-0.0016*	-0.0016	-0.0027	-0.0037	-0.0020**	-0.0025**	-0.0018	0.0002
	(0.0009)	(0.0017)	(0.0021)	(0.0041)	(0.0008)	(0.001)	(0.0018)	(0.0021)
Work hours*M3			0.001	0.003			-0.0001	-0.0046
			(0.0031)	(0.0051)			(0.0025)	(0.003)
Work hours*M4			0.0016	0.0028			-0.0004	-0.0028
			(0.0023)	(0.0043)			(0.0021)	(0.0025)
Self-employed	-0.0007	0.0474	0.1154**	0.2086***	-0.0263	-0.0218	-0.0024	0.0202
	(0.0214)	(0.0334)	(0.0462)	(0.0778)	(0.0181)	(0.0231)	(0.0344)	(0.0455)
Self-employed*M3			-0.2446***	-0.2668**			-0.0713	-0.0882
			(0.0792)	(0.1094)			(0.0525)	(0.0664)
Self-employed*M4			-0.1163**	-0.1879**			-0.0111	-0.0448
			(0.0524)	(0.0869)			(0.0423)	(0.0539)
Recovery	-0.0538**	-0.0305	-0.0516	-0.1059*	-0.1395***	-0.1414***	-0.1238***	-0.1554***
	(0.0221)	(0.0335)	(0.0355)	(0.0579)	(0.0189)	(0.0233)	(0.0266)	(0.0338)
Recovery*M3			0.0202	0.1457*			-0.0014	0.0594
			(0.044)	(0.0744)			(0.0312)	(0.038)
Recovery*M4			-0.0106	0.0841			-0.0325	-0.0129
			(0.0355)	(0.0637)			(0.0269)	(0.0335)
N obs.	3,376	1,814	3,376	1,814	5,204	4,072	5,204	4,072
R2	0.37	0.41	0.37	0.42	0.44	0.43	0.44	0.43

Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses.

(a) Evaluated at the mean value of the partner's workday (42 hours per week).

Other controls: age, age squared, nationality, supervisory tasks, type of contract, years of work experience, workday (weekly hours), firm size (5 dummies), occupation (24 dummies), economic sector (12 dummies), residence's degree of urbanisation (3 dummies), annual employment growth rate in NUTS-2 regions (autonomous regions).

Source: Own elaboration (ECV cross-sectional microdata, waves 2009 to 2017, Base 2013).

Table 5. Motherhood wage penalty by educational level and firm size. Small firms. OLS

	Small firms (<50 workers)							
	Primary or secondary education				Tertiary education			
	Model 1-A		Model 2-C		Model 1-A		Model 2-C	
	Hourly wage		Hourly wage		Hourly wage		Hourly wage	
	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
M3: Children 0-3	-0.0522**	-0.0252	-0.0857**	-0.0777	0.0093	-0.0153	0.0303	0.0459
	(0.0263)	(0.0439)	(0.0383)	(0.0529)	(0.0229)	(0.0268)	(0.0387)	(0.0477)
M4: Children > 3	-0.0285	0.0048	-0.024	-0.0276	0.0351	0.0367	0.0413	0.0916**
	(0.0237)	(0.0441)	(0.0337)	(0.049)	(0.0221)	(0.0264)	(0.0355)	(0.0446)
Part-time	-0.2920***	-0.3611***	-0.3685***	-0.4107***	-0.2573***	-0.2803***	-0.2662***	-0.3038***
	(0.033)	(0.071)	(0.0731)	(0.1236)	(0.0581)	(0.0863)	(0.0582)	(0.0874)
Part-time*M3			0.0946	0.114			-0.0018	0.0017
			(0.0787)	(0.144)			(0.0618)	(0.0898)
Part-time*M4			0.0844	0.0282			0.0218	0.0687
			(0.0712)	(0.1277)			(0.0566)	(0.0834)
Male partner's characteristics								
Tertiary educ.	0.0311*	0.1026***	0.0402	0.0951	0.0535***	0.0638***	0.0540*	0.1143***
	(0.0189)	(0.0352)	(0.0387)	(0.0662)	(0.0157)	(0.0215)	(0.0293)	(0.0442)
Tertiary educ*M3			0.0696	0.0639			-0.0246	-0.1060*
			(0.0547)	(0.0968)			(0.0406)	(0.0549)
Tertiary educ*M4			-0.0475	-0.035			0.0161	-0.0433
			(0.0465)	(0.0825)			(0.0358)	(0.05)
Work hours (a)	-0.0019*	-0.0001	-0.0032	0.0051	-0.0028***	-0.0039***	-0.0023	-0.0002
	(0.0011)	(0.0017)	(0.0027)	(0.0044)	(0.0011)	(0.0012)	(0.0026)	(0.0025)
Work hours*M3			0.0021	-0.0046			-0.0008	-0.0071**
			(0.0037)	(0.0057)			(0.0032)	(0.0035)
Work hours*M4			0.0014	-0.0073			-0.0008	-0.0029
			(0.003)	(0.0047)			(0.0029)	(0.0031)
Self-employed	0.0108	0.0704*	0.1368**	0.2408**	-0.0127	0.0062	-0.0056	0.0574
	(0.0239)	(0.0407)	(0.0563)	(0.1033)	(0.0219)	(0.0271)	(0.0458)	(0.0539)
Self-employed*M3			-0.2429***	-0.2667*			-0.0244	-0.074
			(0.0909)	(0.1526)			(0.0613)	(0.0727)
Self-employed*M4			-0.1253**	-0.1905*			-0.0016	-0.0718
			(0.0629)	(0.1126)			(0.0552)	(0.0637)
Recovery	-0.0828***	-0.048	-0.0957**	-0.1363*	-0.1451***	-0.1590***	-0.1264***	-0.1450***
	(0.0267)	(0.0433)	(0.0439)	(0.0745)	(0.0247)	(0.0316)	(0.0361)	(0.0493)
Recovery*M3			0.0545	0.117			-0.0044	0.0268
			(0.0528)	(0.0918)			(0.0403)	(0.0527)
Recovery*M4			0.0035	0.1084			-0.0417	-0.0588
			(0.0441)	(0.0815)			(0.0367)	(0.048)
N obs.	2,354	1,147	2,354	1,147	3,024	2,161	3,024	2,161
R2	0.35	0.36	0.35	0.37	0.45	0.46	0.45	0.46

Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses.

(a) Evaluated at the mean value of the partner's workday (42 hours per week).

Other controls: age, age squared, nationality, supervisory tasks, type of contract, years of work experience, workday (weekly hours), firm size (5 dummies), occupation (24 dummies), economic sector (12 dummies), residence's degree of urbanisation (3 dummies), annual employment growth rate in NUTS-2 regions (autonomous regions).

Source: Own elaboration (ECV cross-sectional microdata, waves 2009 to 2017, Base 2013).

Table 6. Motherhood wage penalty by educational level and firm size. Medium and large firms. OLS

	Medium and large firms (≥50 workers)							
	Primary or secondary education				Tertiary education			
	Model 1-A		Model 2-C		Model 1-A		Model 2-C	
	Hourly wage		Hourly wage		Hourly wage		Hourly wage	
	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)	Total sample	Treatment control (CEM)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
M3: Children 0-3	-0.1012**	-0.0678	-0.0093	-0.0847	-0.0776***	-0.0842***	-0.0895*	-0.1628***
	(0.0412)	(0.055)	(0.0626)	(0.0717)	(0.0253)	(0.0277)	(0.0469)	(0.0526)
M4: Children > 3	-0.0335	-0.0397	0.008	-0.0133	0.0127	0.0271	-0.0205	-0.0686
	(0.0357)	(0.045)	(0.0498)	(0.0616)	(0.0241)	(0.0253)	(0.0418)	(0.0478)
Part-time	-0.2012***	-0.1523*	-0.125	-0.1806	-0.1629***	-0.1576***	-0.0978	-0.2125
	(0.0511)	(0.0874)	(0.0964)	(0.1684)	(0.044)	(0.0609)	(0.0908)	(0.1445)
Part-time*M3			-0.1569	-0.018			-0.0234	0.0965
			(0.104)	(0.1766)			(0.0965)	(0.1516)
Part-time*M4			-0.065	0.054			-0.1107	0.0129
			(0.0867)	(0.1438)			(0.0855)	(0.1434)
Male partner's characteristics								
Tertiary educ.	0.0094	0.0462	-0.0544	-0.0953	0.0735***	0.0788***	0.0261	0.0133
	(0.0279)	(0.0451)	(0.0558)	(0.0779)	(0.0182)	(0.0207)	(0.0328)	(0.0401)
Tertiary educ*M3			0.0727	0.3078**			0.0276	0.0573
			(0.1009)	(0.1467)			(0.0495)	(0.0565)
Tertiary educ*M4			0.087	0.1505*			0.0846**	0.1073**
			(0.0631)	(0.0901)			(0.041)	(0.0488)
Workhours (a)	-0.0006	-0.0046**	-0.002	-0.0099***	-0.0009	-0.0014	-0.0011	-0.0016
	(0.0017)	(0.0022)	(0.0035)	(0.0027)	(0.0013)	(0.0015)	(0.0021)	(0.0027)
Workhours*M3			0.0001	0.0066			0.0023	0.0022
			(0.0058)	(0.006)			(0.0037)	(0.0043)
Workhours*M4			0.0025	0.0113***			-0.0005	-0.0009
			(0.0039)	(0.0039)			(0.0027)	(0.0034)
Self-employed	-0.0586	0.0556	0.0617	0.2877**	-0.0492	-0.0468	0.0122	0.0245
	(0.0446)	(0.0614)	(0.0859)	(0.1131)	(0.0309)	(0.0367)	(0.0514)	(0.0614)
Self-employed*M3			-0.2523	-0.3445**			-0.1772*	-0.1838*
			(0.1592)	(0.1512)			(0.095)	(0.1086)
Self-employed*M4			-0.1283	-0.3294**			-0.0307	-0.0465
			(0.0987)	(0.1332)			(0.065)	(0.0752)
Recovery	0.0373	0.0384	0.1307**	0.0329	-0.1253***	-0.1297***	-0.1214***	-0.1845***
	(0.0388)	(0.0499)	(0.0632)	(0.0733)	(0.0289)	(0.0333)	(0.0384)	(0.0462)
Recovery*M3			-0.134	0.068			0.0178	0.1100**
			(0.0827)	(0.102)			(0.0469)	(0.0529)
Recovery*M4			-0.1097*	-0.0135			-0.019	0.0548
			(0.0595)	(0.0717)			(0.0386)	(0.0456)
N obs.	1,022	667	1,022	667	2,180	1,911	2,180	1,911
R2	0.39	0.46	0.40	0.48	0.41	0.41	0.41	0.42

Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses.

(a) Evaluated at the mean value of the partner's workday (42 hours per week).

Other controls: age, age squared, nationality, supervisory tasks, type of contract, years of work experience, workday (weekly hours), firm size (5 dummies), occupation (24 dummies), economic sector (12 dummies), residence's degree of urbanisation (3 dummies), annual employment growth rate in NUTS-2 regions (autonomous regions).

Source: Own elaboration (ECV cross-sectional microdata, waves 2009 to 2017, Base 2013).

[Insert Appendix here]

Appendix

Selection of the sample and variables and calculation of hourly wages

The ECV does not offer direct information on hourly wages at the time of the interview and it must therefore be computed. To that end, it is necessary to take into account that the ECV distinguishes between the 'survey period' (the year of the interview), and the 'income reference period' (the year preceding the survey period). The survey offers information about annual gross employee income in the year prior to the interview, which jointly refers to the main job and other secondary jobs. It also offers information regarding the number of full-time and part-time months worked during the income reference period. The labour market situation of individuals refers to the survey period and allows distinguishing between full-time salaried workers, part-time salaried workers, the self-employed, the unemployed, and individuals out of the labour market. Additionally, the survey offers information—referred to the survey period—on the number of hours usually worked per week in the main job and the total number of hours usually worked in second, third… jobs. Hence, the total number of hours worked per week is the sum of both variables, and the number of hours worked per year is computed assuming 48 weeks. For the purpose of our study, the sample is composed of female salaried workers aged 25 to 45 whose partner was employed at the time of the interview. In order to solve the lag between the information on wages (referred to the year before the interview) and the working status information (referred to the 'survey period'), we have applied an additional set of restrictions to construct our sample. In particular, for the sample of women who stated they were full-time workers during the survey period, we selected those who worked full time for twelve months during the income reference period and still worked in the same job at the time of the survey. For the sample of women who

stated they were part-time workers during the survey period, we selected those who worked part time for twelve months during the income reference period and still worked in the same job at the time of the survey. Following the procedure proposed by Pal and Waldfogel (2016), we eliminated salaried workers whose annual wage was 45% below the legal minimum wage. The reference for part-time workers was 45% below half of the legal minimum wage. As an example, the annual minimum wage in Spain in 2009 was 8,736 euros. Hence, we excluded full-time workers with an annual gross wage below 3,931 euros and part-time workers with an annual gross wage below 1,966 euros. Finally, the gross hourly wage is the annual gross wage divided by the total number of hours worked per year.