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# Motherhood, Labor Market Trajectories, and the Allocation of Talent: harmonized evidence on 29 countries

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## Abstract

In this paper we assess whether changes in labor market decisions upon motherhood lead to potential inefficient allocations of talent. Using an event study approach with retrospective data drawn from SHARE for 29 European countries we show that motherhood effects go beyond the well studied effects of labor market participation decisions: the arrival of the first child substantially affects the uptaking of alternative modes of employment, such as part-time and self-employment, that are characterized by flexible or reduced work schedules but also lower pay on average. We also show that the size of labor market responses to motherhood are larger in societies with more conservative social-norms or with weak policies regarding work-life balance. To assess the effects of motherhood over the allocation of talent, we explore how labor market responses to parenthood vary by alternative measures of talent or ability. We find that all women, even those with the highest level of ability and abler than their husbands face large motherhood effects, while men show virtually no changes in the labor market when becoming fathers. We also find that mothers who become self-employed after the birth of the first child are those that are less entrepreneurial-able according to cognitive ability and personality traits shown to impair business survival. Overall, our results suggest relevant changes in the allocation of talent caused by gender differences in nonmarket responsibilities that can have sizable impacts on aggregate market productivity.

Keywords: Child penalty, Part-time, Self-employment, Motherhood, SHARE data.

JEL Classification: J13, J16, J24

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# 1 Introduction

Children trigger a strong demand for flexibility in the labor market and, in this sense, recent literature sees motherhood as the last hurdle to achieve gender equality. Voluntarily or not, many women leave the labor market after the birth of their first child (Angelov et al., 2016; Kuziemko et al., 2018; Kleven et al., 2019a; Nix and Andresen, 2019), whereas those who remain tend to move to more flexible work arrangements such as part-time jobs (Kleven et al., 2019b; Paull, 2008 and de Quinto et al., 2020) and informal jobs in less developed economies (Berniell et al., 2019).

Based on harmonized data for 29 European countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) and following an event study approach, we contribute to the literature on the so-called child penalties or motherhood effects in three directions. First, we provide extensive evidence on the role of motherhood as one common trigger for labor market decisions that result in a large representation of women among part-time workers, and, to a lesser extent, also among the self-employed—as part-time jobs and self-employment are seen as a route for those in search of more flexible schedules.<sup>1</sup> We explore whether these effects on part-time and self-employment upon motherhood are permanent for most European women—even if they intended to be temporary. Also, we assess whether there is an increase in job instability after motherhood, possibly due to going back and forth in and out of the labor market when having a child, or to switching from full-time to part-time or to self-employment.

Second, and most importantly, we study how the birth of the first child affects the allocation of talent in the labor market. We state that resources are being underused when, in response to motherhood, more “talented” women decide to stop working or engage in part-time work, or when women with less managerial skills decide to become entrepreneurs—which in our data is identified with self-employment. To assess how parenthood affects the allocation of talent, we study labor market responses to the birth of the first child across groups with different talent or ability levels. We use three alternative measures of talent: educational attainment, a measure of the ability at math by the age of 10, and measures of personality traits (which are formed during childhood and have been shown to be quite stable and are related to entry into self-employment and success of entrepreneurship).

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<sup>1</sup>The quest for work-life balance is usually cited as the main reason why part-time work is so dominated by women (over 77% of European part-timers are female women, according to Eurostat). In addition, several papers find that one of the main reasons that lead women to opt for self-employment is that the greater flexibility allows balancing work and family responsibilities (Buttler and Sierminska, 2020; Hughes, 2003; Lombard, 2001). This may explain why women with young children are more likely to be self-employed, and why self-employment is more common among women when public childcare services are scarcer (Carrasco and Ejrnæs, 2012). These papers follow into a larger literature on the relationship between fertility and labor market (e.g. Angrist and Evans, 1996; Agüero and Marks, 2008).

Furthermore, we provide evidence of motherhood effects on women’s labor market outcomes for a large set of European countries. This is made possible because SHARE has the unique advantage of asking respondents about all the important life events—including parenthood and labor histories—that have occurred to them from childhood to old age, using the same questionnaire across all countries. We carry out our estimations first over the pooled sample of the 29 countries, before looking for heterogeneous effects across all 29 countries, and last across four groups of countries (Northern, Southern, Western, and Eastern). Moreover, we relate the size and directions of labor market responses to motherhood to gender-role attitudes and “family-friendly” policies.

Our results for the pooled sample of 29 countries show that women’s probability of working drops 25% upon motherhood. We find, however, that these results vary considerably across countries, and that societies with more conservative social-norms or with weak policies regarding work-life balance are characterized by larger motherhood effects in employment. We also find a sharp increase, of close to 50%, of both part-time employment and self-employment shortly after the birth of the first child. These effects remain of the same order of magnitude 15 years later. In contrast, we find a negligible effect of fatherhood on all outcomes. Naturally, were all labor market transitions into part-time- and self-employment temporary adjustments to motherhood, they would facilitate the combination of work and family life, thus allowing women to stay in the labor force. However, the literature has shown that part-time and self-employment impose costs on women’s long term career prospects. Self-employed women in non-professional occupations not only earn less than men (Budig, 2006) but also receive lower returns to experience (Williams, 2000).<sup>2</sup> The switch to part-time jobs—particularly when it involves a change of employer—and to self-employment, may partly explain why we find that women face much more job instability than men: 15 years after the birth of the first child, they have had twice as many different jobs than men, despite holding an identical number of jobs up to parenthood. This adds to the concern of self-employment and part-time jobs being worse quality jobs than regular employment, as a history of job changes is perceived by prospective employers as a signal of a poor attitude, which may feed back into even worse opportunities (Cohn et al., 2020). It could also indicate lower attachment to the labor market with frequent entry and exits, due to, for example, subsequent

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<sup>2</sup>The shortage of part-time vacancies often forces workers in search of a reduction in working hours to downgrade their job category, change employer, and accept both lower hourly wages and worse career prospects (Connolly and Gregory, 2008, 2009; Manning and Petrongolo, 2008; Hudson and Kalleberg, 2019; Russo and Hassink, 2008; Fernández-Kranz and Rodríguez-Planas, 2011; Goldin, 2014). Self-employment may offer an alternative to part-time where downgrading is either absent or less visible, but this option is risky and, on average, also considerably worse remunerated than a salaried full-time job (Hamilton, 2000; Yurdagul, 2017; Poschke, 2013b). Self-employment also works as an alternative to unemployment for women with low levels of education. Several papers discuss this possibility in general and for women in particular (Carrasco and Ejrnæs, 2012; Wellington, 2006; Poschke, 2013a).

births.

More novel, our results suggest that motherhood has large effects on the allocation of talent in the labor market: we find that all women, even those with the highest level of ability, face large motherhood effects on employment. Regarding self-employment, women who become entrepreneurs do not have the qualities usually associated with successful entrepreneurship, such as high levels of educational attainment, better cognitive skills, as well as some personality traits (Levine and Rubinstein, 2017a; Caliendo et al., 2020a). When studying the heterogeneous impacts of motherhood on self-employment for groups with high and low entrepreneurial talents we find that mothers who choose self-employment after the birth of the first child are those with less entrepreneurial ability. Moreover, when focusing at the household level we also find evidence of changes in the allocation of talent. In fact, even in couples where women have a higher level of education than her partner, parenthood implies a sharp decrease in the probability of working and an increase in holding part-time jobs or engage in self-employment for mothers, while no significant changes are observed for fathers.

These results are related to the recent literature that has shown that gender differences in non-market responsibilities can have sizable impacts on aggregate productivity and welfare. Hsieh et al. (2019) shows how a sizable part of aggregate growth from 1960 to 2010 in the US can be explained by the increasing presence of women and black men in occupations from which at the beginning they were basically banned. Even though women are able to access the labor market, Goldin (2014) and Erosa et al. (2020) argue that the greater time that women allocate to non-market activities may in part explain the existing misallocation. For instance, misallocation and gender wage gaps may arise because children generate career interruptions of mothers at a stage of their life cycle when substantial accumulation of human capital takes place (Erosa et al., 2016).<sup>3</sup> Our work states that this misallocation may in part be associated to motherhood—and the associated non-market responsibilities—rather than marriage. Moreover, we show that this inefficiency in the allocation of talents not only results from changes in the extensive and intensive margins in the labor market upon motherhood, but that it may also occur along a different dimension of occupational choice: the entry into self-employment.

In the remainder of the paper we start by describing the data and the empirical strategy in Section 2. In Section 3 we discuss the motherhood effects on employment, part-time work, self-employment, and job instability for the pooled sample of countries as well as by region and individual countries.

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<sup>3</sup>Similarly, Adda et al. (2017) finds that the greater part of the career cost of children—losses in lifetime labor earnings—can be explained by the intermittency or reduced labor supply, while the remainder part is due to wage changes as a result of lost investments in skills and depreciation.

Also in Section 3, we relate the previous results to gender norms and gender-friendly legislation at the country level. In Section 4 we analyze how motherhood affects the allocation of talent in the labor market using several measures of human capital such as education attainment, math ability at the age of 10, and personality traits. Finally, in Section 5 we present our main conclusions.

## 2 Empirical Strategy

### 2.1 Event Study Specification

We adopt the event study approach in Kleven et al. (2019b) to estimate the impact of the first child on mothers' and fathers' labor outcomes. Throughout the paper we refer to 'first birth' or 'first child' as the first live birth. Identification rests on the assumption that labor market outcomes are uncorrelated with the timing of the first birth, conditional on becoming a parent within our sample period and several controls.<sup>4</sup>

Consider a panel of  $i = 1, \dots, N$  individuals observed for all or some  $t = 1, \dots, T$  calendar periods (years). Individuals become parents for the first time in calendar period  $E_i$ , and positive (negative)  $e_{it} = t - E_i$  is the number of years since (before) the birth of the child. Let  $\tau$  be the relative period or event time index, such that  $\tau = 0$  denotes the year of birth of the first child. The relative time index allow us to compare individuals with the same exposure to parenthood even if their children were born in different calendar years. We model outcome  $Y$  for individual  $i$  in county  $c$  and calendar time  $t$  as:

$$Y_{itc} = \sum_{\tau \neq -1} \beta_{\tau} I(\tau = e_{itc}) + \sum_j \gamma_j I(j = age_{itc}) + \sum_y \delta_y I(y = t) + \sum_s \lambda_s I(s = c) + \varepsilon_{itc}. \quad (1)$$

The first term in the right hand side includes event time dummies. The event time coefficients  $\beta_{\tau}$  for  $\tau \geq 0$  capture the post-child effects.<sup>5</sup> We set  $\tau = -1$  as the omitted category, thus all  $\beta_{\tau}$  are measured relative to the year before the first child was born. The following terms include a full set of age-in-years dummies, calendar year dummies, and country dummies. As usual in the related literature, we convert level effects to percentage effects relative to the counterfactual outcome without children. Formally, the percentage effect for each event time  $\tau$  is given by  $P_{\tau} = \frac{\hat{\beta}_{\tau}}{E[\tilde{Y}_{itc} | \tau]}$ , where  $\tilde{Y}_{itc}$  is the predicted outcome

<sup>4</sup>Kleven et al. (2019b) show that this approach performs well in identifying both short- and long-run effects of children compared to widely used alternative approaches, such as instrumental variables and differences-in-differences. For a formal discussion about the identifying assumptions in an event study see Borusyak and Jaravel (2018), Sun and Abraham (2020), and Schmidheiny and Siegloch (2020).

<sup>5</sup>Long-term effects will also capture the impact of children born after the first child.

at event time  $\tau$  from model (1) when subtracting the event time terms. We use bootstrap samples when computing standard errors for  $P_\tau$  to account for the fact that the denominator is an estimated object.

The dependent variable  $Y$  represents our four labor market outcomes of interest: (i) whether the individual was working at time  $t$ ; (ii) whether the individual was working part-time at time  $t$ ; (iii) whether the individual was self-employed at time  $t$ ; and (iv) the number of jobs held up to period  $t$ . The three last outcomes are conditional on being employed, hence a potential concern is that our estimates may also capture selection effects. However, since the existing evidence supports a positive selection into employment (for a review of the literature see Blau and Kahn, 2017), our estimates would be a lower bound of the true impact of children on these outcomes.

## 2.2 Data and sample

We use data from the SHARE Job Episodes Panel, which is a single retrospective panel dataset built from waves 3 and 7 of the Survey of Health, Ageing and Retirement in Europe (SHARE).<sup>6</sup> SHARE is originally a harmonized panel of about 140,000 individuals aged 50 and over in 28 European countries and Israel. What makes waves 3 and 7 of SHARE special is that respondents were asked about their life history—including working life and fertility history—through a retrospective questionnaire. Our sample is drawn from the 28,465 individuals interviewed in wave 3 (SHARELIFE) and the 62,561 individuals who participated in the life history interview in wave 7, i.e., SHARE respondents taking part in wave 7 who had not participated in wave 3. We merge these data with information on those same respondents from the regular waves of SHARE in order to have information on their socio-demographic characteristics and other variables.

Built in this way, the retrospective panel dataset contains yearly information at the individual level. Each respondent contributes with as many observations as the years of age from her/his birth to the age at the time of interview. In particular, the dataset contains yearly information that allows us to construct our four labor market outcomes of interest: employment status, self-employment, part-time employment, and the number of jobs held up to a certain year. Employment status for each individual-year is defined based on the start and end year of each job spell. The dummy variable *employed* takes the value 1 if the respondent in a given year was working and 0 otherwise. The other three outcomes are defined for working individuals only, by attaching job characteristics to each job

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<sup>6</sup>Specifically, we use the Job Episodes Panel release 7.1.0 (DOI: 10.6103/SHARE.jep.710). See Brugiavini et al. (2019) for methodological details.

spell. Based on the job title—employee, civil servant, or self-employed—we generate the dummy variable *self-employed*. The dummy variable *part-time* takes the value 1 if the individual was working part-time in the corresponding job spell and year. Finally, we construct the variable *number of jobs* that counts all job spells and which we interpret as a measure of job instability.

The data also include information on the dates of birth of children, which is asked independently from information on work history, i.e., instead of asking whether the person was employed before and after having a child, respondents are asked in two separate sections about the dates of birth of their children on the one hand, and about the dates of start and end of each of the jobs they had in their life on the other hand.

Using SHARE allows us to estimate both short- and long-term effects of motherhood on labor market outcomes for the 29 countries using the same data, hence avoiding issues of heterogeneity across questionnaires or survey methods (any deviation from the original questionnaire is strictly forbidden). The richness of the SHARE questionnaire also allows us to explore potential mechanisms to explain differences in labor market responses to motherhood across countries and across time. For instance, we use cognitive abilities at age 10, data on educational attainment from other waves of SHARE, and the Big Five personality traits data collected in wave 7, to show how motherhood, on top of pushing women out of the labor market, also leads to inefficient choices for those women who remain in the labor force.<sup>7</sup> Had we used administrative data to carry out our analysis, we would have had to deal with problematic discrepancies from one country to another, as ways of computing or reporting labor force status may differ across countries. More importantly, we could not have studied such a large sample of countries. Survey data has additional perks: it allows us to access information that does not exist in administrative data, such as any subjective question, personality traits, childhood circumstances, etc.<sup>8</sup>

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<sup>7</sup>One novelty of the SHARE wave 7 questionnaires is that they introduced the 10-item Big Five Inventory to measure personality. The Big Five has been the predominant model of personality traits since the 1980s. This taxonomy arranges a variety of personality variables into concise personality constructs: openness to experience, extroversion, neuroticism, conscientiousness, and agreeableness. For methodological details about the 10-item Big Five Inventory in SHARE wave 7 see Chapter 2.3 of Bergmann et al. (2019).

<sup>8</sup>Of course this comes at a cost, as several concerns usually emerge when using survey data. First, the reliability of a survey depends on both the precision of respondent’s assessments and the distribution of errors originating during the interviews. In other words, if measurement errors are non-classical, inference is problematic. One study (Bingley and Martinello, 2014) used an individual linkage with extremely precise Danish administrative registers to perform an internal validation study of SHARE in Denmark data for education, labor market status and gross household income. Where they find measurement error (in schooling only), it is modest, small and insignificant. They conclude that “unlike income validation studies for the US Panel Study of Income Dynamics and the Health and Retirement Study, we find that SHARE Denmark income measurement error is classical.” Another common issue, in retrospective studies more particularly, is recall bias, which occurs when respondents provide erroneous responses due to their inability to recall past events. As established in Mazzonna and Havari (2011), which assesses the internal and external consistency of some measures of childhood health and socio-economic status, respondents seem to remember well their health status and living conditions between ages 0-15.



Our sample includes only those individuals we observe at least once before and once after becoming parents, and whose age at the birth of the first child is over 16 years old. The resulting sample contains 45,326 women (summing 1,327,120 person-year observations) and 33,683 men (summing 1,082,997 person-year observations), who had children at some point of their life before the time the retrospective interview takes place. The number of observations for each individual ranges from 20 years before to 20 years after the birth of their first child. All 29 countries are part of the sample: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and Switzerland.

Tables A.1 and A.2 in the Appendix describe the samples for the pool of countries (pooled sample) and for each country, respectively, in the year prior to the birth of the first child. In our pooled sample, 91% of men were working at that time, compared with 72% of women; self-employment was higher among men, so was the number of jobs held up to that time, while part-time jobs were more prevalent among women. On average, women first became mothers when they were 24.4 years old (from 22.2 in Romania and Bulgaria to 26.8 in Ireland), while men first became fathers when they were 27.5 years old. Figure A.1 in the Appendix shows the distribution of age at first birth for men and women across countries. Our sample is made of cohorts born mostly between the 1920s and the 1960s, with an emphasis on early baby-boomers (average year of birth around 1947, as shown in Table A.1), who in turn gave birth to their first children mostly between the 1950s and the 1980s (see Figure A.2 for the whole distribution of years of birth of the first child for the sample of women). Therefore, our sample allows us to explore the effects of motherhood on the labor outcomes of women who had their first child in the early 1970s on average.

### **3 Motherhood Effects on Employment, Part-Time Employment, Self-Employment, and Job Stability**

#### **3.1 Pooled Results**

In this section we present the results from estimating equation (1) on the pooled sample of all 29 countries for our four outcome variables: (i) whether the individual was working at time  $t$ , (ii) whether the individual was working part-time at time  $t$ , (iii) whether the individual was self-employed at time  $t$ , and (iv) the number of jobs held up to period  $t$ , where the last three outcomes are conditional

on being employed. Figures 1a, 1b, 1c, and 1d show the normalized estimates of  $\beta_\tau$ s (i.e.  $P_\tau = \frac{\hat{\beta}_\tau}{\bar{Y}}$ ) for these outcomes, respectively, from 5 years prior to parenthood to 15 years after. As explained in Section 2, these normalized coefficients are to be read relative to the year before the birth of the first child ( $\tau = -1$ ).

Our estimates of short- and long-run motherhood effects (i.e., the effects at  $\tau = 1$  and  $\tau = 15$ ) on the probability of working for the pooled sample of 29 European countries, -24% and -21%, respectively, fall close to the lower end of the (-20)-(-40%) interval found in the literature (Angelov et al. 2016; Kleven et al., 2019b; Kleven et al. 2019a; Berniell et al., 2019; and Kleven et al., 2020).<sup>9</sup> Results for women also point to a sharp increase, larger than 50%, of both part-time employment and self-employment immediately after the birth of the first child.<sup>10</sup> Importantly, fifteen years after motherhood, all labor market responses remain of the same order of magnitude.<sup>11</sup> Results for men reveal a zero immediate effect of fatherhood on employment and self-employment, and a small negative effect on part-time employment. Likewise, the effect on employment, although very small (around -1% in the long-run), eventually becomes statistically significantly negative for men. The transition to fatherhood is, therefore, smooth for all three outcomes in contrast to the abrupt transitions to motherhood.

The stability of employment is captured by our fourth outcome measure, namely the number of jobs held up to a given period (see Figure 1d). Despite a common trend in the number of jobs held before parenthood, women face increased instability of employment relative to men after motherhood to the extent that 15 years after motherhood, the average number of jobs held by women (relative to the number held up to  $\tau = -1$ ) has increased by 15% while over the same period that of men has only increased by 7%. Moreover, whereas in the case of men the number of jobs evolves smoothly through time, for women it stalls during pregnancy, to jump abruptly immediately after the first birth: from this point onwards, a growing gap between men and woman emerges. We interpret this evidence as higher job instability for women upon motherhood. This could be due to women searching for more

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<sup>9</sup>In the Appendix, we assess whether the large labor market effects observed can be attributed to marriage instead, which often occurs right before or right after birth. We show that although marriage has an effect, the magnitude is much smaller compared with the effect of the first child. Based on this evidence we discard a narrative centered on marriage—rather than motherhood—bearing the responsibility of women exiting the labor force or going into more unstable forms of employment.

<sup>10</sup>As we argued before, self-employment may offer more flexible arrangements in terms of working hours. Figure A.3 in the Appendix shows that the distribution of hours worked per week is bunched around 40 hours for non self-employed men and women, while self-employment seems to offer more opportunities for adjusting working hours, as the distribution of hours per week is more disperse, especially for women.

<sup>11</sup>Long-term effects will also capture the impact of children born after the first child. To explore this possibility we run separate regressions for women who had only one child and those who have more than one child. We find that for the former the effects of the first child diminish over time while for the latter the effects persist in the long-run. This should be interpreted as suggestive evidence of the cumulative effect that subsequent children have, since we cannot rule out that the heterogeneous effects in the two groups is just the result of differences in their underlying characteristics.

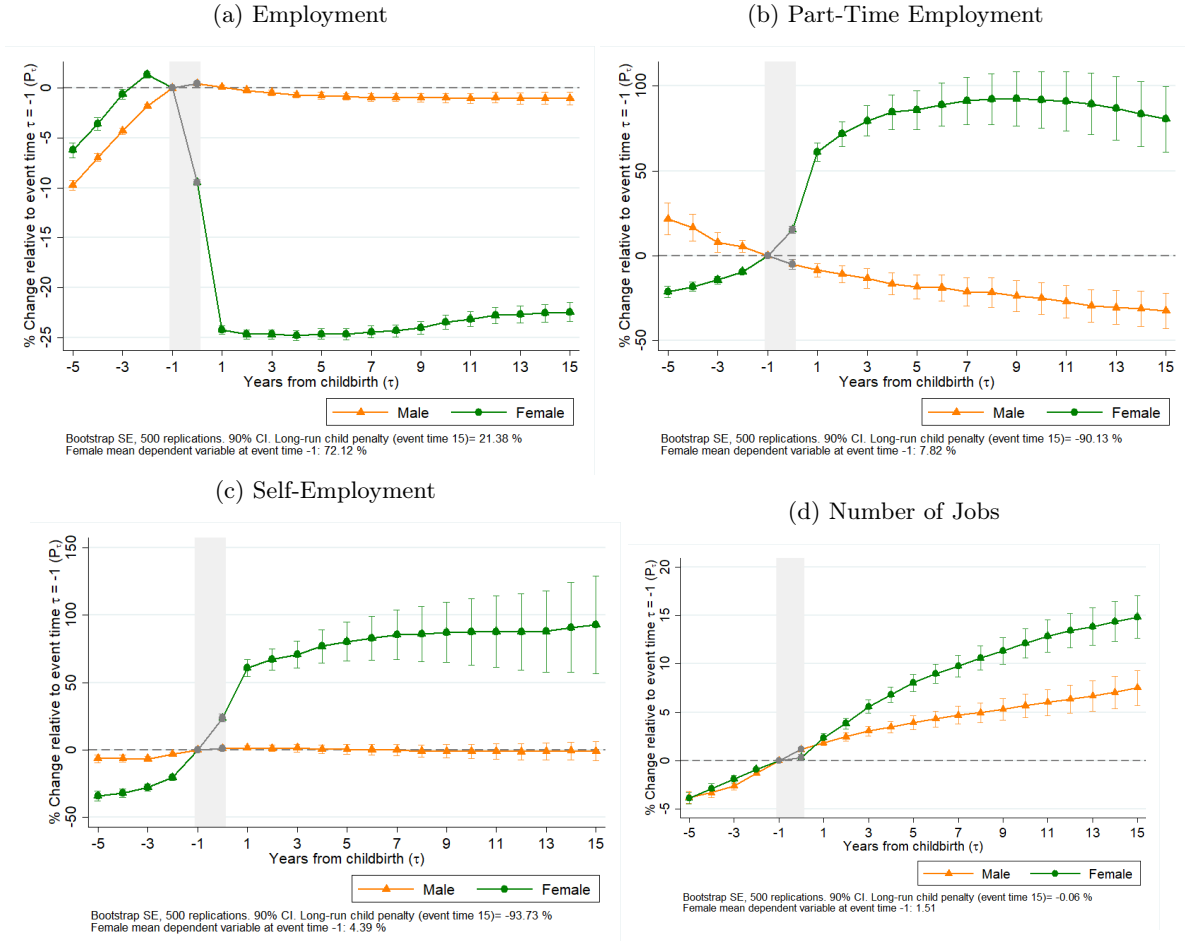
flexibility or to the fact that they do not enjoy any job-protected leave.<sup>12</sup>

Across all four dimensions of the labor market, the gap between trajectories of men and women is driven exclusively by women upon the birth of the first child: this is very clear in Figures 1a and 1d, as trends were perfectly parallel before childbirth for men and women and started diverging since then. When pretrends—i.e., trends before the first birth—are common to men and women, and fathers' outcomes do not change discontinuously at the time of birth, we can implicitly rely on fathers as a control group to provide further credibility to our estimated long-run effects. Figures 1b and 1c offer a more complex response in terms of part-time employment and self-employment, as men and women evolve differently before childbirth. In both cases the birth of the first child produces a clear-cut break in women's trend, while men follow their pre-existing trend.

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<sup>12</sup>Even though the number of jobs held by women may increase mechanically due to work interruptions occurring at each pregnancy, we can rule out this possibility. By definition, this "number of jobs" does not count as two different jobs if the same position is held before and after a child birth.

Figure 1: Parenthood Effects on Labor Outcomes, Pooled Sample



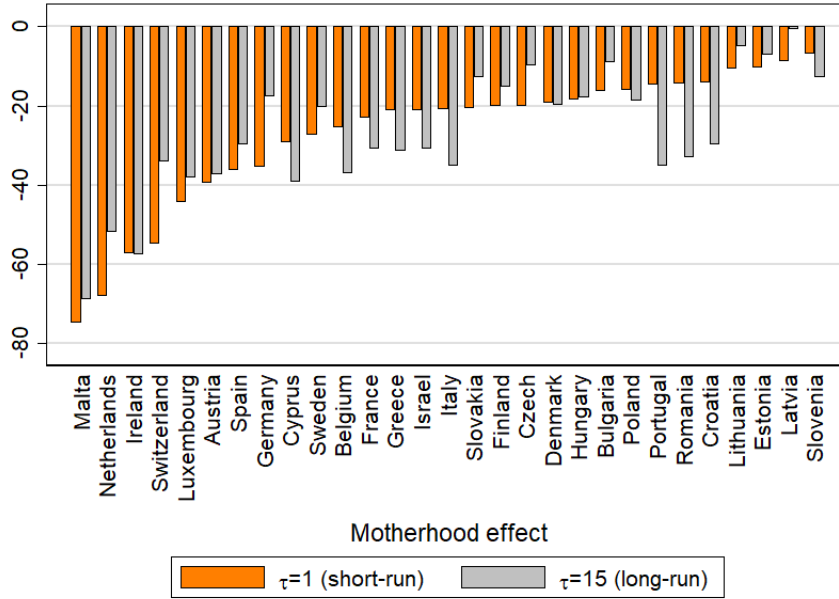
Notes: These graphs show the normalized effects  $P_t$ , which result from estimating equation (1) for mothers and fathers separately in the pool sample of 29 countries. The outcome variables are employment status, working part-time, being self-employed, and the number of jobs held. The last three outcomes are conditional on being employed. See Section 2 for definitions. The standard errors were computed using 500 (clustered by individual) bootstrap samples.

### 3.2 Heterogeneity Across Countries, Homogeneity Within Regional Clusters of Countries

When analyzing countries individually, we confirm that motherhood decreases the probability of working in all of them, but results show considerable variation. The average estimated motherhood effects are displayed in Figure 2 for employment, both in the short- (one year post birth) and the long-run (15 years post first birth). Figures A.5 and A.6 in the Appendix display motherhood effects for part-time and self-employment.<sup>13</sup>

<sup>13</sup>Our country by country estimates of motherhood effects are slightly different from those obtained previously in the literature for a subset of countries possibly because they pertain to an earlier time period and also because of some

Figure 2: Short- and Long-Run Motherhood Effects on Employment by Country



Notes: This graph shows the normalized effects  $P_\tau$  for the year immediately after motherhood ( $\tau = 1$ ) and 15 years after motherhood ( $\tau = 15$ ), which result from estimating equation (1) for mothers by country. The outcome variable is employment status. The standard errors for each country were computed using 150 (clustered by individual) bootstrap samples. All estimates are statistically significant at 10%, except for Latvia.

A few stand-alone countries, such as Malta, Ireland, or the Netherlands, hold the largest motherhood effects in terms of employment, followed by other Western European countries such as Switzerland, Luxembourg, and Austria. Northern countries exhibit lower motherhood effects, followed by Eastern countries, amongst which Baltic countries, with close to zero effects. The evolution of motherhood effects also differs across countries: for example, Portugal, Romania, Croatia and Italy show increasing motherhood effects both in absolute and relative terms, while Germany, Slovakia, Spain and Sweden see a reduction of motherhood effects with time.

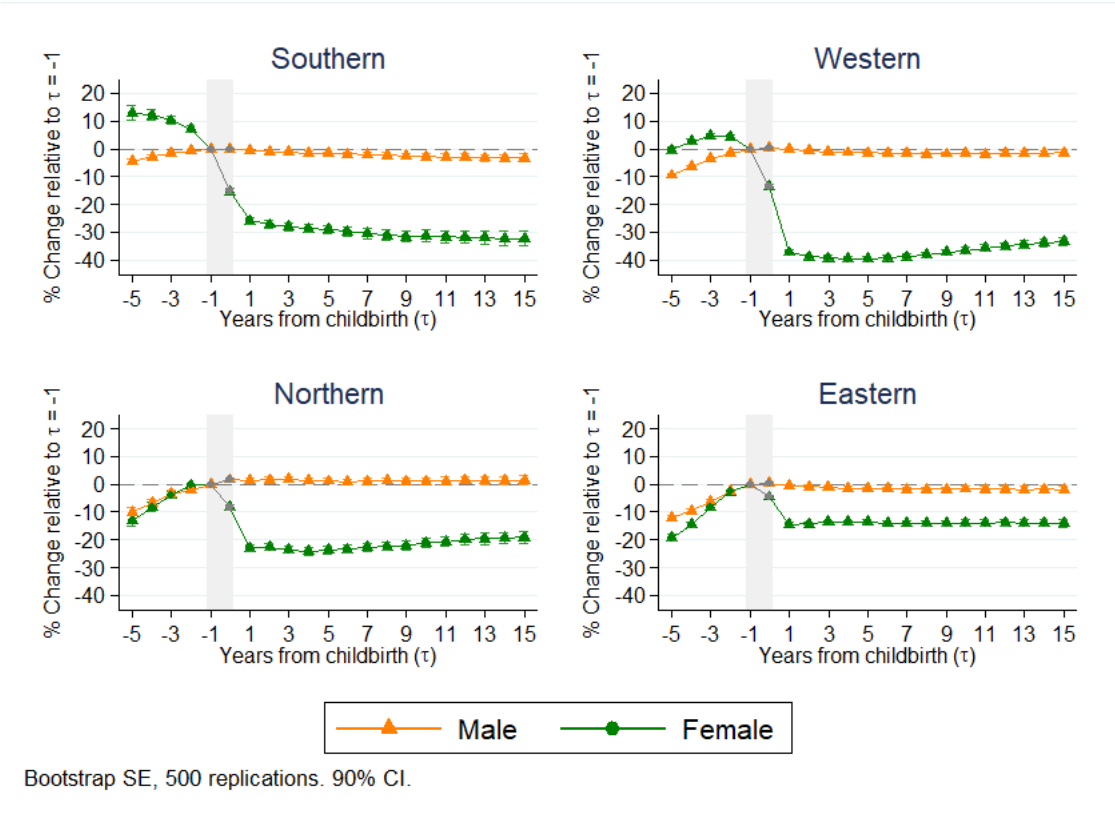
Despite considerable variation across countries, certain regional patterns emerge. For example, Eastern European countries (all belonging to the former Sovietic bloc) stand at the bottom of this ranking of European countries with small or close to zero effects on employment, part-time- and self-employment. Likewise, there seems to be some common patterns—although less extreme—between

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minor methodological differences. With a horizon of 15 years, our estimates of -20 and -27% for Denmark and Sweden are higher in absolute terms than those found in Kleven et al., 2019a (-13 and -7%) over a 10 year horizon; we find a -18 and -42% motherhood effect for Germany and Austria, where their estimates are -30 and -27%; we find a -48% effect for Ireland, but do not provide estimates for the US and the UK as these countries are not part of SHARE for which they find a -43 and -44% effect, respectively.

other geographical clusters of countries, e.g. Southern, Northern and Western countries. Pooling countries into four geographical clusters has the additional advantage of dealing with the small number of observations—and large standard deviations—for some of the countries, particularly when looking at part-time- or self-employment outcomes which are only defined for those who work. Hence, we estimated (1) for the same outcome variables but pooling countries by geographical region.<sup>14</sup> Figure 3 below, and A.7, A.8 and A.9 in the Appendix, show the normalized effects  $P_\tau$  for employment, part-time employment, self-employment, and number of jobs, respectively.

Figure 3: Parenthood Effects on Employment by Region



Notes: These graphs show the normalized effects  $P_\tau$ , which result from estimating equation (1) for mothers and fathers separately on pooled data for four groups of countries. The dependent variable is employment status. Western Europe includes: Austria, Belgium, France, Germany, Ireland, Luxemburg, The Netherlands, and Switzerland. Northern Europe includes Denmark, Finland and Sweden. Southern Europe includes: Cyprus, Greece, Israel, Italy, Portugal and Spain. Eastern Europe includes: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. Malta is not included in any of the geographical clusters. Regressions are estimated separately for males and females. The standard errors were computed using 500 (clustered by individual) bootstrap samples.

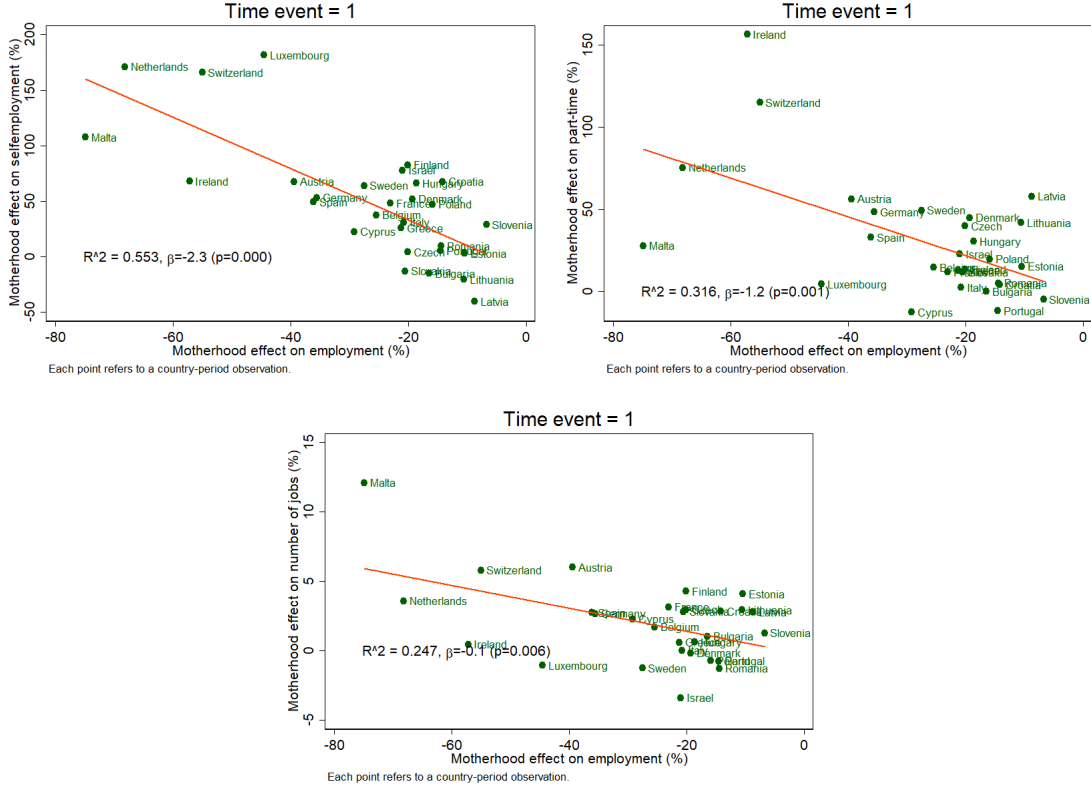
<sup>14</sup>Western Europe includes Austria, Belgium, France, Germany, Ireland, Luxemburg, The Netherlands and Switzerland; Eastern Europe includes Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Southern Europe includes Cyprus, Greece, Israel, Italy, Portugal and Spain; Northern Europe includes include Denmark, Finland and Sweden. Malta is left out of any geographical cluster.

Figure 3 shows that Western Europe displays the largest motherhood effect in employment, close to 40%, which starts decreasing only 10 years after first birth to reach almost 30%, 15 years after motherhood. In contrast, Eastern countries exhibit the lowest motherhood effect on employment, around 15%, which remains almost constant through time. For South European countries, the motherhood effect is roughly 20% right after birth but it grows with time to a bit over 30%, 15 years down the road. For Northern countries, the motherhood effect is slightly larger than 20% and remains fairly constant 15 years on. A.7, A.8, and A.9 in the Appendix show similar patterns for the other outcomes of interest.

### **3.3 Policies Versus Gender Norms as Potential Drivers of Heterogeneity Across Countries**

At the regional level as well as at the country level, larger drops in womens' employment tend to be observed in regions where more women enter self-employment or part-time employment, conditional on remaining in the labor force. We therefore look into correlations between all these motherhood effects: Figure 4 shows that while the Netherlands, Switzerland and Ireland have large negative effects on employment and even larger positive effects on self- and part-time employment, Eastern countries have low responses in terms of all outcomes. These negative correlations suggest all these employment responses to motherhood may share common drivers. One obvious example is given by Eastern countries, which were all part of the Soviet bloc at the time these mothers had their first baby: the quasi-absence of motherhood effects there is very likely to be the result of Socialist policies aimed at reaching gender equality during the Soviet era. For example, Campa and Serafinelli (2019) show how regime's efforts could shape gender-role attitudes and women's attitudes toward work by comparing attitudes formed in Eastern and Western countries during that period; and Pronkina et al. (2020) show how not all Soviet regimes had the same impact on education returns, workforce participation, and fertility, depending on whether they were part of the USSR or of the Soviet bloc only. Our results echo theirs, as we find much lower (almost zero) motherhood effects in the Baltic countries, which were part of the USSR, than in Poland, very much similar to Lithuania in many respects, but with a different kind of Socialist regime and a weaker implementation of the gender-equal Soviet ideology.

Figure 4: Correlations Between Short-Run Motherhood Effects Across Countries



Notes: These graphs show the normalized effects  $P_\tau$  for the year immediately after motherhood ( $\tau = 1$ ), which result from estimating equation (1) for mothers by country.

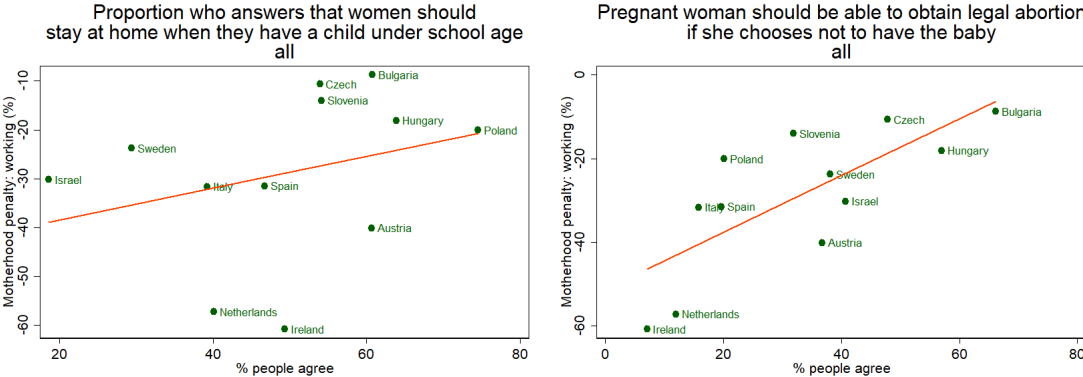
Which of labor market regulations or gender norms is more likely to explain how mothers' labor market response differs across countries is a tricky question to answer, as government policies and political regimes have been shown to trigger changes in social norms, both inside and outside the Soviet context. Bertrand (2011) provides a comprehensive review of the empirical determinants of gender identity norms. One brilliant example can be found in Goldin and Katz (2002), which shows that the introduction of the Pill led to both an increase in women's investment in schooling and an increase in the age at first marriage. These findings are then linked to a change in women's adult identities, which were less influenced by traditional gender roles and more influenced by career considerations (Goldin, 2006).

It is therefore relevant to look both at how gender-role attitudes and family policies correlate with the motherhood effects we find. Attitudes are elicited from the 1994 International Social Survey Program, as being the values survey that dates back the closest to our study time frame. We look at



two different questions: whether women should stay at home when they have a baby (a child under school age) and whether pregnant women should be able to obtain legal abortion if they wanted to. When plotted against motherhood effects on the working outcome, these two questions paint two opposite pictures: on the one hand, the higher the share of those for whom women should stay at home, the lower the motherhood effect, which is both counterintuitive and at odds with Kleven et al. (2019a). However, had we considered all but the ex-Communist countries, we would have found a negative slope, in accordance with Kleven et al. (2019a) (which does not include any country from the ex- Soviet bloc in their analysis). The fact that a greater share of the population agrees with such a statement in those same countries that promoted more gender equality makes us wonder whether this measure does a good job at defining which country is characterized by more gender equal views. On the other hand, when using the percentage of people agreeing with women’s right to abortion, we do find that the more in favor of women’s right a society is, i.e., the least conservative it is, the lesser the motherhood effects there. Besides, with that measure, the ex-Communist countries do look more gender equal. We interpret these findings as supportive of the conclusion that gender norms have a role to play in women’s response to motherhood.

Figure 5: Long-Run Motherhood Effects and Gender-Role Attitudes Across Countries

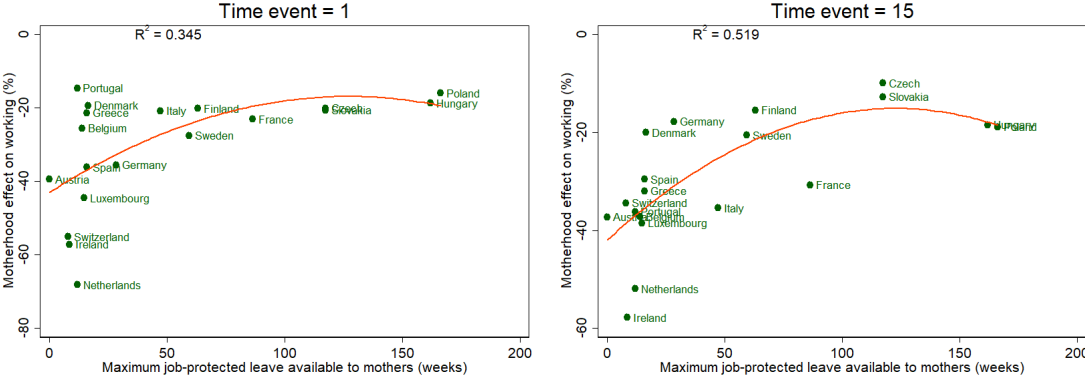


Notes: These graphs show the the normalized effects  $P_\tau$  for  $\tau = 10$  from estimation of equation (1) for mothers by country on the employment outcome, plotted against the share of the population agreeing with the corresponding statement in each country (on the horizontal axis). Source: ISSP 1994.

Family-friendly policies—e.g., maternity leave, flexible work arrangements, childcare benefits—could also play a role in the cross-country heterogeneity of motherhood effects, given that they are usually aimed at encouraging female labor supply and that they are also intrinsically linked to gender norms. We explore correlations between one of these policies—maximum weeks of job-protected

leave available to mothers, regardless of income—and the motherhood effects on employment, self-employment, part-time employment, and number of jobs. We follow Olivetti and Petrongolo (2017) and choose this variable as the most relevant family policy for our purpose. We also make use of their historical data, and compute its average from 1970 to 1989. Simple correlations plotted in Figures 6 confirm findings from Olivetti and Petrongolo (2017) of a nonmonotonic relationship between the duration of parental leave and female outcomes: while motherhood effects decrease with the length of job-protected maternity leave, there is a threshold beyond which that protection is ineffective. We find similar patterns when exploring correlations between parental leave and the other three labor market outcomes: the longer the job-protected leave, the lesser the increase in self-employment, part-time employment, and job instability (see Figures A.10 in Appendix).<sup>15</sup> As it was the case with gender norms, the huge discrepancies between countries from the ex-Soviet bloc and “the West” seem to drive the relationship we find between policies and motherhood effects.

Figure 6: Short- and Long-Run Motherhood Effects on Employment and Family-Friendly Policies



Notes: These graphs show the normalized effects  $P_\tau$  for the year immediately after motherhood ( $\tau = 1$ , left panel) and 15 years after motherhood ( $\tau = 15$ , right panel), which result from estimating equation (1) for mothers by country. The outcome variable is employment status. On the horizontal axis, we show the variable “Maximum job-protected leave available to mothers” measured in weeks from Olivetti and Petrongolo, 2017.

Our findings seem compatible with both gender norms and policies having to do with motherhood effects: the more conservative a society, and the less “family-friendly” government policies are, the more women respond to motherhood by either withdrawing from the labor force or entering alternative types of employment, often characterized by more instability and worse quality.

In the following section, we assess whether these adjustments to motherhood are responsible for

<sup>15</sup>This echoes Kluge and Schmitz, 2018, which finds that the introduction of a generous parental benefit in Germany (hence, a different kind of family-friendly policy) led to more female employment, but also more job continuity, with mothers returning to their previous employer more frequently (which employers rewarded with better quality jobs).

derailing the career paths of "talented" women who else would have had better outcomes. To do so, we analyze how parenthood affects the allocation of "talent" in the labor market.

## 4 Motherhood and The Allocation of Talent

In this section we study how parenthood impacts on the allocation of talent in the labor market. There are alternative definitions of "talent", but basically all of them refer to different dimensions of human capital that are needed to successfully perform an occupation. To analyze talent allocation, the literature on occupational choice has focused on the relationship between occupations and educational attainment, cognitive skills, and personality traits. Taking advantage of the rich information available in SHARE and SHARELIFE, we construct measures of these three alternative notions of talent in order to explore heterogeneous impacts of parenthood across groups of individuals defined by their levels of talent. In particular, we study the 4 occupational choices analyzed before: being employed or not, working part-time, being self-employed, and the number of jobs held up to time  $t$ .

In this section we aim at assessing whether there is evidence of parenthood leading to a misallocation of talent, in the sense that the skills of the more talented and thus productive individuals are underused in the labor market. Thus, we interpret as a signal of misallocation of talent in the labor market if, in response to parenthood, some of the following situations arise: (1) the more "talented" individuals stop working; (2) the more talented individuals engage in part-time work, as part-time jobs are often associated with an underutilization of skills, with lower wages and human capital accumulation (O'Reilly and Bothfeld, 2002; Connolly and Gregory, 2008)<sup>16</sup>; (3) individuals with relatively low "entrepreneurial ability" become entrepreneurs (Allub and Erosa, 2019); (4) if parenthood increases job mobility, since it leads to a loss of experience/worker-specific skills (Topel, 1991). We have already shown that parenthood increases job instability of mothers and not fathers (see Figure 1), which is suggestive evidence on the last mechanism. Therefore, in what follows we focus on the other three signals. More precisely, we study labor market responses to parenthood by talent level for mothers and fathers, separately. In addition, to gain insight on the intra-household allocation of talent we reproduce the analysis by spousal-ability gap.

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<sup>16</sup>Connolly and Gregory (2008) shows that 25% of British women moving from full- to part-time work experience downgrading.

## 4.1 Parenthood, Labor Supply, and the Allocation of Women’s and Men’s Talent in the Labor Market

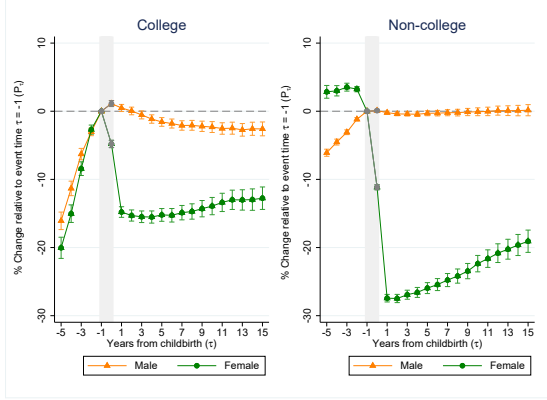
The literature has consistently found a positive association between mathematical ability or high educational attainment and labor productivity, suggesting that in terms of the current aggregate market product it is better to use relatively more skills of the individuals with high cognitive abilities.. In this section we analyze how parenthood impacts the allocation of talent in the labor market by studying the heterogeneous impacts according to educational attainment and cognitive ability.

We define two groups based on educational attainment: individuals with some college education and with no college education. As for the cognitive ability level, we define a high-ability group that includes those individuals who by the age of 10 years old were high-achievers in math. We find that the drop in labor supply, both at the extensive and the intensive margins, is considerably larger for the less educated women (Figures 7a and 7b) as well as for those that were non-high achievers in math at childhood (Figures 7c and 7d). This result is consistent with a stronger labor market attachment of highly educated women, for whom opportunity costs of quitting a career in the labor market are larger (e.g., Berniell et al., 2019). However, the drop in labor supply upon motherhood is large for both groups of women—the more and the less talented. On the contrary, we find almost no effect for fathers, irrespectively of their educational attainment and math ability. Therefore, while the most talented women leave the labor market or start working fewer hours after the birth of the first child, men with much less talent stay employed (Figure 7a and 7c). The fact that the skills of many women who are more talented than men are underused—or not used at all—in the labor market, while less talented individuals remain in the labor force, is our first signal of misallocation of talent in the labor market.

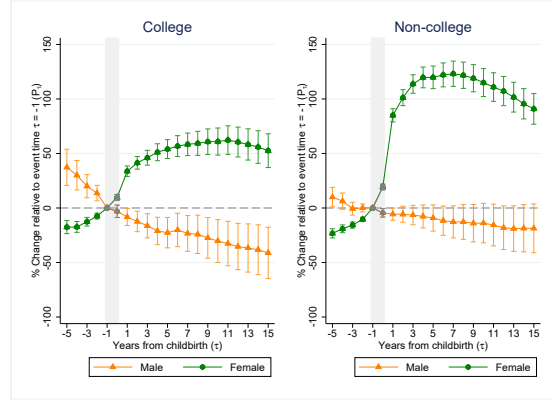
Figure 7: Heterogeneous Impacts of Parenthood by Cognitive Ability

**Panel 1: Education**

(a) Working

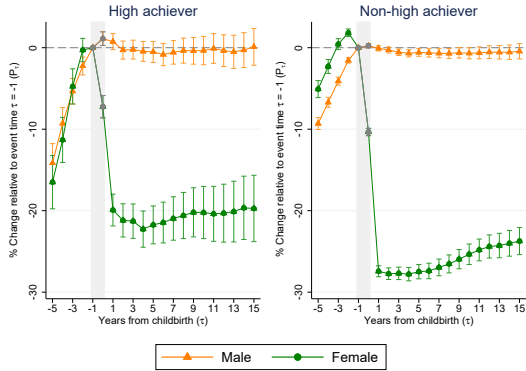


(b) Part-time

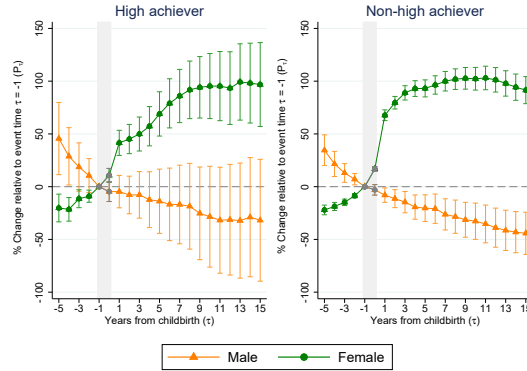


**Panel 2: Mathematical ability at age 10**

(c) Working



(d) Part-time



Notes: These graphs show the normalized effects  $P_t$ , which result from estimating equation (1) separately for mothers and fathers, for high and low level of education (Figures a and b) and for high and non-high achievers in math (Figures c and d), in the pool sample of 29 countries. The outcome variables are employment status and working part-time (this last outcome is conditional on being employed). See Section 2 for definitions. 90% confidence intervals were computed using standard errors clustered by individual.

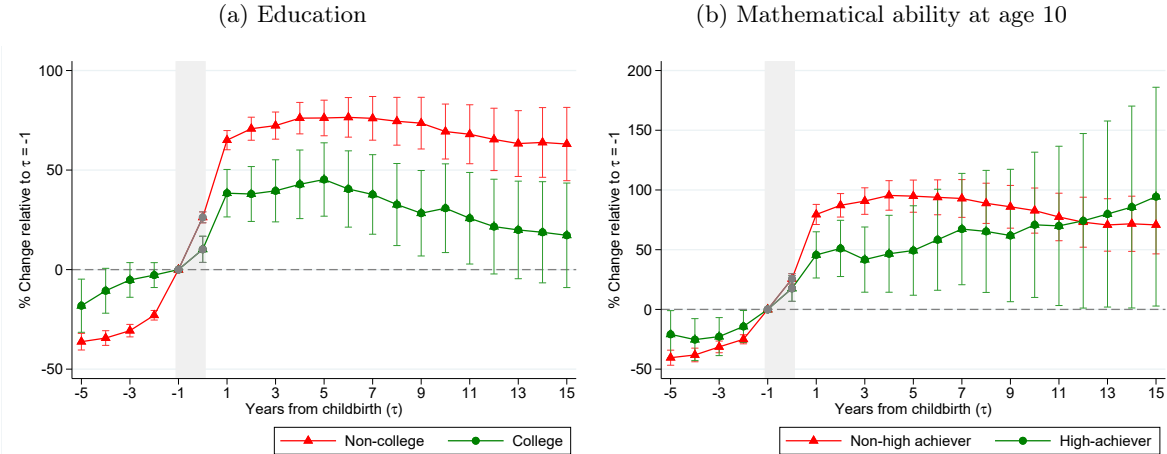
## 4.2 Are the More “Entrepreneurially Talented” Women the Ones Becoming Self-employed?

The literature shows a positive relationship between educational level and successful self-employment (Van der Sluis et al., 2008; Hartog et al., 2010; Levine and Rubinstein, 2017b; Caliendo et al., 2020b). For instance, Levine and Rubinstein (2017b) finds that more successful entrepreneurs (i.e., incorporated) tend to be more educated and, as teenagers, scored higher on learning aptitude tests. Similarly,

Hartog et al. (2010) find that mathematical ability has a higher return in entrepreneurship than in wage employment. In particular, they find that individuals positioned in the very top of the distribution of mathematical ability are financially better off as entrepreneurs.

As we have seen in Figure 1c, the birth of the first child results in a sharp increase in the probability of mothers—but not fathers—of becoming self-employed.<sup>17</sup> Therefore, in order to study the allocation of talent at this margin we analyze whether those women becoming self-employed upon motherhood are those more “entrepreneurially talented” or not. We find that, conditional on working, less educated women are more likely to become self-employed after the birth of the first child (Figure 8a).<sup>18</sup> Similarly, we find that, conditional on working, higher achievers in math are less likely than non-high achievers in math to be self-employed after the birth of the first child (Figure 8b). If, and according to the cited evidence, we think of college education and early math ability as entrepreneurial skills, then our results imply that motherhood induces a negative selection of talents into self-employment.

Figure 8: Heterogeneous Impacts of Motherhood on Self-employment by Cognitive Ability.



Notes: These graphs show the normalized effects  $P_{\tau}$ , which result from estimating equation (1) for mothers, for high and low level of education (Figure a) and for high and non-high achievers in math (Figure b), in the pool sample of 29 countries. The outcome variable is being a self-employed (this outcome is conditional on being employed). See Section 2 for definitions. 90% confidence intervals were computed using standard errors clustered by individual.

Regarding personality, previous literature has shown that certain traits are important to succeed in entrepreneurship (Levine and Rubinstein, 2017b; Caliendo et al., 2020b). To understand the effect of

<sup>17</sup>Figure A.4 in the Appendix shows the percentage of own-account workers—as opposed to employers—among self-employed workers by gender and country. The general rule is that most self-employed workers are own-account workers. This is particularly so for women, where in most countries under analysis own-account working women represent more than 60% of self-employed women.

<sup>18</sup>To keep the exposition of results simple, in this analysis of self-employment we do not show results for fathers, for which we do not find any type of heterogeneous effects across groups defined according cognitive ability and personality traits.

motherhood on the selection into self-employment across individuals with different personality traits we take advantage of the information contained in SHARELIFE regarding the five-factor model of personality, better known as the Big Five model. The Big Five has been the predominant model of personality traits since the 1980s. This taxonomy arranges a variety of personality variables into concise personality constructs—openness to experience, extroversion, neuroticism (or its opposite: emotional stability), conscientiousness, and agreeableness—, which have been found to influence career choice and work performance (Kerr et al., 2017).<sup>19</sup>

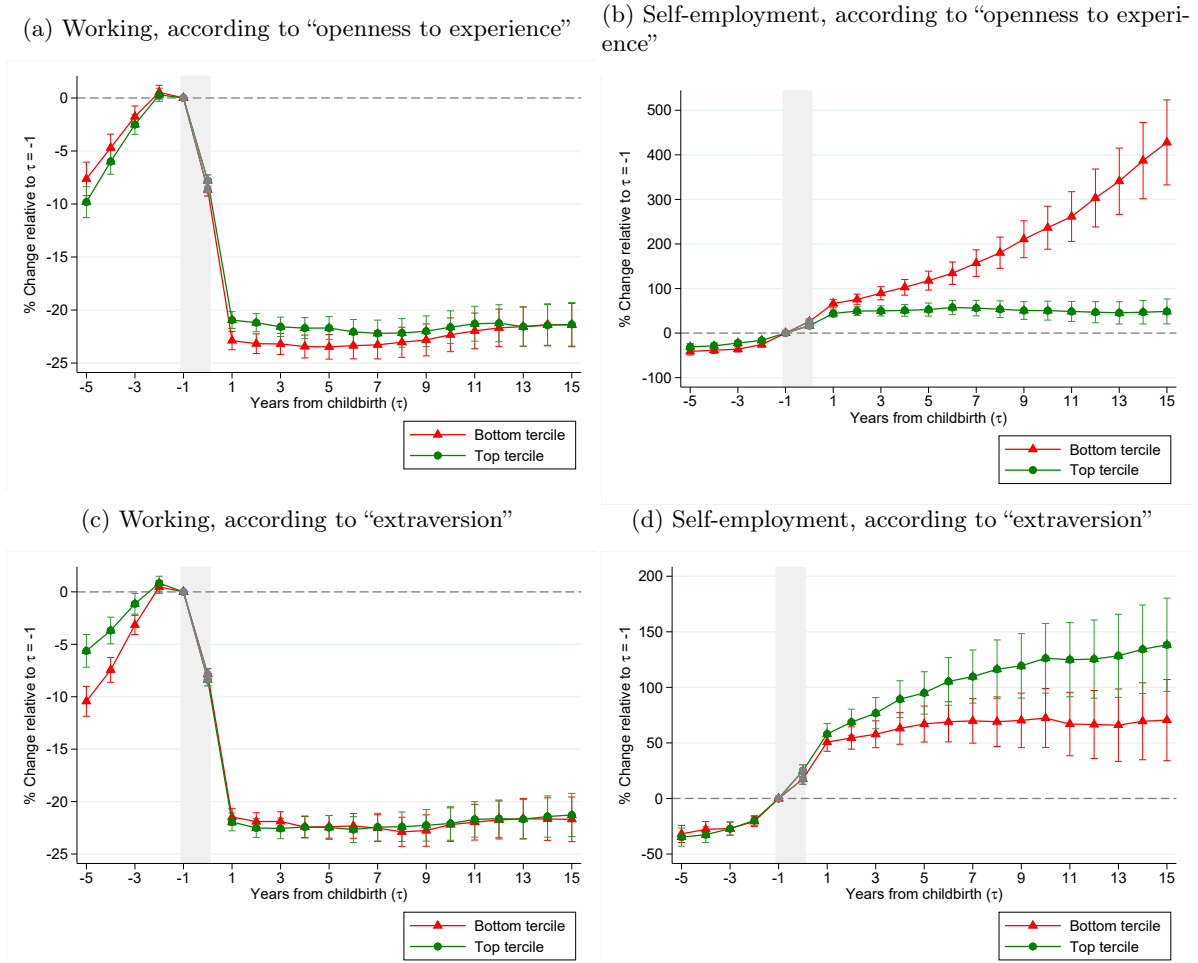
Openness to experience, which describes an individual’s ability to seek new experiences and to explore novel ideas, has been found to be positively associated with both entry into self-employment (Caliendo et al., 2014) and business survival (Caliendo et al., 2020b). Caliendo et al. (2020b) also find that extraversion is negatively related to firm performance proxied by business survival, while the remaining factors of the Big Five model do not consistently show an association neither with entry nor with measures of successful entrepreneurship.<sup>20</sup> According to Figures 9b and 9d, motherhood causes that relatively less entrepreneurial-able (less opened to experience and more extraverted) women are the ones more likely to become self-employed. Interestingly, we do not observe heterogeneous impacts of motherhood on employment across groups defined by women’s personality traits (Figures 9a and 9c).

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<sup>19</sup>It is worth mentioning that these personality traits are predetermined when educational and occupational choices are made, since these are traits that are formed in the first two decades of life. Naturally, math ability at age 10 is also predetermined.

<sup>20</sup>Extraversion implies an energetic approach toward the social and material world and includes traits such as sociability, activity, assertiveness, and positive emotionality (Kerr et al., 2017).

Figure 9: Heterogeneous Impacts of Motherhood for Women According to Personality Traits



Notes: These graphs show the normalized effects  $P_\tau$ , which result from estimating equation (1) for mothers, for high and low levels of education openness to experience (Figures a and b) and for high and low levels of extraversion (Figures c and d), in the pool sample of 29 countries. The outcome variables are employment status and being a self-employed (this last outcome is conditional on being employed). See Section 2 for definitions. 90% confidence intervals were computed using standard errors clustered by individual.

### 4.3 Intra-household Allocation of Talent

Finally, we turn into the analysis of how parenthood affects the intra-household allocation of (labor-market) talent. To this end, we build a new sample—the sample of couples—by matching the women in our original sample with their partners. Then we divide the sample of couples into three groups: (1) couples where the woman is more educated than her male partner, (2) couples where the woman has the same education level as her male partner, (3) couples where the woman has less education than her male partner.

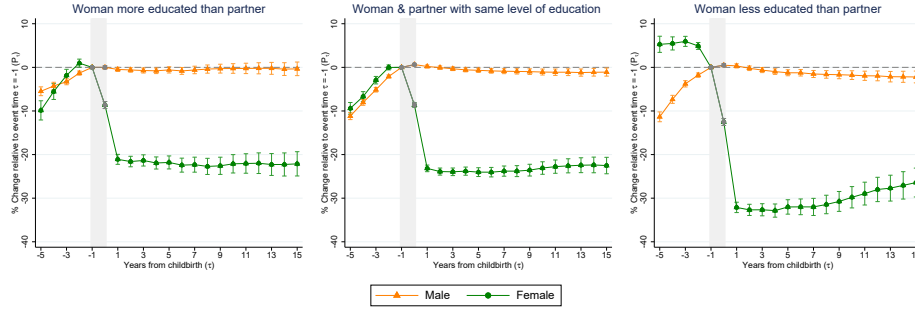


As education is correlated with labor market productivity, women in the first group are potentially more productive in the labor market than their partners. Given everything else, that these women—but not their husbands—reduce their labor supply and adjust their occupational choices towards more flexible jobs when their first child is born suggests an inefficient assignment of labor market talent within couples. Of course, the missing piece to judge if this implies a misallocation of talent in the whole economy (market and non-market) is the (unobservable) within couple difference in productivity for home production. If women had a relative advantage in home production compared to men, it would be efficient that they stay at home despite of being also more productive in the market than their male partners. However, recent literature suggests that there are no such gender differences in productivity for home production, at least after the first year of the child's life (Kleven et al., 2020). Thus, the efficient intra-household allocation of labor market talent would predict that men—and not women—in group (1) be the ones desattaching from the labor market by exiting the labor market, reducing the number of hours, becoming self-employed, or changing jobs (Erosa et al., 2020; Cortés and Pan, 2020).

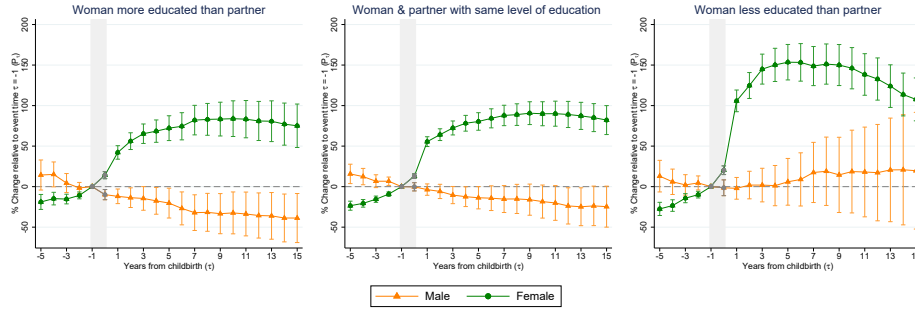
However, Figure 10 shows that for the first group of couples—as well as for the other two—there is a large negative impact of motherhood on women's labor market trajectories and almost no effect for fathers. The fact that the birth of the first child leads to an underutilization of women's talent independently of partners relative ability—whereas men's labor market trajectories do not change—suggests that motherhood leads to a misallocation of labor market talent as a consequence of childcare responsibilities, with probably sizable impacts on aggregate market productivity.

Figure 10: Parenthood Effects by Spousal Education-Gap

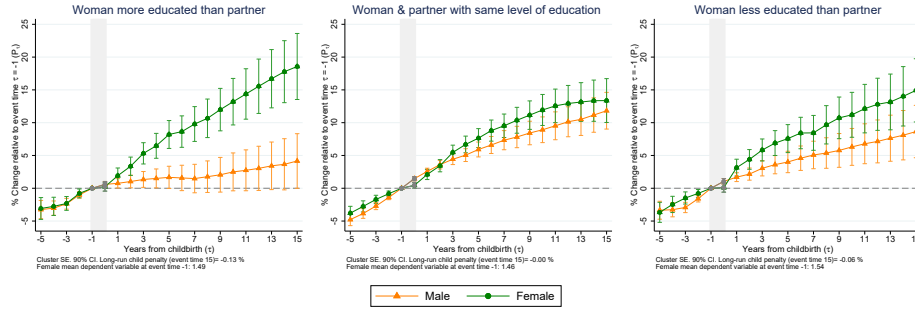
(a) Employment



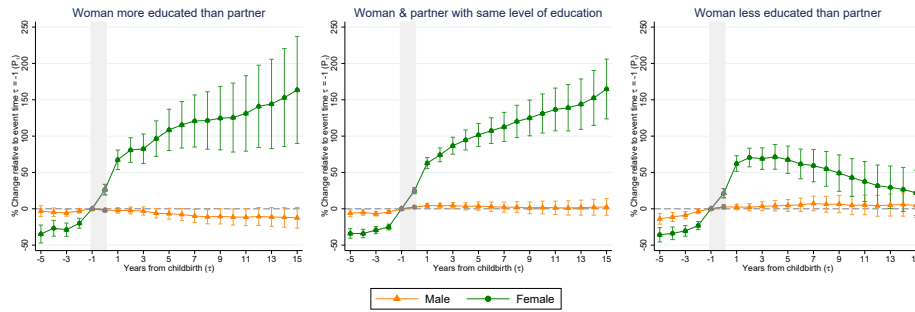
(b) Part-time Employment



(c) Number of jobs



(d) Self-employment



Notes: These graphs show the normalized effects  $P_T$ , which result from estimating equation (1) separately for mothers and fathers for couples where women are more educated than their male partners (first column), couples where women are equally educated than their male partners (second column), and couples where women are less educated than their partners (last column), in the pool sample of 29 countries. The outcome variables are employment status, working part-time, being a self-employed (these last two outcomes are conditional on being employed) and the number of jobs held up to period  $t$ . See Section 25 for definitions. 90% confidence intervals were computed using standard errors clustered by individual.

## 5 Conclusion

There are now a substantial number of papers showing the effects of motherhood on women’s participation in the labor market for either a particular country or a small subset of countries. Using retrospective data from SHARE, we estimate motherhood effects for a harmonized sample of 29 European countries and find, not only, that they are widespread and significant (25% on average), but also that they remain of the same order of magnitude 15 years after the first child. More importantly, we show that motherhood effects go beyond labor market participation decisions to substantially affect the uptaking of alternative modes of employment that are characterized by flexible or reduced work schedules such as part-time and self-employment with the subsequent increase in job instability. Transitions into part-time and self-employment, which increase on average close to 50% upon motherhood, are neither specific to a country nor the result of particular policies, but instead have been occurring to women in most European countries and they are long-lasting. There is, however, heterogeneity across countries regarding the extent of the motherhood effects as well as their dynamics. Interestingly, larger negative effects on employment coincide with larger positive responses on self-employment and, to a lesser extent, on part-time employment. The magnitude of the effects is shown to be related to country-specific features such as social norms—as others before us have revealed for a small subset of countries—and the adoption of gender-friendly policies.

Uncovering and measuring motherhood effects on the type of job are important for at least two reasons. First because both part-time and self-employment are associated with worse career prospects and lower pay. Indeed, the selection of women out of employment or into lower paid employment reinforces the idea set out in Kleven et al. (2019b) whereby a zero wage gap—i.e. equal pay for equal job—does not imply gender equality. Second because long lasting effects of motherhood on both the extensive and intensive margins of employment may result in changes in the allocation of talent which in turn affects aggregate market productivity. Based on three alternative measures of talent/ability (educational attainment, ability at math by age 10 and personality traits) we assess whether parenthood leads to differential labor market responses. We find evidence of large effects in the allocation of talent of women upon motherhood, but no effects are found for fathers. Even in couples where women show higher levels of ability than their partners, it is the mother -and not the father- the one to face higher probabilities of leaving the workforce or reducing working hours. Moreover, when we look at self-employment it is the least entrepreneurial women, i.e. the ones without a college degree, less able at math by age 10 and without the psychological traits necessary to succeed, that enter self-employment.

We interpret these results as evidence of parenthood producing misallocation of talent in the labor market inasmuch as many high skilled women dropout of the labor force or reduce working hours when becoming mothers and those with the lower entrepreneurial skills enter into self-employment, while fathers show no changes. Given that motherhood affects a substantial share of the female workforce, this misallocation of talent results in labor market inefficiencies that are potentially large enough to justify the incremental costs of policies aimed at reducing them.

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## Appendix

Table A.1: Descriptive Statistics

	Mothers	Fathers
<i>Socio-demographic characteristics</i>		
Parent's year of birth	1947.52 (10.88)	1946.65 (10.03)
Age	23.42 (4.53)	26.52 (5.06)
1st child's year of birth	1970.93 (11.48)	1973.17 (10.76)
Age at first child	24.42 (4.53)	27.52 (5.06)
Firt child's year of birth	1971.93 (11.48)	1974.17 (10.76)
College graduate	0.24 (0.43)	0.28 (0.45)
<i>Labor characteristics</i>		
In the labor force	0.74 (0.44)	0.92 (0.28)
Employed (unconditional)	0.72 (0.45)	0.91 (0.28)
Self-employed	0.04 (0.20)	0.08 (0.28)
Part-time	0.08 (0.27)	0.02 (0.14)
Number of jobs	1.51 (0.89)	1.76 (1.06)
No. of individuals	45,326	33,683

*Note:* This table uses data from SHARE Waves 3 and 7. Columns 1 and 2 show, separately for mothers and fathers, the mean and SD (in parentheses) of socio-demographic and labor market variables one year before the birth of the first child ( $\tau = -1$ ). Part-time, self-employed, and number of jobs are computed for those who are employed. The sample includes parents observed at least once before and at least once after childbirth. Sample is restricted to mothers and fathers whose age at first childbirth is over 16 years old.

Table A.2: Descriptive Statistics by Countries- Mothers Only.

	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Israel	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	Switzerland
<i>Socio-demographic characteristics</i>																													
Parent's year of birth	1945	1947	1951	1951	1949	1946	1948	1947	1951	1946	1947	1946	1948	1944	1947	1947	1950	1950	1951	1951	1944	1950	1949	1952	1956	1948	1944	1944	1945
	(10.06)	(11.83)	(10.21)	(9.79)	(11.34)	(9.44)	(11.50)	(10.50)	(10.14)	(11.57)	(10.62)	(11.52)	(8.41)	(9.46)	(9.76)	(10.85)	(10.92)	(11.09)	(9.48)	(9.37)	(9.11)	(11.07)	(8.97)	(10.22)	(8.36)	(9.87)	(11.61)	(9.98)	(10.93)
Age	23.01	24.03	21.25	22.02	23.27	22.00	23.90	23.22	24.45	23.67	23.40	24.40	22.01	25.85	23.48	24.33	23.35	23.32	24.88	24.16	24.61	22.31	23.29	21.24	22.43	22.30	24.57	24.24	25.36
	(4.82)	(4.32)	(3.92)	(3.99)	(4.75)	(3.88)	(4.45)	(4.27)	(5.42)	(4.67)	(4.63)	(4.95)	(3.94)	(4.88)	(4.81)	(4.59)	(4.54)	(4.22)	(4.71)	(4.19)	(4.26)	(3.84)	(4.33)	(3.79)	(4.16)	(3.93)	(4.48)	(4.89)	(4.62)
1st child's year of birth	1968	1971	1972	1973	1972	1968	1972	1970	1975	1969	1971	1970	1970	1970	1970	1971	1973	1974	1976	1975	1968	1972	1973	1973	1978	1970	1969	1968	1971
	(10.86)	(12.67)	(11.14)	(10.65)	(12.41)	(9.89)	(12.93)	(10.52)	(11.93)	(12.69)	(11.43)	(11.59)	(9.02)	(10.14)	(10.89)	(11.87)	(10.76)	(11.03)	(10.97)	(10.52)	(9.88)	(11.56)	(9.26)	(10.58)	(9.99)	(9.73)	(11.87)	(11.16)	(12.11)
Age at first child	24.01	25.03	22.25	23.02	24.27	23.00	24.90	24.22	25.45	24.67	24.40	25.40	23.01	26.85	24.48	25.33	24.35	24.32	25.88	25.16	25.61	23.31	24.29	22.24	23.43	23.30	25.57	25.24	26.36
	(4.82)	(4.32)	(3.92)	(3.99)	(4.75)	(3.88)	(4.45)	(4.27)	(5.42)	(4.67)	(4.63)	(4.95)	(3.94)	(4.88)	(4.81)	(4.59)	(4.54)	(4.22)	(4.71)	(4.19)	(4.26)	(3.84)	(4.33)	(3.79)	(4.16)	(3.93)	(4.48)	(4.89)	(4.62)
Firt child's year of birth	1969	1972	1973	1974	1973	1969	1973	1971	1976	1970	1972	1971	1971	1971	1971	1972	1974	1975	1977	1976	1969	1973	1974	1974	1979	1971	1970	1969	1972
	(10.86)	(12.67)	(11.14)	(10.65)	(12.41)	(9.89)	(12.93)	(10.52)	(11.93)	(12.69)	(11.43)	(11.59)	(9.02)	(10.14)	(10.89)	(11.87)	(10.76)	(11.03)	(10.97)	(10.52)	(9.88)	(11.56)	(9.26)	(10.58)	(9.99)	(9.73)	(11.87)	(11.16)	(12.11)
College graduate	0.24	0.31	0.18	0.14	0.15	0.13	0.44	0.44	0.45	0.21	0.26	0.15	0.19	0.55	0.43	0.09	0.49	0.46	0.18	0.08	0.18	0.15	0.05	0.11	0.11	0.18	0.09	0.41	0.23
	(0.43)	(0.46)	(0.39)	(0.35)	(0.36)	(0.34)	(0.50)	(0.50)	(0.50)	(0.40)	(0.44)	(0.36)	(0.39)	(0.50)	(0.50)	(0.29)	(0.50)	(0.50)	(0.39)	(0.27)	(0.39)	(0.36)	(0.21)	(0.31)	(0.31)	(0.38)	(0.29)	(0.49)	(0.42)
<i>Labor characteristics</i>																													
In the labor force	0.85	0.76	0.77	0.65	0.45	0.90	0.78	0.87	0.80	0.75	0.83	0.40	0.86	0.80	0.57	0.59	0.85	0.87	0.73	0.51	0.74	0.76	0.52	0.60	0.86	0.78	0.56	0.83	0.82
	(0.36)	(0.43)	(0.42)	(0.48)	(0.50)	(0.30)	(0.41)	(0.34)	(0.40)	(0.43)	(0.38)	(0.49)	(0.35)	(0.40)	(0.49)	(0.52)	(0.36)	(0.34)	(0.45)	(0.50)	(0.44)	(0.43)	(0.40)	(0.49)	(0.35)	(0.41)	(0.50)	(0.38)	(0.38)
Employed (unconditional)	0.85	0.74	0.73	0.55	0.42	0.90	0.77	0.86	0.80	0.74	0.82	0.35	0.85	0.79	0.56	0.52	0.85	0.85	0.73	0.44	0.74	0.74	0.50	0.59	0.85	0.74	0.54	0.83	0.82
	(0.36)	(0.44)	(0.44)	(0.50)	(0.49)	(0.30)	(0.42)	(0.34)	(0.40)	(0.44)	(0.38)	(0.48)	(0.35)	(0.41)	(0.50)	(0.50)	(0.36)	(0.36)	(0.45)	(0.50)	(0.44)	(0.44)	(0.50)	(0.49)	(0.36)	(0.44)	(0.50)	(0.38)	(0.39)
Self-employed	0.05	0.07	0.01	0.01	0.10	0.00	0.04	0.00	0.03	0.05	0.02	0.29	0.00	0.03	0.03	0.11	0.00	0.00	0.04	0.03	0.05	0.13	0.12	0.02	0.00	0.01	0.10	0.02	0.05
	(0.22)	(0.25)	(0.11)	(0.10)	(0.30)	(0.07)	(0.19)	(0.05)	(0.18)	(0.21)	(0.13)	(0.45)	(0.04)	(0.17)	(0.17)	(0.31)	(0.05)	(0.06)	(0.19)	(0.17)	(0.21)	(0.33)	(0.32)	(0.13)	(0.04)	(0.08)	(0.39)	(0.14)	(0.21)
Part-time	0.07	0.17	0.05	0.02	0.06	0.03	0.13	0.02	0.06	0.09	0.12	0.10	0.03	0.05	0.17	0.11	0.02	0.02	0.09	0.06	0.18	0.03	0.04	0.03	0.03	0.02	0.09	0.16	0.16
	(0.26)	(0.37)	(0.21)	(0.13)	(0.24)	(0.18)	(0.34)	(0.12)	(0.24)	(0.28)	(0.33)	(0.30)	(0.16)	(0.21)	(0.37)	(0.31)	(0.14)	(0.14)	(0.29)	(0.23)	(0.38)	(0.17)	(0.20)	(0.16)	(0.18)	(0.13)	(0.28)	(0.36)	(0.37)
Number of jobs	1.53	1.53	1.18	1.16	1.25	1.23	2.20	1.49	1.89	1.60	1.46	1.15	1.34	1.81	1.57	1.46	1.42	1.42	1.50	1.36	2.03	1.29	1.31	1.14	1.04	1.26	1.38	1.95	2.23
	(0.84)	(0.83)	(0.47)	(0.44)	(0.52)	(0.53)	(1.48)	(0.79)	(1.11)	(0.90)	(0.79)	(0.48)	(0.62)	(1.09)	(1.03)	(0.76)	(0.71)	(0.70)	(0.80)	(0.64)	(1.15)	(0.60)	(0.76)	(0.42)	(0.20)	(0.55)	(0.67)	(1.21)	(1.39)
No. of individuals	1,888	2,911	1,012	1,222	678	2,843	1,943	2,879	966	2,369	2,311	2,008	855	407	974	2,597	1,006	1,186	598	537	1,033	2,822	255	1,113	966	1,991	2,701	1,944	1,311

*Note:* This table uses data from SHARE Waves 3 and 7. Each column shows, for each country in the sample, the mean and SD (in parentheses) of socio-demographic and labor market variables one year before the birth of the first child ( $\tau = -1$ ). Part-time, self-employed, and number of jobs are computed for those who are employed. The sample includes parents observed at least once before and at least once after childbirth. Sample is restricted to mothers and fathers whose age at first childbirth is over 16 years old.

Figure A.1: Age at First Birth

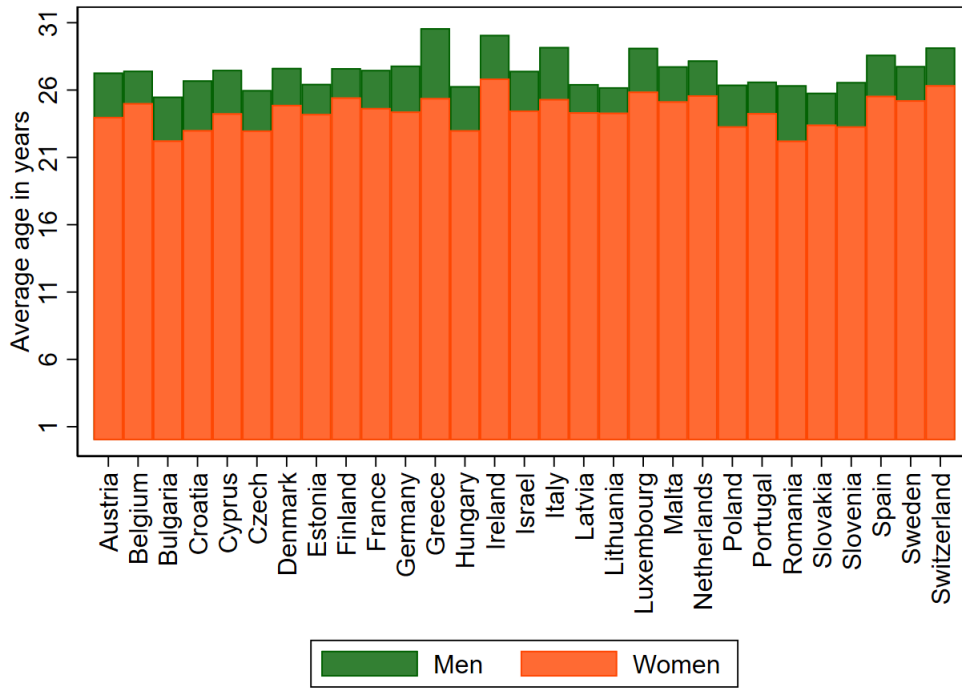


Figure A.2: Year of First Birth (Women)

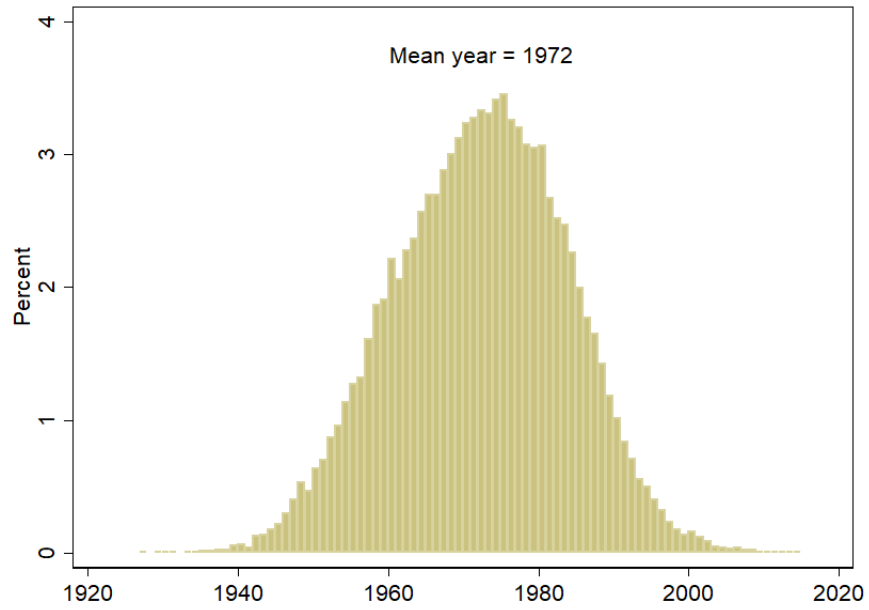
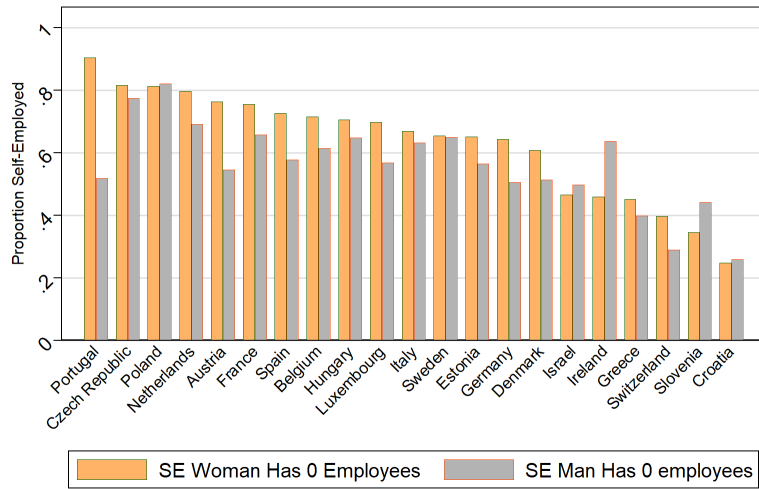


Figure A.3: Self-Employed: Number of Employees

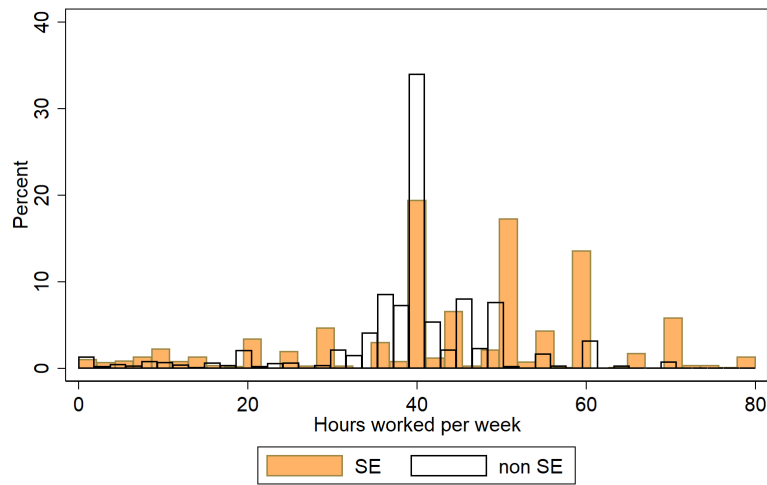


Source: SHARE Wave 1,2,4,5,6. Sample: 50+

Notes: This graph shows the proportion of self-employed with and without employees, for men and women aged 50+ years old. The data source is the main SHARE survey, waves 1, 2, 4, 5 and 6, as this information is not included in the SHARE Job Episodes Panel.

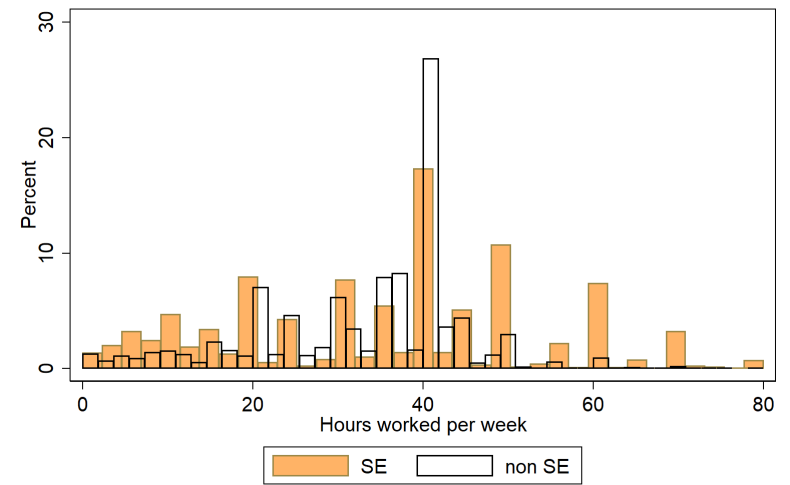
Figure A.4: Hours Worked per Week by Self-Employed Status

(a) Men



Source: SHARE Wave 1,2,4,5,6- Sample: Men aged 50-65 years old.

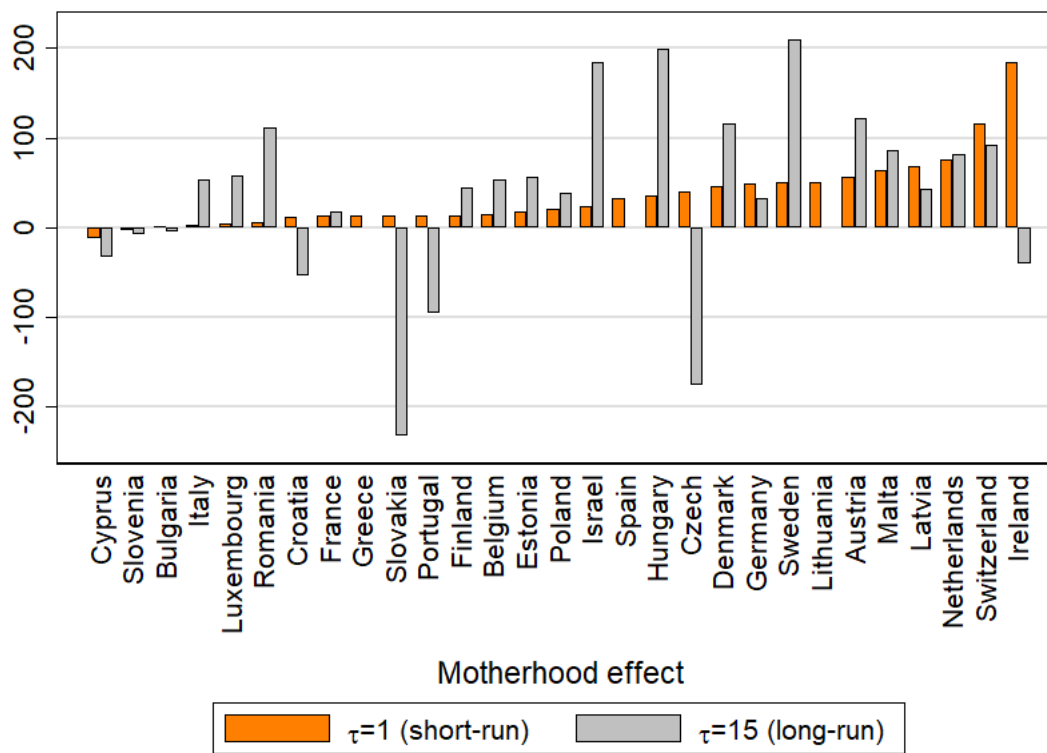
(b) Women



Source: SHARE Waves 1,2,4,5,6- Sample: Women aged 50-65 years old.

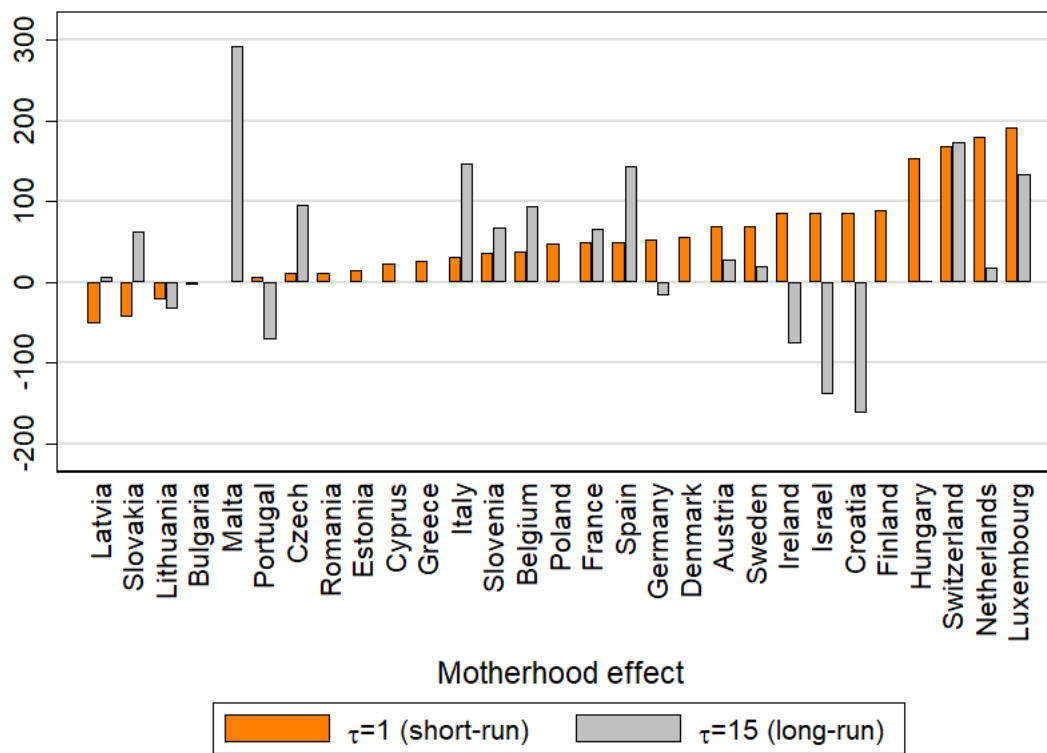
Notes: These graphs show the distribution of hours worked by self-employed and non self-employed workers, for men and women aged 50-65 years old. The data source is the main SHARE survey, waves 1, 2, 4, 5 and 6, as this information is not included in the SHARE Job Episodes Panel.

Figure A.5: Long-run Child Penalty in Part-Time Job



Notes: This graph shows the normalized effects  $P_\tau$  for the year immediately after motherhood ( $\tau = 1$ ) and 15 years after motherhood ( $\tau = 15$ ), which result from estimating equation (1) for mothers by country. The outcome variable is working part-time. The standard errors for each country were computed using 150 (clustered by individual) bootstrap samples.

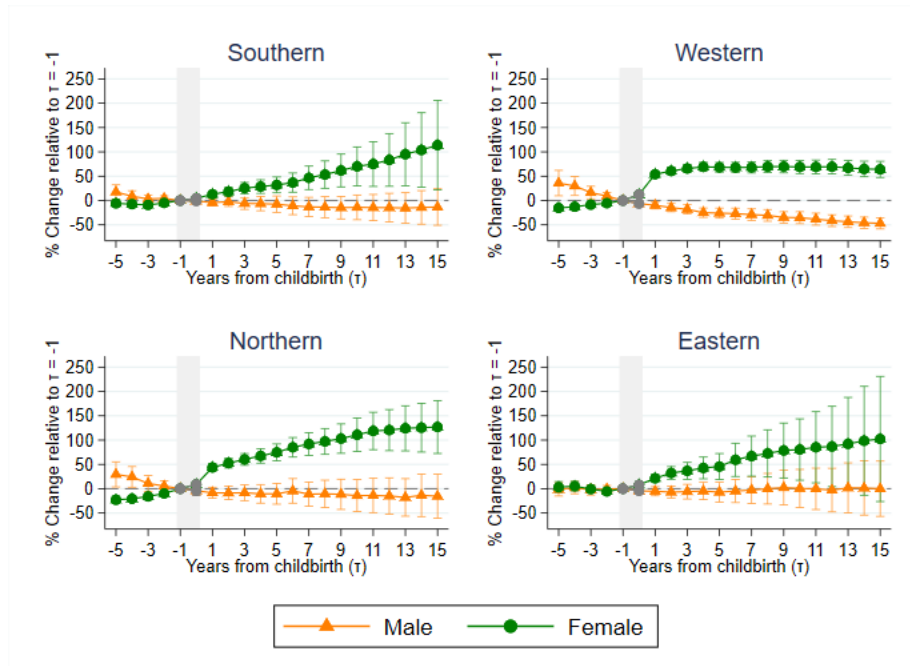
Figure A.6: Long-run Child Penalty in Self-Employment



Notes: This graph shows the normalized effects  $P_\tau$  for the year immediately after motherhood ( $\tau = 1$ ) and 15 years after motherhood ( $\tau = 15$ ), which result from estimating equation (1) for mothers by country. The outcome variable is being a self-employed. The standard errors for each country were computed using 150 (clustered by individual) bootstrap samples.

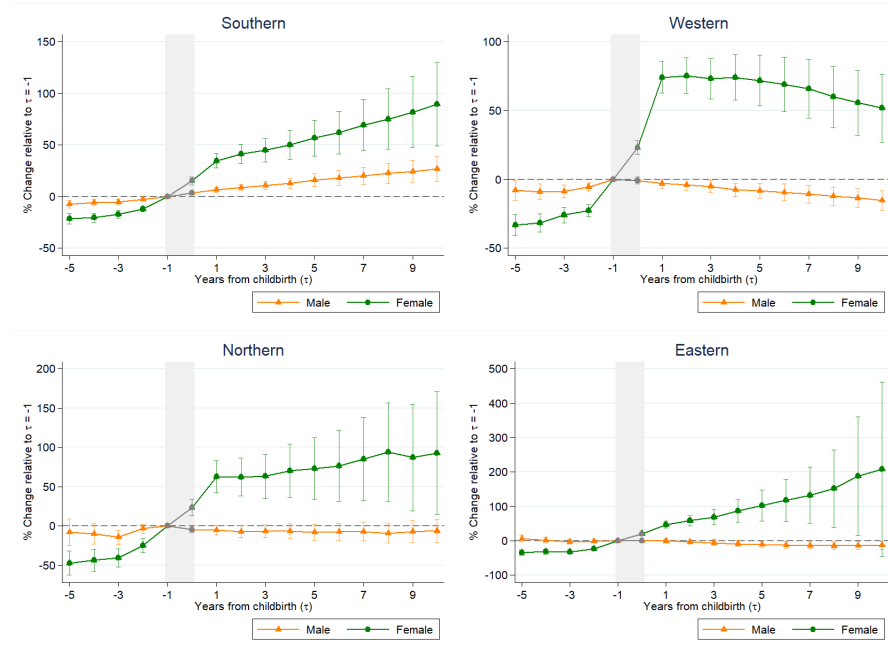


Figure A.7: Short and Long-Run Motherhood Effects on Part-Time Employment by Region



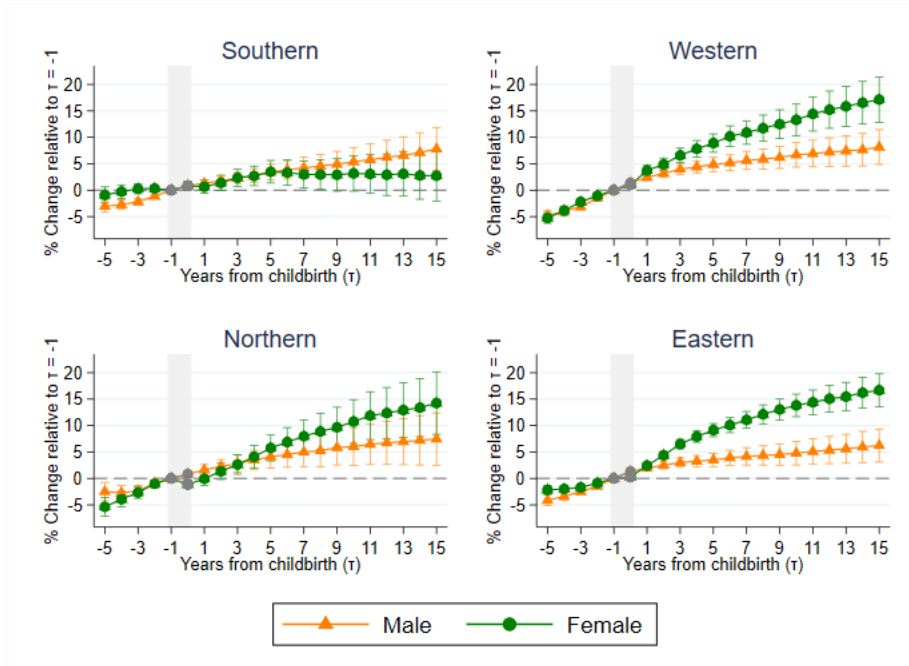
Notes: The graph shows the estimated values of  $P_{\tau} = \frac{\hat{\beta}_{\tau}}{\bar{Y}}$  from estimation of equation (1) on pooled data for four groups of countries. The dependent variable is a dummy variable for whether the individual is working part-time conditional on working. Western Europe includes: Austria, Belgium, France, Germany, Ireland, Luxemburg, The Netherlands, and Switzerland. Northern Europe includes Denmark, Finland and Sweden. Southern Europe includes: Cyprus, Greece, Israel, Italy, Portugal and Spain. Eastern Europe includes: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. Malta is not included in any of the geographical clusters. Regressions are estimated separately for males and females. The standard errors were computed using 500 (clustered by individual) bootstraps.

Figure A.8: Short and Long-Run Motherhood Effects on Self-Employment by Region



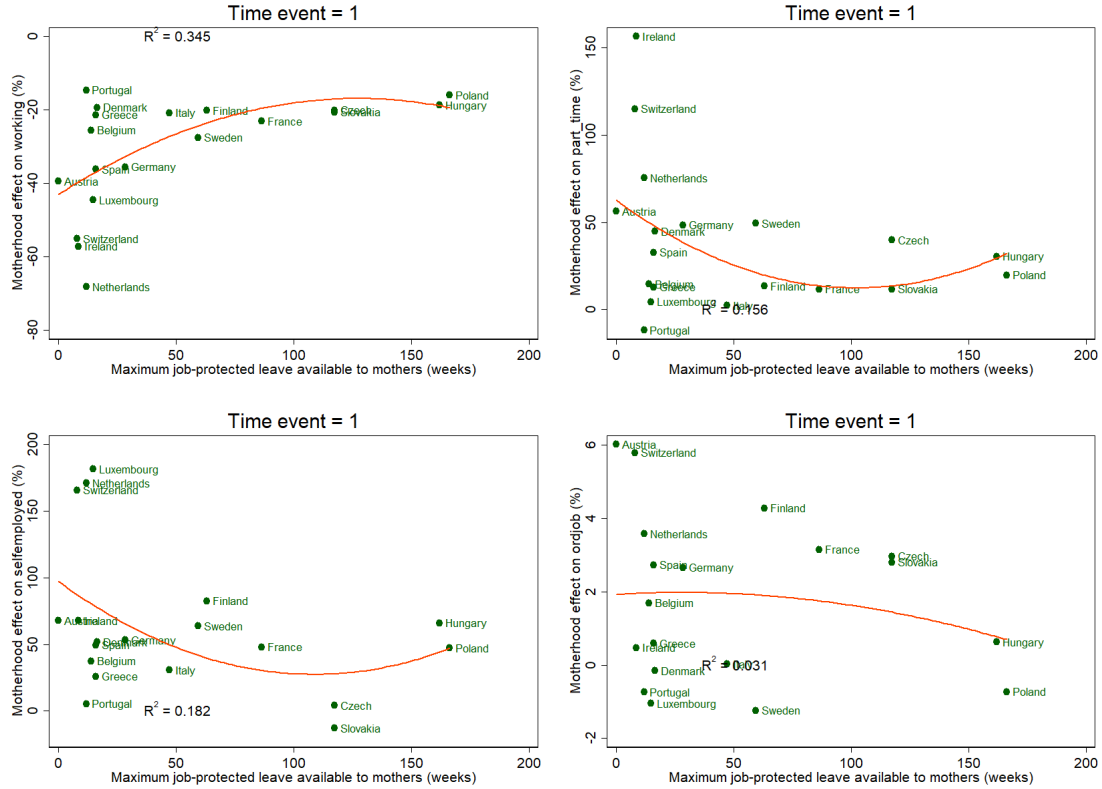
Notes: The graph shows the estimated values of  $P_{\tau} = \frac{\hat{\beta}_{\tau}}{\bar{Y}}$  from estimation of equation (1) on pooled data for four groups of countries. The dependent variable is a dummy variable for whether the individual is self-employed conditional on working. Post parenthood periods were restricted to 10 because large standard deviations after period 10 widen the y-axis scale and complicated the reading and interpretation of the effects. Western Europe includes: Austria, Belgium, France, Germany, Ireland, Luxemburg, The Netherlands, and Switzerland. Northern Europe includes Denmark, Finland and Sweden. Southern Europe includes: Cyprus, Greece, Israel, Italy, Portugal and Spain. Eastern Europe includes: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. Malta is not included in any of the geographical clusters. Regressions are estimated separately for males and females. The standard errors were computed using 500 (clustered by individual) bootstraps.

Figure A.9: Short and Long-Run Motherhood Effects on Number of Jobs by Region



Notes: The graph shows the estimated values of  $P_\tau = \frac{\hat{\beta}_\tau}{Y}$  from estimation of equation (1) on pooled data for four groups of countries. The dependent variable is the accumulated number of jobs up to that time. Western Europe includes: Austria, Belgium, France, Germany, Ireland, Luxemburg, The Netherlands, and Switzerland. Northern Europe includes Denmark, Finland and Sweden. Southern Europe includes: Cyprus, Greece, Israel, Italy, Portugal and Spain. Eastern Europe includes: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. Malta is not included in any of the geographical clusters. Regressions are estimated separately for males and females. The standard errors were computed using 500 (clustered by individual) bootstraps.

Figure A.10: Short-run Motherhood Effects on All Four Outcomes and Family-Friendly Policies



Notes: The graph shows the estimated values of  $P_\tau = \frac{\hat{\beta}_\tau}{\hat{Y}}$  for  $\tau = 1$  from estimation of equation (1) for each country and for the following four outcome variables in the vertical axis: (1) whether or not the individual is working; (2) whether or not the individuals is working part-time (conditional on working); (3) whether or not the individual is self-employed (conditional on working); (4) the cumulative number of jobs held. On the horizontal axis, we show the variable “Maximum job-protected leave available to mothers” measured in weeks from Olivetti and Petrongolo, 2017.

## Appendix: Motherhood or Marriage Effects?

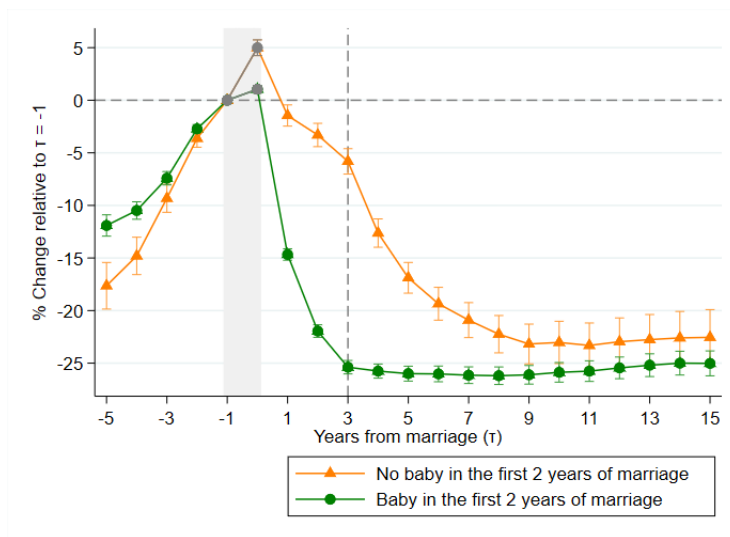
One challenge when trying to pin down the causal effect of the birth of a first child on labor market outcomes is that it may be hard to disentangle that effect from that of an event that often occurs right before or right after birth, i.e. marriage. Can the estimated “motherhood effects” be associated with marriage or cohabitation instead? Although for some women marriage/cohabitation effects may be no more than anticipated motherhood effects, for other women marriage/cohabitation may have an effect on its own. Its direction, however, is a priori unclear.<sup>21</sup> If upon marriage women start looking for a job or hold on to their previous job to help support the newly formed household, and choose

<sup>21</sup>From this point on, we refer to “marriage” as including marriage and cohabitation.

delaying motherhood, then marriage and motherhood would have opposite effects on employment. Alternatively, women could discontinue working due to moving in with their husband far from their activity, because they do not need to contribute pecuniarily to the household, or because pregnancy either precedes or follows immediately the marriage in which case marriage and motherhood would have similar effects on employment.

We assess whether the large labor market effects observed can be attributed to marriage instead, as marriage and childbirth tend to almost coincide in time. We split our sample of women between those that become mothers for the first time within two years after marriage and those that become mothers after two years of marriage. We interpret as the marriage effect the one shown by the evolution of the latter and the motherhood effect by the evolution of the former. The event occurring at  $\tau = 0$  is now marriage, and the coefficient we estimate and plot is therefore the percentage change in employment with respect to  $\tau = -1$ . Although marriage triggers a drop in employment for both types of women, it is clear from the slopes of the two curves in Figure A.11 that the marriage effect is much smaller than the motherhood effect. Over the first three years, women in the "no baby in the first two years" see their probability of working decrease by 6%, to be compared to over 25% for women having their first baby in the first two years following marriage. Because all women in this specific sample are mothers, their trends eventually become parallel, stabilizing around -22% for one group, and -26% for the other. This exercise reveals a negative marriage effect, which may be an anticipation of a motherhood effect, but more importantly, makes it clear that it is the birth of the first child that has the large impact on women's labor market outcomes.

Figure A.11: Short- and Long-Run Marriage Effects on Employment



Notes: The graph shows the estimated values of  $P_{\tau} = \frac{\hat{\beta}_{\tau}}{\bar{Y}}$  from equation (1) when the event at time  $\tau = 0$  is defined as “marriage” and the dependent variable is “employed” on the pool sample of all 29 countries in the dataset for males and females separately. The standard errors were computed using (clustered by individual) bootstraps.