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The Long-Run Effect of Maternity Leave Benefits on Mental Health

Evidence from European Countries

The long-run effect of maternity leave benefits on mental health: Evidence from European countries¹

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ABSTRACT

This paper examines whether maternity leave policies have a causal effect on women's mental health in old age. We link data for women aged 50 and above from eight countries in the Survey of Health, Ageing and Retirement in Europe (SHARE) to data on maternity leave legislation from 1960 to 2010. Using a difference-in-differences approach, our preferred specification suggests that moving from a maternity leave with limited coverage to one with comprehensive coverage around the birth of a first child reduces late life depression scores by 14%.

Keywords: Maternity leave, Depression, Policy evaluation

JEL codes: J08, J13, J14, I18

¹ We wish to thank Rob Alessie, Danilo Cavapozzi, Mike Hurd, Pilar Garcia Gomez, Axel Börsh-Supan, and participants to the Netspar Pension workshop 2013 in Amsterdam, NL; SHARE users conference in Liege, BE; 2014 Royal Economic Society conference in Manchester, UK and seminar participants in Groningen, NL. The authors acknowledge funding from the National Institute on Aging (grants R01AG040248 and R01AG037398), a Starting Researcher grant from the European Research Council (ERC grant No 263684), and the McArthur Foundation Research Network on Ageing.

1. INTRODUCTION

A growing body of literature shows that social policies can have unanticipated health consequences. Studies on the social security notch, the earned income tax credit, the US welfare reform and the food stamp programme show that although these policies were not motivated by health concerns, they have both negative and positive externalities (Snyder and Evans, 2006, Almond et al., 2011, Bitler et al., 2005, Schmeiser, 2009). Maternity leave benefits are an example of a Government intervention that affects women at a critical stage in their lives and has the potential to generate health externalities. During the second half of the 20th Century, most high-income countries enacted comprehensive maternity leave legislation that extends women the right to a period of job-protected leave around childbirth. An extensive literature has examined the impact of these policies on labour market (Ruhm, 2011, Dahl et al., 2013, Ruhm, 1998, Rossin-Slater et al., 2013) and child outcomes (Baker and Milligan, 2008b, Baker and Milligan, 2008c, Berger et al., 2005, Rossin, 2011, Staehelin et al., 2007, Tanaka, 2005, Ruhm, 2000, Ruhm, 2011). However, few studies have examined the impact of maternity leave policies on women's well-being, with existing studies focusing exclusively on health effects in the period around childbirth (Staehelin et al., 2007, Ruhm, 2011, Dagher et al., 2013). In this paper, we examine whether rights to paid maternity leave during the birth of a child have long-lasting effects on the mental health and well-being of mothers in late life.

In this paper, we argue that beyond any potential benefits on employment, families and child outcomes, maternity leave entitlements may also have important externalities on women's mental health in the long-run by reducing the long-term consequences of stress and mental health disorders associated with the experience of childbirth. A strand of literature in epidemiology has shown that the birth of a child is a stressful life event that carries a new role for mothers, potentially generating an imbalance between the demands from multiple roles. This is often accompanied by a sudden change in hormone levels around childbirth (Bloch et al., 2000, Ryan et al., 2008b). New mothers are at increased risk for a range of serious psychiatric disorders such as postpartum depression, posttraumatic stress disorder, anxiety disorders, obsessions of child harm, and postpartum psychosis (Brockington, 2004). The prevalence of post-partum depression is exceptionally high in the weeks after delivery (Hasin et al., 2005, Wisner et al., 2002, 2009): it is estimated that between 10% and 15% of mothers experience depression in the postpartum period. As a result, women are more likely to be admitted to a psychiatric ward unit shortly after giving birth than at any other time in their lives (Glavin et al., 2009, Le Strat et al., 2011, Doucet et al., 2009, Munk-Olsen et al., 2006). Recent evidence suggests that an increase in the length of maternity leave entitlements is associated with a decrease in depressive symptoms in the first six months after childbirth (Dagher et al., 2013, Chatterji and Markowitz, 2012). These findings suggest that, in the short-run, maternity leave may be an effective policy to reduce the negative mental health effects of childbirth.

Maternity leave policies may also have long-term effects by preventing the possibility that the stressful weeks around childbirth result in long-term psychological consequences. A series of psychological studies suggest that stressful life events during mid-life have a strong relationship with the risk of subsequent episodes of major depression and other psychiatric disorders in older age (Kessler, 1997, Hammen, 2003, Ryan et al., 2008a, Risch et al., 2009). This literature draws on the concept of chronic stress, whereby stressful life events have enduring sequelae that increase vulnerability to physical and mental health disorders in later life (Stephoe and Kivimäki, 2012, Steptoe and Kivimäki, 2013, Colman and Atallahjan, 2010). Depression during the postpartum period may thus lead to chronically stressful lifecycle trajectories, punctuated by recurrent episodes of depression throughout the life-course and well into old age (Hammen, 2003). Our research question is therefore whether by reducing depression in the period around childbirth, maternity leave benefits may lead to enduring benefits in long-term mental health.

Our work relates to a strand of literature examining the impact of maternity leave policies on economic outcomes. We contribute to this literature by examining whether leave entitlements have spillover effects on the mental health of women decades after delivery. We focus on late life depression, a serious and growing public health problem: The Global Burden of Disease report ranks major depressive disorders as the second leading cause of disability, accounting for 8.2% of years lived with disability worldwide (Ferrari et al., 2013). In the United States alone, it is estimated that depression costs \$83.1 billion in economic costs, including \$26.1 billion in direct health care costs and \$51.5 billion in costs due to work absenteeism (Greenberg et al., 2003). Late life depression is a common condition substantially more prevalent among women than men in ageing societies: in Western Europe, the prevalence of late life depressive symptoms among women ranges from 18% in Denmark to 37% in Spain (Castro-Costa et al., 2007). Late life depression leads to impairments in the ability to function socially, decreased quality of life, and increased risk of health problems (McCall and Kintziger, 2013, Wang et al., 2003). While a vast literature in psychiatry struggles to identify interventions to treat late life depression (Kok, 2013), to our knowledge, no study has examined whether a social policy affecting women in mid-life may help preventing late life depression and promote healthy ageing.

To address this question, we use unique data from the Survey of Health, Ageing and Retirement in Europe (SHARE), a survey of the older European population, containing detailed retrospective employment and fertility histories, as well as validated measures of mental health in late-life. We match SHARE data to aggregate data on maternity leave legislation in the country and year of delivery derived from the 'Comparative Maternity, Parental and Childcare Leave and Benefits Database' (Gauthier, 2011). Our identification strategy exploits the dramatic variation over time across European countries in the enactment of legislation on the duration and compensation of maternity leave benefits (Gornick and Meyers, 2003, Gornick et al., 1997). We argue that these

reforms to legislation provide a source of exogenous variation in the generosity of maternity leave benefits, which enables us to identify their causal effect on late life depression.

We apply a difference-in-differences approach that exploits variations in paid maternity leave generosity in the country of residence of participating women at the time of childbirth. In essence, our results provide convincing evidence that a longer period of fully paid maternity leave around the birth of a first child leads to a reduction in late life depression scores. Our preferred specification suggests that moving from a maternity leave with limited coverage to one with comprehensive coverage reduces late life depression scores by 14%. Maternity leave policies affect women working at the time of childbirth. The difference-in-differences estimator is based on the comparison of this treated group, with women who were out of the labour force during the birth of their first child (the control group), as these women were not eligible for benefits. Our identifying assumption is that despite the fact that these groups differ in a number of observables, they display similar trends in depressive symptoms by year of first birth. In particular, we provide evidence of a common trend in depressive symptoms across the year of delivery for treated and controls, supporting the validity of our difference-in-differences approach. We carry out a number of sensitivity analyses using various model specifications. Our results consistently show that generous maternity leave benefits during the birth of a child reduce late life depression.

The remaining of the paper proceeds as follows: in the next section we briefly review the literature on the impact of maternity leave benefits on economic and health outcomes and discuss the main features of maternity leave policies in Europe. Section 3 describes the data used for our analysis. In section 4, we spell out the empirical strategy along with the main identification issues and we present our main empirical results. Section 5 describes an extensive set of sensitivity analysis that assess the robustness of our findings. Section 6 concludes and discusses the potential implications of our results for public policies on maternity leave and mental health.

2. BACKGROUND

2.1. Maternity leave and maternal outcomes

Our work relates to a strand of literature in economics on the impact of maternity leave benefits on female employment and careers. This literature examines the impact of maternity leave benefits on job continuity and the length of work interruptions, wage level and growth, career prospects, labour market attachment and employability (Klerman JA and Leibowitz A, 2000, Klerman and Leibowitz, 1999, Rossin-Slater et al., 2013, Brugiavini A et al., 2012, Dahl et al., 2013). There is as yet no consensus on whether maternity leave policies improve female employment and earnings. The evidence for Europe suggests that paid maternity leave entitlements of intermediate duration may

increase long-run employment, while very short or very long extensions of benefits may have little or no impact on employment.

In contrast to the above literature, the impact of policies that enacted lengthy maternity leave rights are more controversial, with several studies finding no positive impacts on female employment and earnings. A common explanation is that benefits of job continuity provided by maternity entitlements are offset by depreciation of human capital for women that stay away from their job for extended periods. For example, Dahl and colleagues (Dahl et al., 2013) examine the impact of a series of policy reforms in Norway that extended paid leave from 18 to 35 weeks and find that these reforms increased the amount of time spent at home versus work, but they had little or no effect on parental earnings and participation in the labour market in the short or the long-run. Our analysis on the impact of maternity leave benefits on late life mental health therefore focuses on legislation that enacted relatively short or intermediate benefits between 1960 and 2010 in European countries.

Our study relates to a small but growing literature on the impact of maternity leave policies on the health of mothers around the period of childbirth (Chatterji and Markowitz, 2012, Dagher et al., 2013, Gjerdingen et al., 1991, Hyde JS et al., 1995, McGovern et al., 1997, Staehelin et al., 2007). Studies accounting for endogenous leave duration provide mixed evidence on the impact of maternity leave on physical health, but they offer some support to the hypothesis that longer maternity leave improves the mental health of mothers shortly after childbirth. In a systematic review (Staehelin et al., 2007), four out of six studies reported a positive association between the length of maternity leave and mental health in the post-partum period. A more recent study assessed the effect of a major increase in maternity leave mandates in Canada (Baker and Milligan, 2008b). This study found that extended maternity leave mandates increase the attainment of critical breastfeeding thresholds, but they do not lead to an improvement in maternal and child health outcomes.

Three studies in the US have found some evidence that maternity leave entitlements reduce depression shortly after birth. Chatterji & Markowitz (Chatterji and Markowitz, 2005) use cross-sectional variation in state-level policies across the US to instrument for the length of the mother's leave from work and find that longer leave is associated with a reduction in depressive symptoms. In a separate paper, they use cross-sectional variation in state policies and community characteristics that predict the length of time off-work after childbirth and find that having less than 12 months of maternity leave or less than 8 weeks of paid maternity leave are both associated with increased depressive symptoms. In a third study based on a sample of eligible employed women giving birth in 2001 in three Minnesota Hospitals, Dagher & McGovern (Dagher et al., 2013) instrument maternity leave using the maximum available duration of all paid leave (including vacation, sickness and disability) and job-protected leave according to employer policy. They find that in the first postpartum year, an increase in leave duration is associated with a decrease in depressive symptoms until six

months postpartum, and conclude that the current FMLA provisions may place mothers at risk for postpartum depression.

Except for the Canadian study above (Baker and Milligan, 2008b), all of these studies focus on the United States, where rights to maternity leave are unpaid and of short duration. The large variation in the generosity of paid maternity leave benefits in Europe provides a unique source of exogenous variation to explore their impact on wellbeing and mental health. Furthermore, existing studies focus on the effects of maternity leave benefits on mental health around the period of childbirth. To our knowledge, no previous study has examined the effect of maternity leave benefits during the childbearing years on late life mental health.

2.2. Maternity Leave and late life mental health

Two theories from psychology provide the basis to link women's mental health to their employment and fertility decisions (Marshall and Barnett, 1993). The 'scarcity hypothesis' (Coser L, 1974, Slater, 1963, Gooede, 1960) argues that women have limited time and energy, so that adding extra roles and responsibilities generates tensions between competing demands from work and family roles. According to this hypothesis, combining work and family responsibilities leads to role overload and role conflict, and the conflicting demands from work and family trigger stress (Frone et al., 1997, Chandola et al., 2004, Wang et al., 2007). A second theory, the 'expansion hypothesis' (Marks, 1977, Sieber, 1974), acknowledges that multiple roles lead to increased stress, but it posits that the rewards from multiple roles offset the costs of combining work and family responsibilities, generating benefits for mental health by improving financial security, self-esteem and recognition (Grzywacz and Bass, 2003).

In the context of these theoretical models, maternity leave benefits are expected to affect late life mental health through three channels. The first and most important channel operates through the potential ability of maternity leave benefits to prevent the long-term implications of mental disorders after childbirth, which are believed to be serious for a significant fraction of mothers, and include a long-term impairment of mother-child relationships, and psychiatric and learning disorders in the children (Brockington, 2004). The period after childbirth is particularly stressful as mothers must recover from the physical strain of child delivery, adapt to changes in household composition, and provide care for their infant. Women who have had an episode of depression at any point during their life, including the postpartum period, have an increased risk of major depression in older age (Bifulco et al., 2000, Hammen, 2003). In the short-run, job protected time off work during the period around childbirth offers women a resource to address the imbalance of multiple demands and release the stress of combining work and family roles. In turn, better mental health in the period around birth may have long-term consequences and prevent sequelae that increase vulnerability to mental health disorders in later life.

A second channel involves the impact of maternity leave on families and the quality of mother-child relationships, which may have long-term implications for family and child well-being in the long-run, and through this channel generate externalities on the mental health of mothers in late life. While the mechanisms linking depression in mid-life to late life depression are not well understood, research has shown that women with a prior episode of depression are more likely to experience divorce and marital difficulties, to have a spouse with psychiatric disorders, and to experience problematic relationships with their children. Depression during the postpartum period may thus lead to chronically stressful lifecycle trajectories, punctuated by recurrent episodes of depression throughout the life-course and well into old age (Hammen, 2003).

Finally, the potential impact of maternity leave benefits on employment, life-time earnings and retirement income may generate externalities on late-life mental health. In addition to a pure income effect, maternity leave benefits may also enable women to accrue the psychological benefits from work postulated by the expansion hypothesis, including security, self-esteem and recognition (Grzywacz and Bass, 2003). Although this channel is controversial and contingent on the ability of maternity leave benefits to impact female labour market careers, it remains a theoretically plausible mechanism linking maternity leave benefit generosity to the mental health of mothers in late life.

2.3. The Policy Context in Europe

Ruhm and Teague (Ruhm and Teague, 1998) provide a brief history of maternity leave legislation in Europe. The majority of western European countries enacted maternity leave programmes in the aftermath of the World War II. These programmes were initially motivated by concerns for the health of child and mother and were often enacted as a restriction to employ women during the period surrounding pregnancy, with no income support or job protection. Since the late 1960's, maternity leave policies evolved from a prohibition to a time-off work to care for newborns and children, combined with job protection for parents.

Policies to support mothers in the period before, during, and immediately after childbirth in which mothers take leave from work are now common in most European countries. Our policy data are derived from Gauthier (2011), a harmonized database of key features of maternity, parental and childcare leave schemes in OECD countries spanning the period from 1960 to 2010. It is considered to be the most comprehensive database on trends in family policy regulations in high-income countries. Collecting reliable and comparable indicators about maternity leave over a long period and a large group of countries is not an easy task since the distinction between different (but related) policies can be blurred. We follow the approach of earlier studies (Ruhm, 1998, Ruhm, 2000) and define maternity leave as the period granted to mothers in connection with childbirth, which includes the period of leave immediately prior and after childbirth.

This definition is restrictive: it excludes parental leave after the maternity protection period ends, which is currently available to both fathers and mothers in many countries. However, we choose to focus on maternity leave entitlements around childbirth for two reasons: First, the features of extended parental leave are very diverse across European countries and over time, so that there is no consensus on how to operationalise these policies into a comparable measure of generosity. Second, most studies on the impact of parental leave on mothers have focused on this period, while the evidence for any effects of extended leave after the maternity protection period ends is more controversial.

3. Data and descriptive analysis

Our aim is to study the effect of support and income policies in place at the moment of childbirth on mental health of mothers late in life. This research question requires detailed information about mothers at two moments of their life, which are decades apart. Individual level data need then to be linked to policy data, accounting for the generosity of maternity leave benefits at the moment of childbirths. We use individual data from the first three waves of the Survey of Health, Ageing and Retirement in Europe (SHARE), and link them to the Comparative Maternity, Parental, and Childcare Leave and Benefits Database (Gauthier, 2011).

SHARE is a cross-national panel survey designed to provide comparable information on the health, employment and social conditions of a representative sample of the non-institutionalized European population aged 50+. Samples in 13 European countries were drawn in Northern Europe (Sweden and Denmark), Western Europe (Austria, France, Germany, Switzerland, Belgium, and the Netherlands), Southern Europe (Spain, Italy and Greece) and Eastern/Central Europe (Poland and Czech Republic), as well as Israel. Participants in each country were interviewed in 2004 and subsequently re-interviewed in 2006/7 and 2008/9. Our analysis concentrates on Western European countries.. We excluded Poland and the Czech Republic since women in Socialist countries were included in a system of full, but not freely chosen, employment (Gal and Kligman, 2000). In these countries,,women's decisions concerning job interruptions at maternity would not be comparable to the behavior of women in Western countries. For the same reason, we exclude women who were living in East Germany before 1989.

We use the first two waves of SHARE to collect our outcome variable, i.e. mental health after age of 50. We use data from the EURO-D (Prince et al., 1999), a standardized scale of depressive symptoms designed to enhance cross-national comparability. The EURO-D consists of 12 items: depression, pessimism, death wish, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness. The first two waves of SHARE are also useful since they contain a set of demographics and physical health measure we use as controls in our analysis.

Data on maternity episodes came from the job episodes panel dataset derived from the 2008/09 wave of SHARE (Brugiavini et al 2013), which reports detailed retrospective life-histories spanning early childhood until 2008/09. Almost 30,000 men and women across 13 European countries took part in this round of the survey (Schröder, 2011). The questionnaire covered several important areas of respondents' lives, ranging from housing to detailed questions on health and health care. This dataset is particularly suitable for our investigation since it provides complete working and maternity histories.

For each maternity episode, the SHARE respondents are asked in the 2008 wave to report if they continued working without interruption, stopped working temporarily or left the labour market and never worked again. As noted in Figure 1, labour market participation at the time of childbirth is very heterogeneous across countries. While in most countries the labour market participation rate of women is above 60%, in some countries, such as Italy and Spain, the percentage of women working at the time of childbirth is very low (between 25 and 40%), with little variation by cohort. Table 1 reports descriptive statistics on a set of variables we use in our analysis.

We supplement SHARE data with the key characteristics of legislation regarding maternity leave in each country over a 50-year span. Data came from the Comparative Maternity, Parental, and Childcare Leave and Benefits Database (Gauthier, 2011), as we explained in the previous section, our study focuses on maternity leave granted to mothers in connection with childbirth, typically referring to a period shortly before and after childbirth. We do not consider parental leave entitlements that refer to periods away from work after the main maternity protection periods, which is available both to mothers and fathers in many countries. As a consequence, we exclude Sweden from our analysis: in Sweden maternity leave policies were fully integrated and replaced by parental leave policies in 1974. We exclude Switzerland as well: in this country maternity leaves were funded through a public insurance scheme until 2005 where the amount of the benefit paid was not linked to the wage earned at childbirth but was a function of the contribution to the insurance scheme. Such a policy design does not allow us to compare the country specific policy to the other countries in the sample.

Table 2 provides summary statistics of the two key variables used in our analysis, namely the duration of leave in weeks and the percentage of past wages that are replaced during maternity leave. Maternity leave length in most countries takes values between 12 and 18 weeks, with the exceptions of Italy, where it is between 17 and 24 weeks. In terms of generosity, most countries have benefits close to 100% of the last wage, with the exceptions of Belgium and Denmark. In order to combine the two dimensions along which the maternity leave policy varies, we follow (Ruhm, 2000) and multiply number of weeks by percentage of past wages and obtain a summary indicator of the generosity of maternity leave benefits that indicates the number of weeks of full wage leave (FWW) provided to mothers around the period of childbirth in each country from 1960 to 2010. Figure 2 reports a line

graph by country of such an indicator. Values are comparable across countries and exhibit a limited number of changes and a moderate upward trend.

The association we are interested in is between the policy variable, FWW, and depression measured on the 12-point Euro-d scale. Figure 3 shows this association, divided by women working at the first childbirth, and women who were not working at first maternity episode. While there is not a clear positive or negative relation, the difference between working and not working women at given values of the policy variables widens between five and twenty weeks at full wage. In order to better appreciate such a regularity, Figure 4 directly plots the difference: women who do not work and are exposed to low levels of FWW exhibit lower depression scores than working women, but the difference is reversed as FWW increases above 10.

4. Empirical analysis

Descriptive analysis, while suggestive, does not account for potential confounding effects. The aim is to assess the impact of the generosity of maternity leave policy on mental health of eligible mothers, i.e. on women working at child birth. A simple comparison of depression scores of working mothers exposed to more or less comprehensive maternity leave policies at the moment of child delivery, may be biased by unmeasured factors. For instance, as reported in Table 1, maternity leave legislation became more and more generous from the '60s until the last decade of the 20th century. Over the same period, many other policies such as unemployment insurance and pensions increase in level of coverage and generosity in most countries. Given such a legislation history, the evidence reported in the previous section may simply capture cohort effects or welfare generosity at large, rather than the effectiveness of maternity leave policies. In order to assess the causal relationship between the exposure to a given maternity leave legislation and mental health later in life we use a Difference-in-Differences (DiD) approach: we compare working women with a control group of women who were not working at the time of first childbirth and therefore were not eligible for maternity leave benefits. Since we know the year of birth of each child, we can link maternity episodes of women out of the labor force to the legislation in place at the moment of maternity. We then compute the same difference within the treated and control groups of women: we compare mental health outcomes of women for which the legislation was comprehensive at the moment of first childbirth, with women facing a less generous maternity leave policy at childbirth. The difference in mental health among the treated women may be due to the effect of the policy, but also to other factors unrelated to the fact treated women were working at child birth. The same confounding factor will drive the difference among non working women. Since the maternity leave legislation affects only the treated women, by computing the double difference $(B-A)-(D-C)$ we are able to isolate the pure effect of the policy. The estimation is formalized by equation (1):

$$eurod_{ic} = \beta_0 + \beta_1 work_{ict} + \beta_2 fww_{ct} + \beta_3 work_{ict} * fww_{ct} + x' \beta_x + \varepsilon_{ict} \quad (1)$$

the outcome variable $eurod_{ic}$, depression in 2010 measured on the euro-d scale, is regressed on the dummy variable $work$ which takes value 1 for treated women, a second dummy variable, fww , defining whether the coverage granted by maternity leave in country c in the year t of the first childbirth of individual i was limited or comprehensive, an interaction term between the two and a set of other determinants of depression included in the k -dimensional vector x . The coefficient of the interaction term β_3 is exactly the double difference (B-A)-(D-C) computed at the mean value of the outcome.

A DiD estimator identifies a causal relation as long as women do not self-select themselves into the treatment or control group on the basis of the policy variable. In our specific exercise, this means we need to assume women do not choose whether to work or not on the basis of the maternity leave generosity at the moment of childbirth. The economic literature suggests that women plan the number and timing of children well in advance, taking into account the utility derived from children and utility from consumption, which is financed with income from labour and public transfers (Troske and Voicu 2013, Klerman and Leibowitz, 2000). In a life cycle framework, a woman decides to have a child if and when the opportunity cost represented by the forgone wages and career prospects due to the forced leave of absence is not too high. If market wages are high but maternity leave benefits are extremely low, the forgone wage of women with a low marginal utility from children would be above her reservation wage, inducing her to work as a consequence of the low maternity leave benefits offered. In order to control for such a self-selection, we include in our analysis only births which took place when the mother was older than 15 and younger than 26. These women are more likely to face lower losses in terms of life time income as a consequence of a maternity irrespective of the offered maternity leave policy: first, wages offered at early ages are lower than later in their working life. Second, even keeping offered wages constant, they have a longer working life ahead to recover for wage losses due to job interruptions at maternity.

We define the coverage of maternity leave to be limited or comprehensive on the basis of the Full Wage Weeks variable (FWW) described in the previous section. Table 3 reports the number of first maternity episodes occurring between age of 16 and 26, by Country of residence of the mother and FWW in place in the specific country and year of childbirth. First, there is no variability in FWW within Greece and Netherlands, therefore we decided to drop these countries from the analysis. The policy variable is then defined as a dummy that takes value 1 if FWW is larger than 12 weeks in Denmark, Germany, France and Austria. It is 1 if FWW is larger than 16 in Italy, larger or equal to 9 in Belgium and Spain. The choice of these thresholds is motivated by the evidence in Table 3, but they imply that maternity leave generosity is a country specific concept: a Spanish women exposed to a FWW equal to 9 will be considered as under the “comprehensive maternity leave policy”, while a

German women exposed to FWW equal to 12 will be considered under a less comprehensive one. We then estimate the model pooling all the countries, but also on subsets of countries for which the threshold is the same: Denmark, Germany, France and Austria on the one hand, Belgium and Spain on the other. The limited sample size does not allow us to run meaningful country-specific analysis.

Regressions include also a set of basic determinants of mental health: a quadratic in age; educational level (a set of dummies accounting for high school or college education); marital status, number of children throughout life; cohort dummies. Moreover, we include among the regressors a set of physical health measures (number of limitations in activities of daily living, number of limitations in instrumental activities, a disability measure) and two measures of health behaviour, number of years spent smoking, amount of drinks per month. Given the common trend towards a more generous welfare state, even controlling for cohorts, our policy variable may simply proxy for the specific pattern experienced by welfare state spending in each country. Therefore, we add to the specification a full set of country specific trends in the year of childbirth.

Table 4 contains the estimation results. The first column reports estimates with all the countries pooled, the second restricts the sample to Spain and Belgium that share a policy variable with threshold set at nine full wage weeks of maternity; the third column, on the other hand, reports estimates obtained on the subsample including Germany, Austria, Denmark and France, where the threshold dividing limited coverage policies from comprehensive policies is set at 12 months.

Being a working mother does not increase the Euro-d depression score in all the specifications. However, in column (3) being exposed to a more generous maternity leave policy seems to increase the depression score for non-working mothers and reduces the same score for working women. The marginal effect for a mother not working at childbirth of moving from a limited coverage to a maternity leave granting at least 13 weeks of full wage is an increase in the euro-d score of 0.52 points, significant at 10% level. On the other hand, the marginal effect for a working mother is the sum of the coefficients for FWW and of the interaction, which is -0.02 points, but not significant (F-stat 0.97, p-value 0.33). Focusing on the first column, the Difference-in-Differences estimator of the effect of the policy, net of common unobserved factors to the treatment and control group, is a reduction of the depression euro-d score of 0.39 points, significant at the 5% level. The effect is not only statistically significant, but also economically and clinically meaningful: Table 5 reports the mean values of depression for working mothers and non working mothers exposed to more or less generous treatments, according to the definitions of the policy variable corresponding to each column of Table 4. Looking at panel A of Table 5, a 0.39 point reduction in the Euro-D scale corresponds to a 14.3% reduction of the depression score, with respect to the mean value among European women working at the moment of child birth. Such a figure increases up to 20.3% in panel B and to 21.2% in panel C where we restrict to the subsamples of countries with common policy definition.

Regarding other determinants of depression, married or cohabiting women have lower depression scores, while the total number of children is associated with increases in the score. at least in column (1) Indices of physical limitations are all strongly associated with higher depression scores. Age and cohort dummies do not play a role, but their statistical significance may be reduced due to their correlation with the country specific trends in the year of childbirth. The statistical relevance of the Danish trend can be explained by a larger variability of FWW: referring back to figure 2 and table 3, Denmark experienced several policy adjustments with the number of full wage weeks increasing progressively until 1990, and it is the only country which then experienced a decline in maternity leave generosity.

5. Robustness

In section 4, we run the analysis considering only mothers who gave birth to their first child before turning 26 years old in order to limit the possibility that women decide when to give birth to the first child as a consequence of maternity leave policy, therefore self-selecting themselves into the treatment and control group. Nevertheless, the sample of women who had their first child when they were younger than 26 may not be representative of the entire population of European women. In column (1) of table 5 we run the same regression without any restriction on age of the mother at first birth. The coefficient of interest is almost identical to what we found in the baseline specification, and it is precisely estimated: moving from a limited coverage maternity leave benefit to a more comprehensive one leads to a reduction of 0.35 points on the euro-d scale, significant at 1% level.

All the specifications in Table 3 do not include socioeconomic status measures throughout lifetime among the regressors to avoid bias due to endogeneity. Such a choice may induce omitted variable bias, if fertility and labour market decisions are actually not taken simultaneously. In column (2) we add the total number of years worked until 2010 and the (logarithm of) permanent income of the mothers, computed according to Brunello et al (2012). The coefficient of interest (interaction between being working and FWW dummies) increases to 0.50, even if it does not appear to be statistically different from the baseline estimation in column (1), Table 4.

While these first two robustness checks relax the assumptions we made to control for self-selection of women into labour market status, it may be argued that limiting the analysis to women who gave birth to their first child between age of 16 and 25 is not enough to solve the self-selection problem. In column (3) of table 5, we add the condition that the mother should not have changed labour market status in the two years before childbirth. If the choice of the time at which she gave birth to the first child does not depend on the generosity of maternity leave benefit, then this additional sample restriction should not affect our results. Again, the coefficient of interest is not statistically different

from our baseline estimate. Still, women could plan the timing of childbirth very early, and account for the generosity of the maternity leave even in the restricted time period we consider. In column (4), we include only maternity episodes that are likely to be unplanned. According to Goldin and Katz (2002) the availability of the contraceptive pill and the legalization of abortion lead to a significant increase in birth control and to the inclusion of economic reasons in fertility choices. If we were able to select only unintended, unplanned maternities, the self-selection problem would disappear. Unfortunately the data do not include such information. Still, we can build an index of the likelihood that a given child birth was not planned in the following way: we construct a dummy which takes value 1 if a given childbirth took place in a country and year where abortion was not legalized; a second dummy variable which takes value 1 if the contraceptive pill was not available; a third variable which takes value 1 if the mother had miscarriages in her life; a fourth variable taking value 1 if the mother was younger than 18 at childbirth. Finally, we create a fifth variable taking value 1 if the mother had no partner at childbirth. The unplanned maternity index is the first principal component from this set of indicators. We then run the regression of interest restricted to women for whom the unplanned maternity index has a value higher than the 75% percentile of the distribution of such an index in the population of mothers. Again, the coefficient of interest in column (4) is not statistically different from the one in the baseline regression. In this case anyhow the substantial reduction in the sample size limits the estimates precision.

Finally, a Difference-in-differences estimator relies on the common trend assumption: given a policy implemented at a certain date, the increase or decline in the mean outcome among the treated observed after such a date in the treatment group would have been equal to the increase or decline observed in the control group, if the policy was not implemented. Such hypothesis cannot be directly tested since the counterfactual is not observable. The usual approach in the literature, if the outcome is observed repeatedly over time, is to check whether the outcome variable follows parallel trends over the period except in the year of the reform. In our specific case, first maternities by definition can be observed only once per individual. Still, whether a woman is exposed to a comprehensive or to a less generous policy depends on the year in which the childbirth took place. Therefore, depression among working and non-working mothers should follow parallel trends along years of first childbirths, but for the moments in which there is a policy change. We observe first maternities by women older than 15 and younger than 26 covered by any maternity policy taking place between 1960 and 1995. Figure 2 and table 3 suggest that policy changes are limited in number. Therefore, over the whole period, we should observe the same trend in depression among women working at childbirth and women non-working at childbirth. Figure 5 reports mean Euro-D scores in the treated and in the control group by year. The solid lines report the actual depression scores, the dashed lines the predicted scores regressing Euro-D on the full set of controls x in equation (1). Both looking at trends in actual and fitted values, the graphical test does not highlight any clear difference between treated and control

group. Assuming a linear trend, the hypothesis can be tested running a regression of the outcome on the year of childbirth separately in the treated and control group, and then running a Wald test of equality of the slopes. The test performed accepts the null of equality of the slopes (χ^2 -statistic=1.19, p-value=0.275). The same test on the fitted scores rejects the null of equality of the slopes: running the two separate regression including the full set of covariates and testing the equality of the coefficient of year of childbirth, the χ^2 -statistic is 5.39, p-value=0.020. Looking back to figure 5, the trend in both groups seem quadratic rather than linear: in this case, the test may reject the null due to the wrong specification of the type of trend, not because of a violation to the common trend hypothesis. Re-running the test assuming the trend to be quadratic, the χ^2 -statistic is 3.77, p-value=0.152 therefore accepting the null of equality of the trends. All in all, neither the graphical analysis, nor the formal testing point to a rejection of the common trend hypothesis.

6. Conclusion

Depression is a leading cause of disability (Ferrari et al., 2013), it is a prevalent condition in old age affecting one to two fifths of older people, and it is disproportionately high among older women (Castro-Costa et al., 2007). Our results suggest that the onset of depression in old age is linked to maternity leave policies during the critical period of the birth of a first child, the year in which women are most vulnerable to depression and hospitalization due to psychiatric conditions. Our findings suggest that maternity leave benefits, which are designed to provide mothers with a job-protected period around childbirth, have welfare effects that extend beyond those documented in earlier studies on labour market careers, wage level and growth, labour market attachment and employability (Klerman JA and Leibowitz A, 2000, Klerman and Leibowitz, 1999, Rossin-Slater et al., 2013, Brugiavini A et al., 2012). Our preferred specification suggests that these effects are large: moving from a maternity leave with limited coverage to one with comprehensive coverage at the birth of a first child reduces depression scores by 14% in older ages.

A key question relates to the mechanisms that account for the effects of maternity leave on the long-run mental health of mothers at old age. A possible explanation is that maternity leave benefits reduce the risk of postpartum depression or other mental health problems shortly after the birth of a child, which may in turn reduce the risk of future episodes of depression in old age. There is in fact some support for the hypothesis that maternity leave benefits improve mental health outcomes around the period of birth (Ruhm, 2011, Staehelin et al., 2007, Chatterji and Markowitz, 2012, Dagher et al., 2013), potentially influencing mental health in the long-run.

The main policy implication of our paper is that maternity leave legislation in Europe brings important long-run welfare benefits for mothers that should be taken into account when considering

the potential impact of extending or shortening maternity leave provisions. The current financial crisis, for example, has sparked debates on the costs and benefits of maternity leave benefits, with some countries such as Czech Republic, the Netherlands, Ireland and Lithuania implementing cuts to current benefit provisions (Gauthier, 2010). Our findings suggest that a cost-benefit analysis of these policies should take into account the potential loss in welfare that would result from diminishing the comprehensiveness of maternity leave benefits.

In conclusion, we find evidence that maternity leave benefit policies yield significant mental health benefits for working mothers, which extend beyond the period of birth and persist into old age. Our findings imply that maternity leave benefits do not only protect mothers and their children around the period of childbirth, but may contributing to healthy ageing among women during the last decades old life. This may have profound implications for the costs of medical care, the social participation and productivity of older women, and the societal impact of older mother's mental health on family members and society.

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FIGURES

Figure 1: Labour Force Participation of Women at childbirth, by cohort.

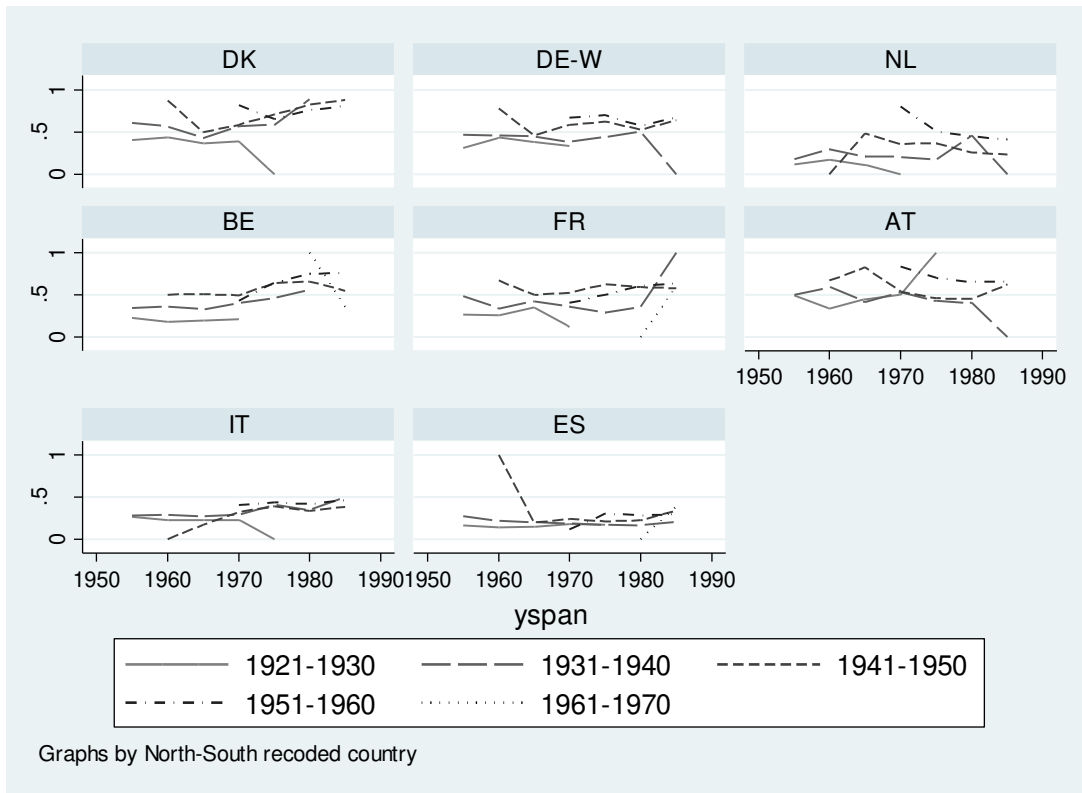


Figure 2: Full Wage Weeks by country

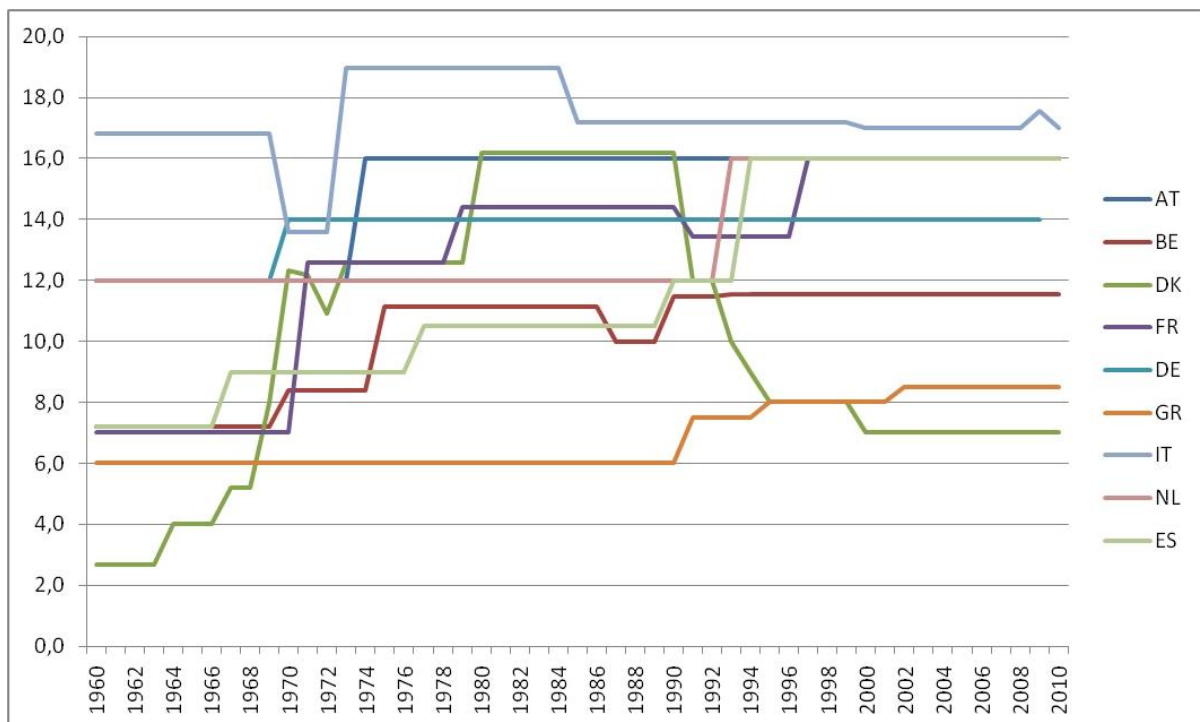


Figure 3: Depression (eurod scale) by Full Wage Weeks of Maternity leave

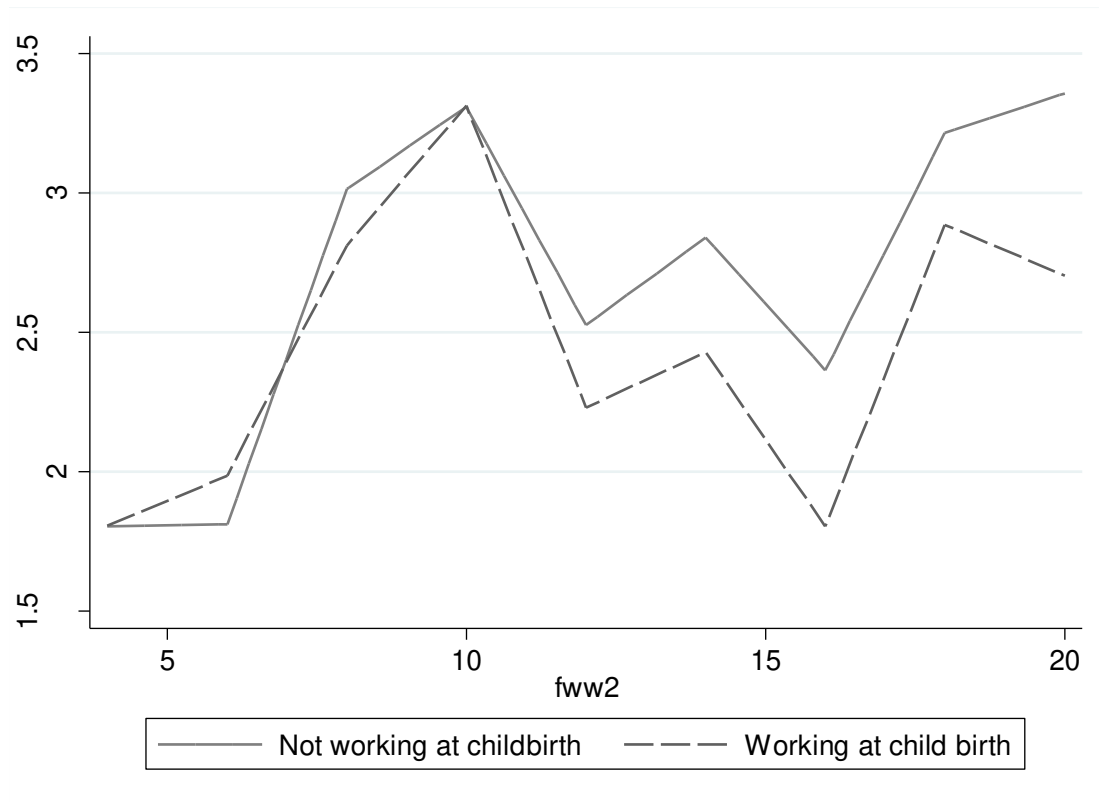


Figure 4: Differential depression (Working mothers – not working mothers) by Full Wage Weeks excluding Sweden

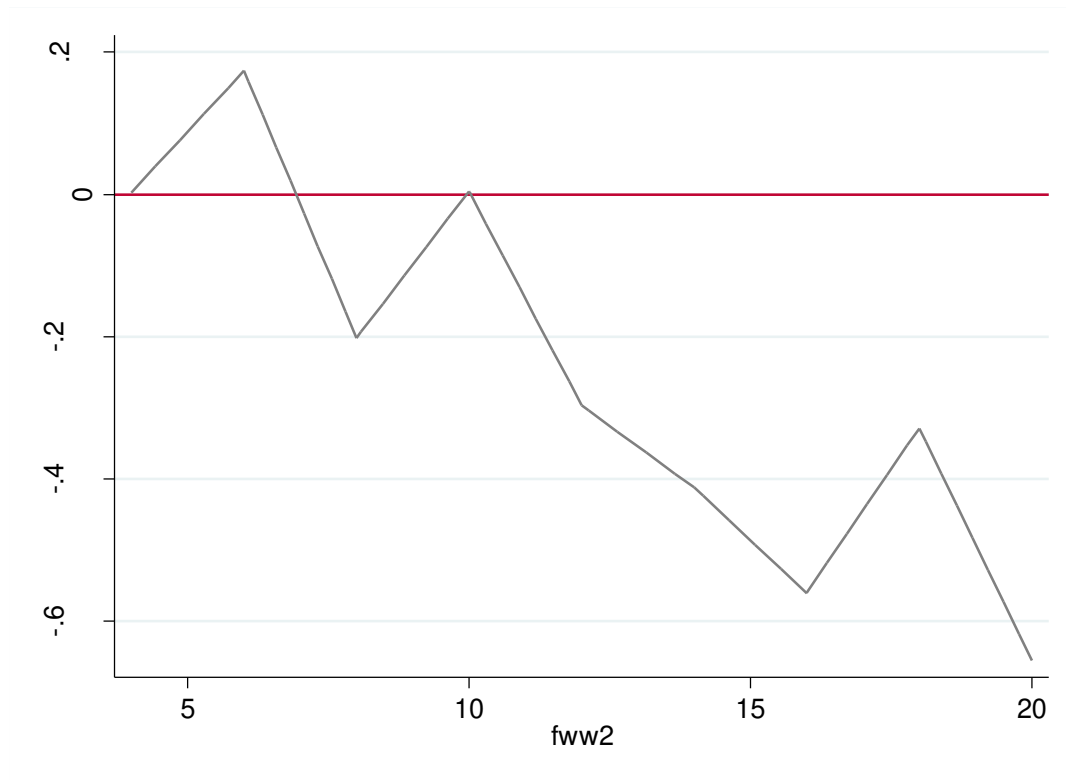
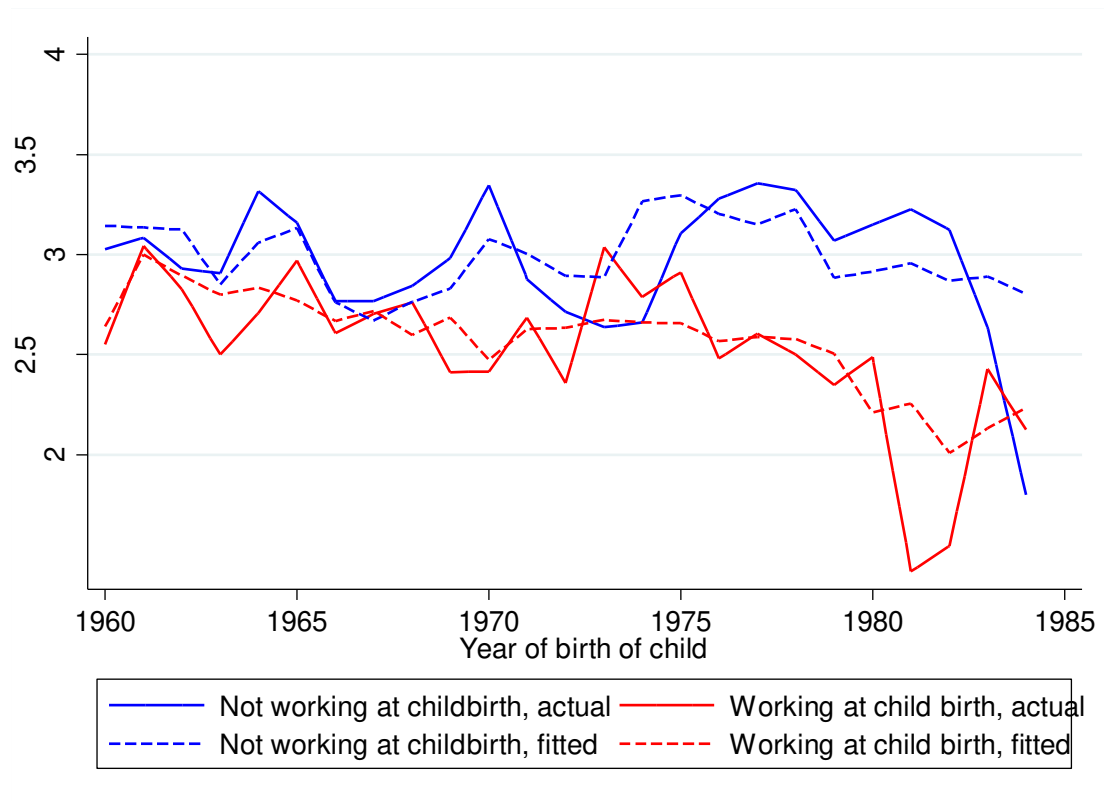


Figure 5: Common trend in year of childbirth



TABLES

Table 1: descriptive statistics

	mean	sd	min	max	N
euro-d depression scale	2,827	2,404	0	12	6601
Age	66,543	10,528	36	100	6897
dummy elementary education	0,350	0,477	0	1	6897
Dummy for high school education	0,355	0,478	0	1	6897
Dummy for college education	0,187	0,390	0	1	6897
Married/Cohab or Single	0,952	0,214	0	1	6897
Number of children	2,533	1,392	1	14	6897
age at childbirth	24,774	4,493	12	47	6897
Total tenure in the labour market	22,050	15,503	0	60	6897
log of permanent income	8,505	0,719	6,393	10,196	5564
Adl	0,217	0,798	0	6	6658
Iadl	0,384	1,074	0	7	6658
limitations with activities -gali	0,433	0,496	-1	1	6659
years smoking	7,731	14,053	0	70	6623
days drinking in a month	7,894	11,046	0	30	6653
number of miscarriages	0,074	0,345	0	5	6897
contraceptive pill available	0,381	0,486	0	1	6897
abortion legal	0,176	0,380	0	1	6897

Table 2: Maternity leave policies database

Country	Period	Duration (weeks)			Benefit (% of wage in manufacturing sector)			Weeks of Full wage leave (benefit*duration/100)		
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Sweden	1960-1979	12.8	39.0	25.3	45.0	90.0	63.8	5.8	35.1	17.2
	1980-2010	39.0	68.6	59.3	62.0	90.0	72.9	27.7	57.6	42.8
Denmark	1960-1980	14.0	14.0	14.0	19.0	90.0	59.3	2.7	12.6	8.3
	1980-2011	18.0	18.0	18.0	39.0	90.0	62.2	7.0	16.2	11.2
Germany	1960-1981	12.0	14.0	13.0	100.0	100.0	100.0	12.0	14.0	13.0
	1980-2012	14.0	14.0	14.0	100.0	100.0	100.0	14.0	14.0	14.0
Netherlands	1960-1982	12.0	12.0	12.0	100.0	100.0	100.0	12.0	12.0	12.0
	1980-2013	12.0	16.0	14.3	100.0	100.0	100.0	12.0	16.0	14.3
Belgium	1960-1983	12.0	14.0	13.0	60.0	79.5	64.9	7.2	11.1	8.5
	1980-2014	14.0	15.0	14.7	76.4	79.5	77.4	10.7	11.5	11.3
France	1960-1984	14.0	16.0	14.1	50.0	90.0	68.0	7.0	14.4	9.6
	1980-2015	16.0	16.0	16.0	84.0	100.0	93.3	13.4	16.0	14.9
Austria	1960-1985	12.0	16.0	13.2	100.0	100.0	100.0	12.0	16.0	13.2
	1980-2016	16.0	16.0	16.0	100.0	100.0	100.0	16.0	16.0	16.0
Italy	1960-1986	17.0	23.7	21.3	80.0	80.0	80.0	13.6	18.9	17.1
	1980-2017	21.5	23.7	21.9	80.0	82.0	80.1	17.2	18.9	17.5
Spain	1960-1987	12.0	14.0	12.3	60.0	75.0	69.7	7.2	10.5	8.6
	1980-2018	14.0	16.0	15.3	75.0	100.0	88.7	10.5	16.0	13.7

Table 3: Weeks at full wage granted by maternity leave policy

FWW	AT	DE	NL	ES	IT	FR	DK	GR	BE	
3	0	0	0	0	0	0	110	0	0	110
4	0	0	0	0	0	0	102	0	0	102
5	0	0	0	0	0	0	79	0	0	79
6	0	0	0	0	0	0	0	741	0	741
7	0	0	0	128	0	378	0	0	388	894
8	0	0	0	0	0	0	40	0	271	311
9	0	0	0	275	0	0	0	0	0	275
11	0	0	0	91	0	0	40	0	266	397
12	232	241	637	0	0	0	72	0	0	1182
13	0	0	0	0	0	327	235	0	0	562
14	0	181	0	0	130	80	0	0	0	391
16	59	0	0	1	0	0	59	0	0	119
17	0	0	0	0	379	0	0	0	0	379
19	0	0	0	0	240	0	0	0	0	240
	291	422	637	495	749	785	737	741	925	5782

Note: number of first maternity episodes occurring between age of 16 and 26, by Country of residence of the mother and FWW in place in the specific country and year of childbirth.

Table 4: Difference-in Differences estimation

	(1)	(2)	(3)
working at maternity	0,178 (0,118)	0,1924 (0,2126)	0,2461* (0,1467)
fww	0,307 (0,190)	0,1771 (0,3419)	0,5164* (0,2982)
working at maternity * fww	-0,385** (0,171)	-0,6527** (0,3226)	-0,5358** (0,2552)
age	0,07 (0,190)	0,0248 (0,3379)	-0,0428 (0,2597)
Age squared	-0,001 (0,002)	-0,0007 (0,0027)	-0,0001 (0,0021)
High school education	-0,145 (0,104)	-0,0329 (0,1737)	-0,2501 (0,1576)
College education	-0,186 (0,134)	0,04 (0,2630)	-0,2712 (0,1854)
Married/Cohab or Single	-0,413** (0,192)	0,6553 (0,4800)	0,6092*** (0,2212)
Number of children	0,066* (0,037)	0,057 (0,0634)	0,0025 (0,0500)
1931-1940 cohort	.	.	0,5471 (1,1423)
1941-1950 cohort	-0,022 (0,203)	0,5086 (0,4090)	0,4458 (1,1752)
1951-1960 cohort	0,31 (0,293)	1,1600** (0,5679)	0,5284 (1,0550)
1961-1970 cohort	0,2 (0,621)	1,9447* (1,0358)	-0,5933 (0,6409)
1971-1980 cohort	0,324 (0,884)	.	.
adl	0,433*** (0,123)	0,4399** (0,1982)	0,3819** (0,1713)
iadl	0,535*** (0,102)	0,6027*** (0,1763)	0,4934*** (0,1551)
limitations with activities -gali	1,142*** (0,093)	1,1275*** (0,1781)	1,1653*** (0,1216)
years smoking	0,004 (0,003)	0,0039 (0,0054)	0,0044 (0,0037)
days drinking in a month	0,001 (0,004)	0,0004 (0,0073)	-0,0021 (0,0057)
denmark	-105,561** (43,617)		90,8264** (44,0397)
tdenmark	0,054** (0,022)		0,0461** (0,0224)
italy	-68,163		

	(52,838)		
titaly	0,035 (0,027)		
belgium	-68,183 (44,790)	-59,4842 (52,7447)	
tbelgium	0,035 (0,023)	0,03 (0,0268)	
france	9,202 (46,664)		15,4723 (47,2584)
tfrance	-0,004 (0,024)		-0,0073 (0,0240)
austria	-16,844 (51,658)		-22,3634 (51,9241)
taustria	0,008 (0,026)		0,0112 (0,0264)
spain	-30,437 (54,539)		
tspain	0,016 (0,028)		
year of child birth	-0,094*** (0,028)	-0,1186** (0,0464)	-0,0655* (0,0341)
constant	187,398*** (56,715)	235,9034** (94,3360)	133,6319* (68,8434)
	2857	908	1406

Notes: Stars represent statistical significance: * p<0.10, ** p<0.05, *** p<0.01. standard errors reported in parenthesis are robust to heteroskedasticity. Excluded cohort is 1931-1940. Germany is excluded time trend in column (1) and (3), Spain in column (2). All estimates include first maternity episodes which took place when the mother was between 16 and 25 years old. Column (1) is based on the country-specific dummy policy variable based on fww. Column (2) includes only Belgium and Spain (fww dummy is equal to 1 if fww >=9). Column (3) includes only countries with common dummy policy variable (fww dummy is equal to 1 if fww>12)

Table 5: Difference-in-Differences results**A. Country-specific policy variable**

	fww low	fww high	difference	% change wrt working with fww low
working	2,70	2,62	-0,08	
not working	2,52	2,82	0,31	
	DiD		-0,38	-14,27%

B. Only countries with fww threshold at 9 months

	fww low	fww high	difference	% change wrt working with fww low
working	3,21	2,74	-0,48	
not working	3,02	3,20	0,18	
	DiD		-0,65	-20,32%

C. Only countries with fww threshold at 13 months

	fww low	fww high	difference	% change wrt working with fww low
working	2,53	2,51	-0,02	
not working	2,28	2,80	0,52	
	DiD		-0,54	-21,19%

Note: mean depression in all European countries included in the sample by work status and maternity leave policy

Table 6: Robustness checks

	(1)	(2)	(3)	(4)
working at maternity	0,118 (0,096)	0,310** (0,133)	0,244* (0,136)	0,158 (0,135)
fww	0,313** (0,133)	0,395* (0,212)	0,391* (0,212)	-0,221 (0,411)
working at maternity * fww	-0,351*** (0,131)	-0,503*** (0,192)	-0,360* (0,192)	-0,375 (0,245)
age	0,189* (0,108)	0,024 (0,203)	0,045 (0,202)	0,093 (0,433)
Age squared	-0,002* (0,001)	-0,001 (0,002)	-0,001 (0,002)	-0,001 (0,003)
High school education	-0,186** (0,082)	-0,159 (0,114)	-0,099 (0,112)	-0,229* (0,138)
College education	-0,390*** (0,096)	-0,152 (0,148)	-0,141 (0,142)	-0,217 (0,176)
Married/Cohab or Single	-0,14 (0,156)	-0,458** (0,192)	-0,429** (0,200)	. .
Number of children	0,048 (0,030)	0,036 (0,042)	0,046 (0,040)	0,025 (0,050)
1931-1940 cohort	-0,267 (0,353)	-0,119 (0,933)	-0,309 (0,928)	-0,538 (0,394)
1941-1950 cohort	-0,283 (0,428)	-0,182 (0,958)	-0,389 (0,951)	-0,463 (0,324)
1951-1960 cohort	-0,051 (0,456)	0,161 (0,869)	-0,179 (0,862)	. .
1961-1970 cohort	-0,25 (0,552)	-0,272 (0,629)	-0,147 (0,594)	. .
1971-1980 cohort	0,3 (0,687)
adl	0,251** (0,102)	0,429*** (0,133)	0,383*** (0,130)	0,512*** (0,152)
iadl	0,603*** (0,076)	0,520*** (0,128)	0,520*** (0,108)	0,583*** (0,137)
limitations with activities -gali	1,250*** (0,071)	1,037*** (0,100)	1,214*** (0,099)	1,088*** (0,120)
years smoking	0,006*** (0,002)	0,002 (0,003)	0,004 (0,003)	0,003 (0,004)
days drinking in a month	0 (0,003)	0,003 (0,004)	0,001 (0,004)	0,004 (0,005)
denmark	-63,999*** (23,700)	-110,182** (44,502)	-116,284** (46,879)	38,047 (96,905)
tdenmark	0,032***	0,056**	0,059**	-0,02

	(0,012)	(0,023)	(0,024)	(0,049)
italy	-42,425	-84,805	-73,531	126,461
	(28,823)	(58,085)	(56,390)	(127,941)
titaly	0,022	0,043	0,038	-0,064
	(0,015)	(0,029)	(0,029)	(0,065)
belgium	-61,857**	-64,649	-51,169	83,807
	(25,599)	(46,423)	(48,881)	(100,516)
tbelgium	0,032**	0,033	0,026	-0,042
	(0,013)	(0,024)	(0,025)	(0,051)
france	9,311	6,078	16,925	166,299
	(25,701)	(49,033)	(50,929)	(197,860)
tfrance	-0,004	-0,003	-0,008	-0,084
	(0,013)	(0,025)	(0,026)	(0,101)
austria	-54,037	-44,053	-0,805	.
	(38,071)	(54,283)	(56,266)	.
taustria	0,027	0,022	0	.
	(0,019)	(0,028)	(0,029)	.
spain	-20,859	-32,225	-47,663	51,005
	(31,002)	(61,801)	(59,799)	(78,051)
tspain	0,011	0,017	0,025	-0,026
	(0,016)	(0,031)	(0,030)	(0,040)
year of child birth	-0,023*	-0,106***	-0,118***	-0,023
	(0,012)	(0,030)	(0,030)	(0,050)
years spent working		-0,007		
		(0,004)		
(log of) permanent income		-0,025		
		(0,072)		
constant	41,234*	213,127***	236,546***	45,614
	(23,680)	(60,275)	(60,882)	(98,959)
N obs	4860	2419	2481	1530

Notes: Stars represent statistical significance: * p<0.1, ** p<0.05, *** p<0.01. standard errors reported in parenthesis are robust to heteroskedasticity. Excluded cohort is 1921-1930. Germany is the excluded country specific trend in year of childbirth. Austria trend as well as married/cohabiting dummy in column (4) since there are no observations of cohabiting women, nor of Austrian women in the specific sample. Column (1) includes all first maternities. Column (2) includes all women aged 16-25 at childbirth, and adds two regressors: years spent working until the 2010 and logarithm of permanent income. Column (3) includes all women aged 15-25 at childbirth, who were either working since at least two years prior to childbirth, or were not working since two years prior to childbirth. Column (4) includes all women aged 15-25 at childbirth with a unplanned maternities index with a value above the 75% percentile of the distribution in the full sample of mothers.