I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 11752

Job Displacement, Family Dynamics and Spousal Labor Supply

Martin Halla
Julia Schmieder
Andrea Weber

AUGUST 2018

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 11752

Job Displacement, Family Dynamics and Spousal Labor Supply

Martin Halla
Johannes Kepler University Linz, IZA and GÖG

Julia Schmieder
DIW Berlin, WU Vienna and IZA

Andrea Weber
Central European University, CEPR and IZA

AUGUST 2018

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Job Displacement, Family Dynamics and Spousal Labor Supply*

We study interdependencies in spousal labor supply and the effectiveness of intrahousehold insurance in a sample of married couples, where the husband loses his job due to a mass layoff or plant closure using data from the Austrian Social Security Database. We show that in our sample of relatively young couples the shock hits households at crucial stages of family formation, which requires careful modeling of the wives' counterfactual lifecycle labor market patterns. In our empirical analysis, we propose three independent control groups of unaffected households to identify the causal effects of husbands' displacement on wives' labor supply. Our empirical results show that husbands suffer large and persistent employment and earnings losses over the first 5 years after displacement. But wives' labor supply increases only moderately and they respond predominantly at the extensive margin. The implied participation elasticity with respect to the husband's earnings shock is very small, about -0:04. While the wives' earnings gains recover only a tiny fraction of the household income loss, public transfers and taxes are a more important insurance at least in the short run. In terms of non-labor market related outcomes, we find a small positive effect on the probability of divorce, but no effect of the husband's job displacement on fertility. The presence and ages of children in the household are crucial determinants of the wife's labor supply response. The most responsive group are mothers, who are planning to return to the labor market after a maternity break, while mothers of very young children or wives without children remain unresponsive. We thus conclude that Austria's strong gender identity norms are an explanation for the limited scope of intra-household insurance.

JEL Classification: D19, J22, J65

Keywords: firm events, household labor supply, intra-household insurance, added worker effect

Corresponding author:
Julia Schmieder
DIW Berlin
Mohrenstraße 58
10117 Berlin
Germany
E-mail: jschmieder@diw.de

* For helpful discussions and comments, we would like to thank Mónica Costa Dias, Itzik Fadlon, Peter Haan, Juan F. Jimeno, Magne Mogstad, Andreas Steinhauer, Katharina Wrohlich, and many conference and seminar participants. The usual disclaimer applies. We gratefully acknowledge financial support from the German Research Foundation within its priority program 1764: The German Labor Market in a Globalized World.

1 Introduction

An important economic motive for marriage is the opportunity to share risk within a couple. If the one partner is affected by an unexpected shock such as illness or job loss, the second partner can increase labor supply as an insurance against the drop in household consumption. Other economic motives for marriage, such as the desire to have children and raise a family and the division of labor between home production and market work (Weiss, 1997), might, however, interfere with the risk sharing potential within marriage. For example, if preferences for spending time with children are unequally distributed in the couple, the spouses might not be willing to switch roles in response to an income shock. More generally, gender norms and role models might limit the flexibility of spouses to respond to changes in economic conditions.

From a policy perspective, the risk sharing potential of marriage is important, as strong intra-household insurance reduces the need for public insurance. The empirical literature has thus long sought to assess the importance of the risk sharing potential of marriage studying the so-called *added worker effect* (henceforth AWE). Early studies provide evidence of a negative correlation between employment of married women and men across labor markets and over time (Heckman and Macurdy, 1980; Mincer, 1962), while later work focuses on the timing of spouses' transitions between employment and unemployment within couples (Juhn and Potter, 2007; Lundberg, 1985; Stephens, 2002; Bredtmann et al., forthcoming). The findings from these studies are mixed, depending on the economic context and institutional framework. But most studies indicate small employment responses by wives and little evidence for a substantial AWE.[1] In contrast to these empirical results, recent studies estimating structural life-cycle family labor supply models based on earnings and consumption data have identified family labor supply as one of the major factors allowing married households to smooth consumption, even when they are faced with persistent income shocks (Blundell et al., 2016; Haan and Prowse, 2015).

The literature provides several arguments why the risk sharing channel via family labor supply might be less relevant in practice. One of them is the generous availability of social insurance programs that crowd out self-insurance or family insurance (Autor et al., 2017; Cullen and Gruber, 2000). A second argument are correlated shocks at the household level, for example, due to economic recessions. Children and fixed gender roles within the household might also reduce the potential to share risk, but they have received comparable less attention in the literature. Blundell et al. (2017) address the importance of children in understanding family labor supply decisions over the life-cycle, within a unified model framework that captures the trade-offs between providing child care and

[1] See Appendix Table A1 for an overview of cross-elasticity estimates in the literature.

insuring consumption against shocks within the household. Their findings confirm that, indeed, families with children respond differently to income shocks than families without children.

In this paper, we try to disentangle the roles of different channels in the responses to income shocks within married households, paying special attention to the effects of children. Our evidence is based on a quasi-experimental setup of married couples in Austria, where the husband loses a job due to a plant closure or mass layoff. These layoff events provide credibly exogenous shocks to household income, allowing us to disregard problems with reverse causality. In addition, the timing of the shock is precisely defined. A large literature documents persistent employment and earnings losses due to job displacement (Ichino et al., 2017; Jacobson et al., 1993; Ruhm, 1991). We have thus a setup in which couples face large, persistent, and unexpected shocks to household income, where we can explore the response of both partners around the time of the shock.

We show that in the Austrian case layoff events affect couples at different stages of the life-cycle. Especially, we observe many young couples with children, for whom we can study the trade-offs between insurance and child care. This is particularly interesting, as Austria is a very conservative society with strong gender identity norms (Akerlof and Kranton, 2000). The typical Austrian household follows the characterization of the male breadwinner model, where wives mostly enter the labor market as secondary earners and in part-time job (Bertrand et al., 2016). This social model is supported by Austrian welfare and family policies, which provide a generous parental leave system, but low levels of subsidized child care. As an illustration of the importance of gender norms and family values, Figure 1 shows the share of individuals who agree with the assessment that '*a pre-school child is likely to suffer if his or her mother works*' for several countries. In this comparison, Austria stands out with more than a third of respondents who strongly agree. In Scandinavian and Anglo-Saxon countries, less than 10 percent of survey respondents agree with this statement. In terms of labor market institutions, Austria has a universal UI system and an individual based income tax system.

Our empirical analysis is based on detailed data from linked Austrian registers, which allow us to identify partners in marriages and divorces as well as plant closure and mass layoff events at the plant level. In total, we have a sample of about 48,000 married couples, where the husband is laid off. The data indicate strong specialization in market and household work within the couples. Only 50% of wives are working before the husband loses the job, and a large fraction of wives are working part-time.

We show that our setup of high volatility in female life-cycle labor supply profiles, with mothers dropping out from the labor force after childbirth for extended periods, requires a careful choice of a control group to measure responses to the displacement shock. In the empirical analysis, we use three different control groups to confirm the robustness of our results. Following the literature, the first control group consists of couples with

the husband working in a firm without mass layoff or plant closure. The second control group consists of couples, where the husband works in a plant with a mass layoff, but is not laid off himself. The third control group exploits the randomness in the timing of displacement, following the strategy applied by Fadlon and Nielsen (2017). We compare outcomes in couples who marry in the same year, but in one case the husband is displaced sooner than in the other, and we use the time between the two displacement events as counterfactual.

Our main results are remarkably consistent across the three control groups. We find that husbands lose on average 21 to 24% of earnings over a 5 year period after displacement and have a 16 to 17% lower employment rate relative to the control group. The labor supply responses of wives are positive and statistically significant, but small compared to the husbands' losses. On average, the female employment rate increases by 1% and earnings by about 2%. We find that wives mainly respond at the extensive margin and are more likely to enter the labor market, if they were not employed before the husbands' job loss. The implied participation elasticity with respect to the husband's earnings shock is very small, roughly -0.04 in the full sample and -0.07 in the sample of wives not employed at displacement.

The intra-household insurance mechanism plays a negligible role compared to public insurance via government transfers and taxes, as the wives' labor supply recovers only a tiny fraction of the overall loss in household income. In particular, UI benefits cover the large initial drop in household income following the job loss. But due to time-limited benefit durations, the longer term losses in household income are not covered by government transfers.

Overall, these results indicate a small role of risk-sharing within married couples in Austria. To disentangle the importance of mechanisms that limit the risk sharing potential, we consider several channels. First, we investigate the stability of the family structure with respect to the husband's job loss. If the shock leads to divorce or changes in fertility plans this could explain the limited scope of the insurance mechanism. We find a small increase in the probability of divorce comparing displaced couples with couples where the husband works in a firm without mass layoff or plant closure. But there is no increase in the divorce rate of displaced couples relative to those where the husband works in a plant with mass-layoff, indicating some spill-over effects. Furthermore, we do not see any effects of the husband's job loss on fertility, which indicates that couples are not willing to revise fertility plans.

Second, we investigate heterogeneity in responses by the age of the youngest child in the household. The wife's labor force participation before the husband's job displacement varies greatly in size by the age of children in the household. Women with very young kids below the age of 3 are mostly on parental leave and only 18% of them are employed. In contrast, wives with children above compulsory schooling age or without children have

a much higher employment rate of 66%. We find that the most responsive group are mothers with children between age 3 and 15, who increase their employment rates and earnings persistently after the husband's job loss. We find no response among mothers of very young children or among women without children or with older children. This seems to imply that some trade off in child care provided by the mother and by formal channel occurs, especially among women who bring forward their entry into the labor market after a maternity break. Notably, we find no evidence on substitution in child care responsibilities between mothers and fathers of very young children from whom no formal child care is available.

Third, it could be the case that labor market shocks are correlated among wives and husbands. Assortative matching and the fact that they work in the same labor market could reduce employment opportunities for wives. Indeed, we don't find any female labor supply responses in couples where the husband loses the job in a market with a high unemployment rate. But even in markets with low unemployment, the additional earnings from the wife's employment just cover a tiny fraction of the total household income loss. We further find that wives with high earnings potential, i.e. those with high earnings before marriage, respond more strongly to the husband's job loss. In addition, the wife's labor supply response is stronger in couples, where the husband loses a well-paid job from a firm that pays above average wages to all their other workers. If labor market shocks within couples were strongly correlated, we would not expect to find heterogeneity along these two dimensions.

Our paper relates to the large literatures on family labor supply and on the long term effects of job displacement, to which we contribute clean quasi-experimental evidence on the effects of job loss on family labor supply in married coupes. We also contribute to the emerging literature on the role of social norms and gender identities in shaping labor market outcomes (Bertrand et al., 2016; Kleven et al., 2018). In our setup, we show that the traditional male breadwinner model of the family can severely limit the insurance potential of marriage. Further, we contribute to the literature on the motives of marriage and fertility (Weiss, 1997). Especially, we provide empirical evidence that in Austria fertility decisions often precede marriage decisions.

The remainder of the paper is organized as follows: Section 2 discusses relevant aspects of the institutional setting. Section 3 introduces our data sources. We also discuss how we identify plant closures and mass-layoffs and provides descriptive statistics on the key outcome variables. Section 4 describes the life-cycle patterns of women of displaced husbands, and motivates our three alternative quasi-experimental counterfactual scenarios. Section 5 outlines our estimation strategy. Section 6 presents our main estimation results along with a number of robustness checks and three extensions. First, we examine consequences of husband's displacement on households disposable income by accounting for changes in taxes and benefits. Second, we explore the underlying mechanisms of the

AWE that go beyond an income effect and affect the family structure. Third, we investigate heterogeneity in responses for different types of households. This last step helps us to understand the reasons for the limited responses by wives. The final Section 7 concludes the paper and discusses potential policy implications.

2 Institutional setting

In this section, we provide background information on several aspects of the institutional setting in Austria. This information is helpful to put our results into perspective.[2]

Trends in household formation Austria witnessed trends in marriage and fertility behavior, which are quite comparable to other high-income countries. Both the age at first marriage and at first birth have increased substantially over time, while other patterns have remained stable. The vast majority of Austrian females will be married at some point in their lives, and will give birth to at least one child. About 90 percent of females 45 years of age or older have been ever married (see Census 1981, 1991 and 2001). An almost comparable share of this age group gave birth to at least one child. The relative timing of marriage and first birth also remained constant. Most women give birth to their first child in the first two years after marriage. A sizeable (but declining) fraction of these women give birth to a second child a couple of years later. The birth timing gives rise to drastic changes in women's labor market participation in the years after marriage, as we will see below.

Development of the female labor force participation In 1990, about 64 percent of all Austrian women between the age of 25 and 54 were participating in the labor market. This rate had increased over time and since the early 2000s the female labor force participation has been consistently above 80 percent.[3] However, even today, the female participation rate is still well below the male rate of 92.5. Moreover, at any point in time, there is much more heterogeneity in the female than in the male participation rate. The most important dimensions predicting labor force participation are women's age, marital status, and the number and age of children. Married women with children, especially those with young children, are the group with the lowest participation rates (see Appendix Figure A1).

Gender identity norms and beliefs about child care One potential explanation, for the rather low participation rates of (married) women with children, are prevailing gender identity norms and beliefs about the quality of child care. Using data from the *European and World Values Surveys*, Table 1 shows that a large share of Austrians believe that '*a pre-school child is likely to suffer if his or her mother works*', while few agree with the

[2]The time-constrained reader may appreciate the five most important stylized facts at the end of this section and skip to Section 3.

[3]All figures are according to estimates of the *International Labour Office*, Source: *ILOSTAT Database* (accessed on September 20, 2016).

statement that '*a working mother can establish just as warm and secure a relationship with her children as a mother who does not work*'. A comparison with figures from other high-income countries reveals that Austrians hold a comparably high degree of conservatism toward gender roles and the labor force participation of mothers. In line with this, relatively few Austrians consider '*sharing household chores*', as '*important for [a] successful marriage*'. This is supported by the evidence presented by Bertrand et al. (2016), who classify Austria based on a series of measure of gender attitudes as a high-sexism country. These patterns are very robust across sub-populations defined by sex and marital status, and also hardly change over the available sample period from 1990 to 1999.

Maternity and parental leave policies Another explanation, for the rather low participation rates of (married) women with children, is the generous parental leave system. Austrian law mandates a compulsory maternity leave period of eight weeks before and after delivery for all working mothers (Lalive et al., 2014). Subsequently, eligible parents are entitled for paid and job-protected parental leave up to the child's third birthday. In the vast majority of the cases it is the mother, who takes the leave. Thus, almost all women leave the labor market at least temporary after the birth of a child, and a significant share leaves the labor market also permanently. The latter particularly applies to mothers with two children or more (see above).

Child care The Austrian system of formal child care distinguishes between facilities for children below the age of three (nurseries) and for those aged three to six (kindergarten). While the vast majority of communities have offered a kindergarten since the 1980s, the local availability of nurseries has been traditionally much lower. In 1995, only about 3 percent of communities had nurseries. These nurseries were predominantly located in more densely populated areas and covered about 35 percent of the total population. A widespread problem with both types of institutions are oversubscriptions, short opening hours (until noon) and long holidays.

Taxation of families The Austrian tax system follows the standard of individual income taxation, which means that partners in married couples are taxed separately. The entry tax rate for the second earner is thus lower, all other things equal, than in joint or family-based taxation system. In addition, basic family allowances are rewarded universally and independent from the level or distribution of earnings (OECD Economic Surveys: Austria 2015). Both aspects of the tax system should promote dual-earner households. On the other hand, certain characteristics of the tax and benefit system work in favor of single-earner household or a '1.5 model'. In particular, the quite high marginal tax wedge for medium incomes promotes part-time work.

Unemployment insurance In Austria, all private sector workers are automatically enrolled in the universal UI system. Eligibility for and duration of unemployment benefits depends on the individual's work history and age. UI payments replace around 55% of

the previous net wage and are subject to a maximum and minimum. Job losers in our samples can receive UI benefits for 20 to 39 weeks. After exhausting regular unemployment benefits, job losers can obtain means-tested income support, unemployment assistance (UA), that pays a lower level of benefits indefinitely. Unemployment assistance is reduced euro for euro by the amount of any other family income (Card et al., 2007).

The five *most important stylized facts* are: First, within the typical Austrian couple, the man is still the primary earner. Second, women in the age range between 20 to 35 have complex employment patterns. This is particularly true in the years after marriage and first birth. Third, Austrians have on average very traditional views on gender roles, and prefer mothers of (young) children not to participate in the labor market. Fourth, supply of formal child care facilities for children below the age of three does not meet demand. Fifth, married couples are taxed individually.

3 Data sources, firm events, and descriptive statistics

Our empirical analysis is based on combined data from several administrative registers. Information on individual labor market careers is provided by the *Austrian Social Security Data (ASSD)*. This is a linked employer-employee database, which covers the universe of Austrian workers in the private sector from 1972 onward (Zweimüller et al., 2009).[4] The data record individual employment spells on a daily basis along with an employer identifier, and individual earnings per calendar year and employer. In addition, the data include information on other social security relevant events such as unemployment, retirement, parental leave and in the case of women also births. Information on a worker's marital status and the identity of their partner is provided by the *Austrian Marriage Register* and the *Austrian Divorce Register*.

3.1 Plant closures and mass layoffs

We make use of the linked employer-employee structure of the ASSD to identify plant closures and mass layoffs. Our identification strategy relies on an approach investigating detailed flows of workers between employer identifiers that is described in Fink et al. (2010).[5] In particular, we organize plant level information from ASSD employment records in a quarterly panel measuring the number of blue- and white-collar employees at each

[4]The ASSD comprises only incomplete information on self-employed and civil servants (*Beamte*). Since we do not observe earnings for these two groups, we exclude them from our main analysis. Notably, the majority of persons employed with public authorities today are not civil servants, but so-called contractual civil servants (*Vertragsbedienstete*). Since we have precise information for this group, we include them in our main analysis.

[5]In the ASSD, we cannot distinguish between firms and establishments as there is no uniform rule for recording employer identifiers. As the vast majority of identifiers refers to small units, a plant in most cases will refer to an establishment (Fink et al., 2010).

employer identifier on February 10, May 10, August 10, and November 10 of each year.

Plant closures are observed in the quarter when an employer identifier vanishes from the ASSD. We analyze the flows of workers from the exiting identifier to subsequent employer identifiers to distinguish "true" closures from identifier reassignments or mergers with existing plants. We refer to the *closing quarter* as the last quarter in which the plant employs workers. To define our sample of closing plants, we consider all closures in the period from 1990 to 2007, and restrict the sample to plants with at least 5 employees during the last four quarters of their existence.

Mass layoffs are defined by a similar approach. We identify large drops in plant size in the quarterly time series, but exclude events in which a large group of employees moves to the same employer identifier. The exact thresholds to define a reduction in plant size between two quarters as a mass layoff is inspired by the Austrian system of advance layoff reporting. Employers planning to lay off an unusually large number of workers within the next month have to give advance notice to the employment office, if the number of layoffs exceeds a threshold that depends on the size of the plant.[6] In analogy to the closing quarter, we define a *mass layoff quarter* as the quarter immediately before the large drop in employment. In our sample, we consider all mass layoff events between 1990 and 2007. As the Austrian labor market is characterized by strong seasonality in employment, which makes it difficult to distinguish closures or mass layoffs from purely seasonal employment fluctuations, we exclude plants from sectors with a high share or seasonal employment (i. e. agriculture, construction, and tourism).

Restrictions on the sample of displaced workers At the individual level, we define workers as being affected by a plant closure if they are employed at a closing plant at the closure date or in the two preceding quarters. Workers affected by a mass layoff are employed at the mass layoff date, but leave the plant in the subsequent quarter. Our sample of displaced workers consists of men displaced by a plant closure or mass layoff, who have been married for at least two years, and who have at least one year of tenure at layoff. We further restrict the age at displacement to 25–55 for husbands and to 25–50 for wives, selecting the upper age limits to exclude transitions into early retirement.[7] Some individuals are displaced by firm events multiple times over their careers. We only consider the first displacement event for each husband, as subsequent outcomes might be

[6]Our definition only considers plants with more than 10 employees in the quarter before the mass layoff and we apply the following rules for size reductions. In plants with 11 to 20 employees, the size has to decline by at least three individuals; in plants with 21 to 100 employees, the size has to decline by a minimum of five individuals; in plants with 100-600 employees the size has to decrease by at least 5%. In firms with more than 600 employees, the number of employees between two quarters has to decline by at least 30 employees. In robustness analysis in Appendix B we present our main results with a more restrictive definition of mass layoffs.

[7]Our data suggests that this age restriction is reasonable: Less than 1% of all husbands and wives in our sample receive pensions when they are last observed in our sample. On average, 0.7% and 0.5% of husbands and wives, respectively, receive pensions in any quarter in our sample period.

influenced by the first displacement. We also drop couples, who are displaced by the same firm event.[8] Our final sample comprises 18,466 couples, with the husband displaced by a plant closure and 30,027 couples with the husband displaced by mass layoff.[9]

3.2 Outcome variables

The main outcome variables considered in our analysis are employment and earnings of husbands and wives. We organize individual observations at the quarterly level and define employment by an indicator equal to one if the individual is employed at the quarter date (Feb 10, May 10, Aug 10, Nov 10). Earnings refer to average monthly real earnings in Euro (2000 prices) over the quarter with the main employer. Note that the ASSD do not provide information on working hours. Thus, our earnings measure combines wages and hours. For each individual we collect quarterly observations in the 5 years before and after the displacement. We define the individual *reference quarter* by the mass layoff quarter or closing quarter or by the quarter in which the individual is last employed in the case of workers who leave before the closing quarter. In further analysis, we also analyze registered unemployment, receipt of UI benefits and unemployment assistance, household income, divorce, and fertility.

3.3 Covariates

Table 2 presents the main descriptive characteristics measured at the reference quarter. Columns (1) and (2) list the plant closure and mass layoff samples, respectively. Both groups of displaced workers are quite similar in the personal characteristics of husbands and wives, but firm characteristics are different. Mass layoffs tend to happen in larger plants than closures and in plants with a different industry and regional composition. Mass layoff plants also pay higher wages to their average workers. This is reflected in the difference in husbands' pre-displacement earnings of both groups.

Displaced couples in our sample are relatively young: husbands are on average aged about 39 years and their wives are roughly 2.5 years younger. Note that median age of husbands and wives is slightly younger than the mean. At displacement the average couples have been married for 12 years (median is 11 years) and they have 1.4 children. Looking at the distribution of the age of the youngest child in the household, we can see that about 18% of couples have a child below the age of three, 57% have children between age 3 and 15, and roughly a quarter of households either have no child or children aged 16 or older.

[8] 663 couples are affected by the same plant closure and 344 by the same mass layoff. Relative to all households that experience a plant closure (mass layoff) these are 3.47% and 1.13%, respectively.

[9] The highest numbers of displacements are observed in the late 1990s and early 2000s (see Figure A2 in the Web Appendix). There is evidence of seasonality in the number of displacements with peaks in the fourth quarter of each year.

Furthermore, the employment rate among wives prior to the husband's job displacement is low, only 50% of wives are working. If they are employed their earnings are significantly lower than their husband's. On average, a working wife earns about 62% of her husband's earnings, which corresponds to 38% of the household's labor income. The large earning gap within couples can only be explained by a high share of part-time work among wives.

4 Family dynamics around displacement and definition of control groups

Fertility plans and the presence of young children typically affect household labor supply decisions. Therefore, we investigate marriage durations and the timing of first births in our sample of couples with displaced husbands. The mode of marriage durations in the sample is around 5 years and the distribution has a long right tail. This implies that even though we only consider couples who have been married for at least 2 years, the majority are relatively recently married when the husband experiences the job displacement.[10] How soon after marriage do couples have their first child? Figure 2 showing the distribution of the time between marriage and birth of the first child demonstrates that in Austria the marriage date is very strongly related to the birth of a child. While few couples have their first child before marriage, we see a big spike in births 4 to 8 months after the marriage date and then a relatively long right tail. This pattern suggests that in many couples, marriage follows the fertility decision rather than the other way round. Overall, about 64 percent of first births occur within five years after marriage and 30 percent occur in the first year. Due to the generous Austrian parental leave system described above, fertility is also strongly related to female labor force participation. Together, the high prevalence of short marriage durations, presence of young children in the household, and long parental leave periods imply that we observe the husband's job displacement shock during a period of high volatility in household labor supply. The next set of figures illustrates this argument by investigating husband's and wife's employment around the displacement date.

Figure 3a plots the husband's employment probability around job displacement. We have restricted displaced workers to be employed for at least one year at the plant closure or mass layoff event and therefore the graph shows full employment prior to the reference date and slightly lower employment rates in earlier years. After displacement, we see a sharp drop in employment of about 30 percentage points. This is followed by a quick recovery over the next 4 quarters. In the longer run, however, displaced workers cannot fully recover and their post-displacement employment levels are about 20 to 25 percentage

[10]The distribution of marriage durations at the reference date is shown in Appendix Figure A3.

points below full employment.

Figure 4 examines the employment of the wives of displaced husbands. To point out variation in female labor supply around childbirth and marriage, we plot employment rates for 5 groups with different marriage durations. The figure reveals substantial heterogeneity across groups. Starting with the group with the shortest marriage duration of 2 to 4 years, we can see that the average employment probability of women drops shortly after marriage — in line with the arrival of children — and then slowly recovers after a maternity break. This pattern is repeated in groups with longer marriage durations, by parallel shifts to the right of the wives' employment trajectories.[11] The life-cycle pattern thus creates huge variation in female labor supply over time. Depending on the duration of marriage, the wife's employment probability at the time of the husband's displacement varies between 40% and 50% and it rises almost linearly for each group after the reference quarter. Prior to husband's displacement there is a lot of variation in wife's employment across the different groups.

Figure 3b shows the average quarterly employment probability aggregated over all groups of wives. After having investigated different marriage cohorts, it is clear that the aggregate pattern of wives' employment rates is not at all informative about their response to husbands' job displacement.[12]

Because a simple event study design without control group is highly sensitive to female life-cycle patterns, our empirical strategy relies on the choice of appropriate control groups of couples, who did not suffer a job displacement. The idea is to compare labor market outcomes of couples with and without displacement of the husband holding fixed the stage in the life-cycle. As we lack a design with full randomization of job displacements, we control for the complex counterfactual pattern in female employment using three different control groups: (i) households who are not affected by a firm event, (ii) households with husbands employed during a mass layoff, but not displaced themselves, and (iii) households who experience a displacement through a firm event in the near future.

Control group 1: Non-displaced husbands without firm event. The first control group consists of couples fulfilling the same age, tenure, and marriage duration restrictions as our displaced sample. Husbands are employed at any reference quarter from

[11] Alternatively, we show in Appendix Figure A4 the employment probability of wives around their husbands' displacement by the age of the youngest child in the household. Given the close relationship between marriage and fertility established above, the patterns look very similar.

[12] The latter interpretation is supported by Appendix Figure A5. This graph shows quarterly means of the employment probability around displacement, while flexibly adjusting for marriage duration and the calendar quarter of observation. While husbands' employment results are hardly changed by the adjustment (see Panel a), wives' results now show a very different pattern (see Panel b). After the reference date employment of wives still increases, but only by about 3 percentage points in the long run. This indicates that the displacement effect on wives' employment is one order of magnitude smaller than that on husbands.

1990–2007 at firms that are not experiencing a closure or a mass layoff. Because this is a large group, where many couples are observed repeatedly, we draw a ten percent random sample. Workers in control group 1 are not affected by a displacement event, neither themselves, nor in their plant. Table 2 column (3) reports descriptive statistics showing that their characteristics differ from those of displaced workers in terms of age, labor market experience, job stability, and earnings. Importantly, non-displaced workers are employed by larger firms that pay higher wages also to their average workers. Appendix Figure A6 illustrates that firms, which do not experience a mass layoff or closure, are substantially larger and pay on average higher wages than event firms. Wives of non-displaced workers in control group 1 are slightly older than wives of displaced workers, but overall the difference in wives' characteristics are smaller than among husbands.[13] The differences in observable characteristics between displaced couples and control group 1 couples gives rise to concerns that workers might be sorting into more and less risky firms and jobs also on the basis of unobservable characteristics.

Control group 2: Non-displaced husbands in mass layoff firms. To confront the concern of workers sorting into different firms, we define the second control group by husbands employed in mass layoff plants at the mass layoff date, who do not leave their employer in the subsequent quarter. As the number of non-layoff workers at the mass layoff plant typically exceeds the number of layoffs, we draw a 40% random sample of all observations. The reference date for this control group is defined by the mass layoff date.[14] Workers in control group 2 suffer a mass layoff at their plant, but do not lose their jobs. As we can see in column (4) of Table 2 these workers share average firm characteristics with workers displaced by mass layoffs. The mean firm size differs between column (2) and (4), because larger firms tend to have more workers, who survive a mass layoff event. With the definition of control group 2 we do not worry about selection into firms, but we might worry about selection into layoff. Many firms apply 'last-in first-out' or similar policies to select mass layoffs (Sorensen, 2018). A further concern is that economic and psychological shocks related to a mass layoff can also affect non-displaced workers and their spouses, due to increased uncertainty or stress or because of a general deterioration of labor market conditions.[15]

Control group 3: Husbands displaced at a later date. For the third control

[13]Family dynamics, i.e. the marriage duration at the reference date and the time between marriage and first birth, are similarly distributed for households that experience displacement and for those in the control groups. See Appendix Figures A7 and A8 for a comparison.

[14]We also exclude workers who are ever displaced from a plant closure or mass layoff over our observation period from control groups 1 and 2. But individuals can be in the control group in more than one reference quarter. This happens for about 10% of the individuals in control group 1 and 26% of individuals in control group 2.

[15]Gathmann et al. (2017) show that mass layoffs worsen the local labor market situation in a causal way. They find that mass layoffs have sizeable negative effects on the regional economy, especially of firms in the same sector.

group we do not sample individuals who were not displaced, but we exploit the timing of firm events and construct control groups of workers, who are displaced themselves but at a later date. Our approach is inspired by recent studies by Fadlon and Nielsen (2017) and Hilger (2016), who exploit the timing of events to investigate the effects of spousal health shocks on employment and the effect of father's displacement on child outcomes, respectively. Under the assumption that the process determining involuntary job loss does not vary over time, workers who are displaced in later periods should not differ in unobserved characteristics from those who are displaced in the base period. Thus the confounding effects of unobserved heterogeneity should be accounted for by a comparison of workers displaced at different times (Ruhm, 1991).

Our strategy to construct control group 3 is as follows. We start with a cohort of couples getting married in a fixed quarter and define households with husband displaced in a (reference) quarter h as the displaced group. The control group is given by the set of households in the same marriage cohort, who experience husband's displacement in the near future, in $h + \Delta$. We then assign a placebo shock at h to the households in the control group. It is important to hold the marriage date of the displaced and control group fixed to make sure that they are at the same stage of their life-cycle at date h. The choice of Δ is restricted by the trade-off between the length of the horizon over which we can observe post-displacement outcomes and the comparability of displaced and control couples. The two groups should be highly comparable if there is only little time difference between displacements, i.e. if Δ is short. But a short Δ also limits the period over which the counterfactual outcome can be observed. We experimented with values for Δ between 4 and 16 quarters, selecting only multiples of 4 because of the seasonality in mass layoffs and plant closures (see Appendix Figure A2 and robustness analysis in Appendix B). As we do not find much evidence for reduced comparability, we present the main results for $\Delta = 16$. We repeat the construction of the control group for every combination of marriage quarter and reference quarter h and construct weights such that the displaced and control group size is balanced within each cell.

Due to the sample restrictions on marriage duration and tenure at displacement, we have to put two additional restrictions on households in control group 3. This has implications for the comparability in the case of some of the outcome variables. First, the restriction on the husband's job tenure in control group 3 has to hold in quarter h and in quarter $h + \Delta$, which implies that there is full employment among husbands in control group 3 in the 4 quarters preceding $h + \Delta$. Therefore we cannot directly compare the husband's employment and earnings outcomes in control group 3 with the displaced group. Second, due to the restriction on a marriage duration of at least 2 years prior to displacement, households in control group 3 are continuously married between h and $h + \Delta$. If job displacement has an effect on the probability of divorce this cannot be measured by a comparison of couples with a displaced husband and couples in control

group 3. We will come back to these arguments in the results section.

5 Estimation strategy

We measure the effects of the husband's job displacement by comparing outcome variables at the individual wife or husband level, as well as family outcomes for the displaced and control couples in the quarters before and after the reference date. In the results section, we present a set of graphical results, which are quantified by regression estimates.

Our graphical results are based on the following regression model

$$Y_{ik} = \theta D_i + \sum_{l=-20}^{20} \gamma_l^q I\{k = l\} + \sum_{\substack{l=-20 \\ l\neq 0}}^{20} \delta_l^q D_i * I\{k = l\} + \upsilon_{ik}, \tag{1}$$

where Y_{ik} is the outcome of individual or household i in quarter $k \in [-20, 20]$[16], k measures the number of quarters relative to the reference quarter, D_i is an indicator equal to one if the husband is displaced at $k = 0$, $I\{.\}$ is the indicator function, and υ_{ik} is the error term. The parameter θ estimates the overall mean difference in the outcome between displaced and controls, the parameters γ_l^q measure the quarterly time profile of the outcome in the control group and δ_l^q measure the difference in time profiles between the displaced and the control group relative to the reference quarter.

For the presentation of quantitative estimation results we aggregate the effects at a yearly level averaging over the quarterly γ_l^q and δ_l^q. In addition, the model controls for the full set of industry and calendar quarter interactions, λ_{tj}. The model is given by

$$Y_{ik} = \theta D_i + \sum_{l=-5}^{5} \gamma_l I\{int(k/4) = l\} + \sum_{\substack{l=-5 \\ l\neq 0}}^{5} \delta_l D_i * I\{int(k/4) = l\} + \lambda_{tj} + \upsilon_{ik}. \tag{2}$$

By construction, average household characteristics do not differ between control group 3 and displaced households. But we have shown in Table 2 that the other two control groups differ from displaced households in terms of their observed characteristics. To control for these differences, we apply a propensity score weighting strategy following Imbens (2004). In particular, we estimate flexible logit specification for the probability that the household is in the displaced group based on a large set of family and individual characteristics measured at the reference quarter and characteristics of the husband's employer one year prior to the reference date. A plant closure or mass layoff does not come as a complete surprise and households might be able to foresee the event. To allow for responses of the wife in anticipation of the husband's displacement, we only control for

[16] In the estimations with control group 3, we compare displaced and control group only for four years around the reference date. Hence, l varies only from -16 to 16 in (1) and from -4 to 4 in (2).

the husband's time-invariant characteristics, his employment outcomes prior the reference date, his employer characteristics, and overall household characteristics at the reference date such as marriage duration and the number of children in yearly age categories. But we do not condition on labor market outcomes of the wives before the reference date.[17]

Appendix Figure A9 shows the distributions of the estimated propensity scores in the displaced group versus control group 1 and control group 2. The distributional overlap in pre-determined characteristics is closer between control group 2 and the displaced group than between control group 1 and the displaced. This is mainly due to the similarities in firm characteristics.

Based on predicted propensity scores from the logit models, we construct weights for members of the control groups such that the distribution of observable characteristics in each control group equals the distribution among displaced households. Using the weights we estimate weighted regressions of equations 1 and 2. Hence, the estimated parameters reflect the treatment effect on the treated. In all weighted regressions, standard errors are bootstrapped (500 replications) with clustering at the household level.

6 Empirical results

To measure the shock of the husband's job loss on household income, we start by investigating the effect of job displacement on husband's employment and earnings outcomes up to 5 years after displacement. Next, we turn to labor supply responses of wives, reporting employment, earnings, and job search outcomes.

[17] We estimate the probability that the husband in a household is displaced by plant closure or mass layoff using a logit model separately for control group 1 and 2 based on the following variables:

i. Husband characteristics: Interaction of year and season of displacement dummies, age (cubic), tenure in current job (dummies for deciles), employment experience (5 dummies), experience in unemployment (4 dummies), number of previous jobs (4 dummies), number of previous mass layoff events (7 dummies), indicator for blue-collar status in last job, and for the years -4, -3, -2 and -1 before the reference date: monthly wage, indicator for being employed and for being unemployed.

ii. Wife characteristics: Labor market experience measured in last quarter of employment (5 dummies), age distance to husband (5 dummies).

iii. Household characteristics: Marriage duration (30 dummies), number of children aged 0,1,2,...,12 (13 dummies) and total number of children under 18 at the reference date.

iv. Husband's employer variables: Indicators for industry and region, firm age (16 dummies), firm age and industry interactions.

We impose common support. Based on the estimated propensity score $\hat{p}$, we assign control group households weights equal to $\frac{\hat{p}}{1-\hat{p}}$. The normalization ensures that the weights of the control group add up to 1.

6.1 Husbands' employment and earnings responses

Figure 5 compares quarterly employment rates before and after job displacement for husbands in the displaced group and in control groups 1 and 2. The graphs on the left present employment profiles in the displaced group (blue line) and the control group (red line). The graphs on the right show the absolute difference between displaced and controls along with the corresponding 95% confidence intervals. A comparison across panels (a) and (b) confirms that the results do not differ by the choice of control group. Prior to job displacement the weighted difference in employment rates is close to zero, but immediately after the event the employment rate in the displaced group drops by more than 30%. We see a rapid recovery in subsequent quarters, which stalls after about 3 to 4 years. Employment rates also decline in the control group after the reference date, but more gradually.

Estimates of equation (2) quantify the the average annual differences in employment rates between displaced and control groups as shown in Table 3, columns (1) and (3). Five years after job displacement the mean difference in employment between displaced and control husbands is about 12 percentage points. The row indicated by *Displaced*×*Post*, shown below the coefficient estimates for the yearly dummies, reports the average difference between displaced and control individuals over the five years after displacement. Compared to the control group displaced husbands suffer an average annual employment loss of about 16 to 17 percentage points during the first five years.[18]

The corresponding estimates of the effects of job displacement on husband's earnings are shown in Table 4, columns (1) and (3). As we do not observe working hours in our data, we use monthly earnings in Euro (in 2000 prices) as dependent variable and set earnings of individuals, who are not employed equal to zero. In the years prior to displacement, earnings in the displaced and control groups evolve similarly and we estimate only small gaps of less than 0.5% of average pre-displacement earnings. The negative earnings gap increases strongly after job displacement. Depending on the control group, displaced husbands' average yearly earnings loss over 5 years amounts to 21 to 24% of the annual pre-displacement mean earnings.[19] The relative magnitude of the earnings loss from job displacement as well as the time pattern in the subsequent years, mirror the husbands' employment losses, which indicates that lower employment rates are the main driver of earnings drops.

[18]The estimated employment effects are similar in magnitude to those reported for male Austrian workers displaced in the 1980s by Schwerdt et al. (2010).

[19]These direct displacement effects on male earnings are of comparable size to those reported in Jacobson et al. (1993) and slightly smaller than in Davis and von Wachter (2011) for the US. They are also a bit larger than those reported in Sullivan and von Wachter (2009) for Germany.

6.2 Wives' labor supply responses

6.2.1 Wives' employment and earnings

The graphs on the left hand side in Figure 6 shows employment rates of wives in the displaced group and in each of the three control groups around the reference date. Irrespective of husbands' job loss, wives' employment rates in all groups follow the same upward sloping pattern, which confirms the importance of controlling for life-cycle profiles in female labor supply. Prior to the reference date differences in employment rates between displaced and each of the control groups are close to zero. Note that we adjust for differences in observed characteristics between the displaced group and control groups 1 and 2 by propensity score weighting on family, husband, and employer characteristics, which eliminates differences in wives' employment rates prior to the husbands' displacement. We do not correct for pre-displacement differences in observable characteristics between the displaced group and control group 3, as this control group is drawn from the same pool of couples and thus pre-displacement mean differences are zero by construction.

After the reference date a significant gap between displaced and control groups opens and persists over the 5 year horizon. This gap is remarkably similar across all three control groups, which makes us confident that we can interpret it as the wife's labor supply response to the husband's job loss. Compared to the displaced husbands' employment losses, the gains in wives' employment are small, however. The estimated effects shown in columns (2) and (4) of Table 3 are around 1% after 5 years. While the employment effects are small, they are precisely estimated and highly robust to the choice of control group.

The estimated effects of husband's job displacement on earnings of the wife, shown in Table 4 are again similar across all three control groups. While earnings differences between displaced and control groups are close to zero prior to the reference quarter, we see relatively small and positive earnings gains among wives after their husbands' job loss. Comparing wives' earnings gains with husbands' earnings losses makes clear that the shift in labor supply within a household is hardly able to cover losses in household income.

As explained in Section 3, the ASSD records earnings consistently only for employees in the private sector. To check the importance of self-employment as an alternative source of income after job displacement, we can examine the participation in self-employment. We find that self-employment increases among displaced husbands relatively rapidly after the job loss. But the overall effect is rather small; five years after displacement, the self-employment rate is 5 percentage points higher among displaced husbands than in the control groups. The rate of self-employment is very low among wives both in the displaced and the control group (see Appendix Figure A10).

6.2.2 Anticipation of husbands' job displacement and job search

In the job displacement literature, which typically identifies job displacements from major firm events characterized by sudden drops in the employment level, it has been difficult to deal with the anticipation of a worker's own job loss (Schwerdt et al., 2010). This is problematic in the light of Hendren (2017), who provides evidence from several sources that individuals have some knowledge about their future job loss. Evidence from married spouses offers an opportunity to assess the importance of anticipation at the household level, as the second spouse is not restricted to respond at a particular point in time and can start searching for job before the first spouse is displaced. Here, we investigate job search and employment responses of wives prior to the husbands' displacement.

An important feature in Figures 6 is that the gap in wives' employment rates opens only *after* the husband's displacement. Thus, there is no evidence of wives' anticipation of the household shock, at least in terms of employment. This could be due to unawareness of the shock itself, or of its magnitude and persistence. But job search takes time and wives' entry into employment could be delayed due to labor market frictions, even if they are aware of their husbands' job displacement in advance.

To confirm the lack of anticipation at the household level, we investigate responses in registered job search, as an alternative measure of the wife's labor supply that should be less affected by labor market frictions. In the ASSD we observe job search by individuals, who register as unemployed at the employment office. Registered individuals are not necessarily eligible for unemployment benefits, but can receive all job search counseling services. If the wife learns about her husband's planned job displacement, she can immediately register with the employment office. Thus, this measure should convey more direct information about anticipation of the household shock.

In Figure 7, we plot the quarterly patterns of wife's registered unemployment. Let us first consider wives of displaced husbands, shown by the blue line in the graphs on the left. Job search rates among wives in the displaced group remain small and stable until one quarter prior to the husband's displacement. Job search rates start increasing in the final quarter before displacement and rise until the first quarter after displacement, thereafter they remain stable over the next five years. Thus, even in terms of job search, there is not a much evidence of anticipatory responses. Panels (a) to (c) consider the three different control groups. Among wives in control groups 1 and 3, we see no corresponding reactions. Their job search rates remain rather flat throughout. Wives in control group 2, whose husbands were not affected by the mass layoff in their plant, raise their job search rates with some delay after the reference date. This could indicate spillovers from the mass-layoff event to unaffected households, who react to rising uncertainty. The graphs on the right show the absolute difference between displaced and controls and provide a 95% confidence intervals to assess statistical significance. Table 5 summarizes estimates in the five years before and after the reference date. Depending on the control group used, the

estimated difference in job search rates is between 0.3 and 0.7 percentage points. Given pre-treatment means of around 4 percent, these responses correspond to an increase in wives' job search by 7 to 17 percent.

6.2.3 Intensive versus extensive margin labor supply responses

From the evidence in the previous section, we conclude that anticipation of the income shock due to the husband's displacement is moderate and does not affect the wife's labor supply prior to the displacement event. Given that only about 50% of wives in our sample participate in the labor force, in the year when their husbands are displaced, offers an opportunity to investigate, whether wives' earnings respond at the intensive or the extensive margin. Put differently, we analyze to which extent already participating wives increase their working hours or switch to higher paying jobs; versus how many previously inactive wives join the labor force. In Table 2 we have shown that employed wives earn less than 40% of household labor income prior to the husband's displacement, probably due to part time work. This means that in both groups of households, there should be room for labor supply responses, either on the intensive margin or at the extensive margin.

To identify the margin of response, we split the sample and distinguish between couples in which wives worked in the year before their husbands' job loss and those with inactive wives. Specifically, we define a woman as employed if she is employed in all four quarters before the reference date. Similar as before, we weight each control group to resemble the observable characteristics of the displaced households and estimate equation (2) for each subgroup. Table 6 presents results by the wife's employment status before the reference quarter comparing women with displaced husbands with those in control groups 1 and 2. The estimated coefficients report the average annual difference between displaced and control groups in years 1 to 5 after displacement.

Results in columns (1) and (4) of Table 6 show that earnings losses of husbands are similar in the two types of households. This indicates that the husband's labor supply after job displacement is independent of the wife's labor market status at displacement. Results for wives in columns (2), (3) and (5), (6) show that positive employment and earnings responses among wives are driven by couples, in which the wife was not working prior to the husband's job loss. Point estimates for the group of couples with wives employed in the year prior to husband's displacement are even negative, but small in magnitude and only marginally significant. We thus conclude that wives' labor supply responses are concentrated at the extensive margin, as wives who were not employed prior to husbands' displacement enter the labor market.

The interpretation of wives' labor supply responses to husbands' displacement as extensive margin responses, allows us to compute a semi-elasticity of female labor force participation with respect to the husband's earnings. We relate the absolute change in

the wife's employment rate to the husband's relative earnings loss averaging over the five years following job displacement for the group of couples with employed wives prior to the displacement shock. The estimated elasticity, $\eta^{\text{participation}}$, is reported in Table 6. Depending on the control group the elasticity estimates range from -0.07 to -0.08; standard errors are computed by bootstrap. As about half of the total sample consists of couples with working wives, who are unresponsive to the husbands' job displacement, the corresponding participation elasticity for the full sample, reported in Table 3, is about half as big in absolute terms with -0.04, but still significantly different from zero.

6.3 Household income after displacement

Next, we explore what fraction of the overall household earnings loss due to the husband's job displacement is covered by the tax and transfer system. If benefits are very generous and taxes progressive, intra-household insurance might be crowded out by public social insurance. In particular, we account for the role of income taxes and the receipt of unemployment benefits (UB) and unemployment assistance (UA) at the household level. In the data net earnings and benefit income are only recorded from the year 2000 onward. As we want to observe outcomes for at least one year before the husband's job displacement, this part of the analysis focuses on households with a reference date in 2001 or later. As before, we weight couples in control groups 1 and 2 to have the same average predetermined characteristics as households in the displaced group.

Starting with benefit incomes, Figure 8 shows the quarterly probability that any household member receives unemployment benefits or unemployment assistance in graphs (a) and (b), respectively. The share of household receiving benefits is low prior to the displacement date, but in the displaced group UB receipt shoots up to more than 30% in the first few quarters after displacement. The potential duration of unemployment befits is limited to 30 or 39 weeks for most unemployed workers in Austria, therefore we see a relative sharp decline in the UI benefit rate after the initial quarters. In the long run, UI receipt is higher among the displaced households than in the control group, which can be explained with the lower stability of post-displacement jobs. Unemployment assistance benefits become available once UI expires, which is reflected in the delay with which UA receipt sets in after job displacement. But note that the peak in the probability of receiving UA is at about 6%, which is much lower than the peak in UI. Only a relatively small fraction of households transit from UI to UA benefits after UI benefit exhaustion. Columns (1) and (2) in Table 7 report the estimated average yearly effects on benefit receipt.[20] Over the first five years after job displacement, the average rate of UI benefit receipt is 8 percentage points higher in the displaced group and the average

[20]Equivalent results based on control group 2 are shown in the Appendix Figure A11 and Appendix Table A2.

UA benefit receipt is 2 percentage points higher than in the control group. This already suggests that benefit income cannot fully cover the long-term earnings loss experienced by displaced households.

Figure 9 shows the quarterly pattern of the estimated difference in household income between the displaced group and control group 1.[21] The left panel plots the treatment effects in absolute terms and the right panel provides a relative comparison to the corresponding pre-event level of household income. The blue line with the sharpest drop shows gross household labor earnings. This is the income measure we have used, separately for husband and wife, in the analysis above.[22] Husband and wife's combined gross labor earnings drop sharply after the husband's displacement, recover in the next few quarters, but in the longer run household gross earnings are about about 21% lower than in the control group; see columns (3) in Table 7 for corresponding estimation results. The red line in Figure 9 shows net household labor income. After income taxes and social security contributions the average absolute gap in household income between displaced and control groups is smaller than the gap in gross earnings. Due to progressive income taxation, the relative income gap is also smaller for net income and amounts to about 19% after 5 years (column (4) Table 7). If we add UI and UA benefits received by the household to the net labor income, shown by the green line in Figure 9 and column (5) in Table 7, we see that public social insurance primarily covers the large initial income shock suffered by displaced households, but it hardly affects household income in the long run. After 5 years the red and green lines in Figure 9 almost overlap.

Overall the Austrian tax and transfer system covers a larger fraction of the household income loss than intra-household insurance mechanism, especially in the short run.

6.4 Effects of husband's job displacement on family structure

Husband's displacement may affect household outcomes other than his wife's labor supply. In particular, we consider fertility and divorce. These outcomes could be mediators, which lie on the causal pathway between displacement, the associated negative income shock and the wife's labor supply response. Alternatively, the female labor supply response could be a mediator in the causal effect of displacement on these other outcomes. Let us consider divorce, for example. Negative earnings shocks may cause divorce due to changes in the

[21] Control group 2 provides very similar results, see Appendix Figure A12 and Appendix Table A2.

[22] Notice that the reported average household income measures and the effects of displacement on the former are larger than those for the sum of husband's and wife's gross earnings in Section 6. There are two reasons for that. First, we only look here at events in 2001–2007, whereas we previously considered events in 1990–2007. Figure A6 shows that median real earnings were increasing over the relevant time period. Hence, they are on average larger for later observations. Second, we use data from tax records for the income measures in this section, while we use earnings records from the ASSD in Section 6. The latter are top-coded at the maximum threshold for social security contributions; whereas the former are not.

expected gains from marriage (Charles and Stephens, 2004; Eliason, 2012; Rege et al., 2007). This change in marital status could in turn affect women's labor supply behavior. Alternatively, the negative income shock due to displacement and the associated labor supply response of the wife might trigger marital breakdown. In either case, the wife's labor supply adjustment and divorce are causally related to the husband's displacement, but the order in the causal chain differs. While a full mediation analysis is beyond the scope of this paper, we investigate the effect of displacement on family stability and fertility to provide more context for the estimated effects in our main analysis.

Divorce

Our sample includes couples who have been married for at least 2 years at reference date, thus we investigate the probability of divorce in the subsequent years. The left panels of Figure 10 show the divorce rate over 20 quarters for the displaced group and for control groups 1 and 2.[23] In Panel (a) we see a gradual increase in divorce probability among control group 1 couples, where husbands are employed in firms without mass-layoff or closure at the reference date. After 5 years, about 6% of these couples are divorced. Among couples with displaced husbands, the rise in the divorce probability is slightly steeper over the five year horizon. But the gap between both groups opens gradually, rather than immediately after the displacement shock. After 5 years the divorce probability is about half a percentage point higher in the displaced group than in control group 1. This corresponds to an average difference in the annual probability of divorce of 0.04 percentage points, as shown in column (1) of Table 8. Interestingly, control group 2 couples, with husbands employed in mass layoff firms but not laid off themselves, face the same divorce rate patterns as the displaced group, which is shown in the left graph in panel (b) of Figure 10. These couples are potentially exposed to higher uncertainty and stress themselves, which may change their gains from marriage and affect their divorce decisions.

Overall, we do not find evidence of strong effects of husband's job displacement on divorce and thus conclude that husbands' job displacement is affecting relatively stable

[23] In the case of divorce, control group 3 does by construction not provide a valid counterfactual. By assumption, control households remain married up to four years after the reference date.

households whose partners share the income shock over a five year period.[24] Marital stability after the displacement shock also implies the enforceability of intra-household insurance contracts.

Fertility

In Austria fertility and women's labor supply decisions are strongly related, as we have discussed above. It is therefore interesting to investigate whether the husband's displacement leads to an adjustment of fertility decisions. The right hand side panels of Figure 10 contrast the number of births per quarter in the displaced group versus control groups 1 and 2. Consistent with the evidence from Figure 2, fertility rates in our sample of married couples decline over time for all groups. At the reference quarter about 1 in 100 women gives birth to a child. Given the low baseline fertility rate, it is perhaps not surprising that we find no indication of an impact of the husband's job loss on fertility. In Figure 10 fertility patterns in the displaced group follow the controls very closely. This is confirmed by the estimation results in column (2) of Table 8, which show a precise zero effect on fertility.[25] This result implies that households do not adjust fertility plans to cope with the income shock from the husband's job displacement.

6.5 Heterogeneity

Our results based on the full sample indicate that intra-household insurance against husband's job displacement is almost negligible in Austria. To understand the reasons for the limited responses by wives and to identify impediments to the intra-household insurance mechanism, we investigate heterogeneity in responses for different types of households with the goal of identifying more and less responsive groups in the overall population. In particular, we seek to capture the impact of children on household labor supply decisions

[24] In the case of divorce, Austrian divorce law may mandate some redistribution of income between the former spouses depending on the grounds of divorce. There are three main types of divorce: i. divorce by mutual consent, ii. divorce on the ground of fault, and iii. divorce on the grounds of irretrievable breakdown. Divorce by mutual consent is the simplest and cheapest way to obtain divorce and is the most popular type of divorce. Since 1985, between 80 and 90% of all divorces were divorces by mutual consent. In the case of this type of divorce, law does not regulate alimony. However, an agreement on alimony is a condition to obtain such a divorce. In the case of the other types of divorce, typically the spouse who the court found to be (solely or primarily) at fault must pay alimony to the other spouse if the latter does not have sufficient income or assets to live on. The amount of alimony depends on the spouses' financial circumstances. Spouses with no income of their own are entitled to 33% of the net income of the other spouse. Spouses who are employed are entitled to 40% of the common income, less their own income. Additional support obligations for children or another ex-spouse will reduce alimony payments by 3 to 4%.

[25] Existing evidence for Austria (Del Bono et al., 2012) points to small negative and not very robust effect of job displacement on paternity of male workers in a sample that also includes non-married workers. In Finish data no effects are found (Huttunen and Kellokumpu, 2016). Notably, the focus of both studies is the effect of women's own displacement on subsequent fertility, which is found to be statistically significantly negative in both studies.

(Blundell et al., 2017), the role played by the earnings potential of the wife, by heterogeneity in the magnitude of the income shock (Lachowska et al., 2018), and by correlated shocks at the household level.

6.5.1 Heterogeneity by the age of youngest child

We have documented in Section 4 that labor supply patterns of young wives vary substantially over time and are largely determined by the timing of births. It is therefore important to analyze how the wife's response to the husband's job displacement interacts with the presence of children in the household. To guide our analysis and the interpretation of results, we refer to the model of household labor supply with children introduced by Blundell et al. (2017). In this model both partners in the household split their time between market work, child care services provided at home, and leisure. Model estimates for the US indicate complementarity in husbands' and wives' leisure decisions, but substitutability in the spouses' time input in child care services. If the husband suffers a negative wage shock, this model predicts that the wife will increase her labor supply and thus partially insure the household against the income shock. If children are present in the household, there are two additional factors that boost the wife's labor supply. First, as the husband's earnings drop and he works less, the husband takes over some of the wife's child care responsibilities at home. Second, the wife substitutes some of her time at home with the children with formal child care from outside of the household. Together these effects result in stronger predicted female labor supply responses in household with children.

Now we translate the model predictions to the Austrian case, which is characterized by generous parental leave regulations, scarce supply of formal child care for children below age 3, and by traditional gender roles within the household. According to the model we expect the wife's labor supply responses to vary by the age of the child in the following way. First, a strong driver of labor supply responses among women with very young children, should be the substitutability of home provided child care within the household. In this group, most mothers are on parental leave with the option of returning to their previous job, however with poor availability of formal child care. These households have the option to respond by spouses switching roles after the husband's job loss with the wife returning to her job and the husband taking over child care at home.

Second, in households with older children for whom formal childcare is more widely available, mothers have the additional option of substituting their child care time at home with child care outside the household, if they want to increase their labor supply. Third, among couples with children too old to require child care or without children, we should see wives' labor supply responses to the income loss after taking into account leisure complementarities with their husbands. A factor that might limit labor responses within all household are gender roles and differences in gender specific preferences for

spending time with children. This might be relevant in the Austrian case, where almost 40 percent of all Austrians agree that '*a pre-school child is likely to suffer if his or her mother works*' (see Figure 1).

To test these predictions, we start by defining three categories of households with children below compulsory schooling age, where the youngest child is (a) 0–2 years old and parents are eligible for parental leave, (b) 3–9 years old, or (c) 10-15 years old, plus a fourth category (d) of households with no child or all children aged 16 years or older. Similar as before, we weight the corresponding subsamples in control groups 1 and 2 to resemble the observable pre-determined characteristics of the displaced households for each category. Figure 11 plots employment rates of mothers in the displaced group and in control group 1 by the age of the youngest child.[26] Table 9, summarizes the corresponding estimation results of the average effects of husbands' job displacement on wives employment probabilities for each of the three control groups, in panels A to C.

A comparison of wives' average employment rates at the reference date across the four categories of households in Table 9, highlights the amount of heterogeneity in wives' labor supply over the life-cycle. Only 18% of the mothers of very young kids are employed at the reference date. If employed, they work few hours, which is reflected in the wives' earnings which are less than a third of the overall household labor earnings prior to the husband's job displacement. Wives' employment rates at the reference date rise with the age of the youngest child as mothers outgrow their maternity breaks. However, the wives' earnings are still low compared to their husbands', as wives on average contribute slightly more than a third of household labor income, if they are employed. We see the highest employment rates among wives, who have no children or all children above the compulsory schooling age; among those women the employment rate is 66% at the reference date and their share in household labor earnings is 41%, if they are employed.

The blue and red lines in Figure 11, show employment rates in the displaced group and control group and reflect the wife's labor supply responses after the husband's job displacement. We can see small and positive employment gaps opening after the husband's displacement in panels (b) and (c) among mothers with a youngest child aged 3 and older. But no gap appears for mothers with very young children in panel (a) or for wives without school age children in panel (d). The graphical results are confirmed by estimates in Table 9. The response is close to zero and never statistically significant for the household category with very young children aged 0 to 2 in column (1). The wives' employment response increases in the groups with older children across all three control group comparisons in columns (2) and (3) where we see small positive and mostly statistically significant employment responses among couples with children aged 3 to 9 and 10 to 15. The corresponding participation elasticities, estimated for control groups

[26] Equivalent graphs for the other two control groups are provided in Appendix Figures A13 and A14.

1 and 2 for which we can identify husbands' earnings losses, range between −0.03 and −0.07. In the fourth category of household without children of compulsory schooling age, column (4), the wife's employment responses are precisely estimated zeros in all three control group comparisons. The corresponding participation elasticities, are close to zero as well.[27]

Overall, we find evidence for heterogeneity in the wife's labor supply response by the age of the youngest child. The only caveat is that the sample split reduces the number of observations and decreases statistical power, thus differences between columns are never statistically significant. If we interpret the estimates in the light of the predictions from the model by Blundell et al. (2017), we draw the following conclusions.

First, couples who are eligible for parental leave are unlikely to switch roles after the husband's job displacement, and the mother prefers to stay at home with the child in any case. Thus, there is no evidence for mothers and fathers substituting child care at home, at least among couples with children below age three. For these children the mother holds the main child care responsibilities, even if the husband reduces his time in the labor market. Notably, in the sample of wives, who are on parental leave at the time of the husband's displacement, we find no evidence for any employment response (these results are available on request).[28]

Second, the main respondents are mothers of children age 3 to 15, who still face child care needs. These mothers respond to the trade-off between time spent on childcare and time spent in the labor market after the husband's job displacement and substitute time at home with children and time in the labor market. Interestingly, this is also the group of wives on a strongly upward sloping profile in their life-cycle labor supply as shown in Figure 4. These mothers are planning a return to the labor market after the maternity break and their husbands' job loss might induce them to return sooner than otherwise, which is also in line with the evidence of extensive margin labor supply responses.

Third, we find smaller responses in the wife's labor supply to a permanent shock of the husband's wage for couples without children. This is maybe not surprising, given the relatively high employment rate of wives prior to the husband's job displacement in this

[27]Appendix Table A3 reports detailed estimation results of the husband's earnings loss, wife's employment and earnings responses in each of the four categories of households using our three different comparison group. These result document zero earnings responses among wives in the category with no children or all children aged 16 years or older, which confirms the absence of intensive margin labor supply responses even in the group of women with the highest employment rates.

[28]In Austria, labor supply of young mothers may not only be restricted by low substitutability of child care time within the couple but also by the lack formal child care. Therefore, we have also checked whether the mother's willingness to return to employment depends on the availability of formal child care for under three-year-olds. We split the sub-sample of mothers of young children by the availability of a nursery in in the residential community. In neither subsample, we find a significant employment responses among mothers (see Appendix Table A4). However, is hard to tell whether this results can be explained by selection into different types of communities or by the shortage of child care slots in communities with existing facilities.

category. The magnitude of effects in Austrian households is smaller than those reported by Blundell et al. (2017) for the US, as we discuss below.

6.5.2 Heterogeneity by wife's earnings potential

Next, we test whether the intra-household insurance mechanism is more important, if the wife has a higher earnings potential or has a higher chance to cover the income loss. We use three different definitions of the wife's earnings potential: (i) relative earnings of wife and husband before marriage, (ii) years of wife's labor market experience before marriage, and (iii) wife's educational attainment. Information about education is, however, only available at the date of first birth and we can thus measure education only for mothers. Along each measure of earnings potential we split the sample into two groups with high and low earnings potential and measure the responses in terms of the average husband's earnings, the wife's average probability of employment and the wife's average earnings in the first 5 years after the husband's job displacement. Results comparing the displaced group with control group 1 are shown in Table 10.[29] For all three measures, the husbands' earning losses are slightly higher in the group of households with high wives' earnings potential, which might be due to assortative matching. But there is also a clear difference in the wives' responses across both types of households. Wives with high earnings potential are more likely to be employed and have higher earnings after the husbands' job loss than wives with low earnings potential. The difference is strongest, if we measure earnings potential by the wife's labor earnings relative to her husband's in the year prior to marriage. Wives who used to have well-paid jobs before marriage are twice as likely to be employed after their husbands' job loss than wives who had no job or low earnings. Their participation elasticity is -0.07. Also, their earnings increase significantly. However, even though wives with high earnings potential respond more strongly, their earnings gain is small relative to their husbands' earnings loss.

6.5.3 Heterogeneity by magnitude of the income shock

To investigate whether the wife's labor supply response varies by the magnitude of the income shock experienced by the household, we exploit variation in the average wage paid at the husband's pre-displacement firm. Card et al. (2013) document systematic differences in wage levels across employers, which are unrelated to the workers own productivity level. The idea is that an individual, who loses a job in a firm that pays high wages to their average workers should suffer a larger shock than an individual, who loses a job in a firm that only pays moderate wages (Lachowska et al., 2018).

We define firm types by estimating employer-specific fixed effects from an AKM type

[29] Estimations results based on control group 2 provide similar results (see Table A5 in the Web Appendix)

wage decomposition (Abowd et al., 1999).[30] In Table 11, we distinguish between two groups of households where the husbands are displaced by firms with estimated fixed effects below versus above the median fixed effect. Results are shown for comparisons with control groups 1 and 2 in panels A and B, respectively. As expected, husbands' average earnings losses in the first 5 years after displacement are larger, if they lose a job in a high-paying firm. Also wives' labor supply responses are significantly stronger in this group. A comparison of the wife's employment gain relative to the husband's earnings loss results in participation elasticities that are also larger for the group of households that suffer the larger income shock. The participation elasticity is -0.03 among households suffering a small shock and varies between -0.04 and -0.06 in the group with a large shock, depending on the control group.

6.5.4 Heterogeneity by local labor market conditions

The moderate female employment responses to the husband's job displacement could be due to correlated shocks affecting both partners. In a depressed labor market, every worker faces difficulties finding jobs. Even if secondary earners are willing to enter the labor market, there might be few job opportunities. To assess the potential impact of correlated shocks at the household level, we investigate the correlation between female and male labor markets outcomes, and present a heterogeneity analysis by predicted job opportunities for wives.

We start by investigating female and male local labor market conditions among the couples in our sample. Overall, we find that labor markets are strongly segregated by gender. Only 8% of couples where both partners are employed before the husband's displacement work in the same 4-digit industry. For control group 1 and 2, we find similar rates of 10% and 8%, respectively. At the reference date the correlation between occupation-specific male and female unemployment rates in the same district is positive, but not very large with 0.5. Again, this result is similar across displaced and control groups.

To evaluate the wife's response to husband's displacement by local labor market conditions, we split our sample by male unemployment rates (measured in the district of the pre-displacement employer). Table 12 summarizes estimation results of the effect of displacement on husband's earnings, and wife's employment and earnings. The first three columns refer to observations in districts with a low unemployment, and the last three columns to those with high unemployment. The upper panel uses control group 1, while the lower panel focuses on control group 2. Husbands' average earnings losses are comparable across both types of local labor markets. But we consistently find that in depressed labor markets, with male unemployment rates above the median, wives face

[30] See Haller (2017) for documentation of the wage decompositions in the ASSD.

indeed difficulties in entering the labor market. Their employment responses are small and insignificant. In contrast, in local labor markets with male unemployment rates below the median, female employment and earnings respond positively.

6.5.5 Discussion and comparison to the literature

Our results for married couples hit by the husband's job loss indicate positive, but small labor supply responses by wives predominantly at the extensive margin as wives enter the labor force after the husband's job loss. Among couples where the wife did not work when the husband lost the job we estimate a participation elasticity of -0.07 and among couples where the wife worked the response is zero. The heterogeneity analysis above identified certain groups of households with stronger responses. But even among those groups the participation elasticity of wives is around -0.07 and there is no group where the wife's labor supply response covers a significant share of the household's income loss.

How do the Austrian findings compare to the literature? In Appendix Table A1 we have collected elasticity estimates from three types of studies, categorized by the type of variation in husband's earnings that is used to identify the wife's labor supply response. They cover results from different countries, time periods, population groups, and they are based on administrative as well as survey data. Most of reported elasticities refer to the aggregate hours or earnings response, while some studies also distinguish between extensive and intensive margins. Most of the estimated elasticities are negative, but a few studies find elasticities of the opposite sign (Eliason, 2011; Hardoy and Schøne, 2014; Bredtmann et al., forthcoming). These studies identify household labor supply responses from income variation due to a job displacement of the primary earner, taking an empirical approach similar to ours. A potential explanation for the overall negative labor supply response at the household could be correlated shocks or adverse labor market conditions for all household members, the so-called discouraged worker effect.

The average elasticity estimate across all studies which find evidence for an AWE is -0.4, which is an order of magnitude larger in absolute terms than our main estimates. Haan and Prowse (2015) is the only other study which finds a negative elasticity with an absolute value below -0.1. They estimate a structural model based income variation from husbands' involuntary job loss and data from Germany, which is a setup similar to ours.[31] Blundell et al. (2017) report somewhat larger responses on the extensive than the intensive margin, especially among households with children. We can confirm this result, but what stands out in the Austrian case, is the absence of evidence of intensive margin responses. Wives who already participated in the labor force when the husband was displaced, do not increase their labor earnings relative to the control groups. Given that most wives

[31] Unfortunately the paper does not report the earnings loss of the husband and we assume an earnings drop of 20% to calculate the elasticity.

work part time, this is a surprising finding. We also fail to find earnings responses in the group of women without children or children above the compulsory schooling age, who have the highest employment rates at the reference date. This seems to indicate that gender roles within the household are relatively fixed and even large shocks to husband's income are not able to reverse these patterns.

7 Conclusions

This paper investigates how different motives of marriage shape the labor market responses to an income shock within the family. If the insurance motive is dominant, we would expect the second earner to increase her labor supply if the main earner in the household loses the job. If however, other motives such as care for children and housework are more important and the roles within the family are clearly defined, the responses to an income shock should be more moderate.

We test this hypothesis in a setup of married couples in Austria, where husbands lose their job from mass layoffs or plant closures. The setup allows for a precise timing of the shock to the household and a clean quasi-experimental identification of the displacement effect. We document that the husband's job displacement leads to large and persistent drop in his earnings and employment. The wife's employment responds positively, in line with the insurance motive, but the additional earnings generated by the wife only cover a very small fraction of the total income loss. Taxes and government transfers are far more important as insurance against income shocks, at least in the initial period after job displacement.

To find explanations for the low insurance value of female labor supply within the household, we investigate additional outcomes such as job search, fertility, and divorce and analyze the heterogeneity in responses by household characteristics. Our results indicate that gender roles, preferences for time spent with children, and availability of formal child care play a strong role in the wives' labor supply decisions. Wife and husband are not willing to switch roles in the care of small children in response to a shift in relative wages, when parental leave benefits are available but child care outside the home is absent. Neither are wives without children, who are already participating in the labor market prior to the husband's income shock willing to extend their hours and increase their earnings. The most responsive group are mothers of children aged 3 and older, who are in the process of reentering the labor market after a maternity break. These women are willing to bring the re-entry the labor market at higher rates.

In our heterogeneity analysis, we can identify certain groups of women, who show stronger labor market responses to the husband's job loss. In particular, wives with higher earnings potential are able to cover a larger share of the household income loss, wives of husbands who lost well-paid jobs, and wives who face more favorable labor market

conditions are more responsive. But overall, we find that the intra-household insurance mechanism is muted in Austria, compared to evidence from other countries. This may be explained by traditional gender norms which determine the role of women in the household in line with evidence by Bertrand et al. (2016) on the importance of the male breadwinner model, and by Kleven et al. (2018) on the impact of gender inequality in Denmark.

Based on these findings we identify different types of policies that might strengthen the intra-household insurance channel. The first type of policies target the re-entry of mothers into the labor market after a maternity period, by strengthening the job guarantee after parental leave (Lalive et al., 2014), expanding subsidized child care, and providing active labor market programs for mothers after a maternity break. A second type of policies targets fathers' involvement in child care at home, for example by reserving part of parental leave benefits for fathers (daddy months). Finally, policies targeting unemployed workers directly, should take the household situation into account and extend job search counseling also to wives of unemployed workers.

References

Abowd, J. M., Kramarz, F., and Margolis, D. N. (1999). High Wage Workers and High Wage Firms. *Econometrica*, 67(2):251–333.

Akerlof, G. A. and Kranton, R. E. (2000). Economics and Identity. *Quarterly Journal of Economics*, 115(3):715–753.

Autor, D., Kostøl, A. R., Mogstad, M., and Setzler, B. (2017). Disability Benefits, Consumption Insurance, and Household Labor Supply. NBER Working Paper No. 23466, National Bureau of Economic Research, Cambridge, MA.

Bertrand, M., Cortés, P., Olivetti, C., and Pan, J. (2016). Social Norms, Labor Market Opportunities, and the Marriage Gap for Skilled Women. NBER Working Paper No. 22015, National Bureau of Economic Research, Cambridge, MA.

Blundell, R., Pistaferri, L., and Saporta-Eksten, I. (2016). Consumption Inequality and Family Labor Supply. *American Economic Review*, 106(2):387–435.

Blundell, R., Pistaferri, L., and Saporta-Eksten, I. (2017). Children, Time Allocation and Consumption Insurance. NBER Working Paper No. 24006, National Bureau of Economic Research, Cambridge, MA.

Bredtmann, J., Otten, S., and Rulff, C. (forthcoming). Husband's Unemployment and Wife's Labor Supply: The Added Worker Effect across Europe. *Industrial and Labor Relations Review*.

Card, D., Chetty, R., and Weber, A. (2007). Cash-on-Hand and Competing Models of Intertemporal Behavior: New Evidence from the Labor Market. *Quarterly Journal of Economics*, 122(4):1511–1560.

Card, D., Heining, J., and Kline, P. (2013). Workplace Heterogeneity and the Rise of West German Wage Inequality. *Quarterly Journal of Economics*, 128(3):967–1015.

Charles, K. K. and Stephens, M. (2004). Job Displacement, Disability, and Divorce. *Journal of Labor Economics*, 22(2):489–522.

Cullen, J. B. and Gruber, J. (2000). Does Unemployment Insurance Crowd out Spousal Labor Supply? *Journal of Labor Economics*, 18(3):546–572.

Davis, S. and von Wachter, T. (2011). Recessions and the Costs of Job Loss. *Brookings Papers on Economic Activity*, 43(2):1–72.

Del Bono, E., Weber, A., and Winter-Ebmer, R. (2012). Clash of Career and Family: Fertility Decisions after Job Displacement. *Journal of the European Economic Association*, 10(4):659–683.

Eliason, M. (2011). Income after Job Loss: The Role of the Family and the Welfare State. *Applied Economics*, 43(5):603–618.

Eliason, M. (2012). Lost Jobs, Broken Marriages. *Journal of Population Economics*, 25(4):1365–1397.

Fadlon, I. and Nielsen, T. H. (2017). Family Labor Supply Responses to Severe Health Shocks. NBER Working Paper No. 21352, National Bureau of Economic Research, Cambridge, MA.

Fink, M., Kalkbrenner, E., Weber, A., and Zulehner, C. (2010). Extracting Firm Information from Administrative Records: The ASSD Firm Panel. Working Paper 1004, The Austrian Center for Labor Economics and the Analysis of the Welfare State.

Gathmann, C., Helm, I., and Schönberg, U. (2017). Spillover Effects of Mass Layoffs. Unpublished manuscript, Universität Heidelberg.

Haan, P. and Prowse, V. (2015). Optimal Social Assistance and Unemployment Insurance in a Life-Cycle Model of Family Labor Supply and Savings. IZA Discussion Paper 8980, Institute of Labor Economics, Bonn.

Haller, J. (2017). Firm Heterogeneity, Job Mobility, and Wage Growth of Young Workers. Unpublished manuscript, University of Mannheim.

Hardoy, I. and Schøne, P. (2014). Displacement and Household Adaptation: Insured by the Spouse or the State? *Journal of Population Economics*, 27(3):683–703.

Heckman, J. J. and Macurdy, T. E. (1980). A Life Cycle Model of Female Labour Supply. *Review of Economic Studies*, 47(1):47–74.

Hendren, N. (2017). Knowledge of Future Job Loss and Implications for Unemployment Insurance. *American Economic Review*, 107(7):1778–1823.

Hilger, N. G. (2016). Parental Job Loss and Children's Long-Term Outcomes: Evidence from 7 Million Fathers' Layoffs. *American Economic Journal: Economic Policy*, 8(3):247–283.

Huttunen, K. and Kellokumpu, J. (2016). The Effect of Job Displacement on Couples' Fertility Decisions. *Journal of Labor Economics*, 34(2):403–442.

Ichino, A., Schwerdt, G., Winter-Ebmer, R., and Zweimüller, J. (2017). Too Old to Work, Too Young to Retire? *Journal of the Economics of Ageing*, 9:14–29.

Imbens, G. W. (2004). Nonparametric Estimation of Average Treatment Effects Under Exogeneity: A Review. *Review of Economics & Statistics*, 86(1):4–29.

Jacobson, L. S., LaLonde, R. J., and Sullivan, D. G. (1993). Earnings Losses of Displaced Workers. *American Economic Review*, 83(4):685–709.

Juhn, C. and Potter, S. (2007). Is There Still an Added Worker Effect? Staff Report 310, Federal Reserve Bank of New York.

Kleven, H., Landais, C., and Søgaard, J. (2018). Children and Gender Inequality: Evidence from Denmark. NBER Working Paper No. 24219, National Bureau of Economic Research, Cambridge, MA.

Lachowska, M., Mas, A., and Woodbury, S. A. (2018). Sources of Displaced Workers' Long-Term Earnings Losses. NBER Working Paper No. 24217, National Bureau of Economic Research, Cambridge, MA.

Lalive, R., Schlosser, A., Steinhauer, A., and Zweimüller, J. (2014). Parental Leave and Mothers' Careers: The Relative Importance of Job Protection and Cash Benefits. *The Review of Economic Studies*, 81(1):219–265.

Lundberg, S. (1985). The Added Worker Effect. *Journal of Labor Economics*, 3(1):11–37.

Mincer, J. (1962). Labor Force Participation of Married Women: A Study of Labor Supply. In *Aspects of Labor Economics*, pages 63–105. Princeton University Press.

Rege, M., Telle, K., and Votruba, M. (2007). Plant Closure and Marital Dissolution. Discussion Paper 514, Statistics Norway.

Ruhm, C. J. (1991). Displacement Induced Joblessness. *Review of Economics and Statistics*, 73(3):517–522.

Schwerdt, G., Ichino, A., Ruf, O., Winter-Ebmer, R., and Zweimüller, J. (2010). Does the Color of the Collar Matter? Employment and Earnings After Plant Closure. *Economics Letters*, 108(2):137–140.

Sorensen, J. (2018). Firms' Layoff Rules, the Cost of Job Loss, and Asymmetric Employer Learning. Unpublished manuscript, UC Berkeley.

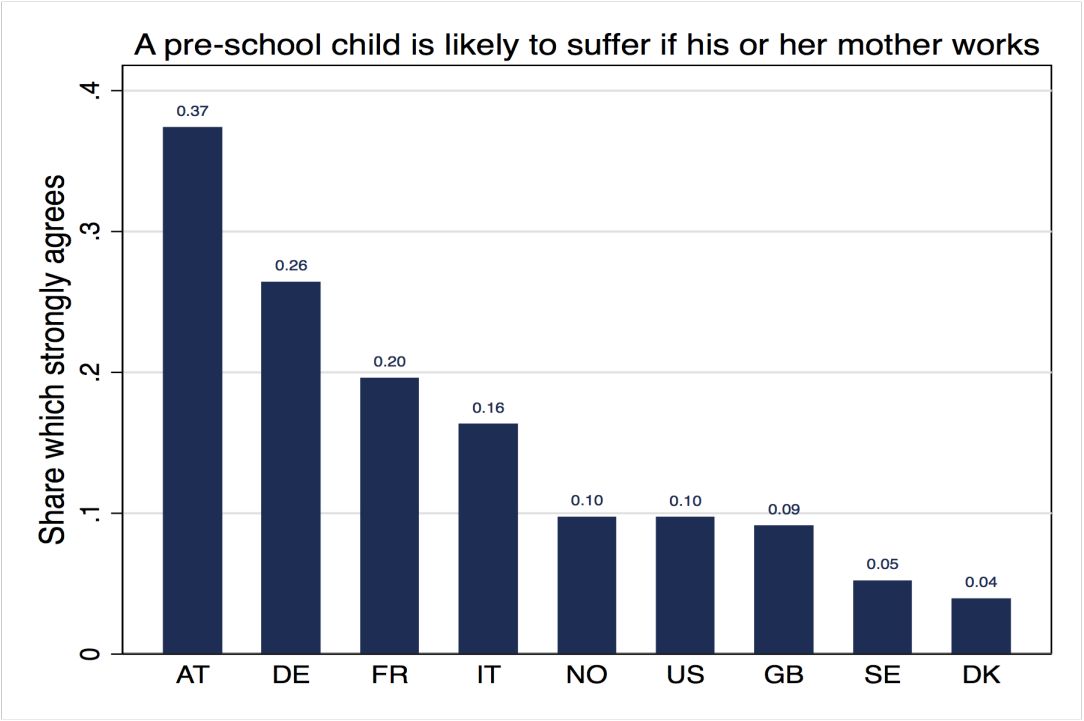
Stephens, M. (2002). Worker Displacement and the Added Worker Effect. *Journal of Labor Economics*, 20(3):504–537.

Sullivan, D. and von Wachter, T. (2009). Job Displacement and Mortality: An Analysis Using Administrative Data. *Quarterly Journal of Economics*, 124(3):1265–1306.

Weiss, Y. (1997). The Formation and Dissolution of Families: Why Marry? Who Marries Whom? And What Happens Upon Divorce. In Rosenzweig, M. R. and Stark, O., editors, *Handbook of Population and Family Economics*, volume 1, pages 81–123. Elsevier.

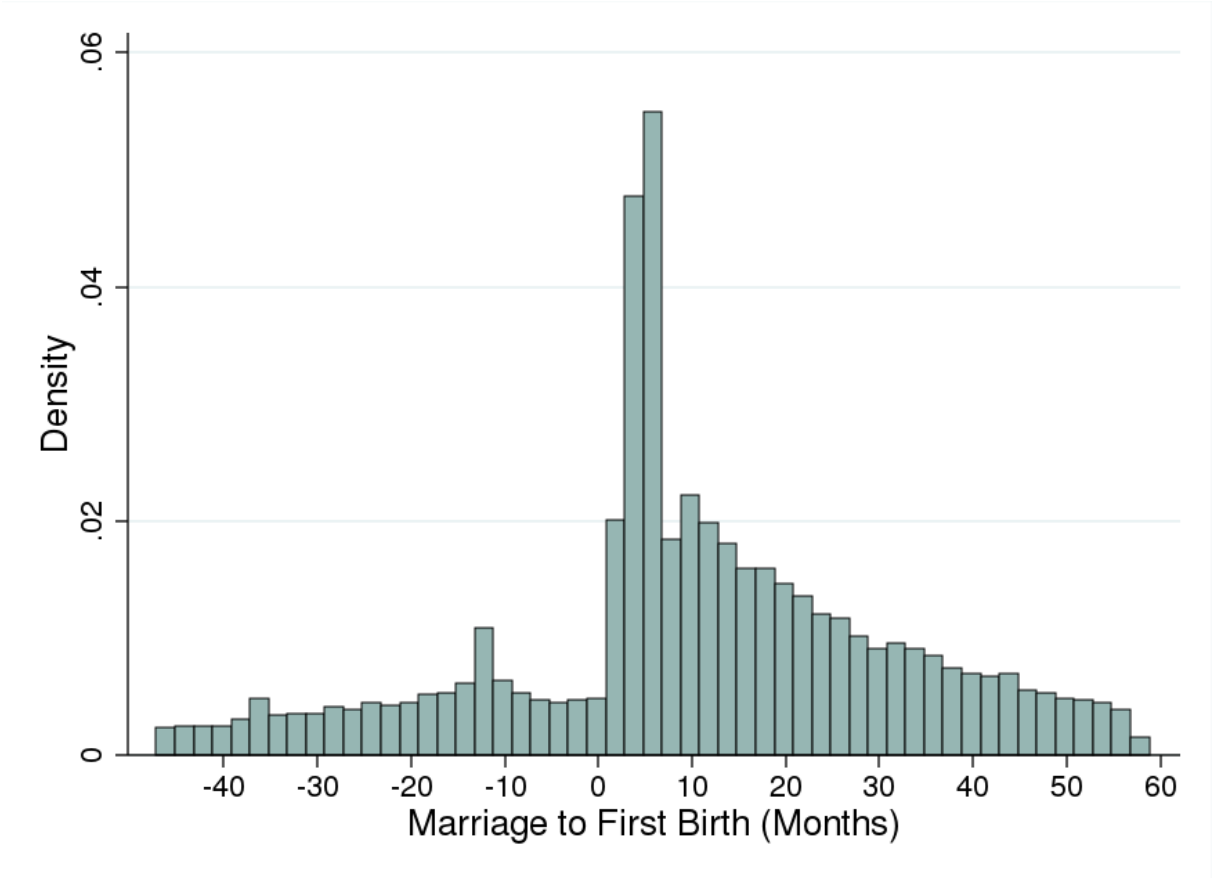
Zweimüller, J., Winter-Ebmer, R., Lalive, R., Kuhn, A., Wuellrich, J.-P., Ruf, O., and Büchi, S. (2009). Austrian Social Security Database. Working Paper 0903, The Austrian Center for Labor Economics and the Analysis of the Welfare State.

Figure 1: Social norm regarding working mothers in selected countries



Notes: These figures are based on data from the *European and World Values Surveys* and include male respondents between 25 and 55 years of age, and female respondents between 25 and 50 years of age. The original survey questions is as follows '*A pre-school child is likely to suffer if his or her mother works*'. Respondents are asked to evaluate this statement on an ordered scale from '*Agree strongly*' (1), '*Agree*' (2), '*Neither agree nor disagree*' (3), '*Disagree*' (4), to '*Strongly disagree*' (5). In the case of some country-years the respondents where given a 4-point scale to answer, which does not include the answer possibility '*Neither agree nor disagree*'. The graph shows the share or respondents (by country) which strongly agrees with this statement. The data comprises for each country observations from at least two points in time. The first period is for each country the year 1990. The second (and third) period is AT: 1999, DE: 1997 and 1999, DK: 1999, FR: 1999, IT: 1999, NO: 1996, SE: 1996 and 1999, GB: 1998 and 1999, US: 1995 and 1996. The total number of observations is 11,574.

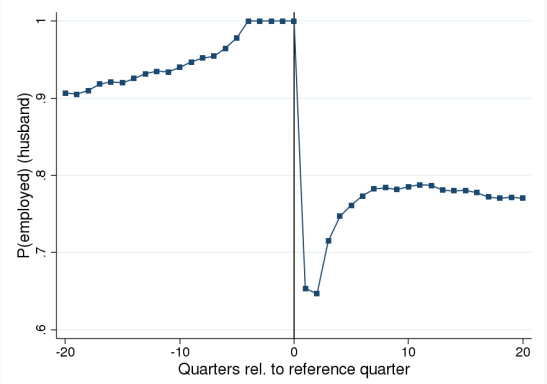
Figure 2: Distance between marriage and first birth



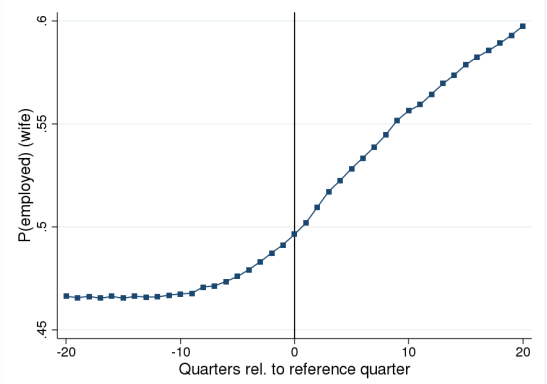
Notes: The figure displays the distribution of the distance from marriage to the birth of the first child in 2 months bins. The sample includes couples experiencing a displacement through a plant closure or a mass layoff. They are married for at least two years at the reference date. We include one observation per household event. We drop observations with values below/above the $10^{th}/90^{th}$ percentile.

Figure 3: Employment of displaced husbands and their wives

(a) Husband

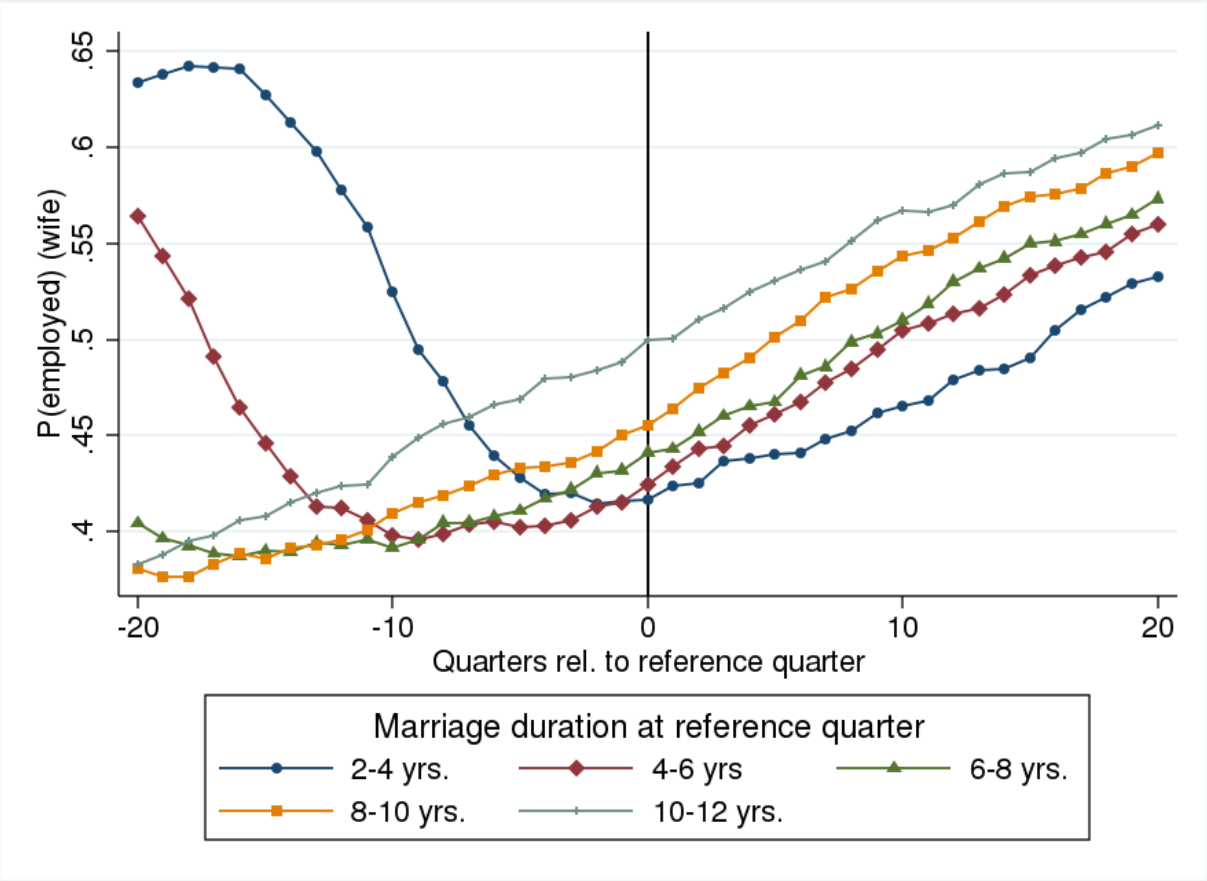


(b) Wife



Notes: Panel (a) and (b) show the mean employment probability around the reference date for all displaced men and their wives, respectively.

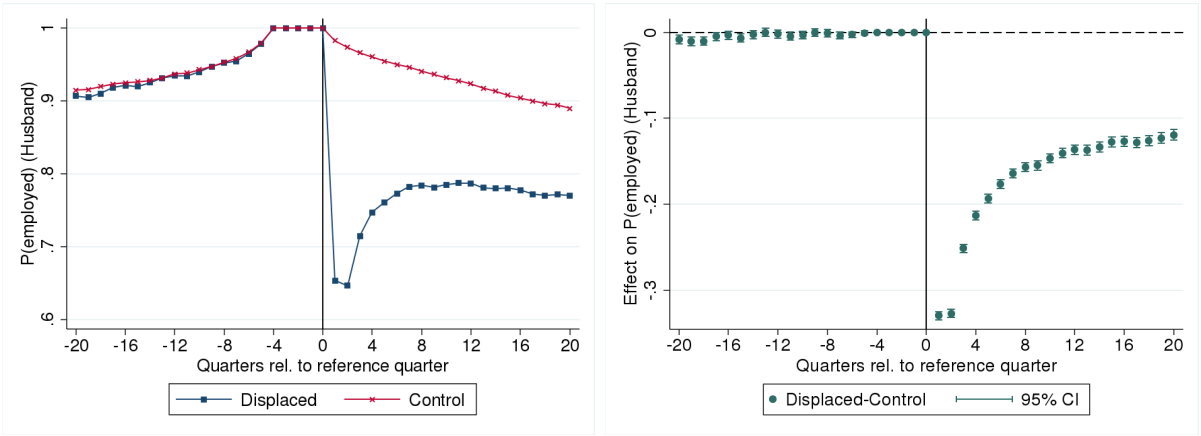
Figure 4: Wife's employment by different marriage durations



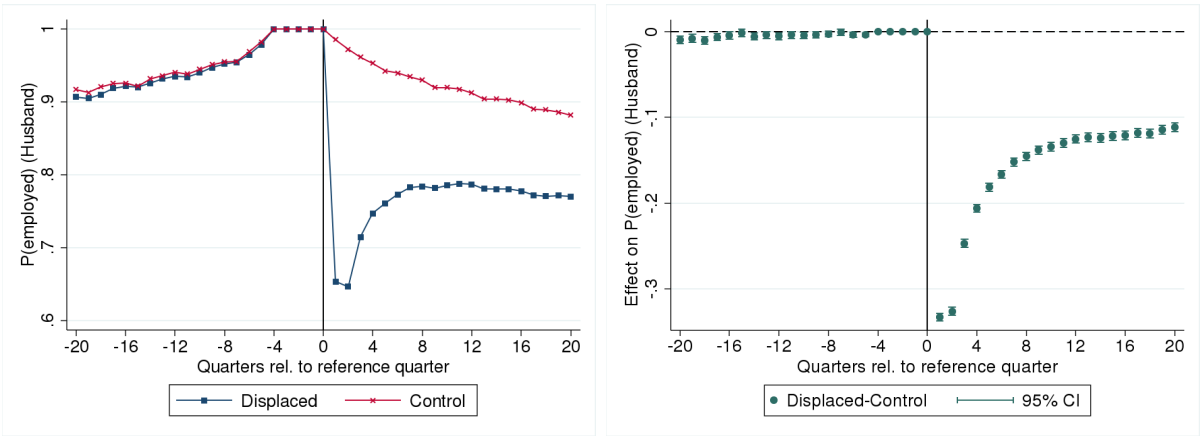
Notes: This figure shows the mean employment probability around the reference date for subsamples of wives of displaced husbands with different marriage durations at the reference quarter.

Figure 5: Employment of displaced husbands with control groups

(a) CG1: No firm event



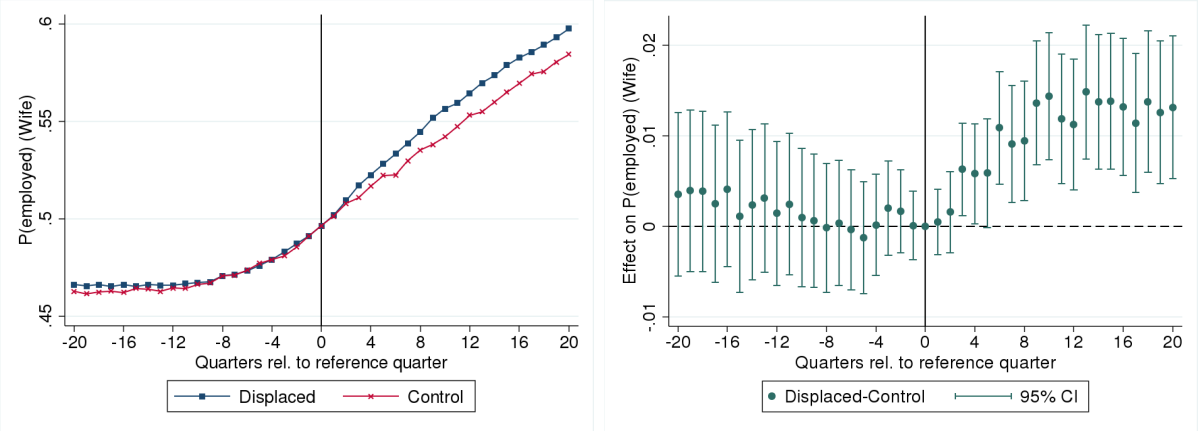
(b) CG2: Non-displaced in mass layoff



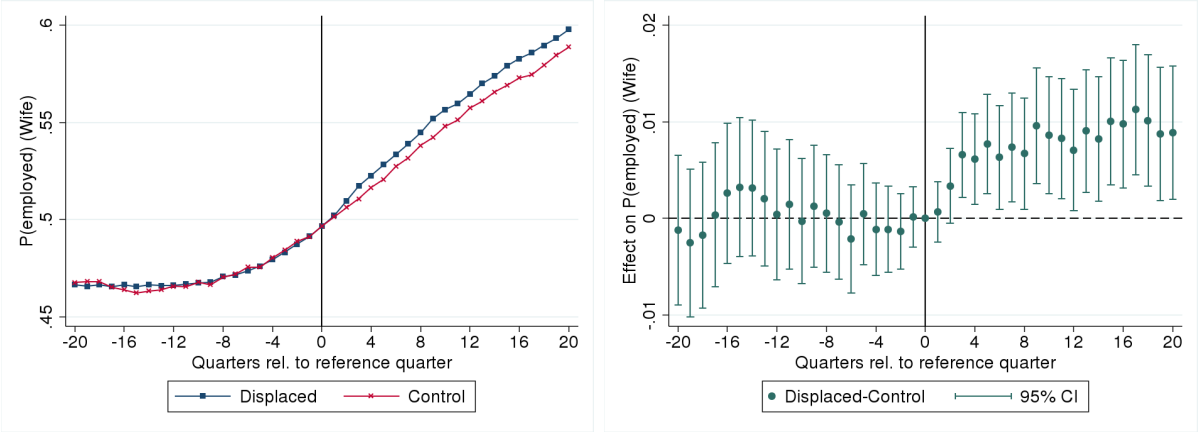
Notes: Comparison of the probability to be employed of men that are displaced (blue, square) to men without firm event at the reference date (red, x) in panel (a) and to non-displaced men working in mass layoff firms at the reference date in (b) based on estimation equation (1). Control groups are reweighted to resemble the displaced group in time-invariant husband and wife characteristics, household composition, employment outcomes of the husband and characteristics of husband's employer (see Footnote 17 for details). The employment probability of the control group is adjusted by its mean difference relative to the displaced group. The graphs to the right plot the difference between the two lines with the corresponding 95% confidence interval.

Figure 6: Employment of displaced husbands' wives with control groups

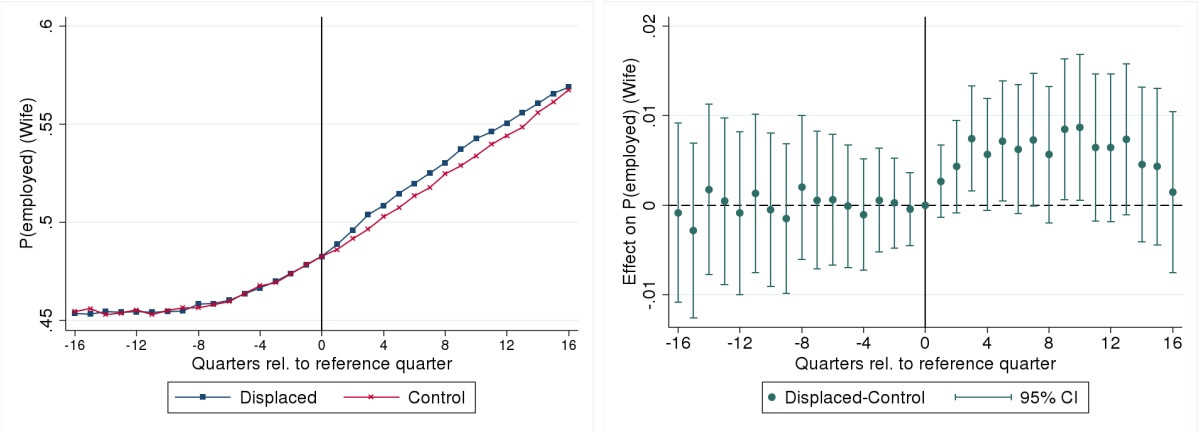
(a) CG1: No firm event



(b) CG2: Non-displaced in mass layoff



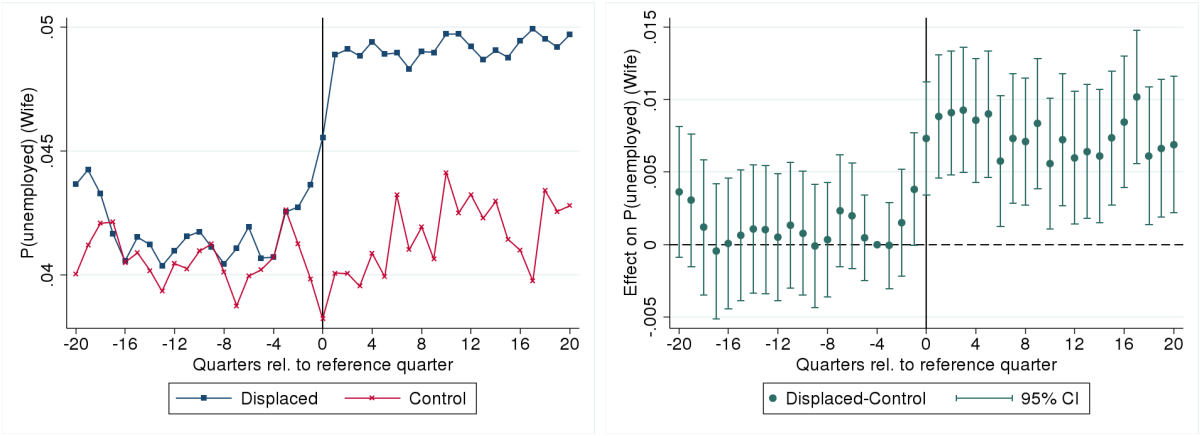
(c) CG3: Displaced in the future



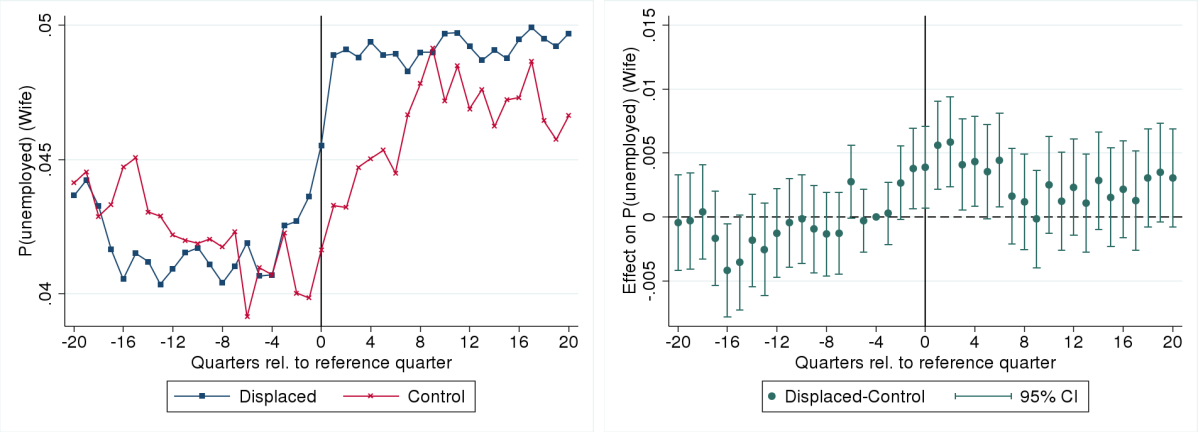
Notes: Comparison of the probability to be employed of wives with displaced husbands (blue, square) to those with husbands without firm event at the reference date (red, x) in panel (a), with non-displaced husbands working in mass layoff firms at the reference date in (b), and with husbands displaced 16 quarters after the reference date in (c) based on estimation equation (1). CG1 and CG2 are reweighted to resemble the displaced group as explained in Figure 5. The employment probability of the control group is adjusted by its mean difference relative to the displaced group. The graphs to the right plot the difference between the two lines with the corresponding 95% confidence interval.

Figure 7: Job search, probability of registered unemployment

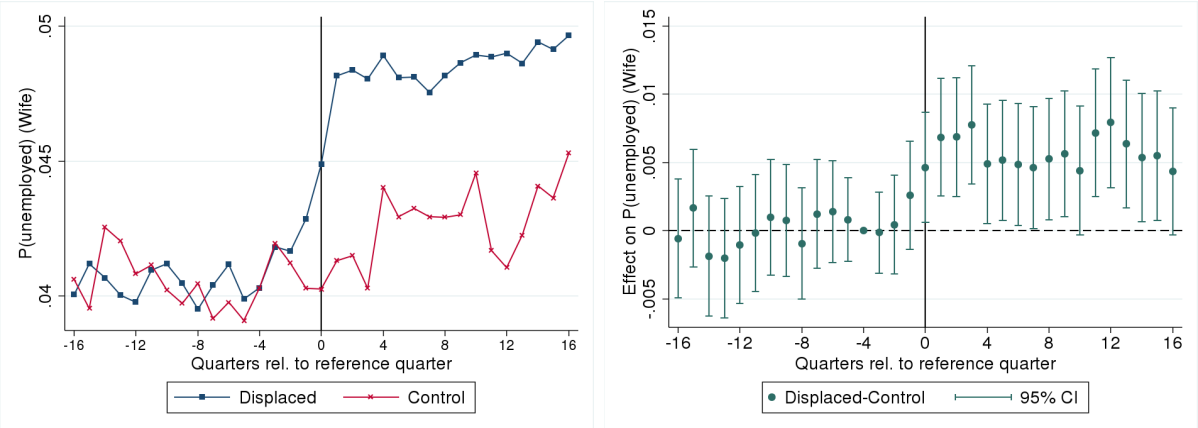
(a) CG1: No firm event



(b) CG2: Non-displaced in mass layoff



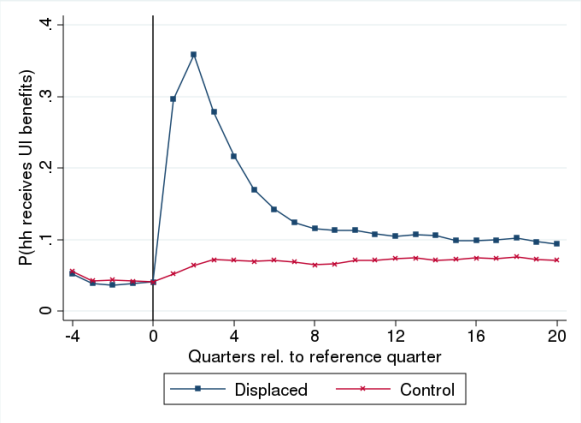
(c) CG3: Displaced in the future



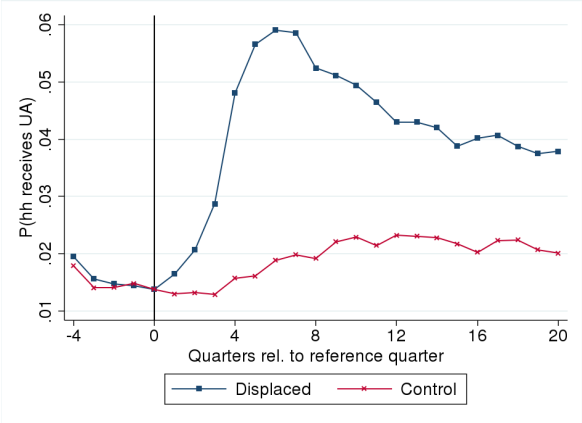
Notes: Comparison of the probability to be unemployed of wives with displaced husbands (blue, square) to those with husbands without firm event at the reference date (red, x) in panel (a), with non-displaced husbands working in mass layoff firms at the reference date in (b), and with husbands displaced 16 quarters after the reference date in (c) based on an adapted version of estimation equation (1), in which we measure unemployment relative to its value in the quarter *one year before* the reference date. CG1 and CG2 are reweighted to resemble the displaced group as explained in Figure 5. The unemployment probability of the control group is adjusted by its mean difference relative to the displaced group. The graphs to the right plot the difference between the two lines with the corresponding 95% confidence interval.

Figure 8: Social benefits around displacement, CG1

(a) Probability that household receives unemployment insurance benefits (UB)

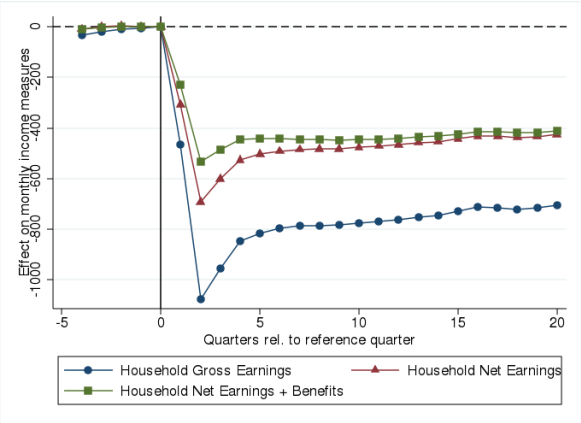


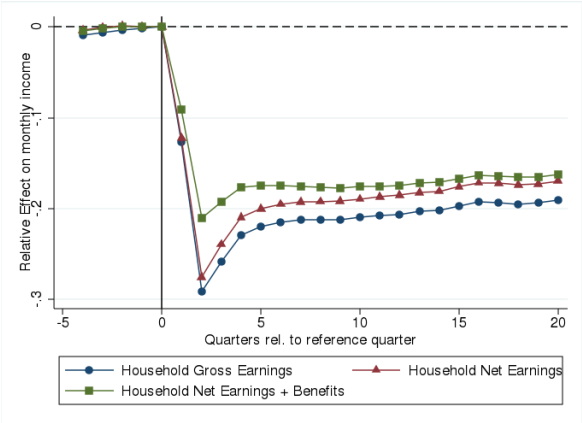
(b) Probability that household receives unemployment assistance (UA)



Notes: Comparison of the probability of receiving benefits of households with displaced husbands (blue, square) to those with husbands without firm event at the reference date (red, x). The control group is reweighted to resemble the displaced group within each subgroup as explained in Figure 5. The outcome variable of the control group is adjusted by its mean difference relative to the displaced group. With some exceptions, job losers can receive UB for up to 30 weeks. After exhausting UB, job losers can obtain means-tested income support, UA, that pays a lower level of benefits indefinitely.

Figure 9: Displacement effect on household income, CG1

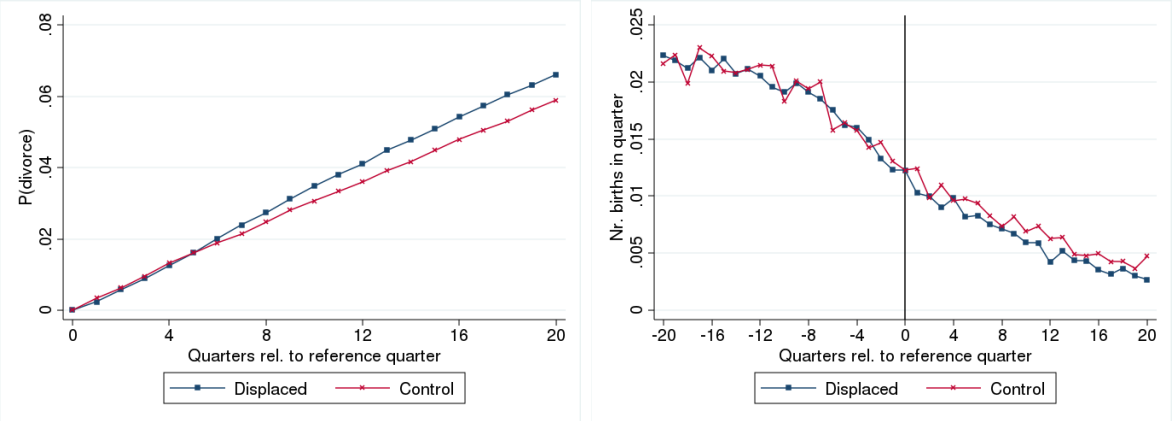




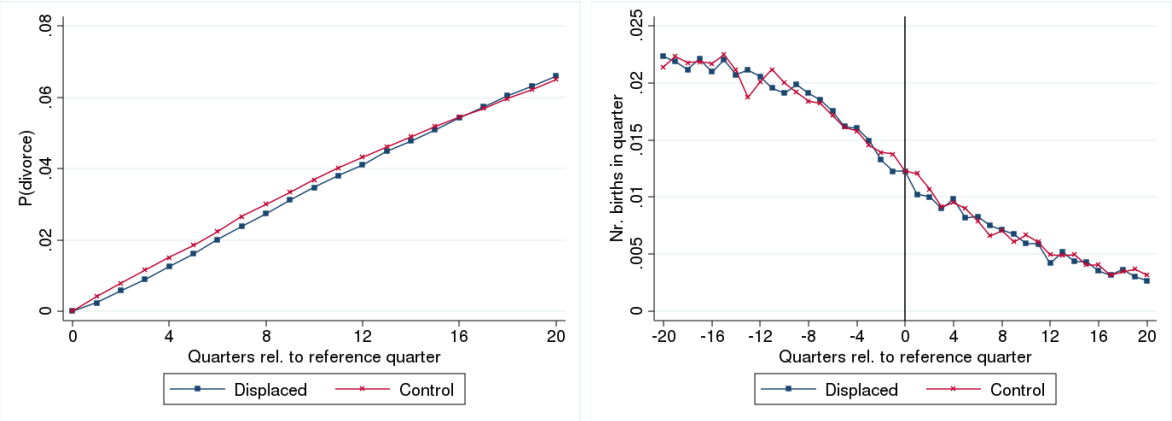
Notes: This figure shows the effect of husband's displacement on monthly household income measures (in Euro, 2000 prices). The effect is given by the difference between households that experience a displacement and reweighted and mean-adjusted households that have husbands without any firm event at the reference date. *Household Gross Earnings* is the sum of husband's and wife's labor earnings in each quarter according to tax data. *Household Net Earnings* subtracts social security contributions and payroll taxes from the former. *Household Net Earnings + benefits* adds benefits from unemployment insurance and unemployment assistance.

Figure 10: Divorce and fertility around displacement

(a) CG1: No firm event



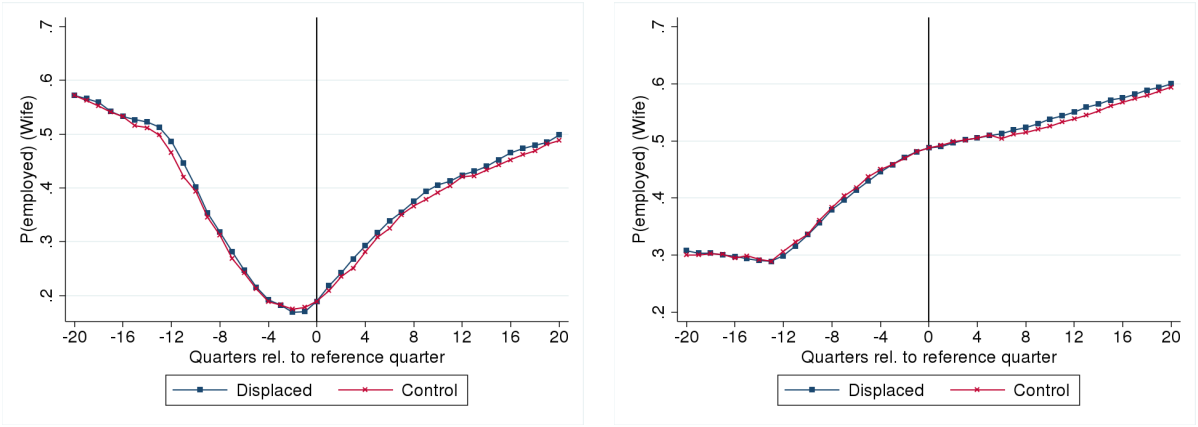
(b) CG2: Non-displaced in mass layoff



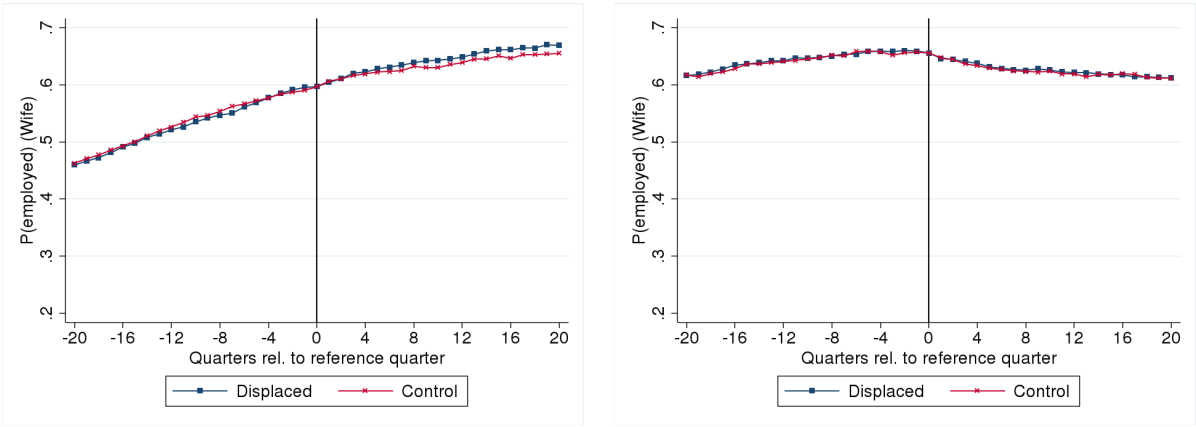
Notes: Comparison of the probability to live in divorce (left) and the number of births (right) for households with husbands experiencing a displacement (blue, square) to households with husbands without firm event (red, x) at the reference date in panel (a) and with non-displaced husbands working in mass layoff firms at the reference date in (b). CG1 and CG2 are reweighted to resemble the displaced group as explained in Figure 5. The number of births of the control group is adjusted by its mean difference relative to the displaced group. Divorce is only displayed after the reference date, since couples are required not to divorce until that date.

Figure 11: Employment of displaced husbands' wives by age of the youngest child, CG1

(a) 0-2 yrs. **(b)** 3-9 yrs.



(c) 10-16 yrs. **(d)** No children aged younger than 16 yrs.



Notes: Comparison of the probability to be employed of wives with displaced husbands (blue, square) to those with husbands without firm event at the reference date (red, x) for subgroups defined by the age of the youngest child at the reference date based on estimation equation (1). The control group is reweighted to resemble the displaced group within each subgroup as explained in Figure 5. The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Table 1: Gender identity norms and beliefs on child-care in Austria and some selected high-income countries

	Share of survey respondents which strongly agrees with the respective statement across countries									
	AT	DE	DK	FR	IT	NO	SE	GB	US	Total
1.) A pre-school child is likely to suffer if [. . .] mother works	0.37	0.26	0.04	0.20	0.16	0.10	0.05	0.09	0.10	0.17
2.) A working mother [as good as] a mother who does not work	0.23	0.18	0.56	0.51	0.19	0.47	0.51	0.23	0.29	0.32
3.) Important for successful marriage: Sharing household chores	0.28	0.23	0.45	0.39	0.30	0.34	0.55	0.45	0.49	0.36
4.) Both husband and wife should contribute to household income	0.29	0.17	0.26	0.39	0.25	0.35	0.54	0.14	0.23	0.28

Notes: These figures are based on data from the *European and World Values Surveys* and include male respondents between 25 and 55 years of age, and female respondents between 25 and 50 years of age. The original survey questions on statement 1 is as follows '*A pre-school child is likely to suffer if his or her mother works*'. The original survey questions on statement 2 is as follows '*A working mother can establish just as warm and secure a relationship with her children as a mother who does not work*'. The original survey questions on statement 3 is as follows '*Important for successful marriage: Sharing household chores*'. Respondents are asked to evaluate this statement on an ordered scale from '*Very*' (1), '*Rather*' (2), to '*Not very*' (3). The table summarizes the share or respondents (by country), which strongly agrees with statements 1 to 3, and which answers statement 4 with very important. The original survey questions on statement 4 is as follows '*Both the husband and wife should contribute to household income*'. Respondents are asked to evaluate these three statements on an ordered scale from '*Agree strongly*' (1), '*Agree*' (2), '*Neither agree nor disagree*' (3), '*Disagree*' (4), to '*Strongly disagree*' (5). In the case of some country-years the respondents where given a 4-point scale to answer, which does not include the answer possibility '*Neither agree nor disagree*'. The data comprises for each country observations from at least two points in time. The first period is for each country the year 1990. The second (and third) period is AT: 1999, DE: 1997 and 1999, DK: 1999, FR: 1999, IT: 1999, NO: 1996, SE: 1996 and 1999, GB: 1998 and 1999, US: 1995 and 1996. The total number of observations varies across questions (Min: 11, 574, Max: 16, 729).

Table 2: Sample characteristics

	Displaced		Control	
	Closure (1)	Mass layoff (2)	Group 1 (3)	Group 2 (4)
I. Husband				
Age (yrs)	39.41	39.05	40.09	39.74
	[38.95]	[38.54]	[39.84]	[39.44]
	(6.75)	(6.79)	(6.63)	(6.67)
Experience in employment (yrs)	16.97	16.70	18.54	18.06
	[17.03]	[16.75]	[18.61]	[18.36]
	(6.77)	(6.72)	(6.61)	(6.46)
Tenure (yrs)	6.92	6.92	9.66	8.77
	[4.58]	[4.73]	[6.86]	[8.11]
	(6.24)	(6.06)	(6.91)	(6.70)
Number of previous jobs	4.44	4.11	2.90	3.14
	(4.34)	(4.17)	(3.29)	(3.49)
Number of previous mass layoffs	1.41	1.92	0.53	1.94
	(2.26)	(2.39)	(1.31)	(2.46)
Share blue collar	0.47	0.48	0.38	0.44
	(0.50)	(0.50)	(0.49)	(0.50)
Real Monthly Earnings (€)	2443.16	2500.61	2706.99	2672.92
	[2319.86]	[2455.63]	[2722.46]	[2649.97]
	(918.09)	(776.33)	(725.15)	(722.34)
Censored earnings	0.16	0.20	0.25	0.24
	(0.37)	(0.40)	(0.43)	(0.43)
II. Wife				
Age (yrs)	36.66	36.39	36.99	37.40
	[36.38]	[35.97]	[36.77]	[37.23]
	(6.14)	(6.20)	(6.14)	(6.13)
Experience in employment (yrs)	9.50	9.41	9.95	9.72
	[8.50]	[8.37]	[8.94]	[8.73]
	(6.15)	(6.06)	(6.28)	(6.19)
Number previous jobs	1.57	1.52	1.49	1.53
	(2.64)	(2.49)	(2.46)	(2.56)
Employed	0.49	0.50	0.50	0.50
	(0.50)	(0.50)	(0.50)	(0.50)
Blue collar | employed	0.31	0.31	0.28	0.31
	(0.46)	(0.46)	(0.45)	(0.46)
Real monthly earnings (€) | employed	1320.50	1343.11	1321.56	1320.63
	[1196.09]	[1232.67]	[1181.57]	[1207.13]
	(788.78)	(800.86)	(806.11)	(795.31)
Earnings rel. to husband | employed	0.63	0.61	0.52	0.53
	(0.67)	(0.66)	(0.39)	(0.44)
Censored earnings | employed	0.02	0.02	0.02	0.02
	(0.13)	(0.15)	(0.14)	(0.14)
III. Household composition				
Marriage duration (yrs)	12.20	12.00	13.06	12.84
	[11.20]	[10.93]	[12.40]	[12.13]
	(6.80)	(6.76)	(6.92)	(6.84)
Number of children	1.39	1.38	1.41	1.38
	(1.00)	(1.00)	(0.99)	(0.99)
Share with youngest child 0–2	0.18	0.19	0.16	0.16
	(0.38)	(0.39)	(0.37)	(0.37)
Share with youngest child 3–9	0.36	0.36	0.35	0.35
	(0.48)	(0.48)	(0.48)	(0.48)
Share with youngest child 10–16	0.20	0.20	0.22	0.22
	(0.40)	(0.40)	(0.41)	(0.41)

Continued on next page.

Table 2 — continued from previous page.

	Displaced		Control	
	Closure (1)	Mass layoff (2)	Group 1 (3)	Group 2 (4)
IV. Employer (husband)				
Firm size	51.94	244.39	397.15	326.87
	[20.00]	[138.00]	[135.00]	[239.00]
	(97.79)	(312.98)	(771.13)	(315.70)
Turnover	0.25	0.19	0.14	0.17
	[0.16]	[0.14]	[0.10]	[0.13]
	(0.34)	(0.24)	(0.22)	(0.19)
Mean monthly wage	1903.49	2072.28	2232.27	2160.57
	[1878.23]	[2025.60]	[2191.31]	[2106.37]
	(553.48)	(582.05)	(597.37)	(551.37)
Industry				
Manufacturing	0.41	0.46	0.47	0.59
	(0.49)	(0.50)	(0.50)	(0.49)
Sales	0.29	0.23	0.20	0.17
	(0.45)	(0.42)	(0.40)	(0.38)
Transport	0.10	0.06	0.06	0.05
	(0.30)	(0.24)	(0.23)	(0.22)
Services	0.19	0.25	0.28	0.19
	(0.40)	(0.43)	(0.45)	(0.39)
Region				
Vienna	0.22	0.24	0.15	0.20
	(0.41)	(0.43)	(0.36)	(0.40)
Eastern Austria w/o Vienna	0.22	0.20	0.20	0.22
	(0.41)	(0.40)	(0.40)	(0.41)
Southern Austria	0.21	0.19	0.20	0.22
	(0.40)	(0.39)	(0.40)	(0.41)
Western Austria	0.35	0.36	0.44	0.36
	(0.48)	(0.48)	(0.50)	(0.48)
Observations	18,466	30,027	58,516	61,360

*N*ote: Statistics depicted are means with standard deviations in parentheses. Medians are presented in brackets. Column (1) refers to households with a husband displaced through a plant closure, column (2) to those with a husband displaced through a mass layoff in the quarter after the reference date. Column (3) refers to a 10% random subsample of households with husbands without a firm event in the quarter after the reference date. Households in column (4) are a 40% random sample of non-displaced husbands employed at a firm where other workers are displaced from a mass layoff in the quarter following the reference date. There is one observation per household-event. All variables (except firm size, turnover, and mean monthly wage) are measured at the reference date (one year before the reference date, respectively). All households fulfill the following requirements: Husband and wife are aged 25–55 and 25–50, respectively, at the reference date. They are married for at least two years and husbands have at least one year of tenure at the reference date.

Table 3: Effects of husband's displacement on household employment

	Control group 1		Control group 2		Control group 3
	Husband	Wife	Husband	Wife	Wife
	(1)	(2)	(3)	(4)	(5)
Prior event					
δ_{-5}	-0.008^{***}	0.002	-0.009^{***}	-0.002	
	(0.002)	(0.004)	(0.001)	(0.003)	
δ_{-4}	-0.003^{***}	0.002	-0.004^{***}	0.002	-0.004
	(0.001)	(0.004)	(0.001)	(0.003)	(0.005)
δ_{-3}	-0.002^{**}	0.001	-0.005^{***}	0.001	-0.002
	(0.001)	(0.004)	(0.001)	(0.003)	(0.004)
δ_{-2}	-0.002^{**}	-0.000	-0.003^{***}	-0.000	0.001
	(0.001)	(0.003)	(0.001)	(0.003)	(0.004)
δ_{-1}	-0.000	0.001	0.000	-0.001	-0.000
	(0.000)	(0.002)	(0.000)	(0.002)	(0.002)
Post event					
δ_1	-0.280^{***}	0.004^{*}	-0.278^{***}	0.004^{**}	0.005^{**}
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
δ_2	-0.173^{***}	0.009^{***}	-0.162^{***}	0.007^{***}	0.007^{*}
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
δ_3	-0.144^{***}	0.013^{***}	-0.132^{***}	0.009^{***}	0.008^{**}
	(0.003)	(0.003)	(0.002)	(0.003)	(0.004)
δ_4	-0.131^{***}	0.014^{***}	-0.123^{***}	0.009^{***}	0.006
	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
δ_5	-0.123^{***}	0.013^{***}	-0.116^{***}	0.010^{***}	
	(0.003)	(0.004)	(0.003)	(0.003)	
Displaced×Post	-0.170^{***}	0.011^{***}	-0.162^{***}	0.008^{***}	0.006^{**}
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
$\eta^{\text{participation}}$		-0.043^{***}		-0.036^{***}	
		(0.011)		(0.010)	
Pre-event mean	1	0.490	1	0.486	0.468
Households	101,609		93,666		45,886
Observations	4,386,508		4,502,579		2,161,764

Notes: This table displays the impact of husband's displacement on own and spousal employment based on equation (2), which includes displaced group, distance to event, and industry×quarter fixed effects. The dependent variable is equal to one if husband/wife in household i is employed in a given quarter. Column (1) and (2) ((3) and (4)) compare individuals in households with a displacement to a reweighted control group with no firm event (with households in which husbands keep their jobs during a mass layoff). In column (5), we match to displaced households a control group of households from the same marriage cohort that experience displacement four years after the reference date. The coefficient δ_l measures the average difference between employment in displaced and reweighted control groups l years to the reference quarter relative to the difference at the reference quarter. *Displaced×Post* measures the average difference in the outcome variable between displaced and reweighted control groups in the five years after the reference quarter relative to the difference at the reference date. $\eta^{\text{participation}}$ is the implied participation elasticity of wives with respect to the earnings of their husbands. *Pre-event mean* refers to the mean employment in the year before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Effects of husband's displacement on household earnings

	Control group 1		Control group 2		Control group 3
	Husband	Wife	Husband	Wife	Wife
	(1)	(2)	(3)	(4)	(5)
Prior event					
δ_{-5}	−6.642	5.572	−3.709	−4.608	
	(4.983)	(6.223)	(5.540)	(4.848)	
δ_{-4}	9.554**	4.556	5.236	0.606	−3.661
	(3.833)	(5.853)	(5.202)	(4.679)	(6.814)
δ_{-3}	9.840***	1.943	2.542	−1.637	−1.202
	(3.538)	(5.389)	(4.639)	(4.155)	(5.982)
δ_{-2}	9.687***	−1.050	5.231	−1.866	4.143
	(3.011)	(4.360)	(3.686)	(3.671)	(4.908)
δ_{-1}	−2.522	−0.694	−1.990	−1.148	1.391
	(1.702)	(2.647)	(1.925)	(2.457)	(3.001)
Post event					
δ_1	−810.046***	5.201*	−783.445***	5.618**	11.390***
	(6.049)	(2.696)	(5.564)	(2.283)	(3.153)
δ_2	−612.960***	9.363**	−554.224***	7.261**	11.581**
	(6.611)	(4.071)	(6.382)	(3.552)	(4.768)
δ_3	−554.129***	13.180***	−482.088***	9.510**	15.370***
	(7.308)	(4.547)	(6.944)	(4.120)	(5.643)
δ_4	−523.447***	15.659***	−454.925***	10.312**	14.027**
	(8.092)	(5.122)	(7.372)	(4.600)	(6.212)
δ_5	−504.559***	12.939**	−434.683***	13.541***	
	(8.370)	(5.385)	(7.774)	(4.923)	
Displaced×Post	−601.237***	11.262***	−542.034***	9.245***	13.064***
	(6.473)	(3.789)	(5.819)	(3.402)	(4.402)
Pre-event mean	2458.082	658.549	2463.521	647.718	613.938
Households	101,609		93,666		45,886
Observations	4,386,508		4,502,579		2,161,764

Notes: This table displays the impact of husband's displacement on own and spousal monthly earnings in Euro (2000 prices) based on equation (2), which includes displaced group, distance to event, and industry×quarter fixed effects. The dependent variable is set to zero if an individual is not employed. This table is constructed in the same way as Table 3. *Pre-event mean* refers to the mean earnings in the year before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effects of husband's displacement on wife's job search

	Control group 1	Control group 2	Control group 3
	(1)	(2)	(3)
Prior event			
δ_{-5}	0.002	-0.001	
	(0.002)	(0.002)	
δ_{-4}	0.001	-0.003^{**}	-0.001
	(0.002)	(0.002)	(0.002)
δ_{-3}	0.001	-0.001	-0.000
	(0.002)	(0.002)	(0.002)
δ_{-2}	0.001	-0.000	0.001
	(0.001)	(0.001)	(0.002)
δ_0	0.003^{**}	0.003^{**}	0.002
	(0.001)	(0.001)	(0.002)
Post event			
δ_1	0.009^{***}	0.005^{***}	0.007^{***}
	(0.002)	(0.002)	(0.002)
δ_2	0.007^{***}	0.003	0.005^{**}
	(0.002)	(0.002)	(0.002)
δ_3	0.007^{***}	0.001	0.006^{***}
	(0.002)	(0.002)	(0.002)
δ_4	0.007^{***}	0.002	0.005^{**}
	(0.002)	(0.002)	(0.002)
δ_5	0.007^{***}	0.002	
	(0.002)	(0.002)	
Displaced×Post	0.007^{***}	0.003^{*}	0.005^{***}
	(0.002)	(0.001)	(0.002)
Pre-event mean	0.041	0.041	0.039
Households	101,609	93,666	45,886
Observations	4,386,508	4,502,579	2,161,764

Notes: This table displays the impact of husband's displacement on spousal unemployment. The dependent variable is equal to one if the wife in household i is unemployed in a given quarter. The estimation is based on an adapted version of equation (2), in which the coefficients δ_l measure the average difference between displaced and reweighted control group relative to the quarter *one year before* the reference date. *Pre-event mean* refers to the mean unemployment in the year before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Displacement effects by wife's employment status prior reference date

Outcome	Wife employed			Wife not employed		
	Husband Earnings	Wife P(employed)	Wife Earnings	Husband Earnings	Wife P(employed)	Wife Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
Control group 1						
Displaced×Post	−610.110***	−0.008***	−10.793*	−595.601***	0.019***	22.378***
	(9.853)	(0.003)	(6.060)	(8.120)	(0.004)	(5.002)
$\eta^{\text{participation}}$					−0.079***	
					(0.016)	
Pre-event mean	2490.909	1	1376.356	2435.549	0.111	122.813
Households	43,366			59,165		
Control group 2						
Displaced×Post	−549.429***	−0.005*	−4.616	−536.020***	0.015***	16.652***
	(8.979)	(0.003)	(5.207)	(7.539)	(0.003)	(4.479)
$\eta^{\text{participation}}$					−0.069***	
					(0.015)	
Pre-event mean	2495.640	1	1365.551	2441.058	0.113	124.521
Households	40,492			55,237		

Notes: This table displays the impact of husband's displacement on own earnings, spousal employment and earnings by the employment status of the wife before the reference date. The left panel refers to the group of households in which the wife was employed in all four quarters before the reference date. The panel to the right refers to the group of households in which the wife was not employed in any of the four quarters before the reference date. *Displaced×Post* measures the average difference in the outcome variable between displaced and reweighted control groups in the five years after the reference quarter relative to the difference at the reference date. $\eta^{\text{participation}}$ is the implied participation elasticity of wives with respect to the earnings of their husbands. *Pre-event mean* refers to the year before the reference date. Cluster-robust (at the household level) standard errors are bootstrapped (500 replications) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Effects of husband's displacement on household income, control group 1

	Prob. of HH receiving		Monthly household income		
	UB	UA	Gross	Net	Net + benefits
	(1)	(2)	(3)	(4)	(5)
Prior event					
δ_{-1}	-0.004	0.001	-17.208^{**}	-0.588	-2.297
	(0.003)	(0.002)	(7.634)	(4.988)	(4.923)
Post event					
δ_1	0.223^{***}	0.015^{***}	-835.031^{***}	-530.986^{***}	-422.586^{***}
	(0.004)	(0.002)	(14.467)	(9.102)	(8.483)
δ_2	0.069^{***}	0.038^{***}	-794.45^{***}	-489.393^{***}	-442.212^{***}
	(0.004)	(0.002)	(19.488)	(12.243)	(11.867)
δ_3	0.037^{***}	0.024^{***}	-770.498^{***}	-472.311^{***}	-443.354^{***}
	(0.004)	(0.003)	(20.720)	(13.008)	(12.682)
δ_4	0.028^{***}	0.018^{***}	-734.077^{***}	-445.916^{***}	-425.226^{***}
	(0.004)	(0.003)	(22.537)	(14.106)	(13.780)
δ_5	0.025^{***}	0.017^{***}	-715.350^{***}	-432.797^{***}	-414.887^{***}
	(0.004)	(0.003)	(23.667)	(14.803)	(14.518)
Displaced×Post	0.077^{***}	0.023^{***}	-769.902^{***}	-474.298^{***}	-429.653^{***}
	(0.003)	(0.002)	(18.332)	(11.442)	(11.164)
Pre-event mean	0.040	0.015	3701.048	2515.338	2530.745
Households			40,771		
Observations			1,049,450		

Notes: This table displays the impact of husband's displacement on household income measures based on (2) for the subsample of households with a reference date in 2001 or later. The dependent variable is equal to one if the household receives unemployment insurance benefits and unemployment assistance in column (1) and (2), respectively. In column (3), the outcome is household gross earnings (sum of the couple's labor earnings). Household net earnings in column (4) are gross earnings minus social security contributions and payroll taxes. In column (5), we add unemployment benefits and assistance to the former. All income variables are measured in Euro (2000 prices) on a monthly basis. We compare individuals in households with a displacement to a reweighted control group of households with no firm event. The coefficient δ_l measures the average difference between the outcome variable in the displaced and the reweighted control group l years to the reference date relative to the corresponding difference at the reference quarter. *Pre-event mean* refers to the mean outcome in the year before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Effects of husband's displacement on divorce and fertility

	P(Divorce)	No. of births
	(1)	(2)
Control group 1		
Displaced×Post	0.004^{***}	-0.001
	(0.001)	(0.001)
Pre-event mean	0.000	0.014
Households	101,609	
Observations	4,386,508	
Control group 2		
Displaced×Post	-0.001	-0.000
	(0.001)	(0.001)
Pre-event mean	0.000	0.014
Households	93,666	
Observations	4,502,579	

Notes: This table displays the impact of husband's displacement on the risk to be divorced in a given quarter in column (1) and the number of births per quarter in (2). The upper (lower) panel compare households with a displacement to a reweighted control group with no firm event (with households in which husbands keep their jobs during a mass layoff). Standard errors are clustered at the household level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Wife's employment response by age of youngest child

	0–2 years	3–9 years	10–15 years	None younger than 16 years
	(1)	(2)	(3)	(4)
A. Control group 1				
Displaced×Post	0.011	0.008	0.009*	0.001
	(0.008)	(0.005)	(0.005)	(0.004)
$\eta^{\text{participation}}$	−0.054	−0.033	−0.034*	−0.005
	(0.038)	(0.022)	(0.020)	(0.015)
Pre-event mean	0.182	0.466	0.584	0.659
Earnings rel. to husband | employed	0.491	0.514	0.539	0.709
Households	18,248	36,950	22,031	26,894
B. Control group 2				
Displaced×Post	0.005	0.007*	0.015***	0.005
	(0.007)	(0.004)	(0.004)	(0.004)
$\eta^{\text{participation}}$	−0.031	−0.035*	−0.065***	−0.020
	(0.034)	(0.019)	(0.019)	(0.016)
Pre-event mean	0.181	0.465	0.585	0.661
Earnings rel. to husband | employed	0.482	0.515	0.548	0.699
Households	17,623	34,883	20,560	25,153
C. Control group 3				
Displaced×Post	-0.001	0.013**	0.011**	0.006
	(0.008)	(0.005)	(0.007)	(0.007)
Pre-event mean	0.178	0.447	0.567	0.656
Households	11,927	20,619	10,844	11,536

Notes: This table displays the impact of husband's displacement on spousal employment for subgroups defined by the age of the youngest child at the reference date. The first (second) panel compare households with a displacement to a reweighted control group with no firm event (with households in which husbands keep their jobs during a mass layoff). The third panel compares the displaced group to a control group of households that experience displacement four years after that date. *Displaced×Post* measures the average difference in employment between displaced and reweighted control groups after the reference quarter rel. to the difference at the reference date. *Pre-event mean* refers to the year before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Displacement effects by wife's earnings potential, CG1

Outcome	Low			High		
	Husband Earnings	Wife		Husband Earnings	Wife	
		P(employed)	Earnings		P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
A. Measure 1: Earnings						
Displaced×Post	−558.957***	0.008**	7.241	−649.244***	0.017***	20.328*
	(7.531)	(0.003)	(4.616)	(15.287)	(0.006)	(11.338)
$\eta^{\text{participation}}$		−0.035**			−0.072***	
		(0.014)			(0.025)	
Pre-event mean	2384.058	0.459	548.609	2711.692	0.580	1008.921
Households	68,925			20,959		
B. Measure 2: Experience						
Displaced×Post	−562.861***	0.008*	2.656	−598.032***	0.012***	16.496***
	(9.725)	(0.004)	(6.365)	(9.077)	(0.004)	(6.238)
$\eta^{\text{participation}}$		−0.035*			−0.049***	
		(0.019)			(0.017)	
	2424.419	0.464	593.651	2491.314	0.510	714.223
Households	44,013			45,800		
C. Measure 3: Education						
Displaced×Post	−505.811***	0.010**	9.704*	−659.886***	0.015***	16.063*
	(8.900)	(0.004)	(5.478)	(12.267)	(0.005)	(9.059)
$\eta^{\text{participation}}$		−0.045**			−0.063***	
		(0.020)			(0.021)	
Pre-event mean	2306.676	0.405	468.030	2700.320	0.502	699.960
Households	43,822			29,762		

Notes: This table displays the impact of husband's displacement on own earnings, spousal employment and earnings by measures of wife's earnings potential. Measure 1: High indicates that the wife earned more than 33% of the wage of husbands in the year before marriage. Measure 2: High indicates above median experience compared to other wives in the year before marriage. Measure 3: High indicates that the completed education of the wife is beyond compulsory schooling and apprenticeship education. Pre-marriage wage and experience are only available for those married after 1974. Education is only available for women with children. Results based on control group 2 are in Table A5. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11: Displacement effects by plant wage level at reference date

Outcome	Below median			Above median		
	Husband	Wife		Husband	Wife	
	Earnings	P(employed)	Earnings	Earnings	P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
A. Control group 1						
Displaced×Post	−485.974***	0.007*	1.737	−767.597***	0.015***	19.703***
	(9.787)	(0.004)	(6.289)	(10.888)	(0.005)	(6.653)
$\eta^{\text{participation}}$		−0.032*			−0.055***	
		(0.018)			(0.017)	
Pre-event mean	2239.607	0.505	676.410	2785.463	0.515	711.476
Households	40,939			40,903		
B. Control group 2						
Displaced×Post	−466.395***	0.006	2.484	−693.665***	0.010**	13.905**
	(9.293)	(0.004)	(5.889)	(10.852)	(0.004)	(5.966)
$\eta^{\text{participation}}$		−0.028*			−0.042***	
		(0.018)			(0.015)	
Pre-event mean	2287.456	0.506	677.026	2796.831	0.507	692.800
Households	38,013			34,830		

Notes: This table displays the impact of husband's displacement on own earnings, spousal employment and earnings by the wage level at the husband's employer at the reference date. The wage level at plants are employer-specific fixed effects estimated based on the AKM approach (Abowd et al., 1999), and provided by Haller (2017). These estimates are available only after 1994. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

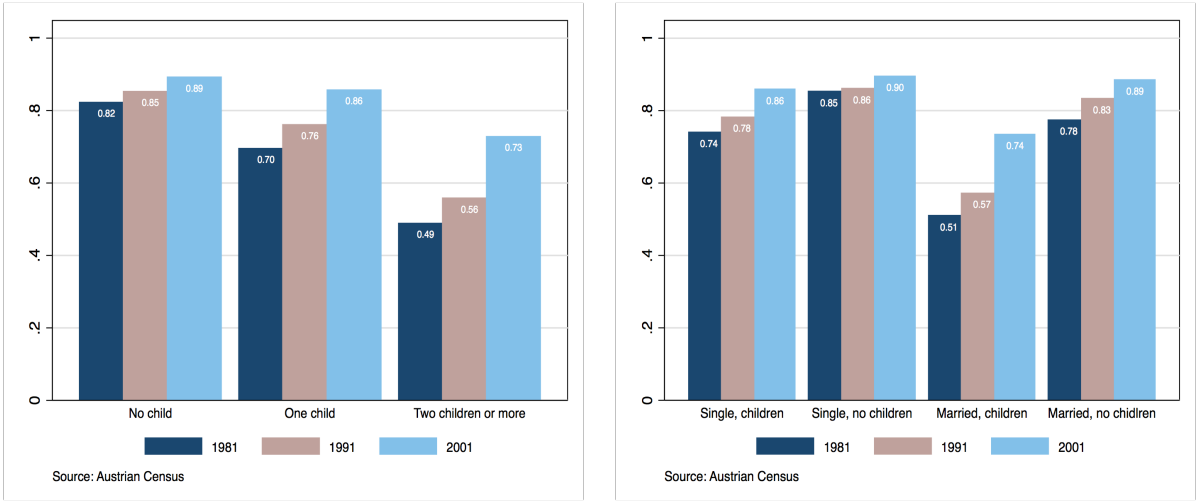
Table 12: Displacement effects by male unemployment rate at reference date

Outcome	Below median			Above median		
	Husband Earnings	Wife P(employed)	Wife Earnings	Husband Earnings	Wife P(employed)	Wife Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
A. Control group 1						
Displaced×Post	−613.381***	0.017***	14.903**	−587.012***	0.006	9.024*
	(9.652)	(0.004)	(5.747)	(8.486)	(0.004)	(5.245)
$\eta^{\text{participation}}$		−0.067***			−0.025*	
		(0.016)			(0.015)	
Pre-event mean	2463.174	0.466	607.385	2457.220	0.511	702.639
Households	50,906			51,311		
B. Control group 2						
Displaced×Post	−550.786***	0.010***	12.033**	−540.268***	0.006*	6.975
	(8.944)	(0.003)	(4.662)	(8.183)	(0.003)	(5.086)
$\eta^{\text{participation}}$		−0.048***			−0.026	
		(0.016)			(0.016)	
Pre-event mean	2478.804	0.465	605.749	2494.340	0.505	689.418
Households	46,973			46,544		

Notes: This table displays the impact of husband's displacement on own earnings, spousal employment and earnings by the male unemployment rate measured at the husband's employment district in the year of the reference date. *Displaced×Post* measures the average difference in the outcome variable between displaced and reweighted control groups in the five years after the reference quarter relative to the difference at the reference date. *Pre-event mean* refers to the year before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

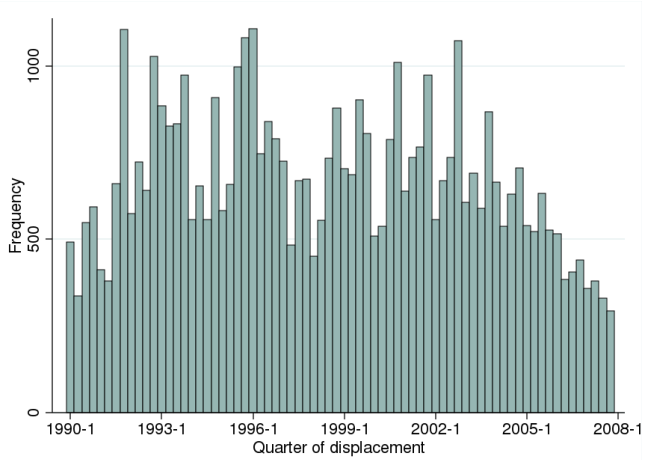
A Additional Figures and Tables

Figure A1: Female labor force participation by family status, number of children, and year



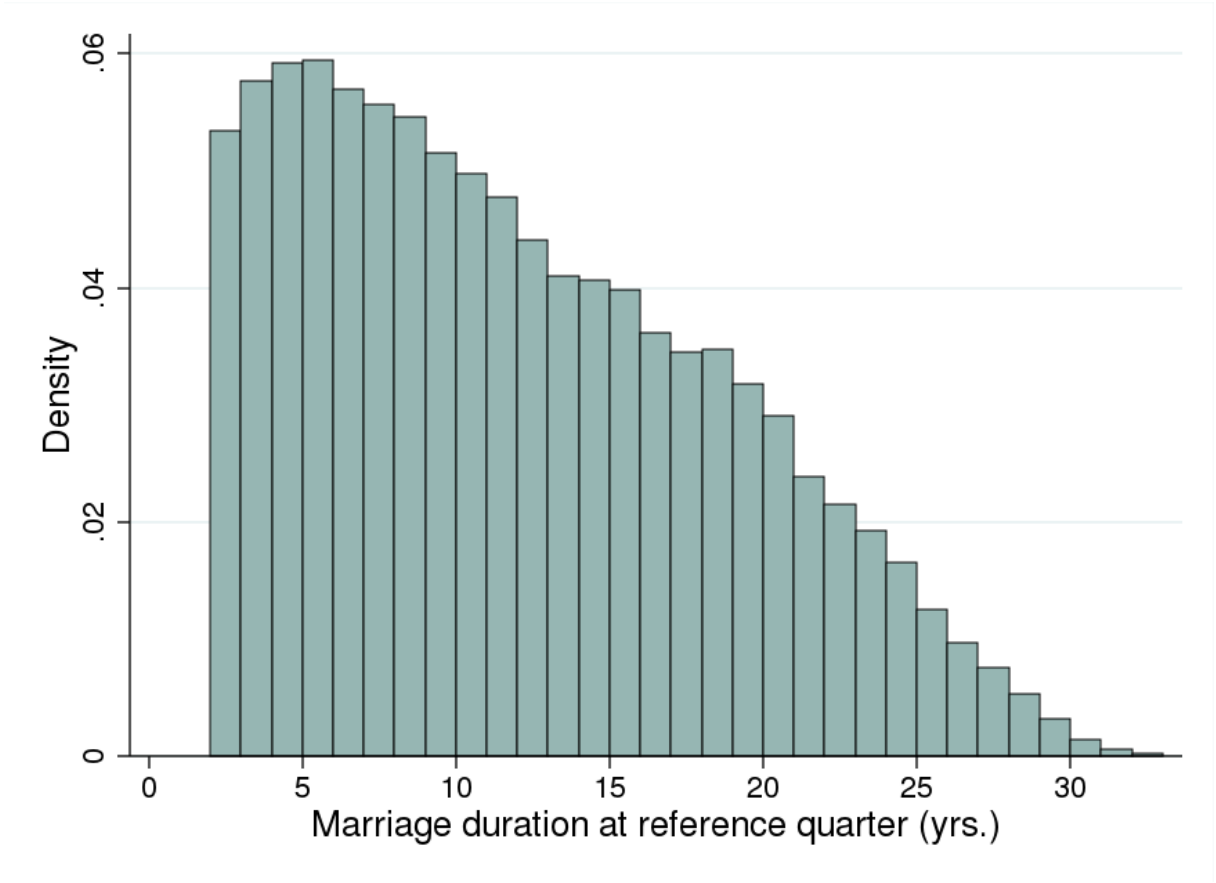
Notes: This figure shows the female labor force participation (for women between 25 and 54 years of age) by family status and year (left graph), and by the number of children and year (right graph). The figures are based on Austrian census data from the years 1981, 1991, and 2001.

Figure A2: Number of displaced workers over time



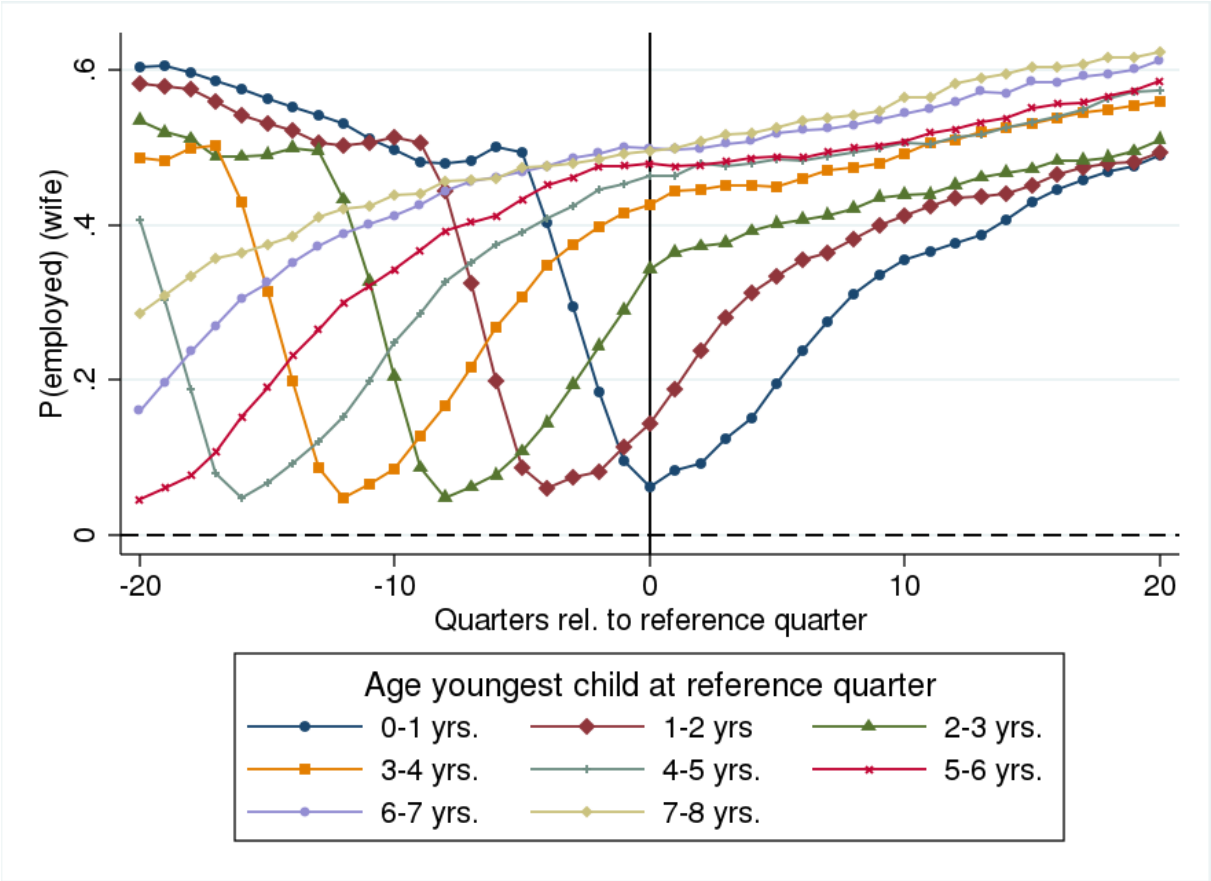
Notes: This figure shows the number of displaced workers for each quarter from 1990 Q1 to 2007 Q4. Workers are displaced through a firm closure or mass layoff event.

Figure A3: Marriage duration at the reference quarter



Notes: The figure shows the distribution of marriage durations at the reference date in years.

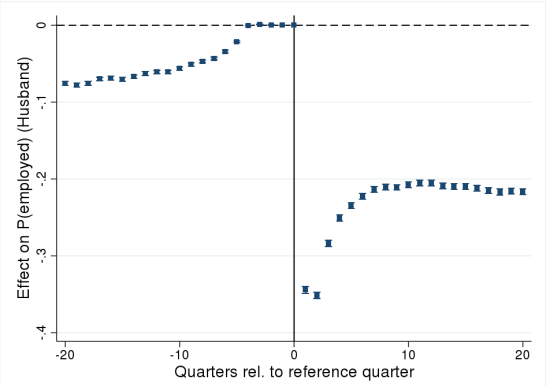
Figure A4: Wives' employment by different ages of the youngest child



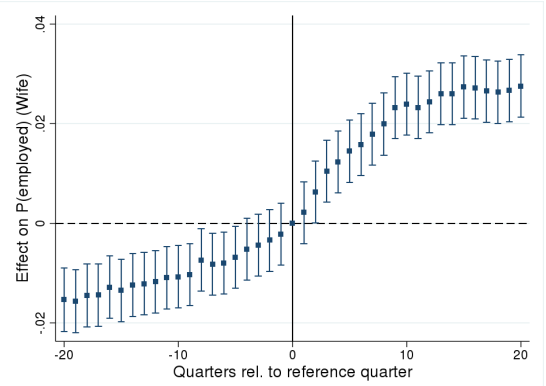
Notes: This figure shows the mean employment probability for subsamples of wives of displaced husbands with different ages of their youngest child at the reference date.

Figure A5: Employment of displaced husbands and their wives controlling for marriage duration and quarter fixed effects

(a) Husband

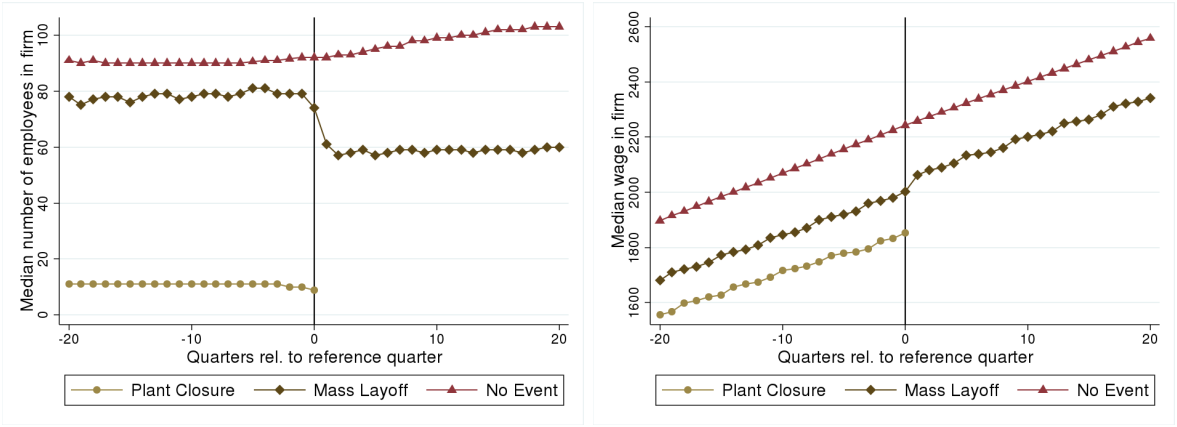


(b) Wife



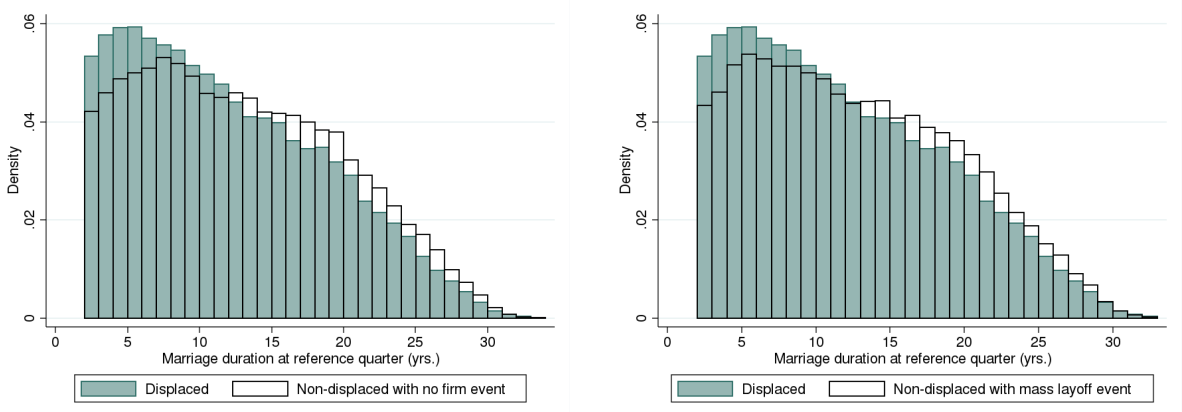
Notes: Panel (a) and (b) plot the probability that a displaced husband and his wife, respectively, is employed relative to the reference date holding constant the marriage duration and quarter of observation. We obtain the former by regressing an indicator of husband/wife being employed on indicators for the quarterly distance to the reference quarter, indicators for the marriage duration, and indicators for the quarter of observation.

Figure A6: Employment and wages of firms around the reference date



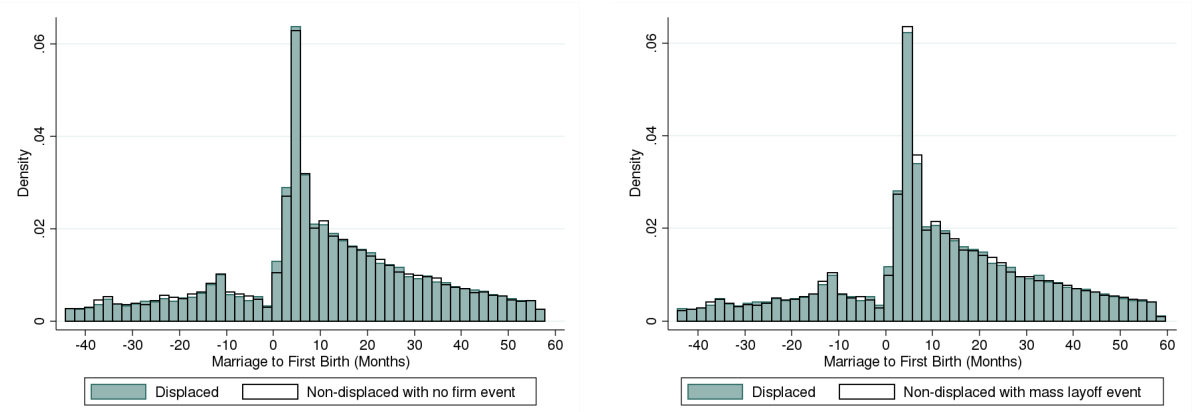
Notes: This figure plots the median number of employees and the average median monthly wage (in Euro, 2000 prices) over time for the employers in our sample. *Plant Closure* refers to firms that close down the quarter following the reference date. *Mass Layoff* refers to firms that reduce employment by at least 5% of their workforce the quarter after the reference date. *No Event* firms have neither a mass layoff nor closure the quarter following the reference date. For each quarter around the reference date, we include one observation per existing firm. We include any firm that employs at least one husband of our sample.

Figure A7: Marriage duration at the reference date by treatment status



Notes: These graphs shows the distribution of marriage durations at the reference date. The graphs display the distribution for the sample of households experiencing a displacement at the reference date (green). The graph to the left adds the distribution of those with no firm event at the reference date (transparent); the graph to the right adds households with husbands working in mass layoff firms who keep their jobs (transparent). We include one observation per household event.

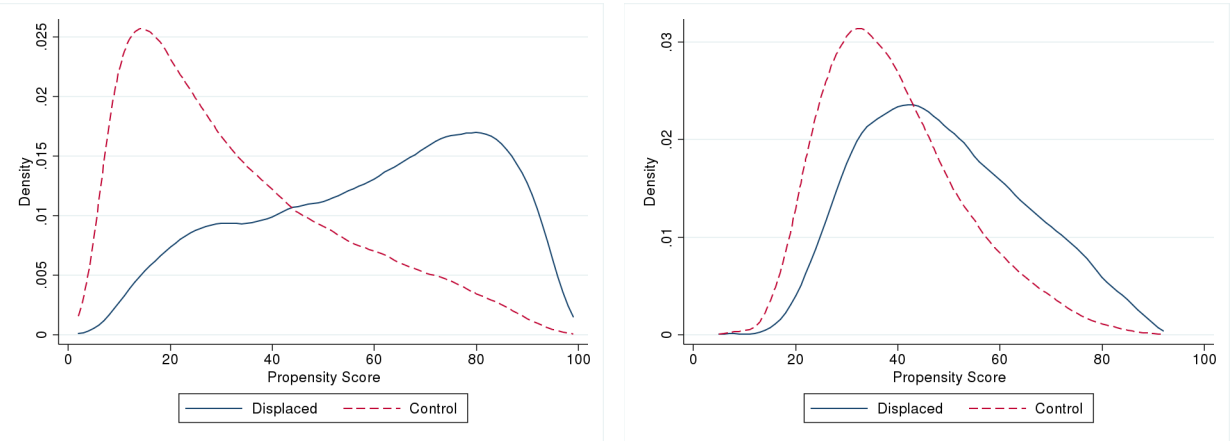
Figure A8: Distance between marriage and first birth (months) by treatment status



Notes: This figure shows the distribution of the distance from marriage to the birth of the first child in months. The graphs display the distribution for the sample of households experiencing a displacement at the reference date (green). The graph to the left adds the distribution of those with no firm event (transparent); the graph to the right adds households with husbands working in mass layoff firms who keep their jobs (transparent). We include one observation per household event.

Figure A9: Propensity score distributions

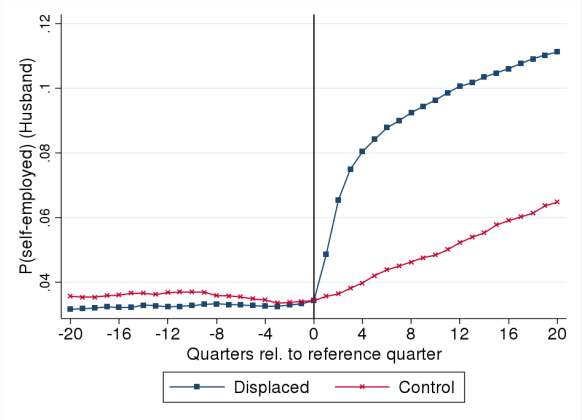
(a) CG1: No firm event **(b)** CG2: Non-displaced mass layoff



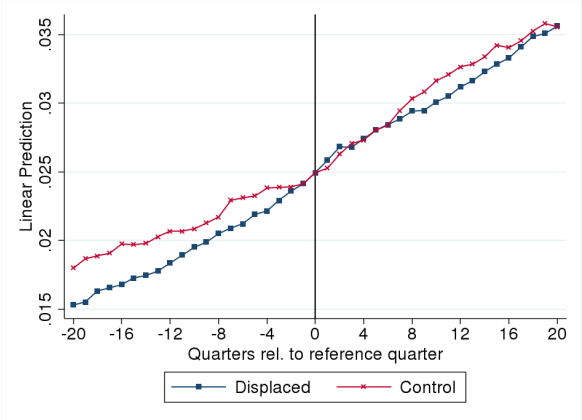
Notes: This figure shows the density distribution of the propensity score in the displaced and control groups. Panel (a) refers to the group of displaced and the group of households with husbands with no firm event. Panel (b) refers to the group of displaced and the group of households with husbands that have a mass layoff at the reference date, but are not displaced.

Figure A10: Self-employment of displaced husbands and their wives, CG1

(a) Probability that husband is self-employed



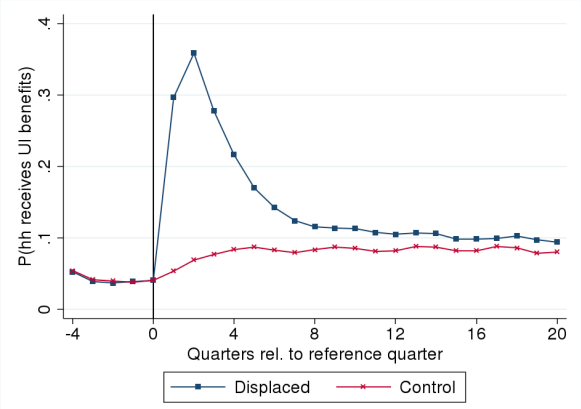
(b) Probability that wife is self-employed



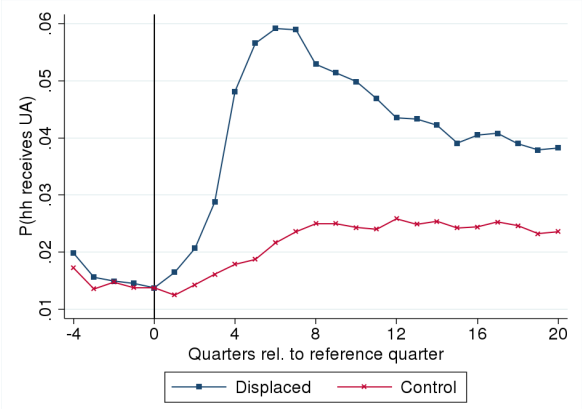
Notes: Figure (a) compares the probability of being self-employed of displaced husbands (blue, square) to husbands without firm event at the reference date (red, x). Figure (b) compares the probability of being self-employed of wives with displaced husbands (blue, square) to those with husbands without firm event at the reference date (red, x). This figure is constructed in the same way as Figure 5.

Figure A11: Social benefits around displacement, CG2

(a) Probability that household receives unemployment insurance benefits (UB)

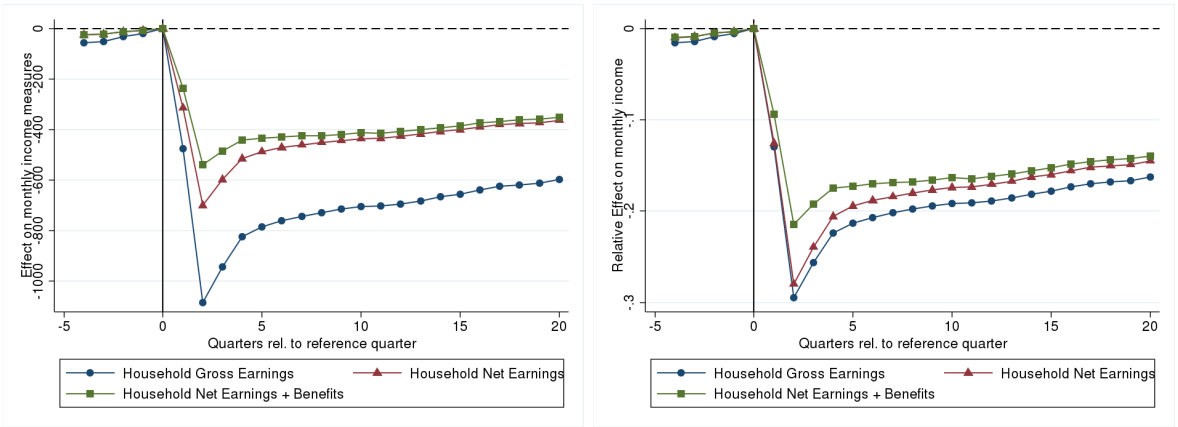


(b) Probability that household receives unemployment assistance (UA)



Notes: Comparison of the probability of receiving benefits of households with displaced husbands (blue, square) to those with non-displaced husbands working at mass layoff employers at the reference date (red, x). The control group is reweighted to resemble the displaced group within each subgroup as explained in Figure 5. The employment probability of the control group is adjusted by its mean difference relative to the displaced group. With some exceptions, job losers can receive UB for up to 30 weeks. After exhausting UB, job losers can obtain means-tested income support, UA, that pays a lower level of benefits indefinitely.

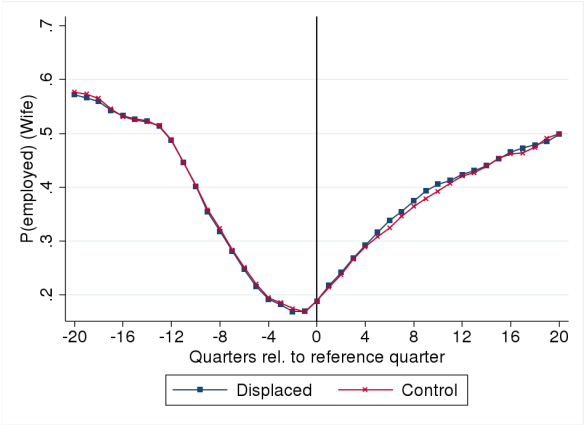
Figure A12: Displacement effect on household income, CG2



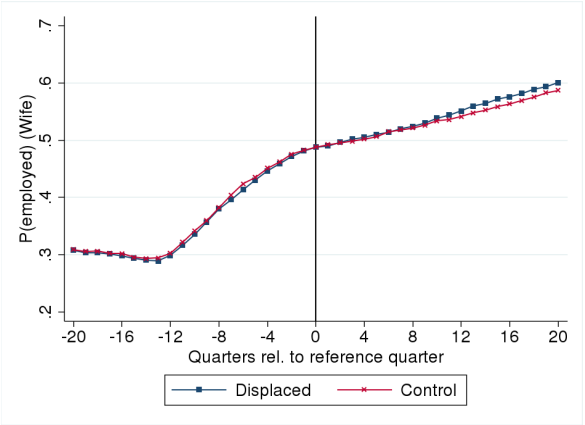
Notes: This figure shows the effect of husband's displacement on monthly household income measures (in Euro, 2000 prices). The effect is given by the difference between households that experience a displacement and reweighted and mean-adjusted households with non-displaced husbands who work at mass layoff employers at the reference date. *Household Gross Earnings* is the sum of husband's and wife's labor earnings in each quarter according to tax data. *Household Net Earnings* subtracts social security contributions and payroll taxes from the former. *Household Net Earnings + benefits* adds benefits from unemployment insurance and unemployment assistance.

Figure A13: Employment of displaced husbands' wives by age of the youngest child, CG2

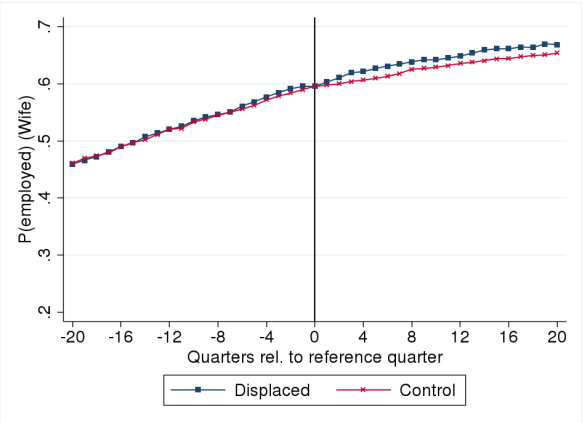
(a) 0-2 yrs.



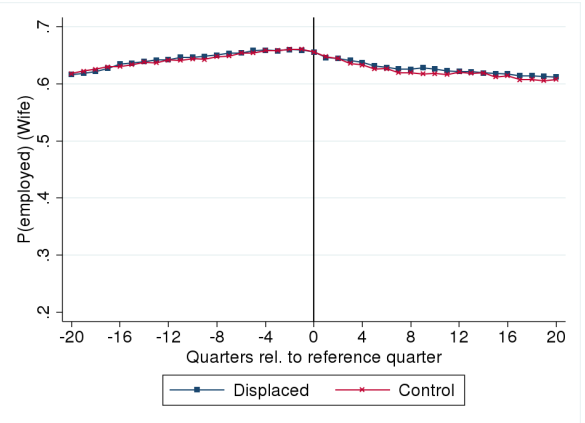
(b) 3-9 yrs.



(c) 10-15 yrs.



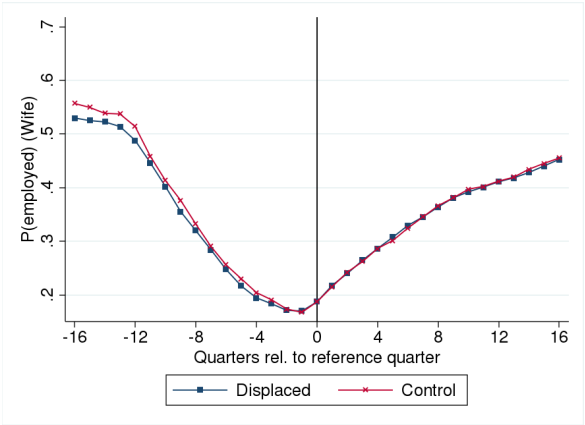
(d) No children aged 16 yrs. or younger



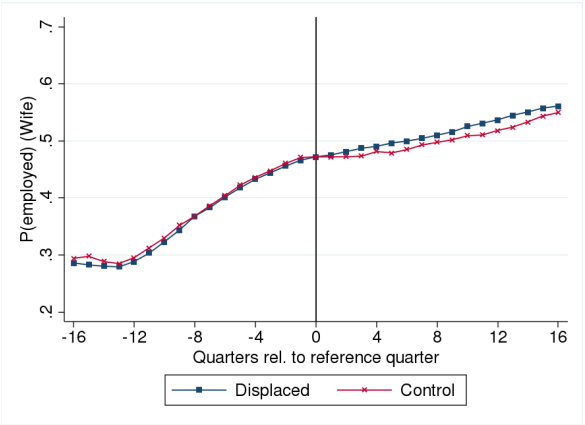
Notes: Comparison of the probability to be employed of wives with displaced husbands (blue, square) to those with non-displaced husbands working at a mass layoff firm at the reference date (red, x) for subgroups defined by the age of the youngest child at the reference date. The control group is reweighted to resemble the displaced group within each subgroup as explained in Figure 5. The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Figure A14: Employment of displaced husbands' wives by age of the youngest child, CG3

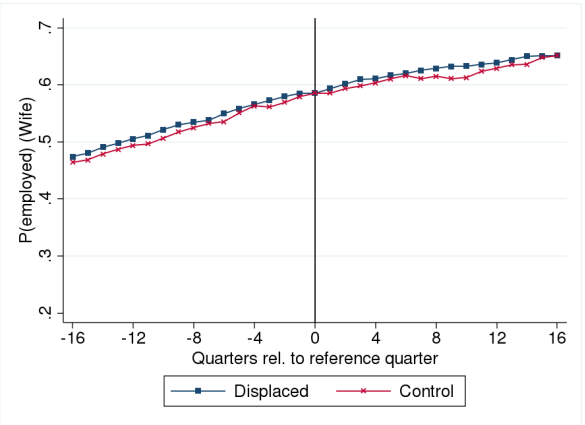
(a) 0-2 yrs.



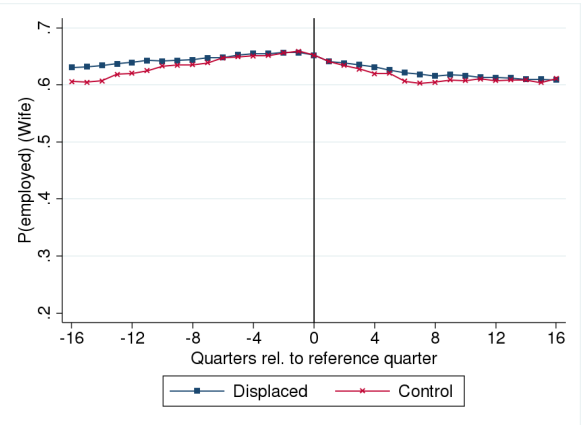
(b) 3-9 yrs.



(c) 10-15 yrs.



(d) No children aged 16 yrs. or younger



Notes: Comparison of the probability to be employed of wives with displaced husbands (blue, square) to those with husbands displaced 16 quarters after the reference date (red, x) for subgroups defined by the age of the youngest child at the reference date. The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Table A1: Wife's Labor Supply Elasticities in Added Worker Effect Studies

	Country	Time	Data	Sample households	Wife's labor supply (semi-)elasticity		Comments
1.Variation in spousal income in a structural life-cycle model of household labor supply							
Haan and Prowse (2015)	DE	1991-2005	GSOEP	Married couples aged 16–65 with labor market experience	Participation without leisure complementarity	-0.025^{a} -0.056^{a}	Comparison of simulated optimal behavior when spouse is vs. is not subject to unanticipated job destruction
Blundell et al. (2016)	US	1999-2009	PSID	Households with participating and married male head aged 30–57	Hours (total response) Extensive margin	-0.75 -0.168	Permanent shock in spousal wage process identified in structural model
Blundell et al. (2017)	US	1999-2015	PSID	Married couples with wife aged 25–65			Permanent shock in spousal wage process identified in structural model
				with children aged ≤ 10	Hours (total response) Extensive margin Intensive margin	-0.296 -0.193 -0.170	
				no children aged ≤ 10	Hours (total response) Extensive margin Intensive margin	-0.14 -0.065 -0.088	
2.Quasi-experimental variation in spousal income through job displacements							
Stephens (2002)	US	1968-1992	PSID	Married couples aged 25–65	Hours	-0.50	Displacement through plant closure/moving, layoff, firing
Kohara 2010[b]	JP	1993-2004	Panel survey	Wife aged 24-35 in 1993	Hours	-0.893^{a}	Layoff, plant closure, and bankruptcy
Eliason (2011)	SE	1987	Admin panel	Married couples aged 25–51	Earnings	0.44	Plant closure
Hardoy and Schøne (2014)	NO	2002	Admin panel	Married couples aged 25–55	Employment Earnings	0.09 0.07	Closure, mass layoff; couple required to stay married in post-treatment period
				with wife not employed at displacement	Earnings	-0.5	
Bredtmann et al. (forthcoming)	C-EU	2004-2013	EU-SILC	Married/cohabiting couples aged 16–65	Employment	0.12^{a}	Continental Europe (C-EU) refers to AT, BE, DE, FR, LU, and the NL
3.Quasi-experimental variation in spousal income through social insurance benefits							
Cullen and Gruber (2000)	US	1984-88, 1990-92	SIPP	Married couples aged 25–54	Hours	$[-0.49,-1.07]$	Lower and upper bound estimates, variation in spousal UI benefits
Autor et al. (2017)	NO	1989-2011	Admin panel	Married couples, one spouse (< 62) applying for DI benefits	Employment	-0.345	Simulated response to permanent change in spousal income in structural model, no separate elasticities by sex
Fadlon and Nielsen (2017)	DK	1980-2011	Admin panel	Married/cohabiting couples, widows (< 67) with spouse dying at age 45–80	Participation	-0.13	Variation in spousal survivor benefits

Notes: The (semi-)elasticity refers to the change in wife's labor supply to a 1% change in husband's income. For the elasticity of hours and earnings, the wife's response is relative to the baseline mean (in %). For the participation and employment elasticity, the response is in absolute terms (in percentage points). [a] Assuming a mean husband's income loss of 20%. [b] This study is published in the *Journal of Population Economics* Volume 23(4). The details for all other listed studies can be found in the List of References in the paper.

Table A2: Effects of husband's displacement on household income, control group 2

	Prob. of HH receiving		Monthly household income		
	UB	UA	Gross	Net	Net + benefits
	(1)	(2)	(3)	(4)	(5)
Prior event					
δ_{-1}	-0.002	0.001	-42.231^{***}	-18.200^{***}	-17.807^{***}
	(0.002)	(0.001)	(7.563)	(4.935)	(4.850)
Post event					
δ_1	0.217^{***}	0.013^{***}	-829.348^{***}	-530.235^{***}	-423.316^{***}
	(0.003)	(0.001)	(13.795)	(8.667)	(8.138)
δ_2	0.055^{***}	0.035^{***}	-754.309^{***}	-467.076^{***}	-427.325^{***}
	(0.003)	(0.002)	(18.595)	(11.692)	(11.333)
δ_3	0.026^{***}	0.023^{***}	-703.547^{***}	-434.679^{***}	-412.512^{***}
	(0.003)	(0.002)	(20.218)	(12.712)	(12.363)
δ_4	0.018^{***}	0.017^{***}	-658.016^{***}	-401.865^{***}	-385.809^{***}
	(0.003)	(0.002)	(21.624)	(13.554)	(13.252)
δ_5	0.015^{***}	0.015^{***}	-610.017^{***}	-370.923^{***}	-357.572^{***}
	(0.003)	(0.002)	(22.906)	(14.353)	(14.074)
Displaced×Post	0.066^{***}	0.021^{***}	-711.126^{***}	-441.015^{***}	-401.320^{***}
	(0.003)	(0.002)	(17.695)	(11.046)	(10.789)
Pre-event mean	0.040	0.015	3772.018	2553.295	2575.851
Households	34,031				
Observations	947,225				

Notes: This table displays the impact of husband's displacement on household income measures based on (2) for the subsample of households with a reference date in 2001 or later. The dependent variable is equal to one if the household receives unemployment insurance benefits and unemployment assistance in column (1) and (2), respectively. In column (3), the outcome is household gross earnings (sum of the couple's labor earnings). Household net earnings in column (5) are gross earnings minus social security contributions and payroll taxes. In column (6), we add unemployment benefits and assistance to the former. All income variables are measured in Euro (2000 prices) on a monthly basis. We compare individuals in households with a displacement to a reweighted control group of households with husbands who keep their job during during a mass layoff event at the reference date. The coefficient δ_l measures the average difference between outcomes in the displaced and the reweighted control group l years to the reference date relative to the corresponding difference at the reference quarter. *Pre-event mean* refers to the mean outcome in the year before the reference date. Standard errors are clustered at the household level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Displacement effects by youngest child

Outcome	Husband Earnings (1)	Wife P(employed) (2)	Wife Earnings (3)
Control group 1			
age $0-2$	-509.603^{***}	0.011	7.949
	(15.118)	(0.008)	(11.793)
age $3-9$	-552.944^{***}	0.008	12.988^{**}
	(10.531)	(0.005)	(6.477)
age $10-15$	-652.137^{***}	0.009^{*}	6.222
	(14.648)	(0.005)	(7.414)
No child	-707.224^{***}	0.001	-6.027
	(12.433)	(0.005)	(8.154)
Control group 2			
age $0-2$t	-473.784^{***}	0.005	6.828
	(13.840)	(0.007)	(9.986)
age $3-9$	-501.594^{***}	0.007^{*}	11.157^{**}
	(10.004)	(0.004)	(5.325)
age $10-15$	-585.793^{***}	0.015^{***}	14.937^{**}
	(13.394)	(0.004)	(6.393)
No child	-615.452^{***}	0.005	0.324
	(12.210)	(0.004)	(7.418)
Control group 3			
age $0-2$	-625.170^{***}	-0.001	25.420^{**}
	(13.635)	(0.008)	(11.193)
age $3-9$	-681.030^{***}	0.013^{**}	21.459^{***}
	(9.822)	(0.005)	(6.683)
age $10-15$	-778.636^{***}	0.011^{*}	14.136
	(13.567)	(0.007)	(8.661)
No child	-839.497^{***}	0.006	6.401
	(12.906)	(0.007)	(11.360)

Notes: This table displays the impact of husband's displacement for subgroups defined by the age of the youngest child at the reference date. It is similar to Table 9, but it additionally includes the effects on husband's earnings (1) and wife's earnings (3). The estimates measure the average difference in the corresponding outcome variable between displaced and reweighted control groups after the reference quarter rel. to the difference at the reference date. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Displacement effects by availability of nursery at reference date

Outcome	No nursery in district			Nursery in district		
	Husband	Wife		Husband	Wife	
	Earnings	P(employed)	Earnings	Earnings	P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
Control group 1						
Displaced×Post	−503.182***	0.005	20.075	−526.537***	0.011	-7.443
	(18.987)	(0.010)	(12.455)	(25.127)	(0.014)	(21.868)
$\eta^{\text{participation}}$		−0.020			−0.053	
		(0.045)			(0.065)	
Pre-event mean	2333.331	0.164	166.678	2496.618	0.206	243.037
Households	11,058			7,170		
Control group 2						
Displaced×Post	−460.569***	0.008	12.111	−482.589***	0.003	4.978
	(17.073)	(0.008)	(10.093)	(22.442)	(0.011)	(17.933)
$\eta^{\text{participation}}$		−0.044			−0.021	
		(0.040)			(0.058)	
Pre-event mean	2339.078	0.162	162.721	2497.289	0.205	241.980
Households	10,754			6,892		

Notes: This table displays the impact of husband's displacement on own earnings, spousal employment and earnings by the availability of nurseries at the reference date. Nurseries provide child care for the under-three-year-old. The availability is measured at the community level. We only look at wives with children aged 0–3 at the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Displacement effects by wife's earnings potential, control group 2

Outcome	Low			High		
	Husband Earnings	Wife		Husband Earnings	Wife	
		P(employed)	Earnings		P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
Measure 1: Earnings before marriage						
Displaced×Post	−511.376***	0.007**	6.656*	−592.745***	0.010**	13.671
	(6.587)	(0.003)	(3.848)	(15.434)	(0.005)	(9.707)
$\eta^{\text{participation}}$		−0.034**			−0.045*	
		(0.014)			(0.024)	
Pre-event mean	2390.720	0.456	544.524	2718.341	0.579	1002.762
Households	63,911			17,986		
Measure 2: Experience before marriage						
Displaced×Post	−518.182***	0.006	6.614	−539.480***	0.010***	9.419*
	(8.613)	(0.004)	(5.680)	(9.089)	(0.003)	(5.340)
$\eta^{\text{participation}}$		−0.024			−0.046***	
		(0.018)			(0.016)	
Pre-event mean	2428.900	0.458	581.638	2496.457	0.507	706.263
Households	40,263			41,594		
Measure 3: Education						
Displaced×Post	−453.777***	0.008**	7.848	−619.957***	0.010**	13.339
	(8.453)	(0.004)	(4.808)	(12.191)	(0.005)	(8.780)
$\eta^{\text{participation}}$		−0.042**			−0.043**	
		(0.020)			(0.020)	
Pre-event mean	2315.542	0.399	457.583	2696.034	0.500	697.313
Households	40,168			26,208		

Notes: This table displays the impact of husband's displacement on own earnings, spousal employment and earnings by measures of wife's earnings potential. Measure 1: High indicates that the wife earned more than 33% of the wage of husbands in the year before marriage. Measure 2: High indicates above median experience compared to other wives in the year before marriage. Measure 3: High indicates that the completed education of the wife is beyond compulsory schooling and apprenticeship education. Pre-marriage wage and experience are only available for those married after 1974. Education is only available for women with children. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B Robustness analysis

In this section, we briefly summarize robustness checks using alternative definitions of displaced and control workers and variations in the weighting procedure.

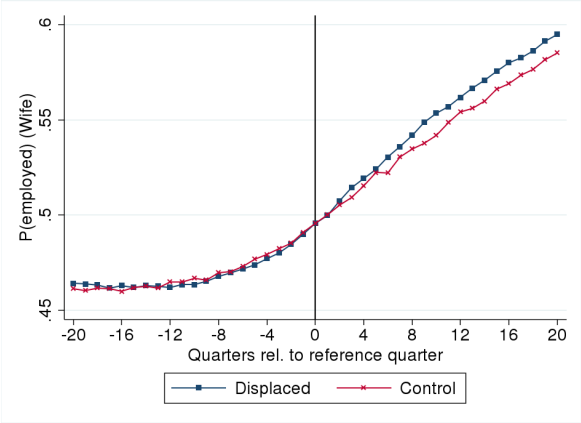
We start with sensitivity checks of our estimations using control group 1 and 2. First, we use an alternative, more restrictive measure to identify mass layoffs. Now firms experience a mass layoff, if at least ten and at most fifty percent of all workers are displaced from one quarter to the other.[1] The graphical evidence (see Figure B1a) and the corresponding estimates (see column (1) of Table B1) illustrate that our main estimation results are robust to a change in the definition of mass layoffs. Second, we match (in addition to the variables used in the main specification, see footnote 17) also on employment outcomes of wives up to one year before the reference date. The resulting estimates (see Figure B1b) are similar and not statistically significantly different from the ones in the main specification. Third, we focus on displaced workers from plant closures. Workers who got displaced due to a mass layoff events are more prone to selection issues, since the underlying process determining leavers and stayers within struggling firms might be endogenous to workers' labor market outcomes. In contrast, there is no selection within a firm when it closes down, since all employees are eventually displaced. The resulting estimates (see Figure B1c) are slightly smaller and not as precisely estimated as in the main specification, but they are indicating that results are robust. Fourth, we focus alternatively on displaced workers from mass layoffs and exclude those from plant closures. Cases from plant closure might be more selective at the firm level. For instance, we can observe that these firms are typically much smaller than other firms with a mass layoff event or no event at all (see Figure A6). In addition, we also match on the firm size up to one year before the reference quarter. The resulting estimates (see Figure B1d) are very comparable to those from our main results.

We now explore the robustness of our estimation result based on control group 3. This approach exploits the timing of displacement and requires the choice of a duration Δ between the events of the households in the treatment and the control group. Importantly, there is a trade-off in this choice: With a smaller Δ, the treatment and control group's displacement is closer in time and there are hence more likely to be comparable. A larger distance in the date of event allows us to compare outcomes of the two groups for more periods (Fadlon and Nielsen, 2017). In our baseline specification we choose a Δ of 16 quarters. Now we consider values of 4, 8, and 12. It turns out that the specific choice of Δ is not crucial (see Figure B2 and Table B2).

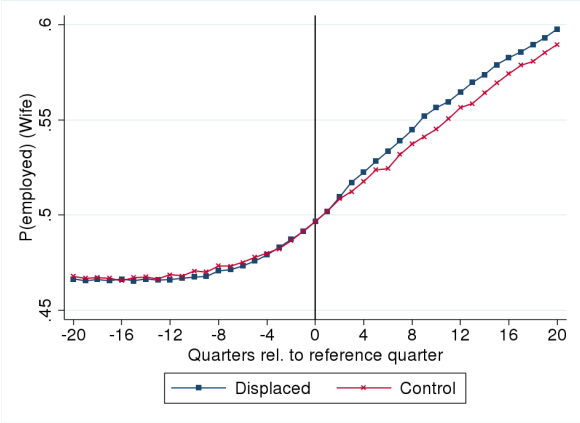
[1] Again, this relative cutoff applies to all establishments with 100 to 600 workers in the base quarter. For smaller firms, the cutoffs are more than 6 workers leaving in firms with less than 20 employees and more than 10 if the establishment has more than 20 and less than 100 workers. For establishments with more than 600 workers, at least 60 employees have to leave the firm in order to make it count as mass layoff.

Figure B1: Displaced husband's wife employment, robustness checks

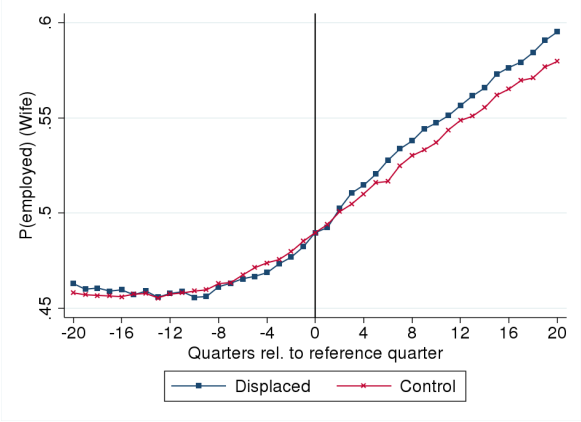
(a) Stricter mass layoff cutoffs



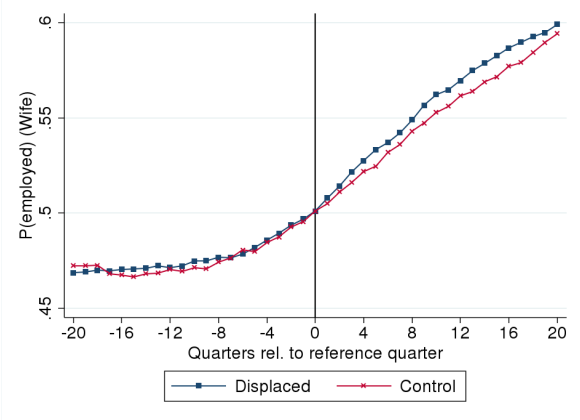
(b) Reweighting includes wives' pre-event employment



(c) Displaced from plant closures only



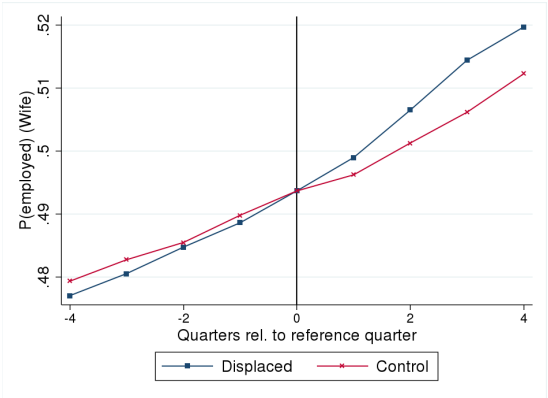
(d) Displaced and non-displaced from mass layoff firms only



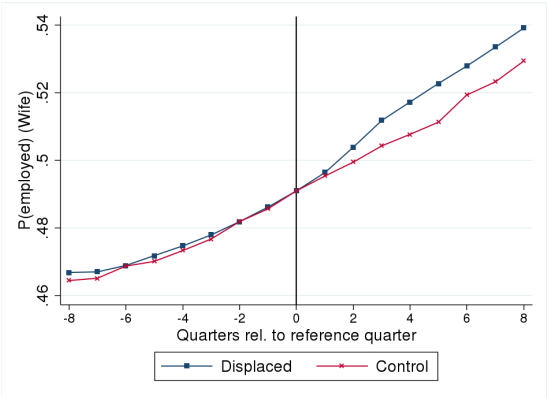
Notes: This figure provides robustness checks to Figure 6a and 6b. In Panel (a), we apply a stricter cutoff for mass layoffs. In Panel (b), we additionally include employment outcomes of wives (up to one year before the reference date) in the weighting procedure. In Panel (c), the group of displaced workers includes only those with a displacement due to a plant closure. In Panel (d), we only look at displaced and non-displaced workers at firms that have a mass layoff in the quarter after the reference date. We also match on the firm size up to one year before the reference quarter. The graphs are constructed in the same way as in Figure 6.

Figure B2: Displaced husband's wife employment, robustness checks (cont'd)

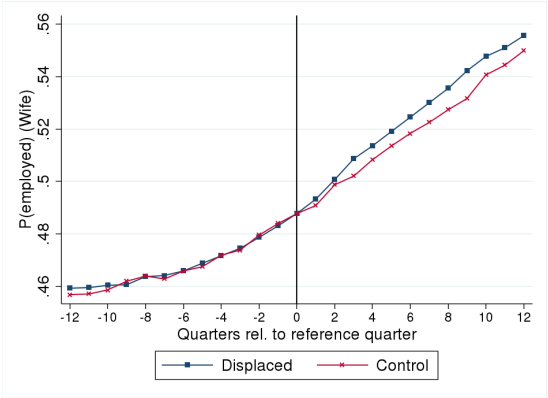
(a) Control group displaced in $\Delta = 4$



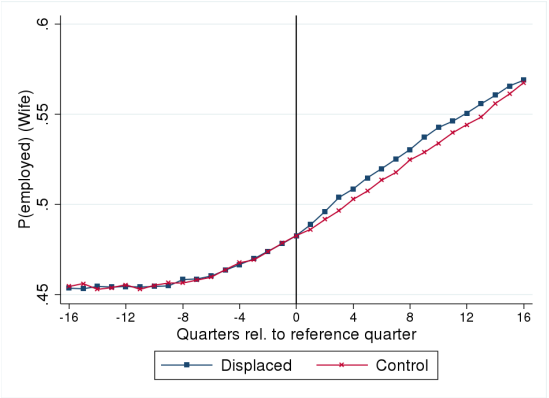
(b) Control group displaced in $\Delta = 8$



(c) Control group displaced in $\Delta = 12$



(d) Control group displaced in $\Delta = 16$



Notes: This figure provides robustness checks to Figure 6c by showing the effect of husband's displacement on wife's employment for different choices of Δ. We compare wives of men that are displaced at the reference date (blue, square) to that of men displaced Δ quarters after that date (red, x). The employment pattern of the control group is adjusted by its mean difference relative to the displaced group.

Table B1: Robustness checks for control group 1 and 2

	(1)	(2)	(3)	(4)	(5)
Prior event					
δ_{-5}	0.001	−0.002	0.002	−0.002	0.003
	(0.005)	(0.004)	(0.005)	(0.004)	(0.003)
δ_{-4}	0.001	−0.001	0.001	0.003	0.003
	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)
δ_{-3}	−0.002	−0.002	−0.002	0.003	0.002
	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)
δ_{-2}	−0.002	−0.002	0.002	0.000	0.001
	(0.003)	(0.003)	(0.004)	(0.003)	(0.002)
δ_{-1}	−0.001	0.000	−0.003	0.001	0.000
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Post event					
δ_1	0.003	0.003	0.003	0.004**	0.004***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
δ_2	0.006*	0.007**	0.007**	0.006**	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
δ_3	0.010***	0.010***	0.009***	0.008**	0.011***
	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)
δ_4	0.011***	0.010***	0.011***	0.010***	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
δ_5	0.010**	0.008**	0.007*	0.007*	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Pre-event mean	0.489	0.486	0.484	0.470	0.485
Households	87,876	101,609	70,942	75,212	100,036
Observations	3,823,455	4,387,451	3,123,503	3,745,965	4,320,949

Notes: This table reports different robustness checks to the results in Table 3 that are based on control group 1 and 2. The dependent variable is equal to one if wife in household i is employed in a given quarter. The coefficient δ_l measures the average difference between employment in the displaced and the control group l years to the reference date relative to the corresponding difference at the reference date. *Pre-event mean* refers to the mean employment in the year before the reference date. In the robustness checks, we vary the approaches used in Table 3 in the following ways: (1) We compare displaced and control group 2 with higher mass layoff cutoffs requirements, (2) We additionally balance displaced and control group 1 with respect to the pre-event employment outcomes of wives, (3) We only include individuals affected by a plant closure in the displaced group and compare them to controls with no firm event, (4) We only take displaced and non-displaced husbands from mass layoffs and additionally balance them with respect to husband's employer size, (5) Instead of matching, we control for the variables included the weighting procedure by including them in a simple regression model. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B2: Robustness checks for control group 3

	$\Delta = 4$	$\Delta = 8$	$\Delta = 12$
	(1)	(2)	(3)
Prior event			
δ_{-3}			0.001
			(0.004)
δ_{-2}		0.002	−0.000
		(0.003)	(0.002)
δ_{-1}	−0.001	0.001	0.001
	(0.002)	(0.002)	(0.003)
Post event			
δ_1	0.006***	0.006***	0.004*
	(0.002)	(0.002)	(0.002)
δ_2		0.010***	0.007**
		(0.003)	(0.003)
δ_3			0.009***
			(0.004)
Pre-event mean	0.482	0.472	0.464
Households	46,730	46,263	45,476
Observations	766,593	1,324,436	1,779,150

Notes: This table illustrates the robustness of results for control group 3 in Table 3 to different choices of Δ. Column (1) shows the effect of husband's displacement on wife's employment comparing households that experience displacement at the reference date to those displaced 4 quarter in the future. Column (2) and (3) refer to estimations using as a control group those displaced 8 and 12 quarter in the future, respectively. The dependent variable is equal to one if wife in household i is employed in a given quarter. The coefficient δ_l measures the average difference between employment in the displaced and the control group l years to the reference date relative to the corresponding difference at the reference quarter. *Pre-event mean* refers to the mean employment before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.