Job Displacement, Family Dynamics and Spousal Labor Supply*

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Abstract

We study the effectiveness of intra-household insurance among married couples when the husband loses his job due to a mass layoff or plant closure. Empirical results based on Austrian administrative data show that husbands suffer persistent employment and earnings losses, while wives' labor supply increases moderately due to extensive margin responses. Wives' earnings gains recover only a tiny fraction of the household income loss and, in the short-term, public transfers and taxes are a more important form of insurance. We show that the presence of children in the household is a crucial determinant of the wives' labor supply response.

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1 Introduction

An important economic motive for marriage is the opportunity to share risk within a couple. If one partner is affected by an unexpected shock, such as illness or job loss, the second partner can increase her labor supply as an insurance against a drop in household consumption. Other economic motives for marriage, such as the desire to have children and raise a family as well as 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. Thus, the empirical literature has long sought to assess the importance of 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 (Mincer, 1962; Heckman and Macurdy, 1980), while later work focuses on the timing of spousal transitions between employment and unemployment within couples (Lundberg, 1985; Stephens, 2002; Juhn and Potter, 2007; Bredtmann et al., 2018). The findings from these studies are mixed, depending on the economic context and institutional framework. However, 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 identify family labor supply as one of the major factors allowing married households to smooth consumption, even when they are facing persistent income shocks (Haan and Prowse, 2015; Blundell et al., 2016).[2]

The literature provides several arguments why the risk-sharing channel via family labor supply might be less relevant in practice. One is the generous availability of social insurance programs that crowd out self-insurance or family insurance (Cullen and Gruber, 2000; Autor et al., 2019). A second argument are correlated shocks at the

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

[2] While consumption data are required to identify responses to the shock in the marginal utility of consumption, most studies in this literature are based on labor market data. In this case, information on the household valuation of insurance can be recovered from spousal labor supply responses to income shocks (Fadlon and Nielsen, 2019).

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 receive comparably less attention in the literature. Blundell et al. (2018) 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 insuring consumption against shocks within the household. Indeed, their findings confirm that 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 (Ruhm, 1991; Jacobson et al., 1993; Ichino et al., 2017; Lachowska et al., 2018). Thus, we have a setup in which couples face large, persistent, and unexpected shocks to household income, allowing us to 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. In particular, we observe many young couples with children, for whom we can study the trade-off 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 jobs (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.

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 their husbands lose their job and a large fraction of wives are working part-time. We show that our setup with a 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 for a control group to measure responses to the displacement shock. Following the literature, we focus on the control group consisting of couples with the husband working in a firm without mass layoff or plant closure at the reference date. Notably, we obtain equivalent results based on two alternative control groups.

We find that husbands lose on average 24% of earnings over a five year period after displacement and have a 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 percentage point 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 -0.08 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. However, due to 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. It is hard to gauge to what extent specifics of the Austrian setting account for the small elasticities, relative to other countries such as the US. To disentangle the importance of mechanisms that limit the risk-sharing potential, we consider several channels. First, 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 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 their husbands' job losses. We find no response among mothers of very young children or among women without children or with older children. This seems to imply a substitution between child care provided by the mother and formal institutions, mostly among women who return to the labor market earlier after maternity break. Notably, we find no evidence on substitution in child-care responsibilities between mothers and fathers of very young children for whom no formal child care is available.

Second, 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, when their husbands are displaced. Indeed, we do not 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 covers just 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 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.

Third, 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. Indeed, we find a small increase in the probability of divorce. In contrast, 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.

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., 2019). 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). In particular, 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 and the definition of plant closures and mass layoffs. Section 4 describes the life-cycle labor supply patterns of women of displaced husbands and motivates our quasi-experimental counterfactual scenario. Section 5 outlines the estimation strategy and Section 6 presents our main estimation results along with a number of robustness checks and extensions. 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 helps to put our results into perspective.

Trends in household formation Austria witnessed trends in marriage and fertility behavior that 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 married at some point (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 within the first two years following 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 following marriage, as we will see below.

Development of the female labor force participation In 1990, about 64 percent of all Austrian women between the ages of 25 and 54 were participating in the labor market. This rate has increased over time and, since the early 2000s, the female labor force participation has been consistently above 80 percent.[3] However, even in 2018, 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).

[3] All figures are according to estimates of the *International Labour Office* (International Labour Office, 2016).

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 Values Study Group and World Values Survey Association (2006), Appendix Table A2 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 statement that '*a working mother can establish just as warm and secure a relationship with her children as a mother who does not work*'. 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.

Maternity and parental leave policies Another explanation, for the rather low participation rates of (married) women with children, is the generous parental leave system; for an international comparison see Appendix Table A3. 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 to paid and job-protected parental leave up to the child's second birthday. In the vast majority of the cases, it is the mother who takes the leave. Almost all women leave the labor market at least temporary after the birth of a child, while a significant share also leaves the labor market permanently. The latter particularly applies to mothers with two or more children.

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. Thus, the entry tax rate for the second earner is lower, all other things equal, than in joint or family-based taxation systems. 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 ben-

efit 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 (UI) 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.[4] 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 Austrian UI system is more comparable to the US and UK systems than to those of typical European countries especially due to the short benefit periods; as illustrated in Appendix Table A3.

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)* (Main Association of Austrian Social Security Institutions, 2019). This is a linked employer-employee database that covers the universe of Austrian workers in the private sector from 1972 onward (Zweimüller et al., 2009). The data record individual employment spells on a daily basis along with an employer identifier, as well as individual gross 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, births. Information on a worker's marital status and the identity of their partner is provided by the *Austrian Marriage Register* (Statistics Austria, 2019b) and the *Austrian Divorce Register* (Statistics Austria, 2019a).

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

[4]The maximum replacement rate for low-income individuals is 80% for claimants with dependent family members and 60% for single claimants.

et al. (2010) and inspired by Benedetto et al. (2007).[5] We start by organizing plant level information from ASSD employment records in a quarterly panel measuring the number of blue- and white-collar employees at each 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, restricting the sample to plants with at least five 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 must provide 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 of 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 on the closure date or in the two preceding quarters. Workers affected by a mass layoff

[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).

[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 must 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 the robustness analysis in Appendix C, we present our main results with a more restrictive definition of mass layoffs.

are employed on 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 the reference date.[7] 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. 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 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 and sample characteristics

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 (February 10, May 10, August 10, November 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.

Table 1 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

[7] Appendix Figure C1 and Appendix Table C1 show that our results are unchanged, if we restrict the sample to workers with at least 3 years of tenure.

[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 Appendix Figure A2). There is evidence of seasonality in the number of displacements with peaks in the fourth quarter of each year.

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 couple has 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 a youngest child between age 3 and 15, and roughly a quarter of households have either their youngest child aged 16 or older or no child.

Furthermore, the employment rate among wives prior to the husband's job displacement is low, with only 50% of wives working. If they are employed their earnings are significantly lower than their husbands'. 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 a control group

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 couples with displaced husbands. The mode of marriage durations in the sample is around 5 years and the distribution has a long right tail (see Appendix Figure A3). How quickly after marriage do couples have their first child? In Austria, the marriage date is very strongly related to the birth of a child. A histogram of the durations between marriage and first birth, presented in Appendix Figure A4, shows a huge spike in births 4 to 8 months after the marriage date, while about 30 percent of first births occur in the year after marriage. This suggests that in many couples, marriage follows the fertility decision rather than the other way round. Due to a combination of relatively short marriage durations, the presence of young children in the household, and long spells of parental leave, 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 2a plots the husband's employment probability around job displacement averaged over all workers (see black line). Because we have restricted displaced workers to be employed for at least one year at the plant closure or mass layoff event, the graph shows full employment prior to the reference date and slightly lower average employment rates in earlier years. After displacement, we see a sharp drop in employment of about 35 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 points below full employment. The employment patterns for husbands are very similar across groups with different marriage durations, which are also shown in this figure. Employment rates in the years before the displacement are lowest for the group with the shortest marriage duration.

Figure 2b examines the employment of the wives of displaced husbands for different marriage cohorts. The figure reveals substantial heterogeneity in female labor supply around childbirth and marriage. Starting with the group with the shortest marriage duration of 2 to 4 years, the line with hollow dots, 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 maternity leave. This pattern is repeated in groups with longer marriage durations, by parallel shifts of wives' employment trajectories to the left. Thus, the life-cycle pattern 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. The average employment rate of wives around the husbands' displacement quarter (see black line), is driven by the patterns in the different marriage duration cohorts and thus not at all informative about their response to husbands' job displacement.

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 an appropriate control group 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. Our main control group comprises non-displaced husbands without firm event. We focus on couples fulfilling the same age, tenure, and marriage duration restrictions as our displaced sample. Husbands are employed at any reference quarter from 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.[10] Table 1 column (3) reports descriptive statistics showing that characteristics of control workers 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.[11] Wives of non-displaced workers are slightly older than wives of displaced workers, but overall the difference in wives' characteristics are smaller than among husbands.[12] The differences in observable characteristics between displaced couples and control 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.

To check the robustness of our results and to confront concerns about sorting, we also consider two alternative control groups. The second control group consists of husbands employed in mass layoff plants at the mass layoff date, who do not lose their jobs. These control workers are by definitions employed at the same firms, but we might worry about selection into layoff.[13] The third control group should address all concerns of sorting by exploiting the randomness in the timing of displacement. We compare outcomes in couples who marry in the same year, but in one case the husband is displaced earlier than in the other, and we use the time between the two displacement events as counterfactual. This approach is inspired by Ruhm (1991); Fadlon and Nielsen (2017), who exploit the timing of events to investigate the effect of job displacement on subsequent nonemployment and the effects of spousal health shocks on employment and the effect, 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. We provide more details about the alternative

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

[11] Appendix Figure A5 shows the average employment and wages for firms with mass layoffs, with plant closures, and without any firm event around the reference date. Again, this figure shows that firms that do not experience a mass layoff or closure are substantially larger and pay on average higher wages than event firms.

[12] Appendix Figure A6 shows that family dynamics, i.e. the marriage duration at the reference date and the time between marriage and first birth, are similarly distributed for the displacement and the control group.

[13] Many firms apply 'last-in first-out' or similar policies to determine mass layoffs. 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.

control groups in Appendix B.

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 that are quantified by regression estimates 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 $k \in [-20, 20]$, 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 $k = 1$, $I\{.\}$ 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.

To quantify the displacement effects, we average the difference between displaced and control individuals relative to the reference date over the 20 quarters after displacement. In addition, the model controls for the full set of industry and calendar quarter interactions, λ_{tj}. The model is given by

$$Y_{ik} = \theta D_i + \sum_{l=-20}^{20} \gamma_l^q I\{k = l\} + \sum_{l=-20}^{-1} \delta_l^q D_i * I\{k = l\} + \delta^{post} D_i * I\{k > 0\} + \lambda_{tj} + \upsilon_{ik}. \tag{2}$$

To control for observed differences between displaced and control individuals, we apply a propensity score weighting strategy following Imbens (2004). In particular, we estimate a flexible logit specification for the probability that the household is in the displaced group based on characteristics of the husband, the wife, and the household measured at the reference date, the husband's labor market outcomes in the years before the reference date, and the characteristics of the husband's employer. 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 do not condition on labor market outcomes of the wives

before the reference date.[14]

Based on predicted propensity scores from the logit model, we construct weights such that the average observable characteristics in the control group resemble those in the group of households that experience a displacement. Then 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 the job displacement on husband's employment and earnings up to five years after displacement. Then we turn to labor supply responses of wives, reporting employment, earnings, and job search outcomes. This section presents the results based on the main control group. Since the main results are remarkably consistent across all three control groups, we relegate detailed further results to the Appendix B.

6.1 Husbands' employment and earnings responses

Figure 3 compares quarterly employment rates before and after job displacement for husbands in the displaced group and in the control group. The graph on the left presents employment profiles in the displaced group (blue line) and the control group (red lines). The graphs on the right show the absolute difference between displaced and controls along with the corresponding 95% confidence intervals. Prior to job displacement, the weighted difference in the employment rate 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. The employment rate also declines in the control group after the reference date, but more gradually.

In column (1) of Table 2, we summarize the estimation results for the mean effects of job displacement on husband's employment (in Panel A) and monthly earnings (in Panel B of Table 2). Earnings of individuals who are not employed are set to zero. The estimated coefficients of $Displaced \times Post$ report the difference between displaced and

[14] Appendix Figure A7 shows the distribution of the estimated propensity score in the displaced versus the control group and provides a list of the regressors included in the model in the notes.

control individuals relative to the reference date averaged over the twenty quarters after displacement. Compared to the control group displaced husbands suffer an average employment loss of about 17 percentage points over the first five years. The equivalent estimate for earnings amounts to 24% of the pre-displacement mean earnings. The relative magnitude of the earnings loss from job displacement, mirrors the husbands' employment losses, which indicates that lower employment rates are the main driver of earnings drops.[15] Appendix Table A4 presents the effects of the husband's job displacement on his labor market outcomes by year. This set of results confirm that employment and earnings of the displaced and the control group evolve similarly in the years prior to displacement. The largest employment and earnings losses occur in the first year after displacement, with a decreasing trend thereafter.

6.2 Wives' labor supply responses

6.2.1 Wives' employment and earnings

The graph on the left hand side in Figure 4a shows the employment rates of wives in the displaced group and in the control group around the reference date. Irrespective of husbands' job loss, wives' employment rates in both 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 the displaced and the control group are close to zero. After the reference date a significant gap between the displaced and the control group opens and persists over the 5 year horizon. We interpret this as the wife's labor supply response to the husband's job loss.

The graphical evidence is confirmed by the estimation results summarized in Table 2. The estimated effects in column (2) of Panel A show that wives of displaced husbands increase their employment on average by about one percentage point during the first twenty quarters after displacement. While the employment effects are small, they are precisely estimated and highly robust to the choice of control group, as can be seen in Appendix Table B3. Compared to the displaced husbands' employment losses, the gains in wives' employment are small. Along with increases in employment, earnings increase by about 2% (see Panel B). Comparing wives' earnings gains

[15]The estimated employment effects are similar in magnitude to those reported for male Austrian workers displaced in the 1980s by Schwerdt et al. (2010). The estimated 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 a bit larger than those reported in Sullivan and von Wachter (2009) for Germany.

with husbands' earnings losses makes clear that the shift in labor supply within a household is hardly able to cover losses in household income.[16]

As explained in Section 3, the ASSD only records earnings consistently 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 a job loss. However, 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 group. The rate of self-employment is very low among wives in both the displaced and the control group (see Appendix Figure A8).

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 is 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 4a 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

[16]Results for the effects of husbands' displacement on their wives' employment and earnings over time are provided in Appendix Table A4. They confirm the patterns observed in Figure 4a.

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 4b, 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 graph on the left. The average job search rate among wives in the displaced group remains small and stable until one quarter prior to the reference quarter. It starts increasing thereafter and rises until the first quarter after the reference date. Over the succeeding five years it remains stable. Thus, even in terms of job search, there is little evidence of anticipatory responses. Among wives in the control group, we see no corresponding reactions. Their job search rates remain rather flat throughout. Panel C of Table 2 summarizes the mean effect for the twenty quarters after the reference date. The estimated average difference in job search rates is 0.7 percentage points. Given pre-treatment means of around 4 percent, these responses correspond to an increase in wives' job search by 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 employment prior to the displacement event. Given that, in the year when their husbands are displaced, only about 50% of wives in our sample are employed, this offers an opportunity to investigate whether wives' earnings respond at the intensive or the extensive margin. We thus analyze to which extent already employed wives increase their working hours or switch to higher paying jobs versus how many previously inactive wives join the labor force. In Table 1, we show 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.

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. As before, we weight the control group to resemble the observable characteristics of the displaced households and estimate equation (2) for each subgroup.

Results in columns (1) and (4) of Table 3 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), (5), and (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 their husbands' displacement are even negative, but small in magnitude and only marginally significant. Thus, we 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 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 not employed prior to the displacement shock. The estimated elasticity, $\eta^{\text{participation}}$, is reported in Table 3 and amounts to -0.08. 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 2, is about half as big in absolute terms with -0.04, but still significantly different from zero. For a comparison with elasticity estimates in the literature see Section 6.6.

6.3 Heterogeneity

Our results based on the full sample indicate that the wives' labor supply response to an exogenous shock to husband's job earnings is almost negligible in Austria. To understand the reasons for the limited responses 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 (Blundell et al., 2018), 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.

6.3.1 Heterogeneity by the age of youngest child

We document in Section 4 that labor supply patterns of young wives vary substantially over time and are largely determined by the timing of births. Thus, it is 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 the results, we refer to the model of household labor supply with children introduced by Blundell et al. (2018). In this model, both partners in the household split their time between market work, child care 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. Together these effects result in stronger predicted female labor supply responses in households with children.

According to the model, we expect the wife's labor supply responses to vary by the age of the child in the following way. In the Austrian case, which is characterized by generous parental leave regulations, a scarce supply of formal child care for children below age 3, and by traditional gender roles within the household, the mechanisms described above translate into the following predictions by the age of the youngest child. First, labor supply responses among women with very young children should be driven by the substitution of home-provided child care within the household. While most mothers are on parental leave with the option of returning to their previous job, and availability of formal child care is poor, 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 child care is more widely available, mothers have the additional option of substituting their child-care time at home with child care outside the household. 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 supply responses within all households are gender roles and differences in gender specific preferences for spending time with children.

To test these predictions, we define 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; (c) 10-15 years old, and an

extra fourth category (d) of households with no child or all children aged 16 years or older. As before, we weight the control group to resemble the observable predetermined characteristics of the displaced households for each subsample. A comparison of wives' average employment rates and relative earnings at the reference date across the four categories of households in Table 4, highlights the amount of heterogeneity in wives' labor supply over the life cycle. Employment rates range from 18% among mothers of very young kids to 66% among women with no children or children older than 16. If employed, mothers with younger kids work fewer hours than those with older children, as reflected in the wives' earnings relative to husbands' pre-displacement earnings.

The blue and red lines in Figure 8, show employment rates in the displaced group and the control group, reflecting 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. However, 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 4. The sample split reduces the number of observations and decreases statistical power. Therefore, we present results from comparisons with the three control groups to get a more complete impression in Panels A to C. The response in the household category with children aged 0 to 2, in column (1), is close to zero and not statistically significant in any of the panels . 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 1 and 2 for which we can identify husbands' earnings losses, range between -0.03 and -0.07. In the fourth category of households without children of compulsory schooling age, column (4), the wife's employment responses are precisely estimated zeros in all three control group comparisons.[17] The corresponding participation elasticities are also close to zero. The caveat remains that differences between columns are never statistically significant.

Overall, we find evidence for heterogeneity in the wife's labor supply response by

[17] Appendix Table A5 reports detailed estimation results of the husband's earnings loss, wife's employment and earnings responses in each of the four categories of households. 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.

the age of the youngest child. If we interpret the estimates in the light of the predictions from the model by Blundell et al. (2018), we draw the following conclusions. First, after the husband's job displacement couples who are eligible for parental leave are unlikely to switch roles and substitute child care at home within the household. The mother stays at home with the child in any case. Second, the main respondents are mothers of children aged 3 to 15, who still face child-care needs. After the husband's job displacement, they substitute child care at home with time spent 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 2b. These mothers are planning a return to the labor market after their 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 might not be surprising, given the relatively high employment rate of wives prior to the husband's job displacement in this category. The magnitude of effects in Austrian households is smaller than those reported by Blundell et al. (2018) for the US, as we discuss below.

6.3.2 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, thus, we can only measure education 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 are shown in Table 5.

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. However, there is also a clear difference in the wives' responses across both types of households. Wives with high earnings potential have larger employment and earnings responses as compared to wives with low earnings potential. The difference relative to the control group 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 increase employment after their husbands' job loss than wives who had no job or low earnings. Their participation elasticity is -0.07. Further, 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.

6.3.3 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 that 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 wage decomposition (Abowd et al., 1999).[18] In Panel A of Table 6, we distinguish between two groups of households where the husbands are displaced by firms with estimated fixed effects below (columns 1 to 3) versus above the median (columns 4 to 6). As expected, husbands' average earnings losses in the first five years after displacement are larger, if they lose a job in a high-paying firm. Wives' labor supply responses are also 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 between -0.03 among households suffering a small shock and -0.06 in the group with a large shock.

6.3.4 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 a job. 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

[18] We describe the AKM sample and explain the estimation in Appendix D. We are very grateful to Jasper Haller for sharing the estimation code for the AKM decomposition with us.

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 husbands' displacement, work in the same 4-digit industry. At the reference date, the correlation between occupation-specific male and female unemployment rates in the same district is positive, but not very large at 0.5. Again, this result is similar across displaced and controls.

To evaluate the wife's response to husband's displacement by local labor market conditions, we split our sample by the male unemployment rate measured in the district of the pre-displacement employer. Panel B of Table 6 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 low male unemployment, and the last three columns to those with high unemployment. Husbands' average earnings losses are comparable across both types of local labor markets. However, we consistently find that in districts with male unemployment rates above the median, wives face 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.

6.4 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 insurance benefits (UI) and unemployment assistance (UA) at the household level. In the data, net earnings and benefit income are only recorded from 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 of 2001 or later. As before, we weight couples in the control group to have the same average predetermined characteristics as households in the displaced group.

Starting with benefit receipt, Figure 5 shows the quarterly probability that any household member receives UI or UA benefits in graphs (a) and (b), respectively. The

share of households receiving benefits is low prior to the displacement date, but in the displaced group UI receipt shoots up to more than 30% in the first few quarters following displacement. The potential duration of unemployment benefits 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. UA benefits become available once UI expires, which is reflected in the delay with which UA receipt sets in after job displacement. However, 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. The estimated effects summarized in Table 7 show that 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 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.[19]

Figure 6 shows the quarterly pattern of the estimated difference in household income between the displaced group and the control group. 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 the gross household labor earnings, which is the sum of husbands' and wives' earnings.[20] Husband and wife's combined gross labor earnings drop sharply after the husband's displacement and recover in the next few quarters (see column 3 in Appendix Table A6). The average difference over the five years after displacement is about 21 percent (see column 3 in Table 7).

The red line in Figure 6 shows net household labor income. After income taxes and social security contributions, the average absolute gap in household income between displaced and the control group 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% over the first five years (column 4 in Table 7). If we add

[19]The Appendix Table A6 reports in the first two columns the estimated yearly effects.

[20]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 Table 2. There are two reasons for that. First, we only look here at events in 2001–2007, whereas we previously considered events in 1990–2007. Median real earnings were increasing over the relevant time period. Second, we use now data from tax records for the income measures, while we used earnings records from the ASSD in in Table 2. The latter are top-coded at the maximum threshold for social security contributions; whereas the former are not.

UI and UA benefits received by the household to the net labor income, shown by the green line in Figure 6, 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 five years the red and green line 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.

6.5 Effects of husband's job displacement on family structure

Husband's displacement may affect household outcomes other than labor supply. In particular, we consider divorce and fertility. These outcomes could be mediators that 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 expected gains from marriage (Charles and Stephens, 2004; Rege et al., 2007; Eliason, 2012). 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.

Divorce

Our sample includes couples who have been married for at least 2 years at the reference date; thus, we investigate the probability of divorce in the subsequent years. The left panel of Figure 7 shows the divorce rate for the displaced and the control group. We see a gradual increase in divorce probability among the control group. After five 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. However, the gap between both groups opens gradually, rather than immediately after the displacement shock. After five years, the divorce probability is about half a percentage point higher in the displaced group than in the control group. This corresponds to an average difference in the probability of divorce of 0.04 percentage points, as shown in column (1) of Table 8.

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

stable households whose partners share the income shock over a five-year period.[21] Marital stability after the displacement shock also implies the enforceability of intra-household insurance contracts.

Fertility

In Austria, fertility and female labor supply decisions are strongly related, as we discuss above. Therefore, it is interesting to investigate whether the husband's displacement leads to an adjustment of fertility decisions. The right hand side panel of Figure 7 contrasts the number of births per quarter in the displaced versus the control group. Fertility rates in our sample of married couples decline over time for both 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 the right panel of Figure 7 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.[22] This result implies that households do not adjust fertility plans to cope with the income shock from the husband's job displacement.

6.6 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. The responses are predominantly at the extensive margin as wives enter the labor force after their husbands' job loss. Among couples where the wife did not work when the husband lost his job, we estimate a participation elasticity of -0.08, while among couples where the wife worked the response is zero. The heterogeneity analysis above identified certain groups of households with stronger responses. However, 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 collect elasticity estimates from three types of studies, categorized by the type of

[21] In the case of divorce, Austrian divorce law may mandate some redistribution of income between the former spouses depending on the grounds of divorce.

[22] Existing evidence for Austria (Del Bono et al., 2012) points to small negative and not very robust effect of male job displacement on fertility 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.

variation in husband's earnings, which 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 both administrative and survey data. Most reported elasticities refer to the total hours or earnings response, while some studies also distinguish between extensive and intensive margins. In the context of the labor supply model, our estimates identify a Marshallian elasticity which also incorporates changes in the marginal utility of wealth. This is conceptually different from estimates based consumption data that allow isolating a Hicksian elasticity, measuring pure substitution effects.

Most estimated elasticities are negative, but a few studies find elasticities with the opposite sign (Eliason, 2011; Hardoy and Schøne, 2014; Bredtmann et al., 2018). Interestingly, the studies reporting positive elasticities 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 a negative female labor supply response, 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 that find evidence for an added worker effect 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 that finds a negative elasticity with an absolute value below -0.1. In a setup similar to ours, Haan and Prowse (2015) estimate a structural model exploiting income variation from husbands' involuntary job loss based on data from Germany. Blundell et al. (2018) 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 group. Given that most wives 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 dominates, we would expect the second earner to increase her labor supply if the main earner in the household loses his job. If, however, other motives, such as child care or 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 following job displacement.

To find explanations for the low insurance value of female labor supply within the household, we analyze the heterogeneity in responses by household characteristics, and investigate additional outcomes (such as job search, fertility, and divorce). 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. Wives and husbands 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. Nor 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. 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 that 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. (2019), 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 also extend job search counseling to wives of unemployed married men.

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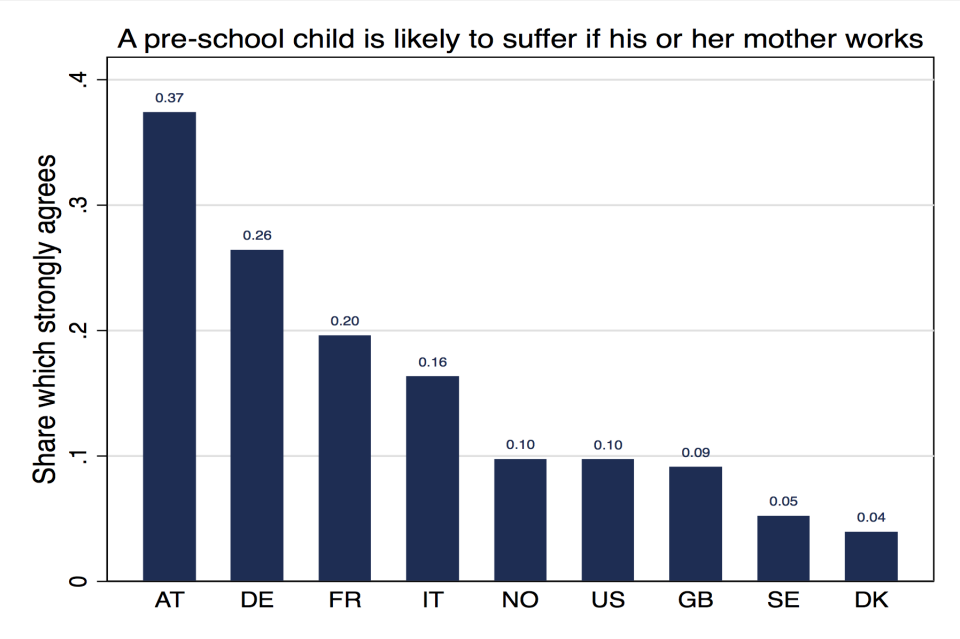
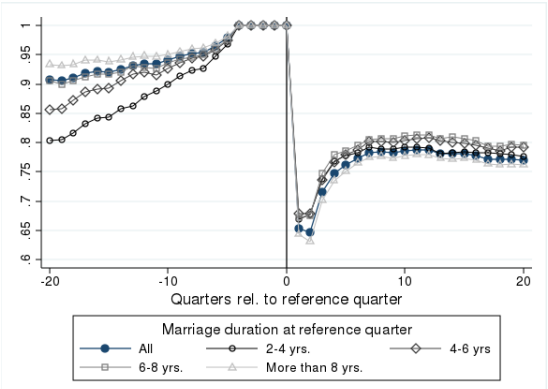
Figure 1: Social norm regarding working mothers in selected countries



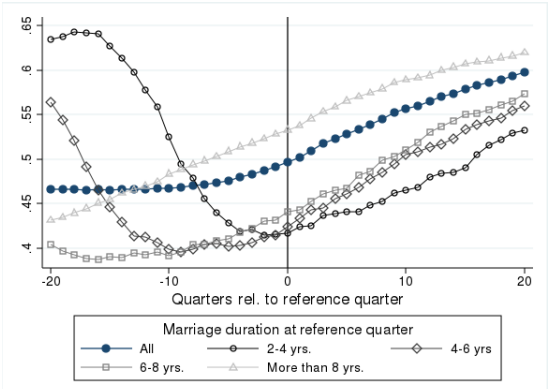
Notes: This figure is based on data from the *European and World Values Surveys* European Values Study Group and World Values Survey Association (2006) and include female (male) respondents between 25 and (55) years of age. The original survey questions is as follows '*A pre-school child is likely to suffer if his or her mother works*'. Respondents 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 (3). 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 (between 1990 and 1999). The total number of observations is 11,574.

Figure 2: Employment of displaced husbands and their wives by different marriage duration groups

(a) Husband

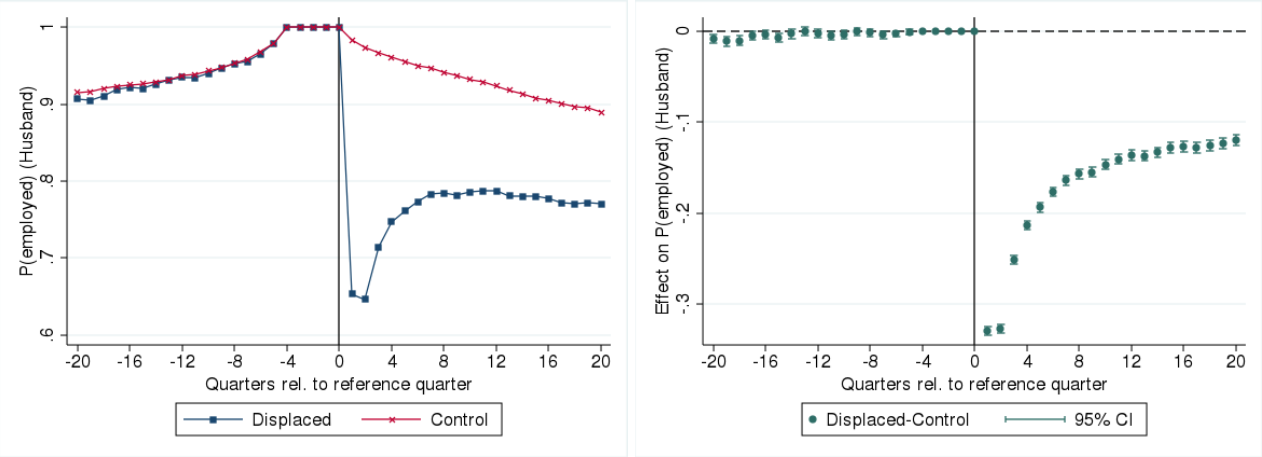


(b) Wife



Notes: Panel (a) and (b) show the mean employment probability around the reference date for all displaced men and their wives, respectively, and for subsamples with different marriage durations at the reference quarter.

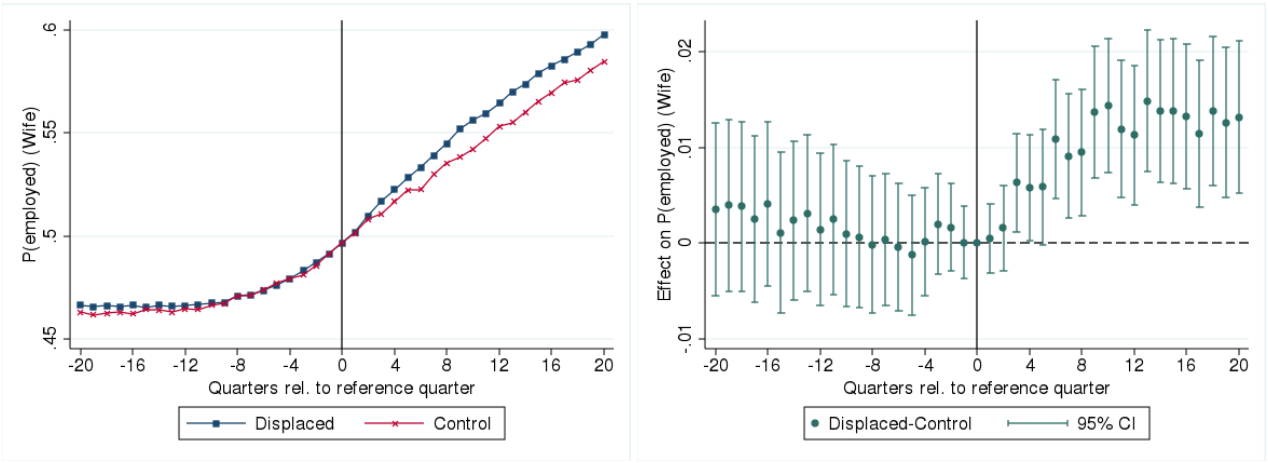
Figure 3: Employment of displaced husbands



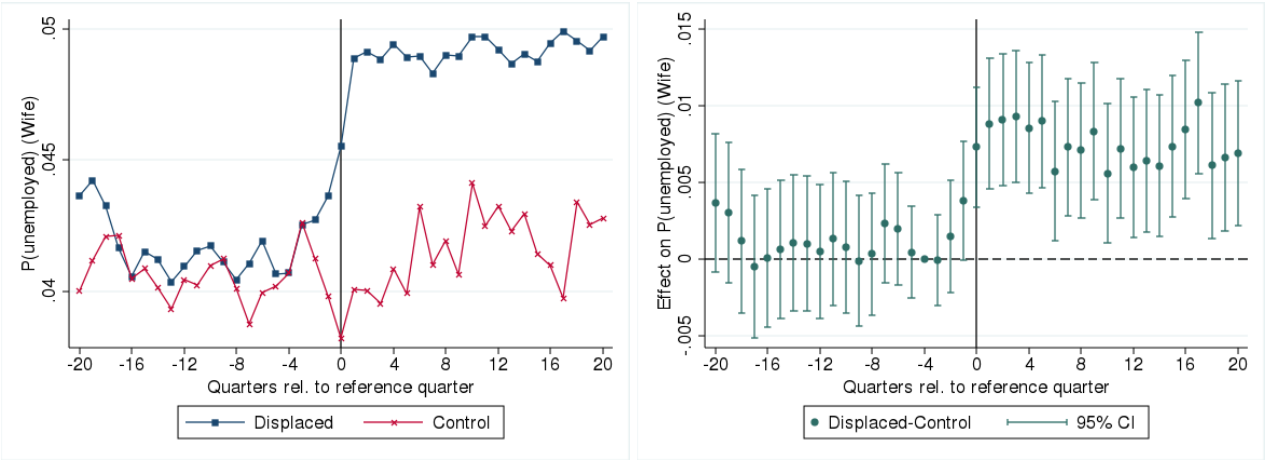
Notes: The graph to the left compares the probability to be employed of men that are displaced (blue, square) to men without firm event at the reference date (red, x) based on estimation equation (1). The graph to the right plots the difference between the two lines with the corresponding 95% confidence interval. The control group is reweighted to resemble the displaced group in characteristics of the husband, the wife, and the household measured at the reference date, the husband's labor market outcomes in the years before the reference date, and the characteristics of the husband's employer (the note in Appendix Figure A7 provides a detailed list of the variables). The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Figure 4: Employment and job search of displaced husbands' wives

(a) Employment



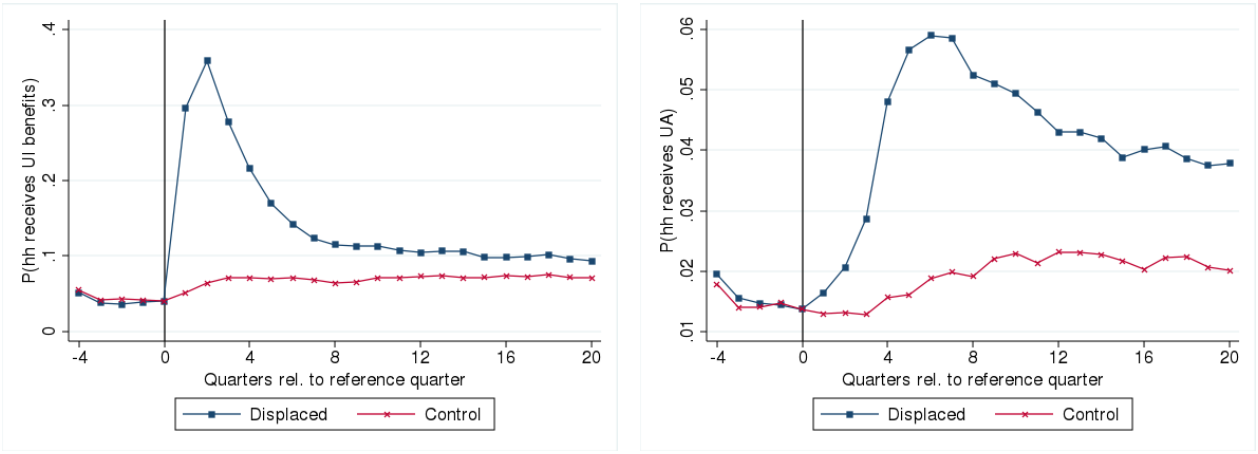
(b) Job search, probability of registered unemployment



Notes: To the left, Panel (a) compares 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) based on estimation equation (1). Panel (b) compares 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) 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. To the right, the graphs plot the difference between the two lines with the corresponding 95% confidence interval. The control group is reweighted to resemble the displaced group as explained in Figure 3. The outcome in the control group is adjusted by its mean difference relative to the displaced group.

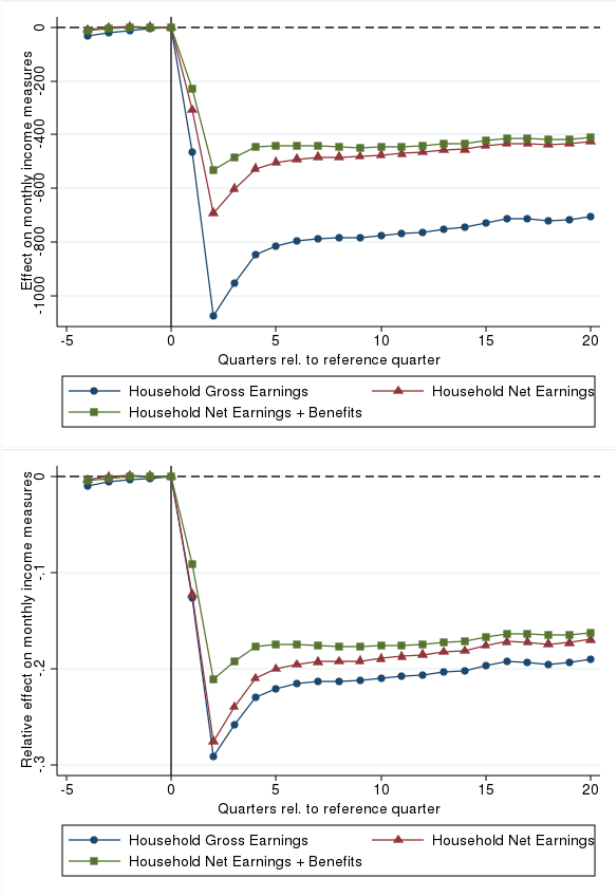
Figure 5: Social benefits around displacement

(a) Probability that household receives UI benefits **(b)** Probability that household receives UA benefits



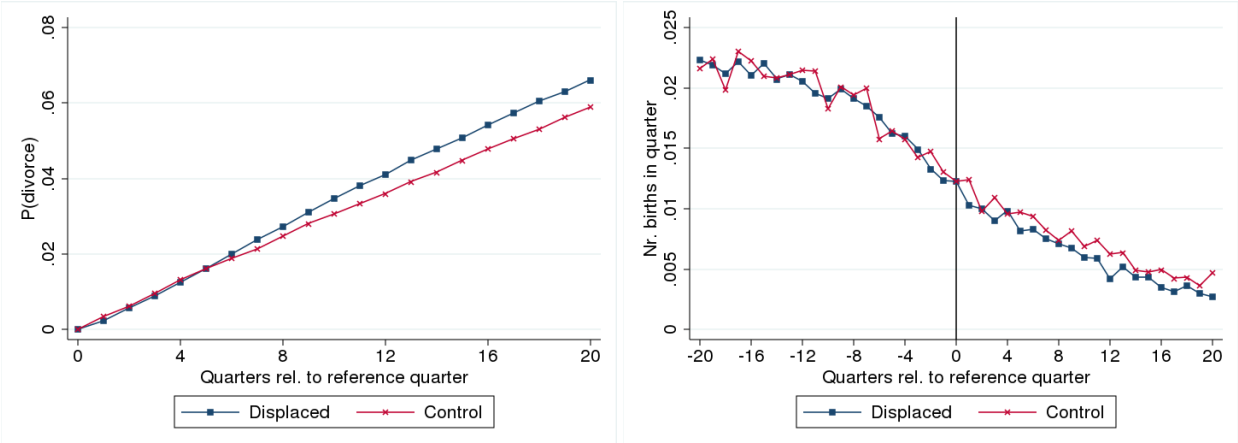
Notes: Comparison of the probability of receiving benefits of households with displaced husbands (blue, square) to those with husbands without firm event at the reference date (red, x). The control group is reweighted to resemble the displaced group as explained in Figure 3. The outcome in the control group is adjusted by its mean difference relative to the displaced group. Only households with a reference date after 2001 are included given that the data is only available after 2000.

Figure 6: Displacement effect on household income



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 according to tax data. *Household Net Earnings* subtracts social security contributions and payroll taxes. *Household Net Earnings + benefits* adds UI and UA benefits. Only households with a reference date after 2001 are included given that the data is only available after 2000.

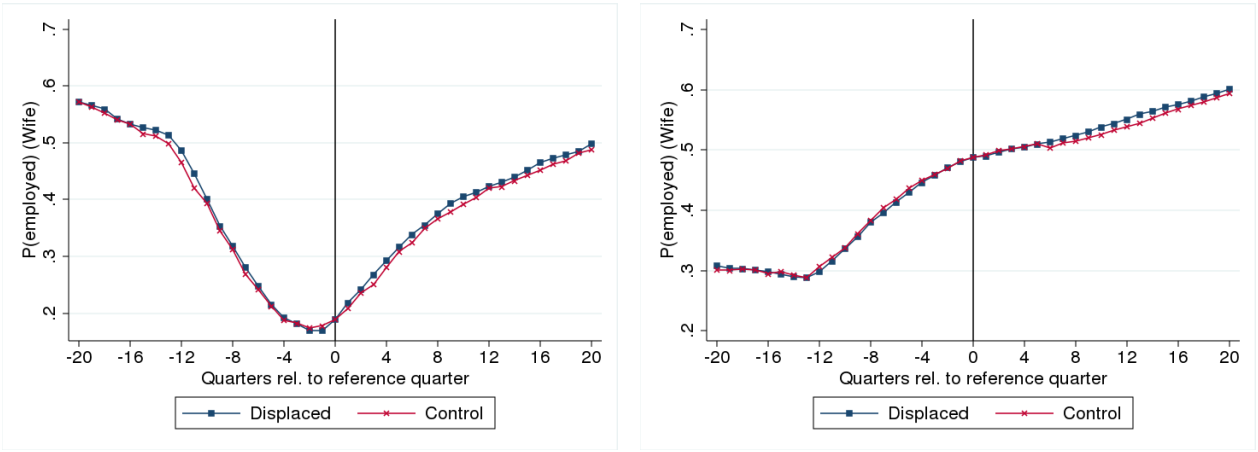
Figure 7: Divorce and fertility around displacement



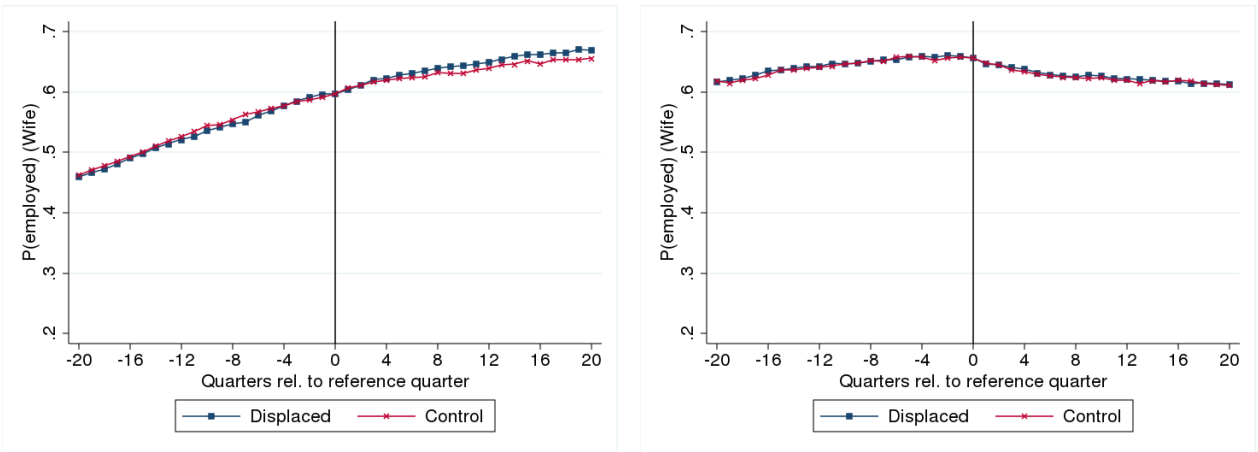
Notes: Comparison of the probability to live in divorce (left) and the number of births (right) for households with husbands experiencing a displacement (blue, square) to households with husbands without firm event (red, x) at the reference date. The control group is reweighted to resemble the displaced group as explained in Figure 3. 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 8: Employment of displaced husbands' wives by age of the youngest child

(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 3. The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Table 1: Sample characteristics

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

Continued on next page.

Table 1 — continued from previous page.

	Displaced		Control group
	Closure	Mass layoff	
	(1)	(2)	(3)
IV. Employer (husband)			
Firm size	51.94	244.39	397.15
	[20.00]	[138.00]	[135.00]
	(97.79)	(312.98)	(771.13)
Turnover	0.25	0.19	0.14
	[0.16]	[0.14]	[0.10]
	(0.34)	(0.24)	(0.22)
Mean monthly wage	1903.49	2072.28	2232.27
	[1878.23]	[2025.60]	[2191.31]
	(553.48)	(582.05)	(597.37)
Industry			
Manufacturing	0.41	0.46	0.47
	(0.49)	(0.50)	(0.50)
Sales	0.29	0.23	0.20
	(0.45)	(0.42)	(0.40)
Transport	0.10	0.06	0.06
	(0.30)	(0.24)	(0.23)
Services	0.19	0.25	0.28
	(0.40)	(0.43)	(0.45)
Region			
Vienna	0.22	0.24	0.15
	(0.41)	(0.43)	(0.36)
Eastern Austria w/o Vienna	0.22	0.20	0.20
	(0.41)	(0.40)	(0.40)
Southern Austria	0.21	0.19	0.20
	(0.40)	(0.39)	(0.40)
Western Austria	0.35	0.36	0.44
	(0.48)	(0.48)	(0.50)
Observations	18,466	30,027	58,518

*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. 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 2: Effects of husband's displacement on household labor market outcomes

	Husband	Wife
	(1)	(2)
A. Employment		
Displaced×Post	-0.170	0.011
	(0.002)	(0.003)
$\eta^{\text{participation}}$		-0.043
		(0.011)
Pre-event mean	1	0.490
B. Earnings		
Displaced×Post	-601.220	11.264
	(6.473)	(3.789)
Pre-event mean	2458.082	658.549
C. Job Search		
Displaced×Post		0.007
		(0.002)
Pre-event mean		0.041
Households	101,609	
Observations	4,386,508	

Notes: This table displays the impact of husband's displacement on household labor market outcomes based on equation (2), which includes displaced group, distance to event, and industry×quarter fixed effects. In Panel A (C) the dependent variable is equal to one if the individual in household i is employed (unemployed) in a given quarter. In Panel B it equals monthly earnings in Euro (2000 prices), with zeros for those not employed. We compare individuals in households with a displacement to a reweighted control group with no firm event. *Displaced×Post* measures the average difference in the outcome variable between the displaced and the control group relative to the reference date in the twenty quarters after the reference quarter. $\eta^{\text{participation}}$ is the implied participation elasticity of wives with respect to the earnings of their husbands. *Pre-event mean* refers to the mean of the dependent variable in the year before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Table 3: Displacement effects by wife's employment status prior reference date

	Wife employed			Wife not employed		
Outcome	Husband	Wife		Husband	Wife	
	Earnings	P(employed)	Earnings	Earnings	P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
Displaced×Post	-610.105	-0.008	-10.769	-595.590	0.019	22.394
	(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		

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. Cluster-robust (at the household level) standard errors are bootstrapped (500 replications) and reported in parentheses.

Table 4: 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)
$\eta^{\text{participation}}$	-0.052	-0.034	-0.035	-0.004
	(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	0.526	0.539	0.665
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)
$\eta^{\text{participation}}$	-0.028	-0.034	-0.065	-0.019
	(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	0.535	0.662
Households	17,623	34,883	20,560	25,153
C. Control group 3				
Displaced×Post	-0.002	0.015	0.012	0.010
	(0.008)	(0.005)	(0.007)	(0.007)
Pre-event mean	0.178	0.447	0.567	0.657
Households	11,949	20,653	10,860	11,559

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. Panel A (B) compares 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). Panel C compares the displaced group to a control group of households that experience displacement four years after that date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Table 5: Displacement effects by wife's earnings potential

Outcome	Low			High		
	Husband	Wife		Husband	Wife	
	Earnings	P(employed)	Earnings	Earnings	P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
A. Measure 1: Earnings						
Displaced×Post	-559.028	0.008	7.809	-648.768	0.017	18.521
	(7.531)	(0.003)	(4.616)	(15.287)	(0.006)	(11.338)
$\eta^{\text{participation}}$		-0.036			-0.070	
		(0.014)			(0.025)	
Pre-event mean	2384.065	0.459	548.532	2711.175	0.580	1008.484
Households	68,900			20,985		
B. Measure 2: Experience						
Displaced×Post	-562.852	0.008	2.653	-598.005	0.012	16.495
	(9.725)	(0.004)	(6.365)	(9.077)	(0.004)	(6.238)
$\eta^{\text{participation}}$		-0.034			-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	-505.777	0.010	9.613	-660.283	0.015	16.145
	(8.900)	(0.004)	(5.478)	(12.267)	(0.005)	(9.059)
$\eta^{\text{participation}}$		-0.044			-0.062	
		(0.020)			(0.021)	
Pre-event mean	2306.547	0.405	468.228	2700.291	0.502	700.086
Households	43,853			29,789		

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.

Table 6: Displacement effects by plant wage level and unemployment rate at the reference date

	Below median			Above median		
Outcome	Husband	Wife		Husband	Wife	
	Earnings	P(employed)	Earnings	Earnings	P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
A. Subgroups by plant wage level at reference date						
Displaced×Post	-507.675	0.007	2.181	-736.075	0.015	19.058
	(10.054)	(0.004)	(6.312)	(10.728)	(0.005)	(6.707)
$\eta^{\text{participation}}$		-0.032			-0.055	
		(0.018)			(0.017)	
Pre-event mean	2245.751	0.506	679.417	2763.549	0.514	709.985
Households	40,723			40,781		
B. Subgroups by male unemployment rate at reference date						
Displaced×Post	-613.397	0.017	14.902	-586.994	0.006	9.026
	(9.652)	(0.004)	(5.747)	(8.486)	(0.004)	(5.245)
$\eta^{\text{participation}}$		-0.067			-0.024	
		(0.016)			(0.015)	
Pre-event mean	2463.174	0.466	607.385	2457.220	0.511	702.639
Households	50,906			51,311		

Notes: This table displays the impact of husband's displacement on own earnings, spousal employment and earnings for different subgroups. In Panel A the wage level at plants are employer-specific fixed effects estimated based on the AKM approach (Abowd et al., 1999) (see Appendix D for details). These estimates are available only after 1994. In Panel B the male unemployment rate is measured at the husband's employment district in the year of the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Table 7: Effects of husband's displacement on household income

	Prob. of HH receiving		Monthly household income		
	UI	UA	Gross	Net	Net + benefits
	(1)	(2)	(3)	(4)	(5)
Displaced×Post	0.077	0.023	-769.926	-474.310	-429.676
	(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				

Notes: This table displays the impact of husband's displacement on household income measures for 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 the 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. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

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

	P(Divorce)	No. of births
	(1)	(2)
Displaced×Post	0.004	-0.001
	(0.001)	(0.001)
Pre-event mean	0.000	0.014
Households	101,609	

Notes: This table displays the average impact of husband's displacement on the risk to be divorced in column (1) and the number of births per quarter in (2). We compare households with a displacement to a reweighted control group with no firm event. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Online Appendix
Job Displacement, Family Dynamics and Spousal Labor Supply

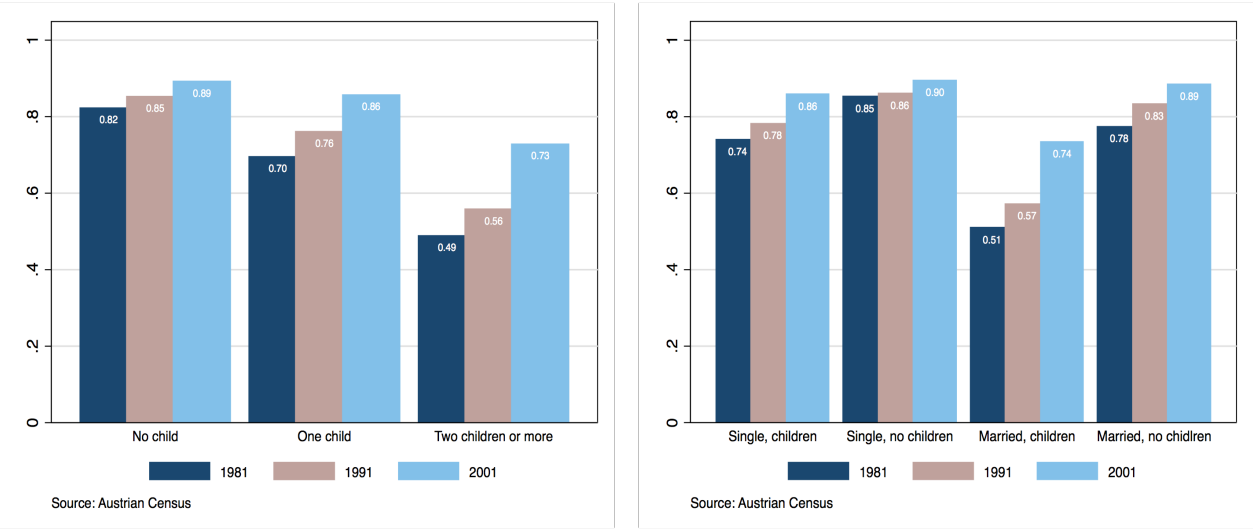
Martin Halla
Julia Schmieder
Andrea Weber

Last update: December 19, 2019

This Online Appendix provides additional material discussed in 'Job Displacement, Family Dynamics and Spousal Labor Supply' by Martin Halla, Julia Schmieder, and Andrea Weber. Section A provides additional figures and tables, Section B provide detailed results based on two alternative control groups, Section C provides further robustness analysis, and Section D describes the AKM sample and explains the estimation.

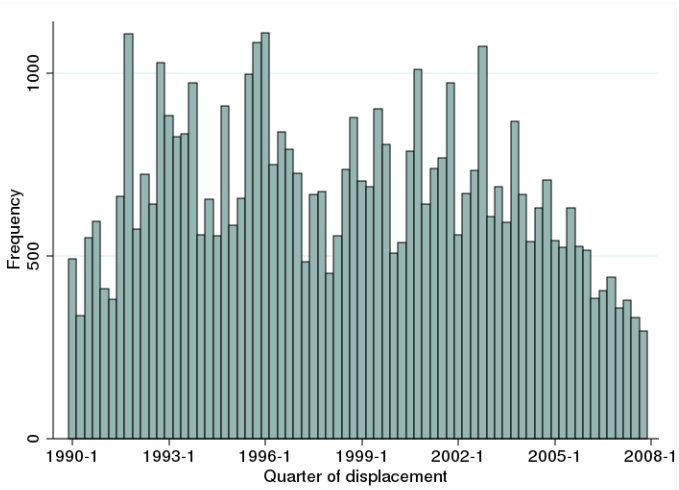
A Additional figures and tables

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



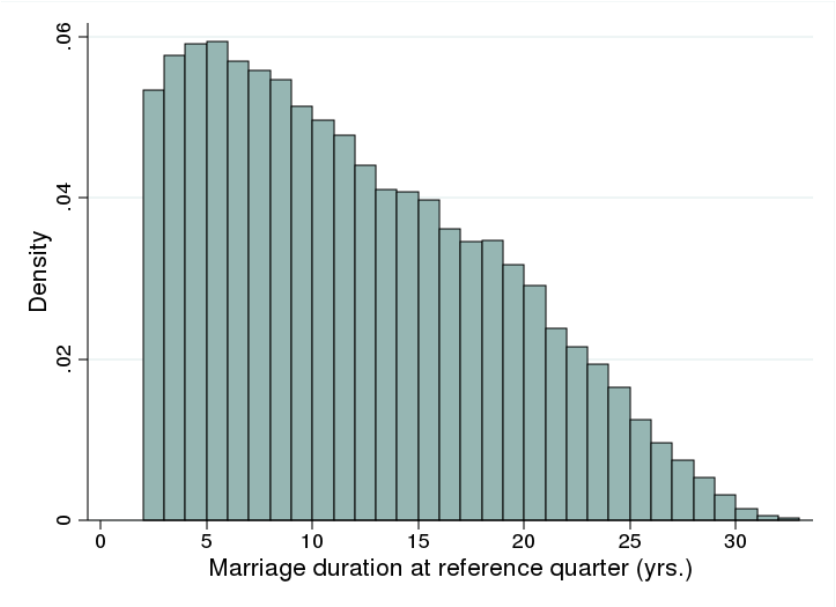
Notes: This figure shows the female labor force participation (for women between 25 and 54 years of age) by family status and year (left graph), and by the number of children and year (right graph). The figures are based on Austrian census data from the years 1981, 1991, and 2001.

Figure A2: Number of displaced workers over time



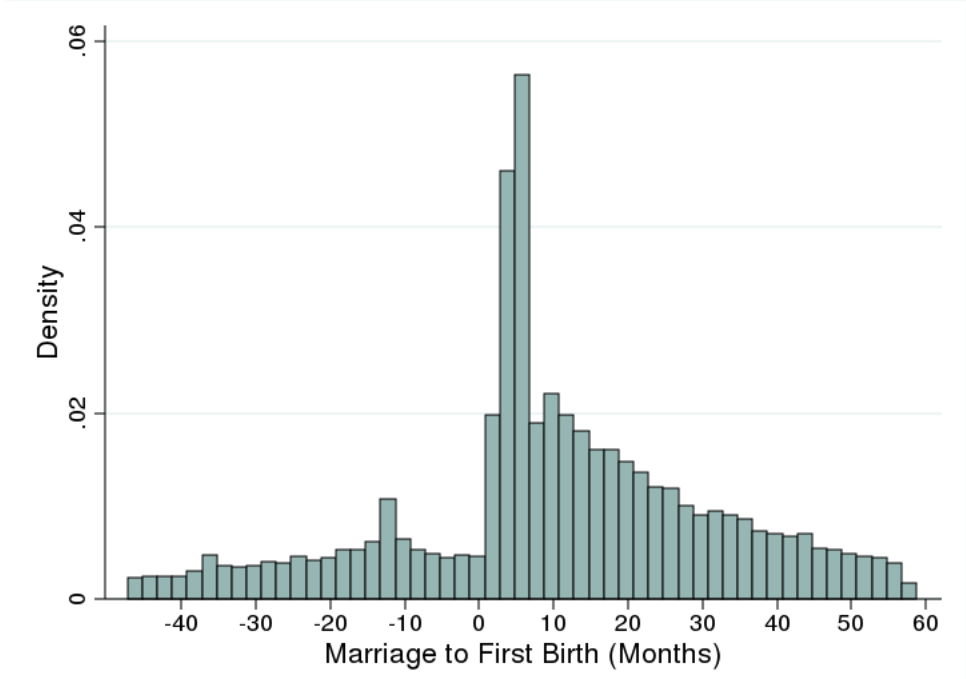
Notes: This figure shows the number of displaced workers for each quarter from 1990 Q1 to 2007 Q4. Workers are displaced through a firm closure or mass layoff event.

Figure A3: Marriage duration at the reference quarter



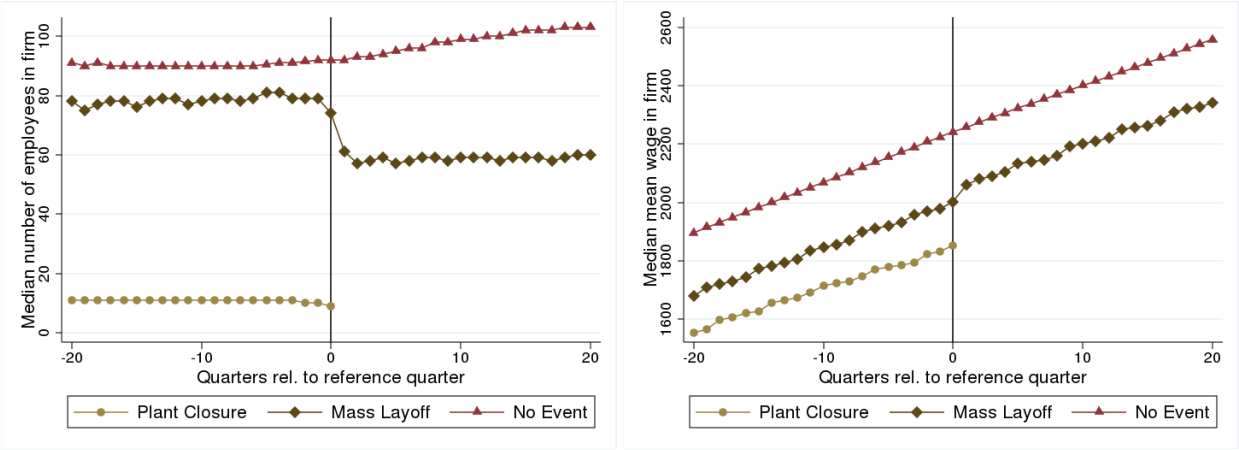
Notes: The figure shows the distribution of marriage durations at the reference date in years.

Figure A4: 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.

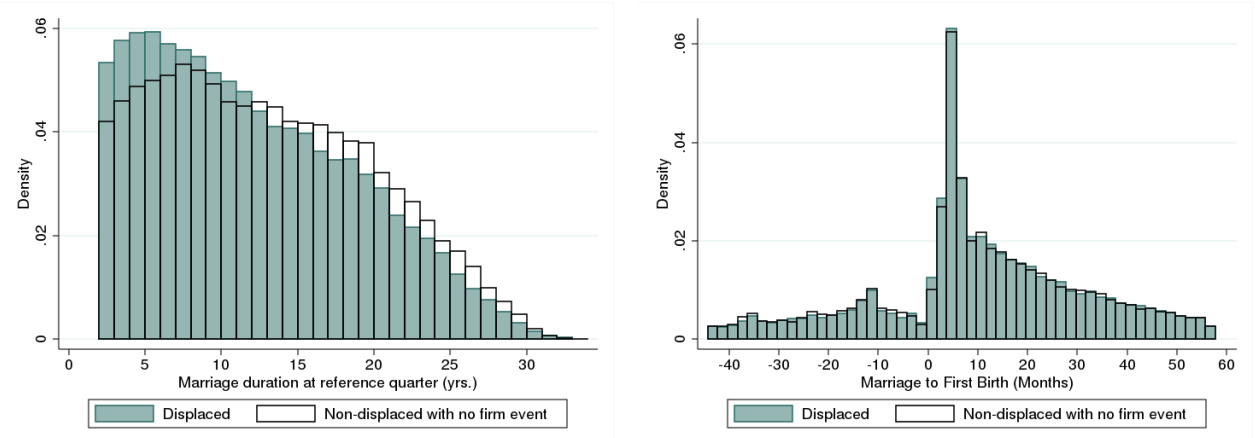
Figure A5: Employment and wages of firms around the reference date



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.

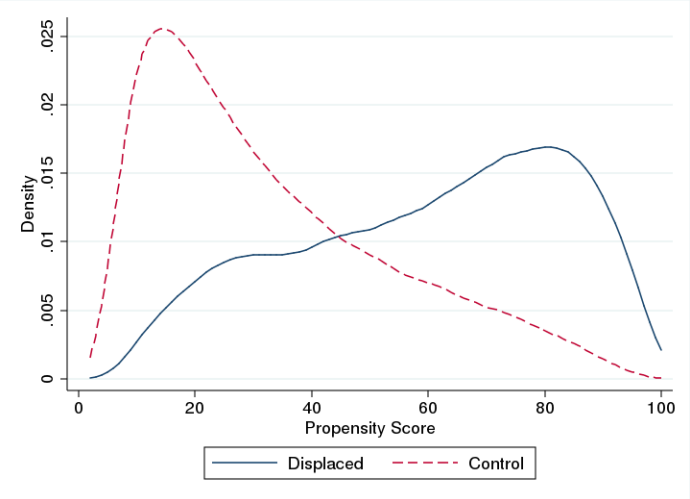
Figure A6: Family dynamics by treatment status

(a) Marriage duration at the reference date **(b)** Distance between marriage and first birth



Notes: Panel (a) shows the distribution of marriage durations at the reference date and panel (b) shows the distance from marriage to the birth of the first child in month. The graphs display the distribution for the sample of households experiencing a displacement at the reference date (green) and for those with no firm event at the reference date (transparent). We include one observation per household event.

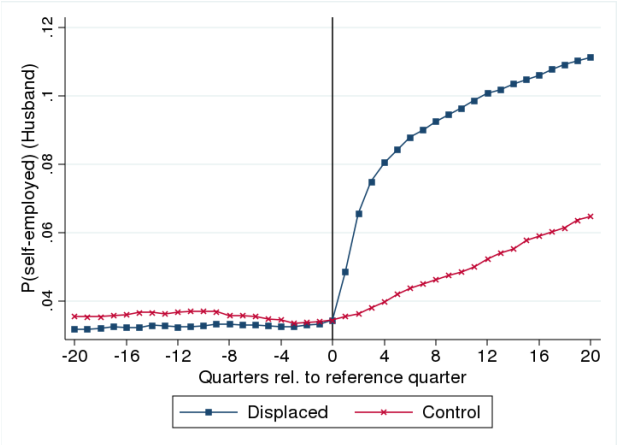
Figure A7: Propensity score distribution



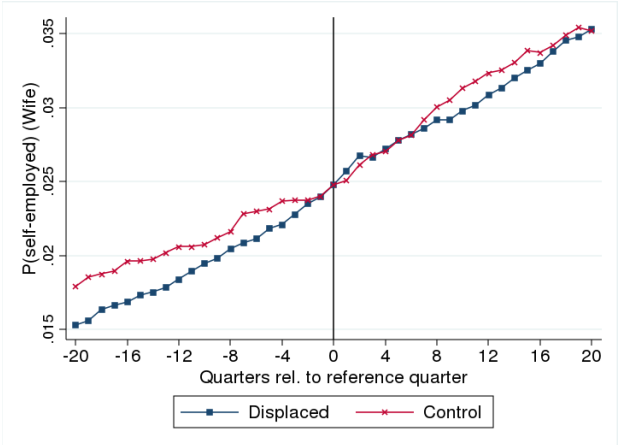
Notes: This figure shows the density distribution of the propensity score in the displaced group and in the control group, which consists of households with husbands with no firm event. We estimate the probability that the husband in a household is displaced by plant closure or mass layoff using a logit model based on the following variables: [husband characteristics at the reference date] interaction of year and season of displacement dummies, age (cubic), tenure in current job (dummies for deciles), employment experience (5 dummies), unemployment experience (4 dummies), number of previous jobs (4 dummies), number of previous mass layoff events (7 dummies), blue-collar indicator [household characteristics at the reference date] marriage duration (30 dummies), number of children aged 0,1,..,12 (13 dummies) and total number of children under 18 [wife characteristics at the reference date] labor market experience (5 dummies), age distance to husband (5 dummies) [husband labor markte outcomes for the years -4 to -1 before the reference date] monthly wage, indicator for being employed and for being unemployed [husband's employer variables] indicators for industry and region, firm age (16 dummies), firm age and industry interactions.

Figure A8: Self-employment of displaced husbands and their wives

(a) Probability that husband is self-employed



(b) Probability that wife is self-employed



Notes: Panel (a) compares the probability of being self-employed of displaced husbands (blue, square) to husbands without firm event at the reference date (red, x). Panel (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 3.

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	-0.025[a]	Comparison of simulated optimal behavior when spouse is vs. is not subject to unanticipated job destruction
					without leisure complementarity	-0.056[a]	
Blundell et al. (2016)	US	1999-2009	PSID	Households with participating and married male head aged 30–57	Hours (total response)	-0.75	Permanent shock in spousal wage process identified in structural model
					Extensive margin	-0.168	
Blundell et al. (2018)	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)	-0.296	
					Extensive margin	-0.193	
					Intensive margin	-0.170	
				no children aged ≤ 10	Hours (total response)	-0.14	
					Extensive margin	-0.065	
					Intensive margin	-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	0.09	Closure, mass layoff; couple required to stay married in post-treatment period
					Earnings	0.07	
				with wife not employed at displacement	Earnings	-0.5	
Bredtmann et al. (2018)	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. (2019)	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: 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* (European Values Study Group and World Values Survey Association, 2006) 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 A3: UI generosity and parental leave across selected OECD member countries

	AT		FR		DE		IT		JP		SE		UK		US	
	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
UI-GENEROSITY:																
Initial net replacement rate[a]																
Single person	0.57	0.55	0.72	0.69	0.60	0.60	0.28	0.51	0.60	0.59	0.80	0.72	0.21	0.18	0.58	0.58
One earner couple with two children	0.73	0.68	0.64	0.70	0.69	0.71	0.35	0.62	0.57	0.56	0.82	0.76	0.38	0.51	0.59	0.54
Max. UI duration (months)[b]		9		23		12		7		9		14		6		6
PARENTAL LEAVE																
Number of weeks[c]:																
with job-protection	96	70	146	146	148	148	26	26	44	44	74	69	0	13	12	12
with paid leave	112	86	16	42	109	58	48	48	58	58	59	60	18	26	0	0

Notes: [a] The net unemployment replacement rate is the fraction of current income which the social unemployment benefit system provides to a person. The figures refer to the initial phase of unemployment. We list the replacement rate for a single worker and for a one earner family with two children. Benefits for families include child benefits, including means tested benefits. For the calculation of wages, the average wage of a production worker is used. *Source*: Olaf Van Vliet & Koen Caminada (2012), 'Unemployment Replacement Rates Dataset among 34 Welfare States 1971-2009: An Update, Extension and Modification of Scruggs' Welfare State Entitlements Data Set', NEUJOBS Special Report No. 2, Leiden University. [b] The maximum UI duration refers to a 40–year–old single worker without children with a 22–year employment record. We do not list figures for the year 1995, since the OECD has changed the definition of this measure substantially in the year 2000. *Source*: *OECD Database* retrieved via `https://stats.oecd.org` (accessed on July 17, 2019) [c] Number of weeks of parental leave with job protection disregard payment conditions and refer to the number of weeks after maternity leave. Number of weeks of paid parental leave refer to the total number of weeks, which a women can be on paid leave after the birth of a child. *Source*: *OECD Family Database* retrieved via `https://stats.oecd.org` (accessed on July 17, 2019).

Table A4: Effects of husband's displacement on household labor market outcomes

	Employment		Earnings		Job search
	Husband	Wife	Husband	Wife	Wife
	(1)	(2)	(3)	(4)	(5)
Prior event					
δ_{-5}	-0.008	0.002	-6.642	5.572	0.002
	(0.002)	(0.004)	(4.983)	(6.223)	(0.002)
δ_{-4}	-0.003	0.002	9.554	4.556	0.001
	(0.001)	(0.004)	(3.833)	(5.853)	(0.002)
δ_{-3}	-0.002	0.001	9.840	1.943	0.001
	(0.001)	(0.004)	(3.538)	(5.389)	(0.002)
δ_{-2}	-0.002	-0.000	9.687	-1.050	0.001
	(0.001)	(0.003)	(3.011)	(4.360)	(0.001)
δ_{-1} (δ_0)	-0.000	0.001	-2.522	-0.694	0.003
	(0.000)	(0.002)	(1.702)	(2.647)	(0.001)
Post event					
δ_1	-0.280	0.004	-810.046	5.201	0.009
	(0.002)	(0.002)	(6.049)	(2.696)	(0.002)
δ_2	-0.173	0.009	-612.960	9.363	0.007
	(0.002)	(0.003)	(6.611)	(4.071)	(0.002)
δ_3	-0.144	0.013	-554.129	13.180	0.007
	(0.003)	(0.003)	(7.308)	(4.547)	(0.002)
δ_4	-0.131	0.014	-523.447	15.659	0.007
	(0.003)	(0.004)	(8.092)	(5.122)	(0.002)
δ_5	-0.123	0.013	-504.559	12.939	0.007
	(0.003)	(0.004)	(8.370)	(5.385)	(0.002)
Pre-event mean	1	0.490	2458.082	658.549	0.041
Households			101,609		
Observations			4,386,508		

Notes: This table displays the impact of husband's displacement on own and spousal labor market outcomes at a yearly level based on equation $Y_{ik} = \theta D_i + \sum_{l=-5}^{5} \gamma_l I\{int(k/4) = l\} + \sum_{\substack{l=-5 \\ l\neq 0}}^{5} \delta_l D_i * I\{int(k/4) = l\} + \lambda_{tj} + \upsilon_{ik}$. In columns (1) and (2), the dependent variable is equal to one if husband and wife, respectively, in household i is employed in a given quarter. In columns (3) and (4), the dependent variable is own and spousal monthly earnings in Euro (2000 prices), respectively. In column (5), the dependent variable is equal to one if the wife in household i is unemployed in a given quarter. 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. *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.

Table A5: Displacement effects by youngest child

Outcome	Husband	Wife	
	Earnings	P(employed)	Earnings
	(1)	(2)	(3)
Youngest child aged 0-2	-509.588	0.011	8.020
	(15.118)	(0.008)	(11.793)
Youngest child aged 3-9	-552.933	0.008	12.989
	(10.531)	(0.005)	(6.477)
Youngest child aged 10-15	-652.092	0.009	6.246
	(14.648)	(0.005)	(7.414)
No child younger than 16	-707.236	0.001	-6.024
	(12.433)	(0.005)	(8.154)

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 4, but it additionally includes the effects on husband's earnings in column (1) and wife's earnings in column (3). The estimates measure the average difference in the corresponding outcome variable between the displaced and the reweighted control group after the reference quarter relative to the difference at the reference date.

Table A6: Effects of husband's displacement on household income

	Prob. of HH receiving		Monthly household income		
	UI	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)
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 the equation specified in Appendix Table A4 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 the 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 UI and UA benefits. 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.

B Alternative control groups

In this Appendix, we summarize our approach based on two alternative control groups. In the first section, we define these two groups and discuss our estimation approach. In the second section, we presents our estimation results, which can be directly contrasted with the results based on our main control group presented in the paper. With very few exceptions, we obtain very comparable results across the three different control groups.

B.1 Definition of two alternative control groups

B.1.1 Alternative control group: Non-displaced husbands in mass layoff firms (CG2)

A potential problem with our main control group (henceforth CG1) is sorting into more or less risky firms on the basis of unobserved characteristics. To confront this concern, we define an alternative control group (CG2) by husbands employed in mass layoff plants at the mass layoff date, who do not leave their employer in the subsequent quarter. Put differently, workers in CG2 suffer a mass layoff at their plant, but do not lose their jobs.

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. As in the case of our main control group, we exclude workers who are ever displaced from a plant closure or mass layoff over our observation period. However, individuals can be in CG2 in more than one reference quarter. This happens for about 26% of individuals. The reference date for CG2 is defined by the quarter before mass layoff.

Table B2 summarizes main descriptive characteristics measured at the reference quarter for the treated group and all control groups. As in the case of CG1, we observe that workers in CG2 and displaced workers are quite similar in the personal characteristics of husbands and wives. In contrast to CG1, we observe much smaller differences in firm characteristics between CG2 and displaced workers. In particular, workers in CG2 share average firm characteristics with workers displaced by mass layoffs.

As in the case of our main analysis, we use propensity score weighting, such that the average of observable characteristics in CG2 equals the average among

displaced households. The distributional overlap in pre-determined characteristics is closer between CG2 (see Figure B2) and the displaced group than between CG1 and the displaced (see Figure A7). This is mainly due to the similarities in firm characteristics; larger firms tend to have more workers who survive a mass layoff event.

With the definition of CG2, 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 determine mass layoffs. 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.[1]

B.1.2 Alternative control group: Husbands displaced at a later date (CG3)

As a further alternative control group (CG3), we do not sample individuals who were not displaced, rather, we exploit the timing of firm events and construct control groups of workers who are displaced themselves, but at a later date. Since CG3 is drawn from the same pool of couples as the displaced group, there are by construction no pre-displacement differences in observable.

Our approach is inspired by Fadlon and Nielsen (2017) and Ruhm (1991), who exploit the timing of events to investigate the effects of spousal health shocks on employment and the effect of job displacement on subsequent nonemployment, 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 CG3 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

[1] Gathmann et al. (201x) 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. Full reference: Gathmann, Helm, and Schönberg (201x). Spillover Effects of Mass Layoffs. *Journal of the European Economic Association*, forthcoming.

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. However, 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. As we do not find much evidence for reduced comparability, we present mainly results for $\Delta = 16$. (Section C includes robustness checks with respect to alternative values of Δ). 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 must put two additional restrictions on households in CG3. 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 CG3 has to hold in quarter h and in quarter $h + \Delta$, which implies that there is full employment among husbands in CG3 in the 4 quarters preceding $h + \Delta$. Therefore, we cannot directly compare the husband's employment and earnings outcomes in CG3 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 $h + \Delta$. Thus, we cannot examine divorce behavior based on CG3.

B.2 Estimation results based on the two alternative control groups

The following Table B1 shows where the estimation results across outcomes and alternative control groups can be found:

Table B1: Overview of Tables and Figures summarizing estimation results across outcomes and alternative control groups

	Control groups		
Outcome	CG1	CG2	CG3
Descriptives			
Sample characteristics	Tab 1	Tab B2	Tab B2
Family dynamics	Fig A6	Fig B1	–
Propensity score distrib.	FigA7	FigB2	–
Main results			
Husband: Employment	Fig 3, Tab 2	Fig B3, Tab B3	–
Wife: Employment	Fig 4a, Tab 2	Fig B4a, Tab B3	Fig B4b, Tab B3
Wife: Job search	Fig 4b, Tab 2 &A4	Fig B5a, Tab B3 & B11	Fig B5b, Tab B3 & B11
Wife: Intensive/extensive	Tab 3	Tab B4	
HH: UI & UA	Fig 5, Tab 7 & A6	Fig B6, Tab B5 & B12	–
HH: Income	Fig 6, Tab 7 & A6	Fig B7, Tab B5 & B12	–
HH: Divorce & Fertility	Fig 7, Tab 8	Fig B8, Tab B6	–
HH: Employment	Tab A4	Tab B9	Tab B9
HH: Earnings	Tab A4	Tab B10	Tab B10
Hetereogeneity results			
Age of youngest child	Fig 8, Tab 4 & A5	Fig B9, Tab B7 & B13	Fig B10, Tab B7 & B13
Wife's earnings potential	Tab 5	Tab B14	
Magnitude of shock	Tab 6 (Panel A)	Tab B8 (Panel A)	
Local labor market cond.	Tab 6 (Panel B)	Tab B8 (Panel B)	

Notes: HH stands for Household.

Our estimation results are remarkably consistent across the three control groups. There are only two exceptions:

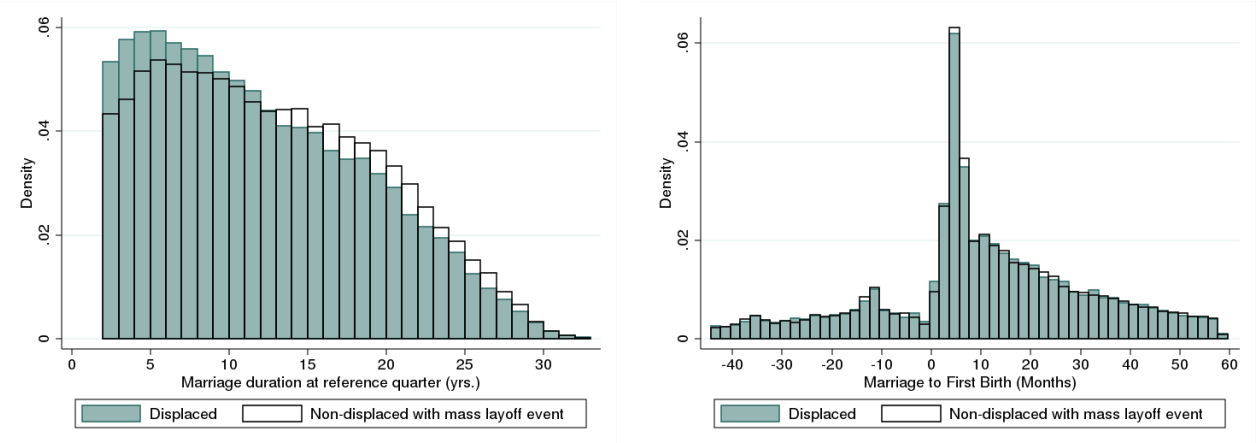
- Job search: Based on CG1 we find evidence for a stable increase in wives' job search rates over five years after the reference date (see Figure 4b and Table A4). Using CG3 we find equivalent results (see Figure B5a). In contrast, CG2 couples, whose husbands were not affected by the mass layoff in their 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 (see Figure B5a). Table B11) provides a comparison of detailed estimation output for all three alternatives.

- Divorce: Based on CG1 we find a small increase in the probability of divorce (see Table 8). In contrast, CG2 couples, with husbands employed in mass layoff firms but not laid off themselves, face the same divorce rate

patterns as the displaced group (see Table B6). A potential explanation for this finding is that CG2 couples are exposed to higher uncertainty and stress themselves, which may change their gains from marriage and affect their divorce decisions. (CG3 couples are by construction not a valid counterfactual in the case of divorce. By assumption, control households remain married up to four years after the reference date.)

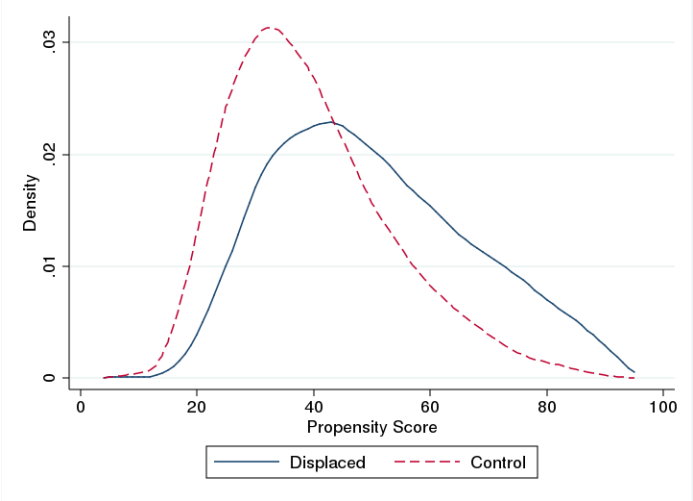
Figure B1: CG2: Family dynamics by treatment status

(a) Marriage duration at the reference date **(b)** Distance between marriage and first birth



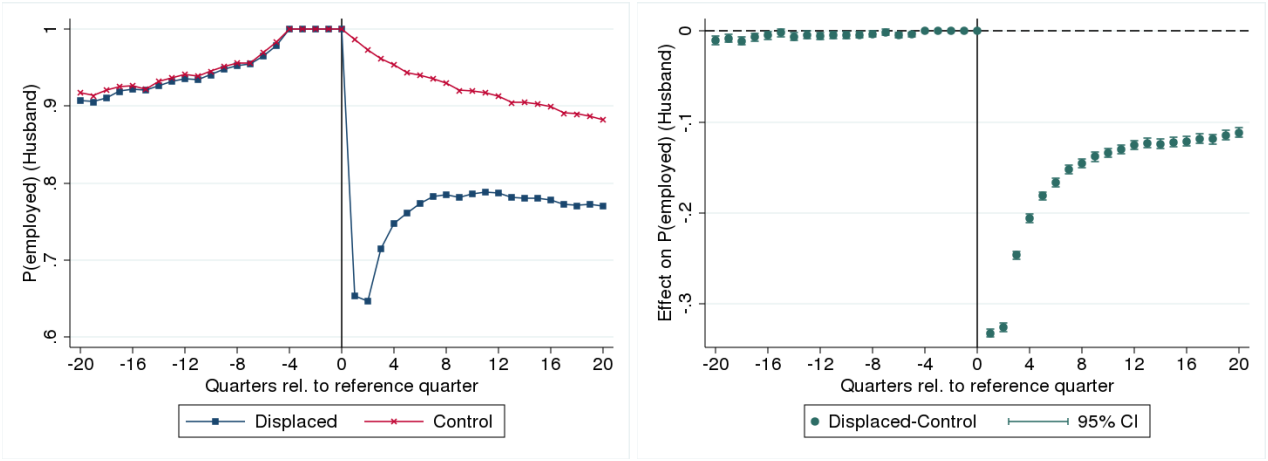
Notes: Panel (a) shows the distribution of marriage durations at the reference date and panel (b) shows the distance from marriage to the birth of the first child in month. The graphs display the distribution for the sample of households experiencing a displacement at the reference date (green) and for households with husbands working in mass layoff firms who keep their jobs (transparent). We include one observation per household event.

Figure B2: CG2: Propensity score distribution



Notes: This figure shows the density distribution of the propensity score in the displaced group and in CG2, which consists of households with husbands that have a mass layoff at the reference date, but are not displaced.

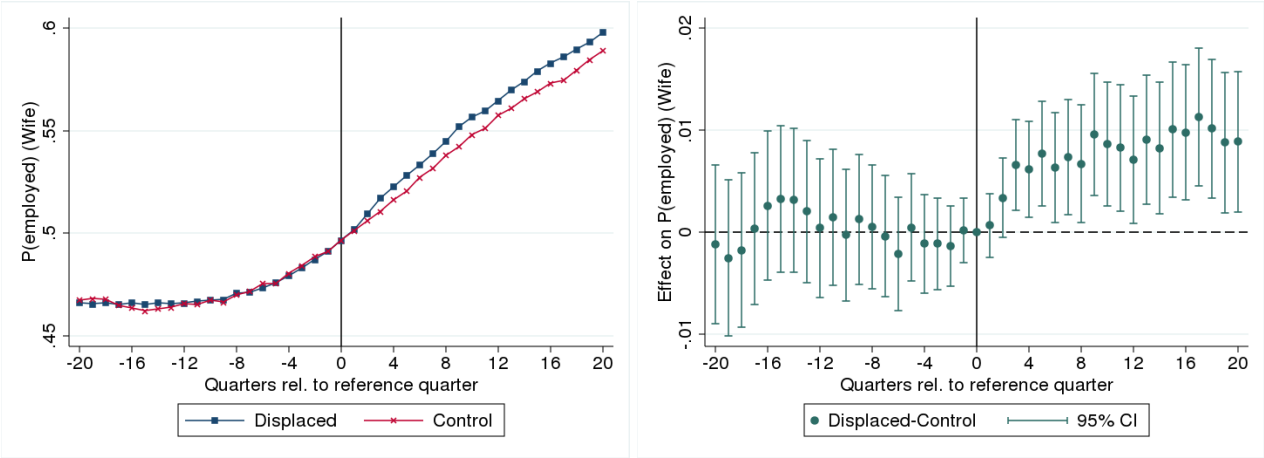
Figure B3: Employment of displaced husbands with CG2



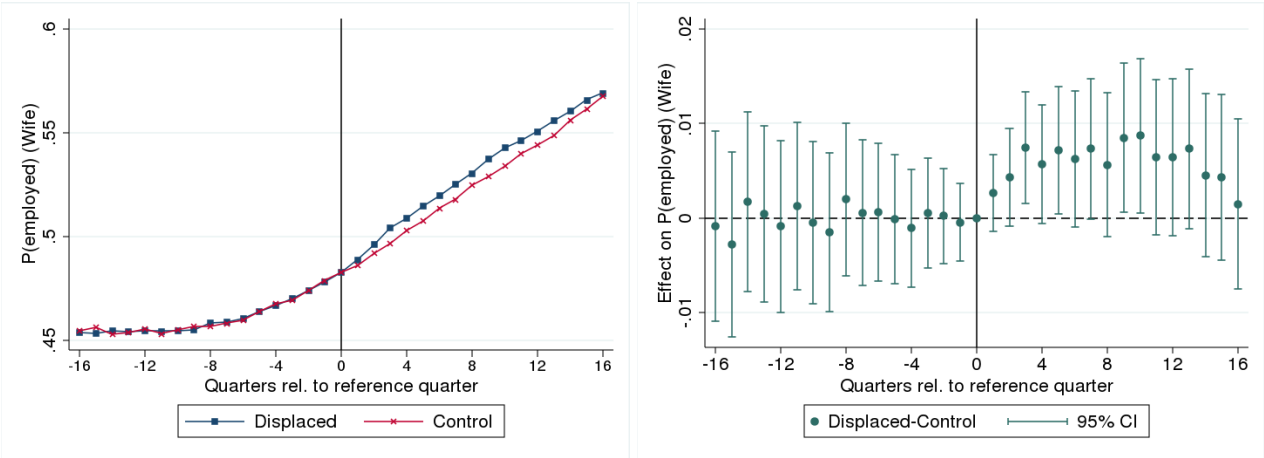
Notes: The graph to the left compares the probability to be employed of men that are displaced (blue, square) to non-displaced men working in mass layoff firms at the reference date based on estimation equation (1). The graph to the right plots the difference between the two lines with the corresponding 95% confidence interval. CG2 is reweighted to resemble the displaced group in characteristics of the husband, the wife, and the household measured at the reference date, the husband's labor market outcomes in the years before the reference date, and the characteristics of the husband's employer (see Appendix Figure A7 for details). The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Figure B4: Employment of displaced husbands' wives with CG2 and CG3

(a) CG2: Non-displaced in mass layoff



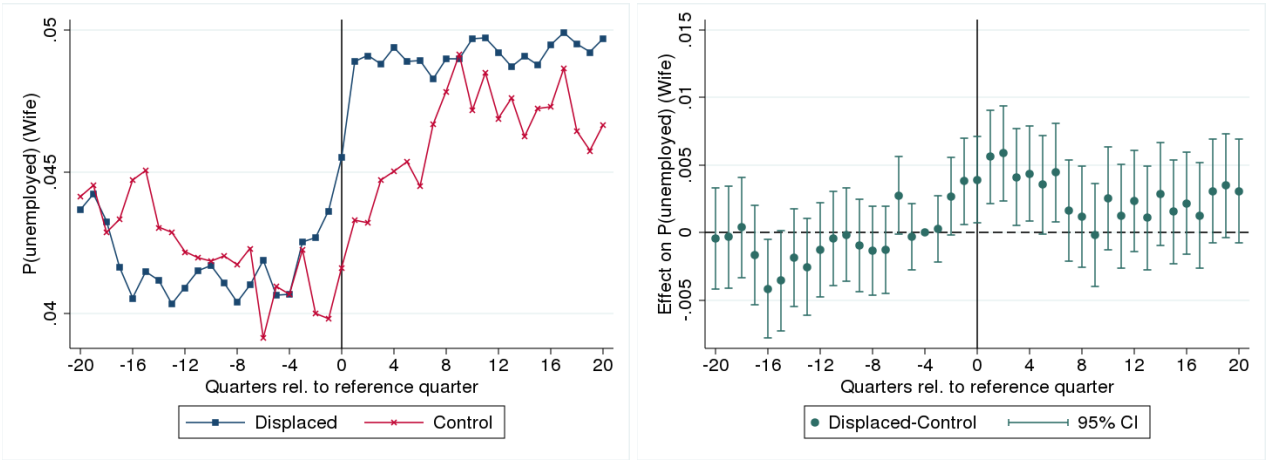
(b) CG3: Displaced in the future



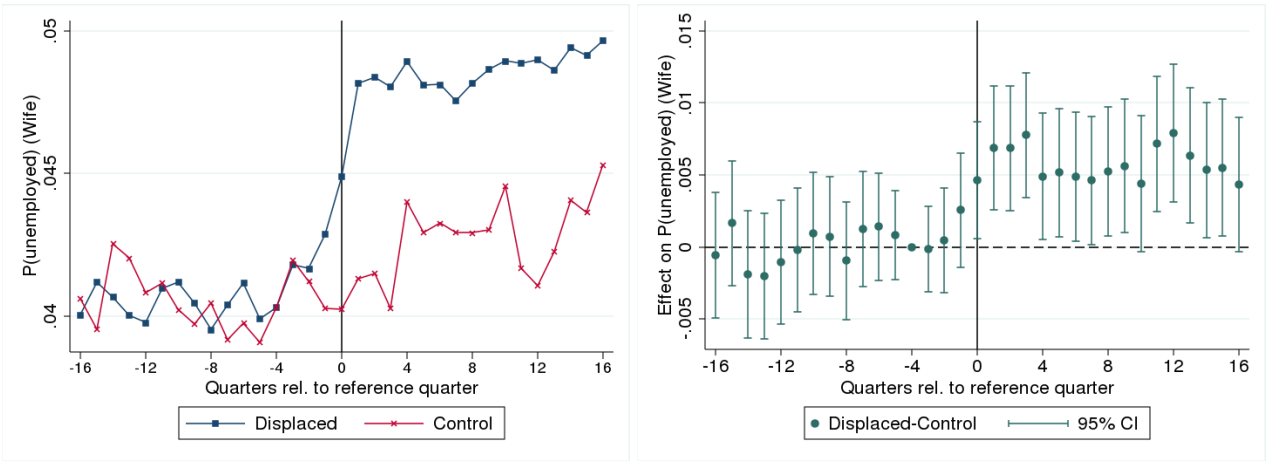
Notes: The graphs to the left compare the probability to be employed of wives with displaced husbands (blue, square) to those with non-displaced husbands working in mass layoff firms at the reference date in Panel (a) and to those with husbands displaced 16 quarters after the reference date in Panel (b). The graphs to the right plot the difference between the two lines with the corresponding 95% confidence interval. CG2 is reweighted to resemble the displaced group as explained in Figure 3. The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Figure B5: Job search, probability of registered unemployment with CG2 and CG3

(a) CG2: Non-displaced in mass layoff



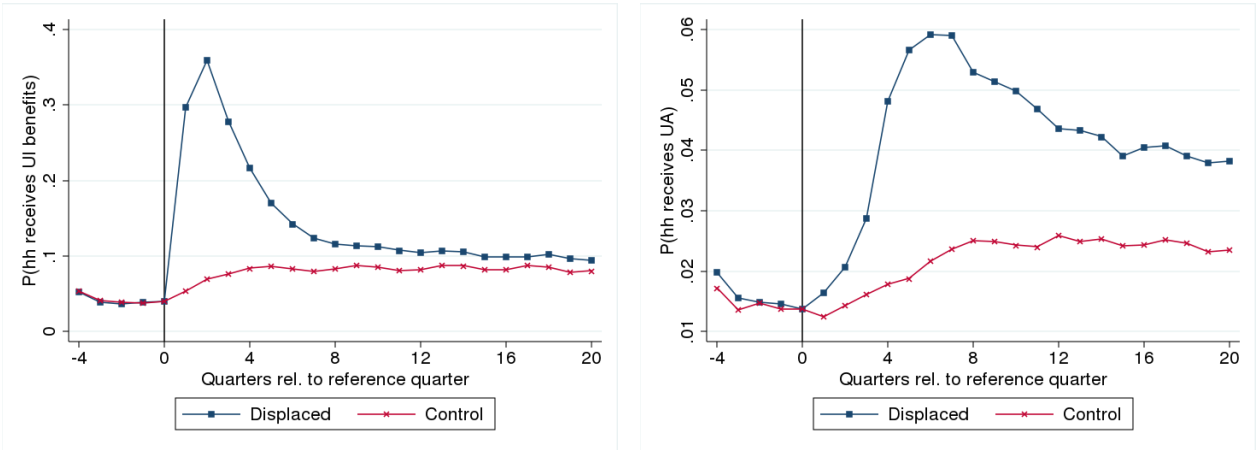
(b) CG3: Displaced in the future



Notes: The graphs to the left compare the probability to be unemployed of wives with displaced husbands (blue, square) to those with non-displaced husbands working in mass layoff firms at the reference date in Panel (a) and to those with husbands displaced 16 quarters after the reference date in Panel (b) 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. The graphs to the right plot the difference between the two lines with the corresponding 95% confidence interval. CG2 is reweighted to resemble the displaced group as explained in Figure 3. The unemployment probability of the control group is adjusted by its mean difference relative to the displaced group.

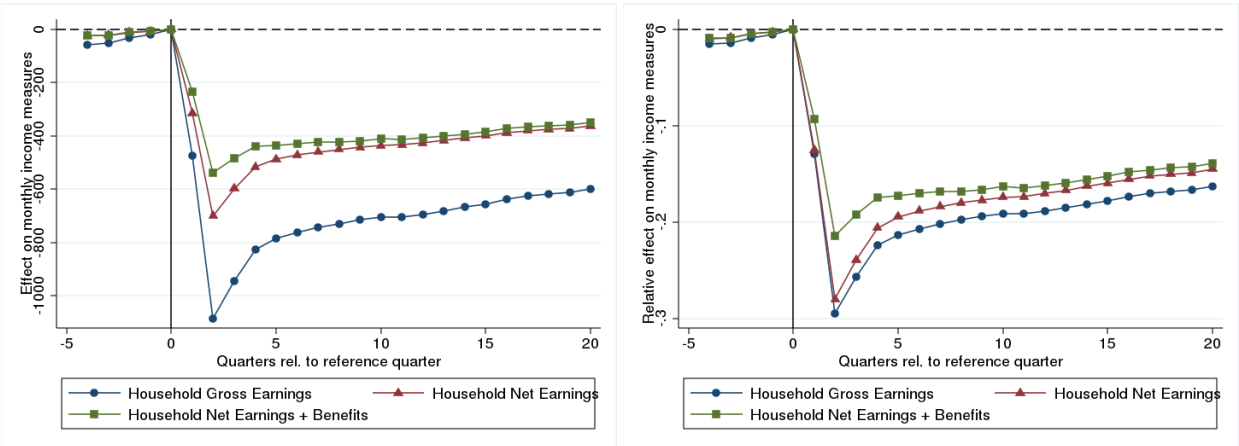
Figure B6: Social benefits around displacement with CG2

(a) Probability that household receives UI benefits **(b)** Probability that household receives UA benefits



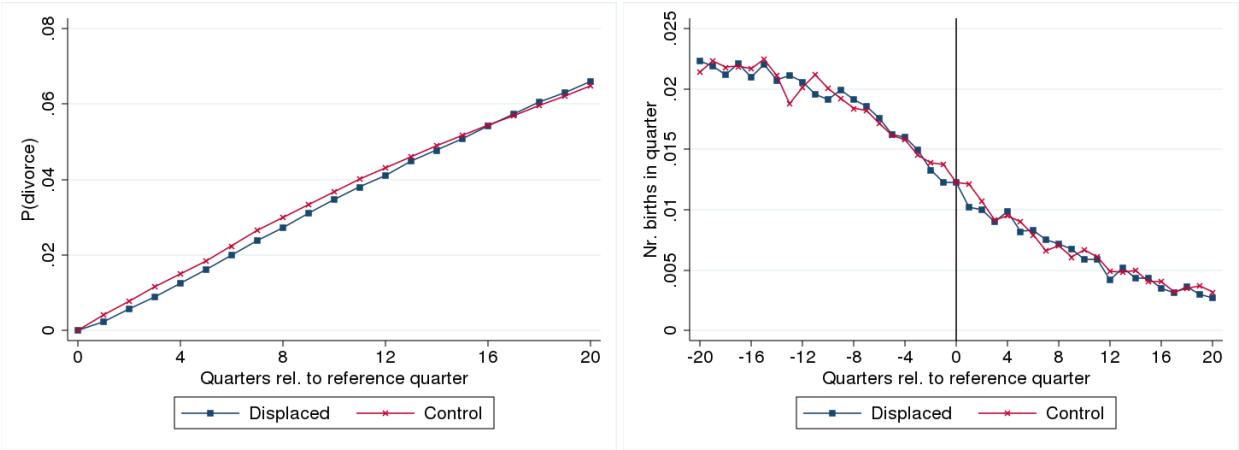
Notes: Comparison of the probability of receiving benefits of households with displaced husbands (blue, square) to those with non-displaced husbands working at mass layoff employers at the reference date (red, x). The control group is reweighted to resemble the displaced group as explained in Figure 3. The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Figure B7: Displacement effect on household income with 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 according to tax data. *Household Net Earnings* subtracts social security contributions and payroll taxes. *Household Net Earnings + benefits* adds UI and UA benefits.

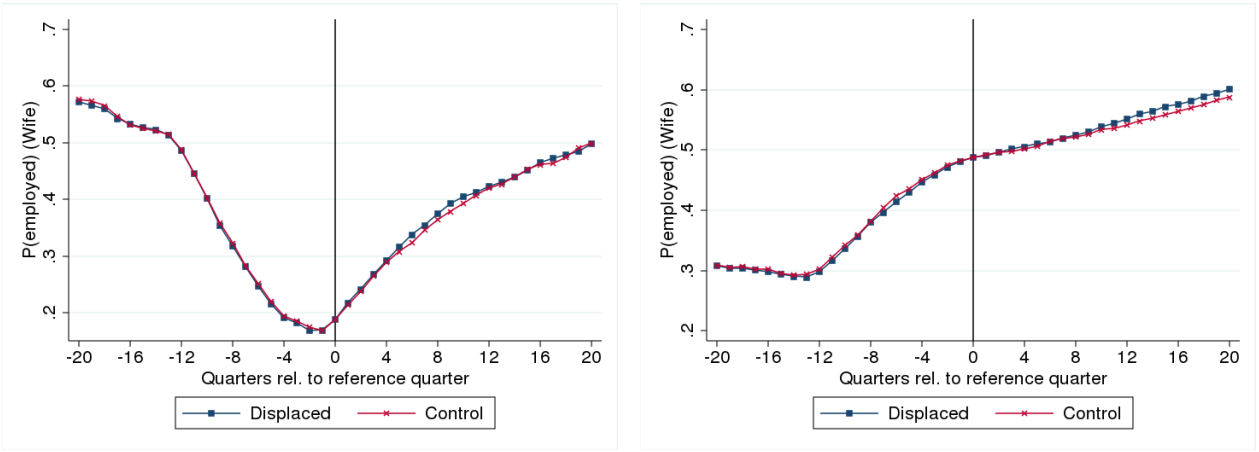
Figure B8: Divorce and fertility around displacement with CG2



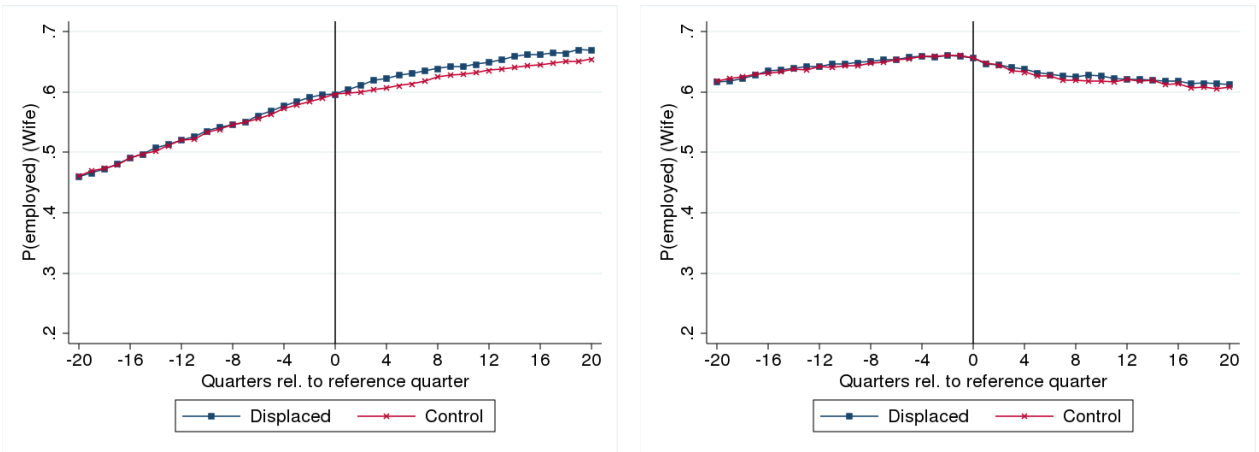
Notes: Comparison of the probability to live in divorce (left) and the number of births (right) for households with husbands experiencing a displacement (blue, square) to households with non-displaced husbands working in mass layoff firms at the reference date. CG2 is reweighted to resemble the displaced group as explained in Figure 3. 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 B9: Employment of displaced husbands' wives by age of the youngest child with CG2

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



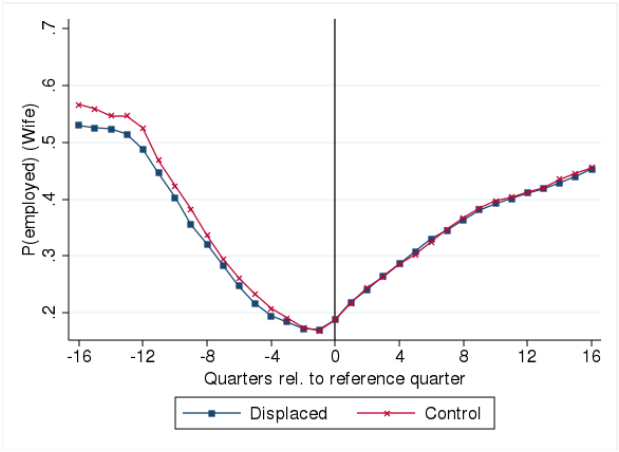
(c) 10-15 yrs. **(d)** No children aged 16 yrs. or younger



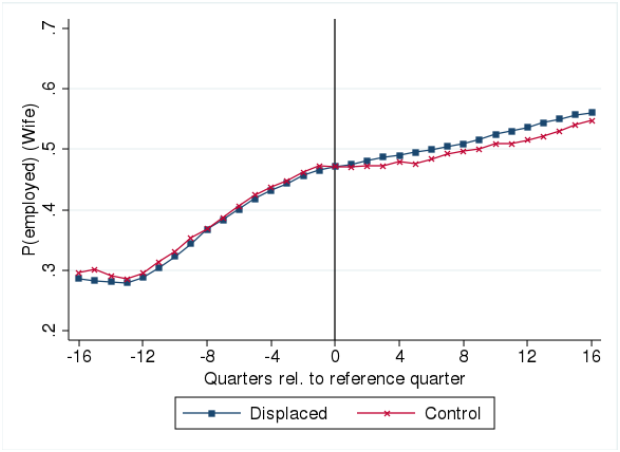
Notes: Comparison of the probability to be employed of wives with displaced husbands (blue, square) to those with non-displaced husbands working at a mass layoff firm at the reference date (red, x) for subgroups defined by the age of the youngest child at the reference date. The control group is reweighted to resemble the displaced group within each subgroup as explained in Figure 3. The employment probability of the control group is adjusted by its mean difference relative to the displaced group.

Figure B10: Employment of displaced husbands' wives by age of the youngest child with CG3

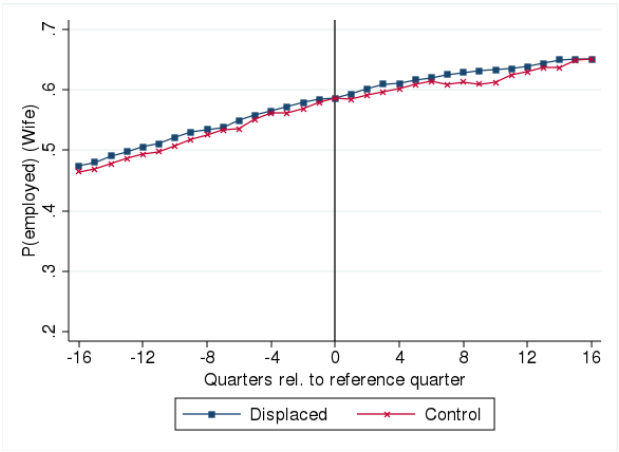
(a) 0-2 yrs.



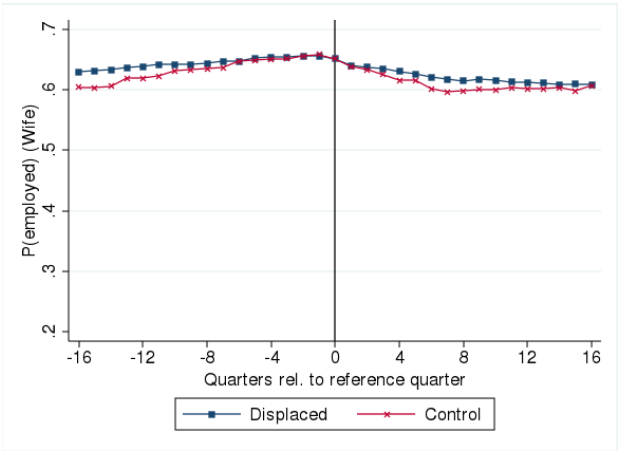
(b) 3-9 yrs.



(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 B2: Sample characteristics including CG2

	Displaced		Control	
	Closure	Mass layoff	Group 1	Group 2
	(1)	(2)	(3)	(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 B2 — 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	58,518	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 B3: Effects of husband's displacement on household labor market outcomes with CG2 and CG3

	CG2		CG3
	Husband	Wife	Wife
	(1)	(2)	(3)
A. Employment			
Displaced×Post	-0.162	0.008	0.006
	(0.002)	(0.002)	(0.003)
$\eta^{\text{participation}}$		-0.036	
		(0.010)	
Pre-event mean	1	0.486	0.468
B. Earnings			
Displaced×Post	-542.040	9.251	13.064
	(5.819)	(3.402)	(4.402)
Pre-event mean	2463.521	647.718	613.938
C. Job Search			
Displaced×Post		0.003	0.005
		(0.001)	(0.002)
Pre-event mean		0.041	0.039
Households	93,666		45,886
Observations	4,502,579		2,161,764

Notes: This table displays the impact of husband's displacement on household labor market outcomes based on equation (2), which includes displaced group, distance to event, and industry×quarter fixed effects. In Panel A (C) the dependent variable is equal to one if the individual in household i is employed (unemployed) in a given quarter. In Panel B it equals monthly earnings in Euro (2000 prices), with zeros for those not employed. 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. *Displaced×Post* measures the average difference in the outcome variable between displaced and control groups relative to the reference date in the twenty quarters after the reference quarter. $\eta^{\text{participation}}$ is the implied participation elasticity of wives with respect to the earnings of their husbands. *Pre-event mean* refers to the mean of the dependent variable in the year before the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Table B4: Displacement effects by wife's employment status prior reference date with CG2

Outcome	Wife employed			Wife not employed		
	Husband Earnings	Wife P(employed)	Earnings	Husband Earnings	Wife P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
Displaced×Post	-549.422	-0.005	-4.631	-536.040	0.015	16.705
	(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. Cluster-robust (at the household level) standard errors are bootstrapped (500 replications) and reported in parentheses.

Table B5: Effects of husband's displacement on household income with CG2

	Prob. of HH receiving		Monthly household income		
	UI	UA	Gross	Net	Net + benefits
	(1)	(2)	(3)	(4)	(5)
Displaced×Post	0.066	0.021	-711.089	-440.991	-401.297
	(0.003)	(0.002)	(17.695)	(11.046)	(10.789)
Pre-event mean	0.040	0.015	3679.622	2500.192	2514.904
Households	34,031				

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. In Panel A (B) we compare individuals in households with a displacement to a reweighted control group of households with no firm event (with households in which husbands keep their jobs during a mass layoff). Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Table B6: Effects of husband's displacement on divorce and fertility with CG2

	P(Divorce)	No. of births
	(1)	(2)
Displaced×Post	-0.001	-0.000
	(0.001)	(0.001)
Pre-event mean	0.000	0.014
Households	93,666	

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.

Table B7: Wife's employment response by age of youngest child with CG2 and CG3

	0–2 years	3–9 years	10–15 years	None younger than 16 years
	(1)	(2)	(3)	(4)
A. Control group 2				
Displaced×Post	0.005	0.007	0.015	0.005
	(0.007)	(0.004)	(0.004)	(0.004)
$\eta^{\text{participation}}$	-0.028	-0.034	-0.065	-0.019
	(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	0.535	0.662
Households	17,623	34,883	20,560	25,153
B. Control group 3				
Displaced×Post	-0.002	0.015	0.012	0.010
	(0.008)	(0.005)	(0.007)	(0.007)
Pre-event mean	0.178	0.448	0.567	0.657
Households	11,949	20,653	10,860	11,559

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. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Table B8: Displacement effects by plant wage level and unemployment rate at reference date with CG2

	Below median			Above median		
Outcome	Husband	Wife		Husband	Wife	
	Earnings	P(employed)	Earnings	Earnings	P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
A. Subgroups by plant wage level at reference date						
Displaced×Post	-492.264	0.005	1.543	-651.488	0.013	16.383
	(9.444)	(0.004)	(5.890)	(10.896)	(0.004)	(5.973)
$\eta^{\text{participation}}$		-0.023			-0.056	
		(0.018)			(0.015)	
Pre-event mean	2279.030	0.508	678.837	2789.954	0.506	689.219
Households	37,821			34,844		
B. Subgroups by male unemployment rate at reference date						
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 for different subgroups. In Panel A the wage level at plants are employer-specific fixed effects estimated based on the AKM approach (Abowd et al., 1999) (see Appendix D for details). These estimates are available only after 1994. In Panel B the male unemployment rate is measured at the husband's employment district in the year of the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Table B9: 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)	
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 the equation specified in Appendix Table A4. 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. *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.

Table B10: 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)	
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 the equation specified in Appendix Table A4. The dependent variable is set to zero if an individual is not employed. This table is constructed in the same way as Table B9. *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.

Table B11: 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)	
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 the equation specified in Appendix Table A4, 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.

Table B12: Effects of husband's displacement on household income with CG2

	Prob. of HH receiving		Monthly household income		
	UI	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	3679.622	2500.192	2514.904
Households	34,031				
Observations	947,225				

Notes: This table displays the impact of husband's displacement on household income measures based on the equation specified in Appendix Table A4 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.

Table B13: Displacement effects by youngest child with CG2 and CG3

Outcome	Husband	Wife	
	Earnings	P(employed)	Earnings
	(1)	(2)	(3)
Control group 1			
age 0-2	-509.588	0.011	8.020
	(15.118)	(0.008)	(11.793)
age 3-9	-552.933	0.008	12.989
	(10.531)	(0.005)	(6.477)
age 10-15	-652.092	0.009	6.246
	(14.648)	(0.005)	(7.414)
No child	-707.236	0.001	-6.024
	(12.433)	(0.005)	(8.154)
Control group 2			
age 0-2t	-473.827	0.005	6.987
	(13.840)	(0.007)	(9.986)
age 3-9	-501.608	0.007	11.124
	(10.004)	(0.004)	(5.325)
age 10-15	-585.778	0.015	14.917
	(13.394)	(0.004)	(6.393)
No child	-615.438	0.005	0.325
	(12.210)	(0.004)	(7.418)
Control group 3			
age 0-2	-625.171	-0.002	23.838
	(13.676)	(0.008)	(11.134)
age 3-9	-680.377	0.015	22.083
	(9.879)	(0.005)	(6.675)
age 10-15	-779.183	0.012	15.666
	(13.541)	(0.007)	(8.556)
No child	-844.417	0.010	11.962
	(13.031)	(0.007)	(11.578)

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 4, 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.

Table B14: Displacement effects by wife's earnings potential with CG2

Outcome	Low			High		
	Husband	Wife		Husband	Wife	
	Earnings	P(employed)	Earnings	Earnings	P(employed)	Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
Measure 1: Earnings before marriage						
Displaced×Post	-511.571	0.007	6.612	-591.763	0.010	13.897
	(6.587)	(0.003)	(3.848)	(15.434)	(0.005)	(9.707)
$\eta^{\text{participation}}$		-0.033			-0.047	
		(0.014)			(0.024)	
Pre-event mean	2390.620	0.456	544.335	2717.717	0.579	1002.762
Households	63,866			18,032		
Measure 2: Experience before marriage						
Displaced×Post	-518.182	0.006	6.611	-539.475	0.010	9.433
	(8.613)	(0.004)	(5.680)	(9.089)	(0.003)	(5.340)
$\eta^{\text{participation}}$		-0.026			-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	2315.499	0.399	457.785	2696.063	0.500	697.475
Households	40,210			26,240		

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.

C Further 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. The corresponding results are presented in Figure C1 and in TableC1. 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.[2] The graphical evidence (see Figure C1a) and the corresponding estimates (see column (1) of Table C1) 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 Appendix Figure A7) also on employment outcomes of wives up to one year before the reference date. The resulting estimates (see Figure C1b and column (2) of Table C1) 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 C1c and column (3) of Table C1) 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 A5). In addition, we also match on the firm size up to one year before the reference quarter. The resulting estimates (see Figure C1d

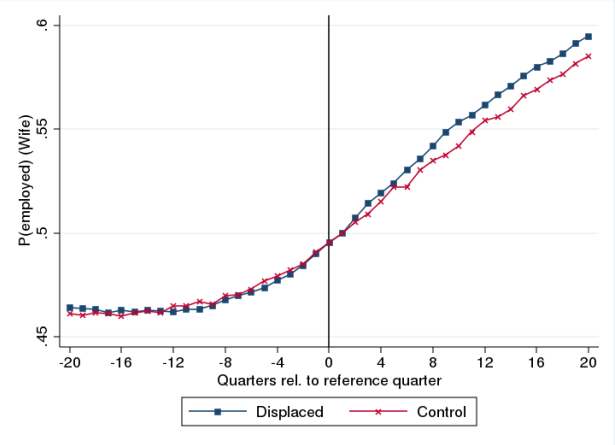
[2] Again, this relative cutoff applies to all establishments with 100 to 600 workers in the base quarter. For smaller firms, the cutoffs are more than 6 workers leaving in firms with less than 20 employees and more than 10 if the establishment has more than 20 and less than 100 workers. For establishments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

and column (4) of Table C1) are very comparable to those from our main results. In the main analysis, we work with a different requirement regarding the minimum size of mass layoff firms than, for example, Jacobson et al. (1993). This is because Austrian firms tend to be very small. As a robustness check, we estimate our model for the sample of mass layoff firms with more than 50 workers at the time of the event. Figure C1e and column (6) of Table C1 show the corresponding results. Compared to the model that includes all mass layoff firms in column (4), this reduces our sample size by about 14%. At the same time the response of wives to their husbands' displacement does hardly change using the more restrictive requirement on mass layoff firm size. In Figure C1f and in column (7) of Table C1 we focus on a sample of households where husbands have at least three years of tenure at the reference date. The response of wives to their husbands' displacement is insensitive to a change in the tenure requirement.

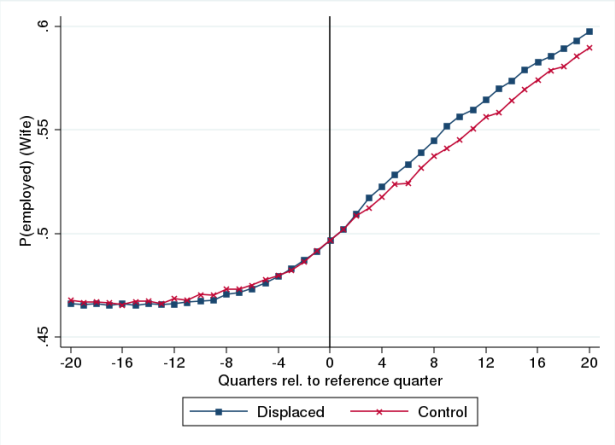
We now explore the robustness of our estimation result based on control group 3. This approach exploits the timing of displacement and requires the choice of a duration Δ between the events of the households in the treatment and the control group. Importantly, there is a trade-off in this choice: With 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 C2 and Table C2).

Figure C1: Displaced husband's wife employment, robustness checks

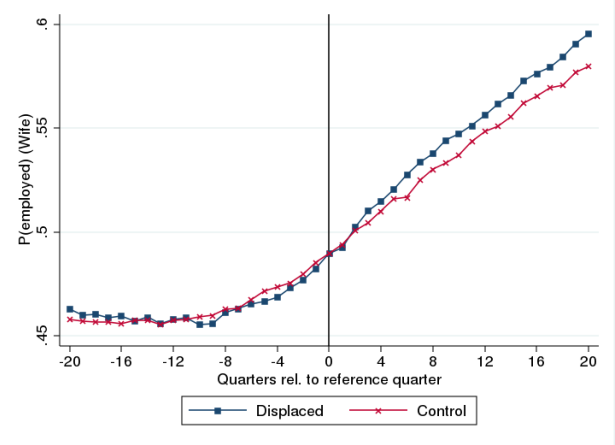
(a) Stricter mass layoff cutoffs



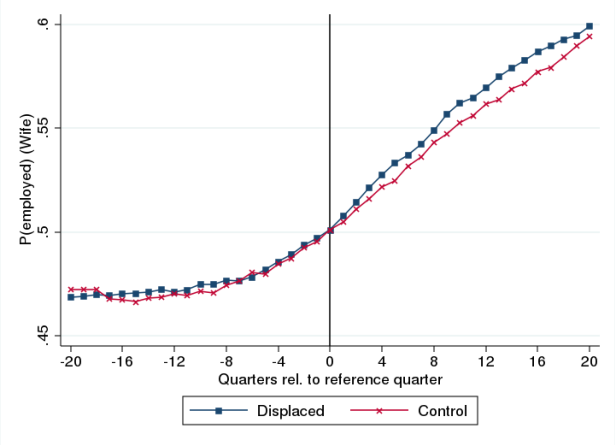
(b) Reweighting includes wives' pre-event employment



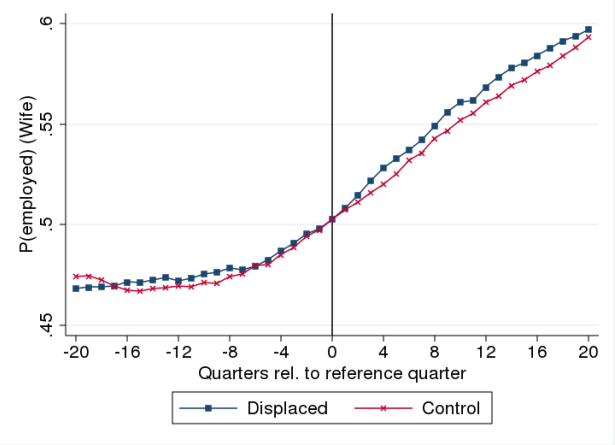
(c) Displaced from plant closures only



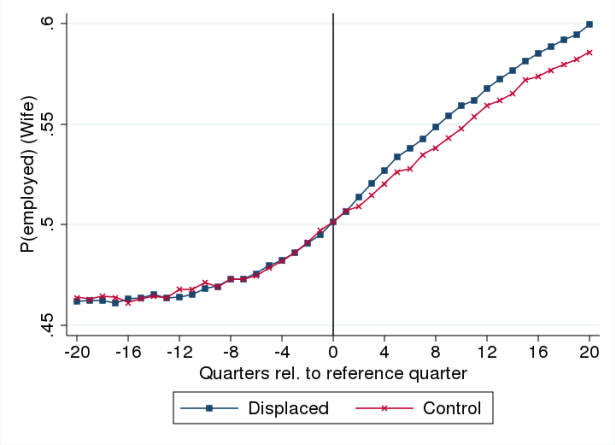
(d) Displaced and non-displaced from mass layoff firms only



(e) Displaced and non-displaced from mass layoff firms with more than 50 employees only



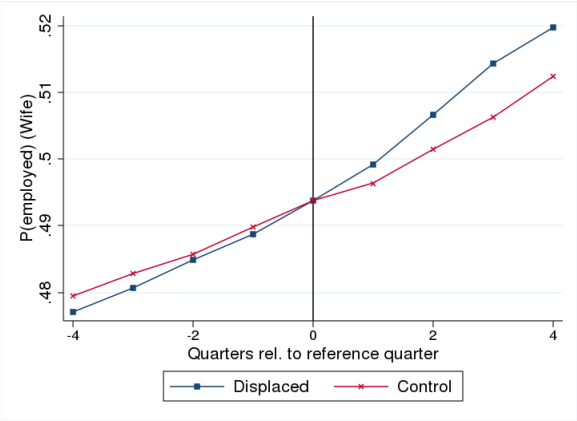
(f) Husbands required to have 3 years of tenure at reference date



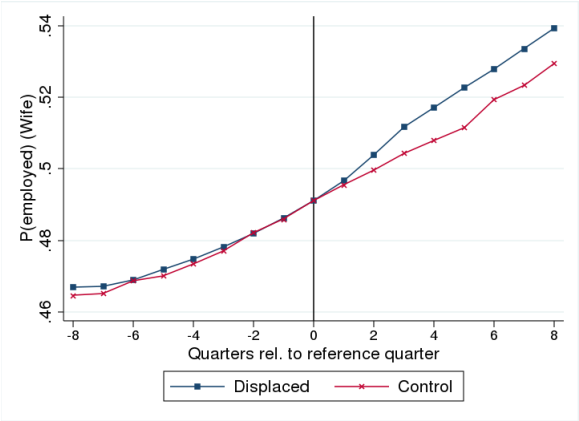
Notes: This figure provides robustness checks to Figure 4a and B4a. In Panel (a), we apply a stricter cutoff for mass layoffs. In Panel (b), we additionally include employment outcomes of wives (up to one year before the reference date) in the weighting procedure. In Panel (c), the group of displaced 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. In Panel (e), we look at displaced and non-displaced workers at firms that have a mass layoff and have more than 50 employees in the quarter after the reference date. In Panel (f), we only look at households where husbands have 3 years tenure at the reference date. The graphs are constructed in the same way as in Figure 4a.

Figure C2: Displaced husband's wife employment, robustness checks (cont'd)

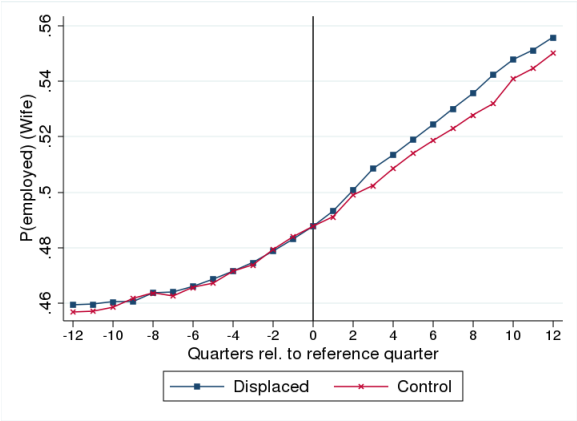
(a) Control group displaced in $\Delta = 4$



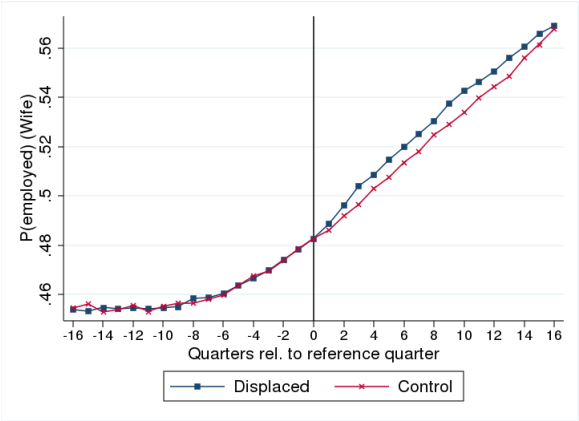
(b) Control group displaced in $\Delta = 8$



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



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



Notes: This figure provides robustness checks to Figure B4b 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 C1: Robustness checks for control group 1 and 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Prior event							
δ_{-5}	0.001	-0.002	0.002	-0.002	0.003	-0.004	-0.002
	(0.005)	(0.004)	(0.005)	(0.004)	(0.003)	(0.004)	(0.005)
δ_{-4}	0.001	-0.001	0.001	0.003	0.003	0.004	0.001
	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.004)	(0.004)
δ_{-3}	-0.002	-0.002	- 0.002	0.003	0.002	0.004	0.002
	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.004)	(0.004)
δ_{-2}	-0.002	-0.002	0.002	0.000	0.001	0.002	0.001
	(0.003)	(0.003)	(0.004)	(0.003)	(0.002)	(0.003)	(0.003)
δ_{-1}	-0.001	0.000	-0.003	0.001	0.000	0.001	-0.000
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Post event							
δ_1	0.003	0.003	0.003	0.004	0.004	0.005	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
δ_2	0.006	0.007	0.007	0.006	0.009	0.006	0.009
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
δ_3	0.010	0.010	0.009	0.008	0.011	0.008	0.010
	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
δ_4	0.011	0.010	0.011	0.010	0.011	0.008	0.011
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
δ_5	0.010	0.008	0.007	0.007	0.010	0.006	0.013
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
Pre-event mean	0.489	0.486	0.484	0.470	0.485	0.488	0.492
Households	87,876	101,609	70,942	75,212	100,036	64,741	74,856
Observations	3,823,455	4,387,451	3,123,503	3,745,965	4,320,949	3,293,776	3,239,533

Notes: This table reports different robustness checks to the results in Table A4 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 A4 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, (6) We only take displaced and non-displaced husbands from mass layoffs with firms with more than 50 employees at the reference date, (7) We only include households where husbands have at least 3 years tenure at the reference date. Standard errors are bootstrapped (500 replications, with clustering at the household level) and reported in parentheses.

Table C2: 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			0.008
			(0.004)
Pre-event mean	0.482	0.478	0.474
Households	46,804	46,336	45,548
Observations	767,799	1,326,493	1,781,925

Notes: This table illustrates the robustness of results for control group 3 in Table B9 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.

D AKM estimation

This appendix describes the estimation of the employer fixed effects for daily earnings, which are used in Section 6.3.3. Firm fixed effect are obtained from estimating the AKM decomposition (Abowd et al., 1999):

$$Y = X\beta + D\theta + F\psi + \epsilon \tag{3}$$

where Y denotes the vector of log daily earnings that worker i earns at firm j in period t, X is a matrix of time-varying covariates, D is a matrix containing indicator variables for each worker, while F is the corresponding matrix of indicators for the firm at which i works at date t. The covariates included in the model comprise a blue-collar dummy, education dummies, a full set of cohort dummies indicating the first year in which we observe a worker in the Austrian Social Security Data (henceforth ASSD), a full set of experience dummies interacted with age at which workers enter the workforce, and a dummy indicating that the worker was born before 1957.

To estimate the AKM model, we use the following sample from the the ASSD. The sample includes employment spells of men for the period between 1994 to 2012. We first restrict the sample to one spell per year and firm-employee pair that last at least 30 days. We further limit the sample to individuals aged between 16 and 65 after the beginning of a stable labor market career and keep only spells with valid wage information. Since the unit of observation is the worker-year, we keep for each worker only the job with the highest total earnings per year. Finally, we exclude all displaced and control workers of the main sample in the paper (displaced and control group 1 and 2 workers as defined in Sections 3.1 and 4, respectively). These workers account for 9.5% of all observations.

We have 26,382,267 worker-year observations on 2,634,741 workers employed at 476,828 firms. The largest connected set contains 432,440 firms. Restricting the sample to the largest connected set of firms, we remain with 26,113,837 worker-year observations on 2,590,070 workers who have 4,451,675 job-to-job transitions.