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Who Buffers Income Losses after Job Displacement? The Role of Alternative Income Sources, the Family, and the State

Daniel Fackler — Eva Weigt

Abstract. Using survey data from the German Socio-Economic Panel (SOEP), this paper analyses the extent to which alternative income sources, reactions within the household context, and redistribution by the state attenuate earnings losses after job displacement. Applying propensity score matching and fixed effects estimations, we find that income from self-employment reduces the earnings gap only slightly and severance payments buffer losses in the short run. On the household level, we find little evidence for an added worker effect whereas redistribution by the state within the tax and transfer system mitigates income losses substantially.

1. Introduction

It is often stressed that reallocation — both among continuing firms and through firm entry and exit — is an important driver of productivity growth (see, e.g. Syverson, 2011) and therefore beneficial for the economy as a whole. However, from the affected workers' point of view, these reallocation processes generate 'winners' and 'losers', the latter being those who suffer from involuntary job losses due to firm exits or mass layoffs that come along with reallocation and structural change. The importance of this issue is well reflected both in public policy debates and in the academic literature. Previous research has shown that job displacement has severe and long-lasting negative impacts on individual earnings (e.g. Couch and Placzek, 2010; Hijzen *et al.*, 2010; Jacobson *et al.*, 1993). The literature has also found serious impacts on non-monetary outcomes such as life satisfaction, health, life expectancy, fertility decisions, and mental health of both displaced workers themselves and their spouses (see, e.g. Black *et al.*, 2015; Del Bono *et al.*, 2012; Huttunen and

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Kellokumpu, 2016; Kassenboehmer and Haisken-DeNew, 2009; Marcus, 2013; Sullivan and von Wachter, 2009).

Although most prior work focuses on earnings from dependent employment, we contribute to the literature by investigating to what extent income from self-employment, severance payments, additional labour supply within the household, and redistribution by the state buffer earnings losses after job displacement.¹ Income from self-employment is particularly interesting because previous studies point to non-negligible increases in the probability of becoming self-employed after job displacement (see the literature review in Section 2). Regarding redistribution by the state, we shed light on the redistributive impact of the rather comprehensive German welfare state. Finally, as previous studies have addressed only selected channels of compensation, the relative importance of various income sources has not been studied so far. In accordance with previous studies, our results show high individual earnings losses and only limited convergence. Income from self-employment slightly reduces the earnings gap and severance payments buffer earnings losses in the short run (i.e. in the year after displacement). Furthermore, we find little evidence for increased labour supply by other household members, whereas redistribution by the state reduces the income gap between displaced and non-displaced workers substantially. Accordingly, the German tax and transfer system substantially mitigates income losses after job displacement whereas individual reactions contribute only little.

In Section 2, we review the related literature, and in Section 3, we describe our data and sample construction. Section 4 presents the econometric approach and discusses the regression results as well as several conducted robustness checks. Section 5 concludes.

2. Related literature

The international literature generally agrees in the finding that job displacement harms individual earnings of affected workers substantially (see, e.g. Jacobson *et al.*, 1993 and Couch and Placzek, 2010 for the United States; Hijzen *et al.*, 2010 and Upward and Wright, 2019 for the UK; Oreopoulos *et al.*, 2008 for Canada; Eliason and Storrie, 2006 for Sweden; Huttunen *et al.*, 2011 for Norway).² For Germany, empirical evidence is scarce and results are ambiguous due to different data, empirical approaches, and observation periods. Using survey data from the German Socio-Economic Panel (SOEP), Burda and Mertens (2001) report slightly lower wage growth for displaced workers with the strongest effect for workers in the upper part of the pre-displacement wage distribution and Couch (2001) ascertains an immediate reduction in annual earnings by 13.5 per cent, which, two years later, diminishes to an earnings gap of 6.5 per cent.³ Using administrative data from the Institute for Employment Research, Bender *et al.* (2002) find moderate wage losses of approximately 1–2 per cent after displacement,⁴ but for workers who are not observed in employment in the year after displacement, an additional wage loss of 19 per cent is observed. Schmieder *et al.* (2010) observe permanent earnings losses of 10–15 per cent that sustain for at least 15 years for workers displaced due to mass layoffs in the early 1980s. Similar results are reported by Schmieder *et al.* (2018) for workers displaced between 1979 and 2008.

Our paper further relates to the literature dealing with compensation of individual earnings losses, particularly severance payments and self-employment entry. Grund (2006) reports that severance payments are granted to every third displaced worker, but he does

not investigate the extent to which severance payments buffer earnings losses of displaced workers. Regarding self-employment entry after job displacement in the United States, Farber (1999a) does not observe a positive effect. In contrast, von Greiff (2009) for Sweden and Røed and Skogstrøm (2014) for Norway detect substantial increases in the probability to enter self-employment after job displacement.

Beyond that, our paper contributes to the literature that deals with the added worker effect. For the United States, Lundberg (1985) and Birinci (2019), e.g. find only small added worker effects whereas Stephens (2002) observes substantial increases in the spouse's labour supply. Birinci (2019) further shows that the small added worker effect might be a result of more generous government transfers during recessions. McGinnity (2002) finds evidence for an added worker effect for Germany but not for the UK. Also for Germany, Triebe (2015) detects an effect for married but not for cohabiting couples. Furthermore, Bredtmann *et al.* (2018) investigate the added worker effect for 28 European countries, and their analysis for a pooled sample of these countries reveals that women whose husbands get displaced have a higher probability to enter the labour market and to change from part-time to full-time employment.

Considering both the role of the spouse and the state to provide insurance after involuntary job loss in Germany and the United States, Ehlert (2012) shows that women are mainly insured by their spouses in both countries. Income losses of unemployed men in Germany are mainly buffered by the state whereas in the United States, they rely more on additional income provided by their families. Hilger (2016) analyses the effect of father's layoffs for the US finding that income losses are mainly buffered by the state whereas mother's earnings only provide little insurance against earnings losses. Halla *et al.* (2018) find evidence for an added worker effect in Austria, but household income losses are mainly buffered by the state. For Norway, Hardoy and Schøne (2014) find that the state plays a more important role than the spouse in compensating income losses after involuntary job loss. Similar results are obtained by Eliason (2011) for Sweden. In contrast, Upward and Wright (2019) find for the UK that state transfers only slightly reduce the income gap after involuntary job loss.

3. Data

The German Socio-Economic Panel (SOEP) is a household panel survey conducted on a yearly basis since 1984.⁵ All members of a household aged at least 16 are included in the survey. Starting with a sample of approximately 6,000 households and 12,000 individuals in 1984, the SOEP by now includes almost 30,000 individuals living in approximately 11,000 households. The data contain detailed information on socio-demographic characteristics of the respondents and their families as well as various job-related variables. The comprehensiveness of the contained income data allows us to gain fundamental insights about the effects of job displacement both on income losses of displaced workers themselves and on the household context. Despite the comprehensiveness of the SOEP, it must be acknowledged that the number of observations is much lower than in administrative data, which lead to less precise estimates.

As it is the aim of our analysis to investigate how different compensation mechanisms succeed in filling the gap in the household budget after involuntary job loss, we consider seven different income variables including various income sources, such as severance payments, income from self-employment, and state transfers as described in Table 1. All

income variables are deflated to prices in 2010 using the consumer price index. Because household incomes may be affected by the number of persons living in a household, we also analysed changes in household constellations over time, which reveals that there are hardly any changes in average household size for both displaced and non-displaced workers. Moreover, we re-estimated our regressions including only households with the same household constellation within our time frame leaving our results unchanged as well.

Involuntary job loss is identified by the following questions: First, respondents are asked whether they have changed (or lost) their job since the last interview.⁶ Those who have experienced a job change or have become unemployed are subsequently asked for the reason of that change. Job displacement can be defined as an ‘involuntary separation based on operating decisions of the employer’ (Farber, 1999b, p. 2445) implying that displaced workers are laid off due to reasons that are beyond their control and independent of their individual characteristics or performance. Accordingly, we consider those workers as displaced who have lost their job due to firm closures.⁷ In Section 4.3, we also discuss estimation results for workers who have been dismissed by their employers for other reasons.

As the question regarding job loss due to plant closures is included for the first time in SOEP wave 1991, we consider involuntary job losses occurring from 1991 to 2011⁸ and follow all displacement cohorts four years prior to and five years after job loss. We construct treatment and control cohorts separately for each year and pool them for the analyses. For a better understanding of how individuals are assigned to treatment and control group, let us take the year 1991 as an example. All individuals who experience a job loss due to plant closure in 1991 are assigned to the treatment group in the 1991 cohort. Individuals are assigned to the control group if they did *not* experience an

Table 1. Description of income variables

Income variable	Description
Individual level	
1. Individual labour income from dependent employment	Yearly gross individual labour income from dependent employment, without income from self-employment and severance payments
2. Individual labour income without severance payments	Yearly gross individual labour income from dependent employment and income from self-employment without severance payments
3. Individual labour income	Yearly gross individual labour income including income from self-employment and severance payments
Household level	
1. Gross household income	Yearly gross income of all household members from labour earnings, private transfers, private pensions, and asset income
2. Gross household income minus income taxes	Yearly gross income of all household members from labour earnings, private transfers, private pensions, and asset income minus household income taxes
3. Household net income	Yearly gross income of all household members from labour earnings, private transfers, private pensions, and asset income minus household income taxes and social security (payroll) taxes
4. Household net income plus transfers	Yearly gross income of all household members from labour earnings, private transfers, private pensions, asset income, and state transfers minus household income taxes and social security (payroll) taxes

involuntary job loss (due to plant closures or other dismissals) in 1991. Also, individuals who terminate employment voluntarily in 1991 (e.g. due to own resignation or mutual agreements) are included in the control group in that year. Individuals who separated from their employers due to other reasons that cannot be unambiguously regarded as involuntary or voluntary terminations in the respective year (e.g. because their job ended automatically due to a limited working contract) are excluded from both the treatment and the control group in this year. The control group is not required to be continuously employed during the observation period, and hence, individuals in the control group can also lose their jobs after 1991, which ensures that we do not condition on future labour market outcomes. In our example, we refer to the year 1991 as the ‘displacement year’ for both the treatment and the control group (although individuals in the control group are obviously *not* displaced in that year).⁹

In the following analyses, we consider workers who were full-time employed non-civil servants aged less than 55 in the year prior to displacement.¹⁰ Individuals who only work part-time in the year preceding displacement are excluded because we want to ensure that job displacement affects a major income source of the household and not only secondary incomes. The same sample restrictions are applied to the control group of non-displaced workers. In addition, due to the unusual economic conditions in Eastern Germany after the fall of the Berlin Wall and the limited period of observation, we consider only individuals working in firms situated in the western part of Germany in the year prior to displacement.

4. Econometric analysis

4.1. Estimation approach

To investigate the income losses of displaced workers compared with a control group of non-displaced workers, we apply an event-study approach that is common in the job displacement literature (e.g. Jacobson *et al.*, 1993). In doing, so we estimate the following equation:

$$Y_{it} = \alpha_i + \sum_{k=-3}^5 \gamma_k T_{it}^k + \sum_{k=-3}^5 \delta_k D_i^k T_{it}^k + \mathbf{x}_{it}\boldsymbol{\beta} + v_{it}$$

On the left hand side, Y_{it} represents the different income variables on the individual and the household level (for person i in calendar year t). α_i captures individual fixed effects. T_{it}^k represents dummies for the k^{th} year relative to the displacement year and γ_k the corresponding coefficients measuring the income development for the control group over time. $D_i^k T_{it}^k$ represents interaction terms of the relative time dummies T_{it}^k with a time invariant dummy D_i^k identifying displaced workers. The corresponding coefficients of these interaction terms δ_k measure the difference in the income development between displaced and non-displaced workers, i.e. the income losses of displaced workers relative to the control group at each point in time. \mathbf{x}_{it} captures a time varying fourth order polynomial in age, and v_{it} is an idiosyncratic error. Standard errors are adjusted for clustering at the personal level.

To make displaced workers and their non-displaced counterparts more comparable with respect to pre-displacement characteristics, we apply a matching approach and estimate the above described model for the matched sample. In particular, we perform 10 nearest

neighbour propensity score matching with replacement. To make sure that we compare displaced and non-displaced workers facing similar general economic conditions, we only allow for matches within the same displacement year. We match on characteristics that refer to the year before displacement. This is done because job loss occurs between the interviews in $k = -1$ and $k = 0$, and hence, the information reported in the displacement year ($k = 0$) already refers to the time after job loss. As covariates for the computation of the propensity score, we include various socio-demographic characteristics as well as variables representing educational attainment and employment histories.¹¹ After matching, we end up with a sample of 565 displaced workers and 5,315 non-displaced counterparts (the number of observations over time is depicted in Table A1).¹² Test results for the matching quality show that there are (at the 5% significance level) no significant differences between displaced and non-displaced workers in the matched sample. Moreover, the median (mean) of the standardized bias amounts to 1.2 (0.9).¹³ Means of selected variables for displaced and non-displaced workers in the matched sample as well as information regarding the matching quality are depicted in Table 2. Furthermore, means of the income variables over time are shown in Figure A1. One can see here that the development of the different income variables is already very similar for treatment and control group before the displacement year.

4.2. Results

4.2.1. Earnings losses and buffering channels at the individual level. Figure 1 shows the coefficients of the interaction terms between the relative time dummies and the displacement dummy (δ_k). Overall, our results for individual earnings corroborate with previous findings because they show substantial and persistent earnings losses for displaced workers (see Tables A2-A4 for complete regression results at the individual level). Losses are highest in the first year after displacement, and there is limited convergence observable in the subsequent years. Starting with individual labour earnings without severance payments and without income from self-employment — the type of income contained in German administrative data — we find that displaced workers suffer a severe earnings loss of approximately 10,100 Euros in the first year after displacement compared with their non-displaced counterparts, which corresponds to a percentage loss of approximately 26 per cent.¹⁴ Five years after displacement, the earnings gap between displaced and non-displaced workers has shrunk to approximately 6,000 Euros or 16 per cent.

As earnings losses of displaced workers can be explained by reduced wages or employment, we analyse the effects of job loss on log hourly wages, working hours, and unemployment probabilities (means of these variables are depicted in Figure A2). Wages are calculated by dividing the income or salary from the main job by annual work hours in that job. Individuals with zero wages are excluded from this analysis, i.e. wages are conditional on employment. Weekly working hours refer to the hours according to the labour contract in the main job and include zeros for non-employed individuals. Unemployment means that an individual is officially registered unemployed. The corresponding regression results in Figure 2 indicate that earnings losses of displaced workers can be explained by both lower wages and less employment (complete regression results are depicted in Tables A5-A7). Wages are reduced by around 14 per cent in the short run, and a gap of around seven per cent is remaining after five years. Results regarding weekly working hours indicate that employment drops substantially in the short run and that displaced workers still

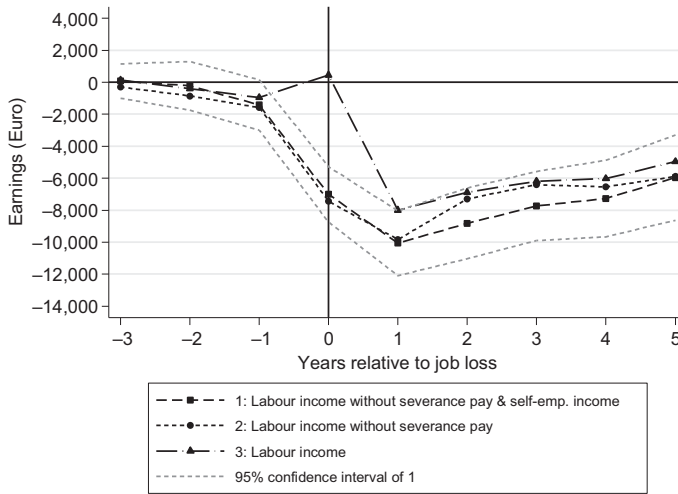
Table 2. Means of selected variables for displaced and non-displaced workers (matched sample)

	Displaced		Non-displaced		Std. bias (%)	t-test
	Mean	Std. Dev.	Mean	Std. Dev.		
Individual labour income from dependent employment (yearly average)	34,194.72	20,475.28	36,067.78	24,991.76	−8.1	−1.34
Household net income plus transfers (yearly average)	40,631.67	19,282.03	42,322.70	22,743.45	−8.7	−1.45
Age (years)	38.2726	9.1122	38.1791	9.2144	0.5	0.08
Female (dummy)	0.3009	0.4590	0.2961	0.4566	0.9	0.16
Firm tenure (years)	7.6865	8.2911	7.8425	8.3692	−0.9	−0.16
Job experience (years)	15.3080	9.2802	15.2531	9.3741	0.3	0.06
Unemployment experience (years)	0.5805	1.3416	0.5817	1.3843	−1.1	−0.16
Firm size (dummies)						
≤20	0.3062	0.4613	0.3038	0.4599	−1.0	−0.15
21–199	0.3434	0.4753	0.3456	0.4756	−0.9	−0.15
200–1,999	0.1575	0.3646	0.1516	0.3587	2.4	0.45
2,000 or more	0.1752	0.3805	0.1800	0.3842	−0.2	−0.03
Level of education (dummies)						
General Elementary	0.1363	0.3434	0.1345	0.3412	−0.1	−0.02
Middle Vocational	0.5469	0.4982	0.5549	0.4970	−1.7	−0.29
Vocational training plus high school diploma	0.0637	0.2445	0.0587	0.2351	2.4	0.44
Higher Vocational	0.0726	0.2597	0.0717	0.2580	0.5	0.08
Higher Education	0.1292	0.3357	0.1260	0.3319	1.3	0.24
Marital status (dummies)						
Married	0.6354	0.4817	0.6332	0.4820	0.2	0.03
Divorced/separated	0.0920	0.2893	0.0941	0.2919	−0.5	−0.09
Unmarried	0.2584	0.4381	0.2615	0.4395	−0.4	−0.06
Other	0.0142	0.1183	0.0113	0.1056	2.1	0.34
Household size (no. of persons)	2.9770	1.3173	3.0181	1.3929	−3.1	−0.52
Number of children (<18)	0.7327	0.9681	0.7476	1.0116	−1.2	−0.20
Household type (dummies)						
Single	0.1257	0.3318	0.1260	0.3319	0.3	0.05
Multi-person household without children	0.4301	0.4955	0.4266	0.4946	0.2	0.03
Multi-person household with children	0.4443	0.4973	0.4473	0.4973	−0.4	−0.07
Number of observations	565		5,316			

Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; all variables refer to the year before displacement; incomes in Euro deflated to prices in 2010.

work around four hours per week less than non-displaced individuals five years after job loss. This corresponds to the probability of being unemployed, which increases by 25 percentage points in the year of job loss and is still approximately four percentage points higher than in the control group after five years.

Figure 1. Individual labour incomes of displaced relative to non-displaced workers over time.

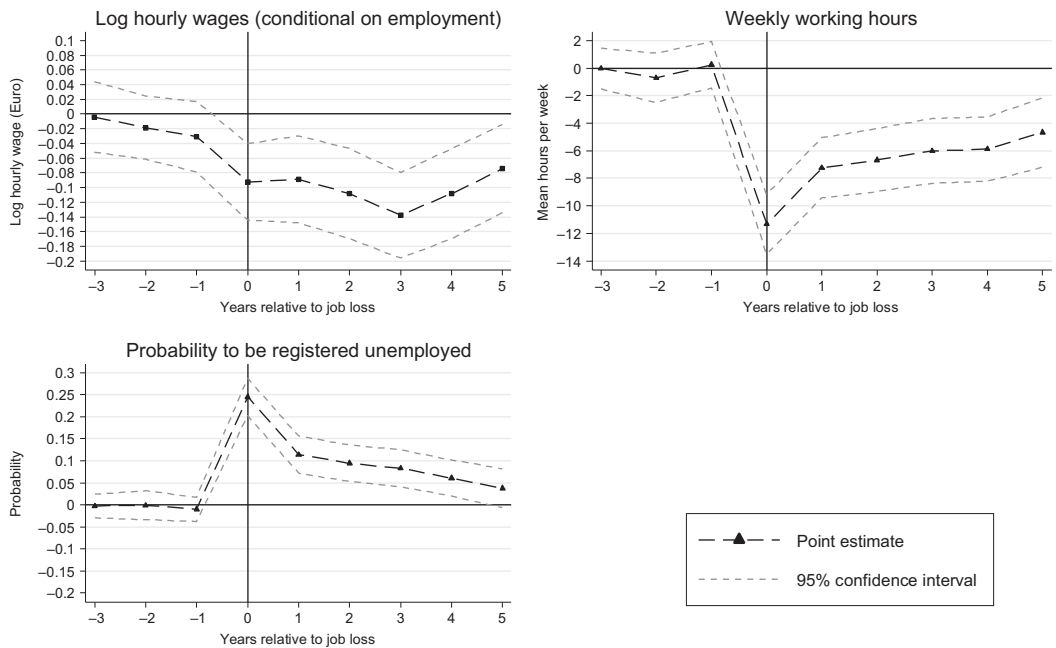


Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level; see Tables A2–A4 for the corresponding regression results.

Comparing our results with previous evidence for Germany reveals very similar patterns. Using the SOEP, Fackler and Rippe (2017), e.g. find large and persistent earnings losses for displaced workers that can be explained by both reduced wages and employment. Using German administrative data and analysing earnings losses after job loss due to mass layoffs, Schmieder *et al.* (2010, 2018) report that the high and persistent earnings losses they find are mainly driven by persistently reduced wages in the long run. When looking at a time frame similar to our analysis, however, earnings losses are also driven by both reduced wages and employment. Similar patterns are reported by Fackler *et al.* (2019), who also make use of German administrative data and analyse job losses after bankruptcies.

Turning to potential buffering channels at the individual level, Figure 1 shows that including income from self-employment reduces the earnings gap in all five years after job loss, but in particular in the second until the fourth year (by approximately 700–1,500 Euros in years $k = 2$ to $k = 4$). This is also well reflected in the shares of displaced and non-displaced workers being self-employed in their main job, receiving income from self-employment and the amount of income received from self-employment (Figure A3).¹⁵ The three graphs show that displaced and non-displaced workers do not differ substantially regarding any of these three outcomes before job loss. Afterwards, displaced workers more often report self-employment as their main job. However, the share of workers receiving income from self-employment, which can be generated in side jobs besides other employment, too, hardly differs between displaced and non-displaced workers. Finally, the amount of income from self-employment supports the finding that displaced workers are more likely to become self-employed in their main job after job loss.¹⁶

Figure 2. Wages, working hours, and unemployment shares of displaced relative to non-displaced workers over time.



Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; log wages in Euro deflated to prices in 2010 and are conditional on employment; standard errors are adjusted for clustering at the personal level; see Tables A5–A7 for the corresponding regression results.

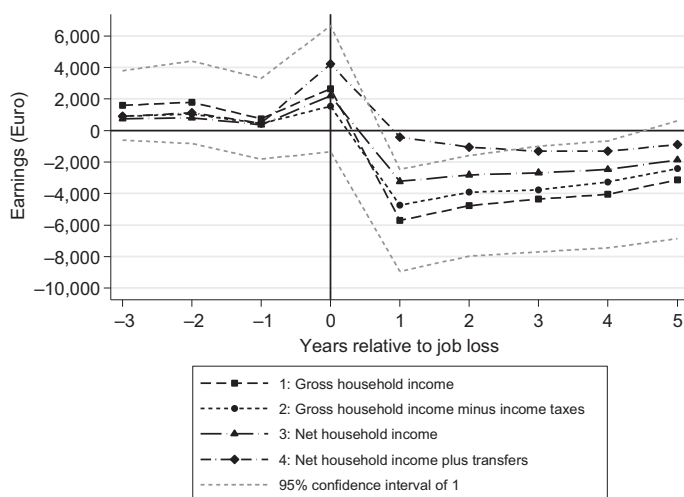
Figure 1 further shows that severance payments reduce the earnings drop substantially in the year of displacement and slightly in the first year after job loss. This effect is, of course, somewhat mechanical because this income source is only received by job losers, and — as expected — its buffering effect does not persist in the longer run. However, our results suggest that severance payments are not negligible in terms of incidence and amount and that they have a comparably strong short-run buffering effect. The median of severance payments received by displaced workers amounts to approximately 10,000 Euros, and this figure corresponds to 25–30 per cent of mean annual labour earnings of displaced workers before job loss.¹⁷ However, only every third displaced worker (i.e. 159 out of 565 individuals) receives severance payments. Table A8 further shows selected covariates for displaced workers with and without severance payments. In line with Grund (2006), we find that individuals receiving severance payments are, e.g. more often women, have more tenure and work experience, are higher educated, and work in larger firms before job loss.¹⁸

To sum up, job displacement has a strong negative impact on individual earnings, which can be explained both by wage and employment losses. Even though income from self-employment and severance payments have a non-negligible buffering function, workers hardly recover from this shock within the time span considered in our analysis.¹⁹

4.2.2. The added worker effect. Before considering the added worker effect as a buffering channel at the household level in greater detail, we start with an analysis of the losses in gross household income as depicted in Figure 3 (see Tables A9–A12 for complete regression results). In the first year after displacement, we find a gap in gross household income between displaced and non-displaced workers of approximately 5,700 Euros and after five years there remains a loss of approximately 3,100 Euros that is, however, statistically not significant. Other sources of private non-labour income (income from assets, private transfers and private pensions) that are also comprised in gross household income might compensate income losses of displaced workers if these workers have access to such income sources. However, they hardly reduce the income gap between displaced and non-displaced workers, thus suggesting that displaced workers do, indeed, not have access to these additional income sources (results are available on request).

One possible explanation for lower income losses on the household level is an added worker effect, i.e. increased labour supply of the partner or other household members as a reaction to an individual's job loss. We check this hypothesis in two ways. First, we use a very broad definition of the added worker effect re-estimating a regression with the labour income of all other household members but the displaced worker's as dependent variable. Second, we use a more restrictive but more common definition of the added worker effect, analysing female responses to male job loss within couples (married and cohabiting) that live in the same household at the time of job loss (as, e.g. Halla *et al.*, 2018). The estimation results for the first approach, i.e. the broader definition of the added worker effect, are presented in Figure 4, showing that labour income of other household members is approximately 1,000–2,000 Euros higher in the treatment than in the control group already

Figure 3. Household incomes of displaced relative to non-displaced workers over time.



Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level; see Tables A9–A12 for the corresponding regression results.

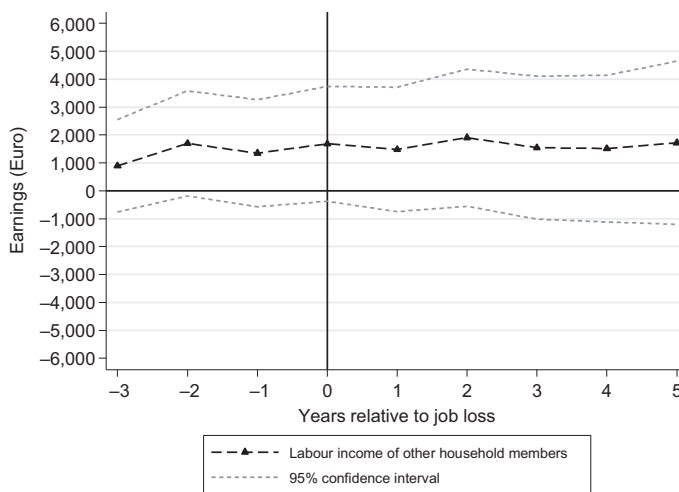
before job loss. However, the difference increases only slightly after job loss and is never statistically significant. Estimation results for the second, more restrictive approach are depicted in Figure 5.²⁰ In line with the results for the broader definition of the added worker effect, labour income of female partners does not increase significantly after job loss.²¹

Our results stand in contrast to findings by Triebe (2015) who finds an added worker effect in Germany using the same data as we do. However, she includes displacements due to various reasons whereas we focus on plant closures only. When we analyse the labour income of female partners of dismissed workers, in contrast, this yields a significant added worker effect of around 1,700–2,100 Euros in all five years after job loss, which is in line with the results by Triebe (2015).

In a related analysis for Austria, Halla *et al.* (2018) find a small added worker effect, and they stress that female labour supply strongly depends on the presence and age of children in the household. To take this issue into account, we re-run the above described regressions separately for three subgroups of households, namely households without children, with children aged 0–7 years, and with children aged above 7 in the year of job loss. This leaves our results for displaced workers unchanged as the added worker effect is insignificant for all subgroups again. For dismissed workers, however, we find that the added worker effect is driven by spouses with young children (i.e. aged 0–7 years at the time of job loss), which is overall in line with the results by Halla *et al.* (2018).

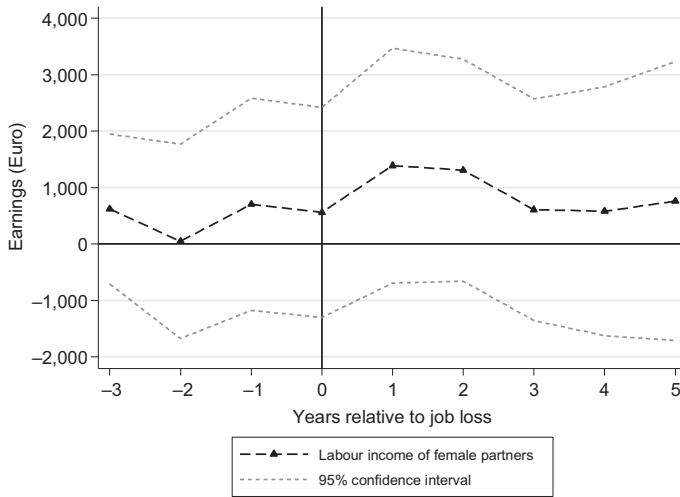
It should generally be noted that the scope for an added worker effect always depends on women's initial level of (full-time) employment. This is due to the fact that, if the partner is already full-time employed, there is, of course, little scope for additional labour

Figure 4. Labour income of other members of displaced worker's households over time, displaced relative to non-displaced workers.



Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; income in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

Figure 5. Labour income of female partners over time, male displaced workers relative to non-displaced workers.



Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; income in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

supply. Figure A4 shows that only every fourth to third female partner has a full-time job, and there is only a very small difference between treatment and control group. There is also no increase observable for the treatment group after job loss. Regarding shares of women in employment in general (i.e. full-time, part-time and marginal employment), there is also hardly any difference.

4.2.3. Redistribution through taxes and transfers. Considering redistribution by the state through income and social security taxes²², Figure 3 reveals that net household income drops by 3,200 Euros in the first year after displacement and by 1,900 Euros after five years. Here again, the coefficients become insignificant in the fifth year after job loss. Hence, compared with gross household income, taxes reduce the income gap between displaced and non-displaced workers by approximately 44 per cent in the short run (i.e. in the year after job loss) and by 41 per cent in the long run (five years after job loss). Distinguishing between income and social security taxes, we find that both kinds of taxes are equally important for buffering income losses of displaced workers on the household level.

Finally, the results for net household income plus state transfers (Figure 3)²³ show even more moderate losses. The positive effect on net household income plus state transfers in the year of displacement can be explained as follows: Remember that there is no reduction in gross household income in the year of displacement. The reason is that displaced workers receive severance payments that reduce the income drop in the displacement year substantially (as shown in our analysis for the individual level, see also Figure A1). In

addition, most displaced workers already receive unemployment benefits in the year of displacement and pay less social security taxes,²⁴ explaining why net household income plus transfers is *ceteris paribus* higher for displaced workers than for their non-displaced counterparts (see Figure A6 for descriptive statistics on taxes and transfers). Overall, there are no statistically significant differences in this income variable between displaced and non-displaced workers after job loss. In absolute numbers, we find the highest but still moderate gap in (approximately 1,300 Euros) in the second year after displacement. In the third year, a process of convergence seems to start and after five years, we observe only an income gap of approximately 900 Euros in net household income plus transfers of displaced workers compared with their non-displaced counterparts.²⁵

In Figure A7, we additionally present results for equivalence weighted household incomes. Equivalence weighting takes differences in household size and composition into account thereby approximating average losses in welfare and living standards of displaced workers and their families. Patterns are very similar to our baseline results, and losses are overall smaller because incomes are rescaled by household size. To be precise, our results for equivalence weighted gross household income reveal an income gap of approximately 4,100 Euros in the year after job loss and this gap reduces to approximately 2,500 Euros after five years. Regarding net household income plus transfers, we find the largest income gap of 1,000 Euros in the third year after job loss and a remaining difference of approximately 900 Euros in $k = 5$.

To sum up, the results for the household level reveal that gross income losses are still substantial and long-lasting. State interventions in terms of redistribution through taxes and transfers reduce the gap in household income between displaced workers and their non-displaced counterparts by approximately 93 per cent in the short run and by 72 per cent in the long run²⁶ and therefore play an important role in compensating the income losses of displaced workers and their families.²⁷

4.3. Heterogeneities and robustness tests

Beyond the results presented above, we have run some further analyses and robustness tests. First, we run our analyses for workers who lost their job due to dismissals that are potentially related to workers' performance or behaviour. Results are depicted in Figures A8 and A9. The distinction between displacements and dismissals is important because Gibbons and Katz (1991) find that dismissed workers have higher earnings losses than workers displaced due to plant closures. They argue that this is due to stigma effects that might occur because dismissed workers are assumed to be selected based on their ability whereas this type of within-plant selectivity is not possible in case of plant closures. Grund (1999), however, does not find differences in wage losses of dismissed workers and those affected by plant closures at all. Krashinsky (2002) argues that there is no stigmatization of dismissed workers because differences in earnings losses vanish once it is controlled for firm size. Our results show that income trajectories of dismissed workers are overall very similar to the baseline results for displaced workers. On the individual level, losses are higher for dismissed than for displaced workers in the very short run. This finding might be driven by firm size because small plants have a higher probability to exit (e.g. Fackler *et al.*, 2013), and they also pay lower wages, but in the longer run, individual earnings losses are almost identical to our baseline results. Regarding the role of buffering channels on the individual level, self-employment seems to play a slightly more important role for dismissed than for displaced workers whereas severance payments do not have a large

impact for the former group. Accordingly, dismissed workers in our sample are less likely to receive severance payments than displaced workers or receive severance payments of lower amounts, which is exactly in line with findings by Grund (2006). On the household level, we also find overall higher income losses (in particular in the short run) for dismissed workers, and losses are also throughout significant. The patterns, however, look very similar to our baseline results. Hence, it can be concluded that the main insights from our baseline analyses also hold for dismissed workers.

Second, we run separate regressions for male and female job loss because results might differ due to potential differences in wage levels and labour supply (results for this and the remaining robustness tests are available on request). Both on the individual level and on the household level, we find very similar patterns for displaced men and women. Third, we imposed a restriction on firm tenure of minimum two years at the time of job loss to see whether our implications change if we focus on higher-tenured workers as it is common in the job displacement literature. For higher-tenure workers, it is generally much more likely that they would have stayed at their employers in the absence of plant closures. Losses are overall slightly higher if we focus on higher-tenured workers, but patterns are, again, very similar to our baseline results both on the individual and on the household level.

Fourth, we address the problem that job losses due to plant closures might be anticipated by affected plants' work forces allowing employees to strategically react to an upcoming displacement event by leaving their firm before it finally closes down. In this context, Schwerdt (2011) finds that so-called 'early leavers', i.e. those workers who leave closing plants already before the final shutdown, have better post-displacement outcomes than those who stay until the end. Accordingly, this implies that those who stay until the end are a rather selective group of low ability workers, which is why studies that use linked employer–employee data often include early leavers in the group of displaced workers. As this is not possible with our data, we address this aspect by making use of a question included in the SOEP that asks individuals about their self-assessed job security and re-estimate our baseline models distinguishing expected and unexpected job losses. Overall, individuals who expected the job loss have higher individual earnings losses than those who did not see the job loss coming. Higher income losses in case of expected job loss are also observable at the household level. We further conducted an analysis of the added worker effect differentiated by expected and unexpected job loss. This allows checking whether other household members in general and female partners of male displaced workers in particular show stronger reactions if they see the job loss coming. This should be reflected in increased labour incomes of other household members and female partners' labour incomes who anticipated the job loss in contrast to those who did not anticipate it. Overall, we do not find a positive effect of anticipation neither on labour income of other household members nor on female partners' labour income of male displaced workers, thus suggesting that there is no added worker effect even for expected job losses.

Finally, we re-run our baseline regressions excluding certain groups of workers to make sure that our results are not driven by particularly disadvantaged subgroups, i.e. old and low educated workers. Our estimation results show that, as expected, losses in both individual and household income are slightly lower when we exclude workers who are older than 50 years in the year before displacement. Potential reasons are that older workers have more tenure, and therefore, more specific human capital that suddenly becomes worthless. In addition, older workers have lower re-employment probabilities (Dietz and Walwei, 2011) and are at higher risk to end up in long-term unemployment after job loss (Oesch and Baumann, 2015). Next, we exclude those individuals with the lowest level of education

(i.e. general elementary schooling) in the year before displacement. Results show overall very similar losses both in individual earnings and in household incomes suggesting that low educated workers do not particularly drive our results.

5. Conclusion

Using household survey data from the German Socio-Economic Panel (SOEP), this paper investigates the impact of job displacement on individual and household income of affected workers and their families. On the individual level, we find substantial and rather persistent earnings losses of displaced workers compared with their non-displaced counterparts that can be explained by both losses in wages and in employment. Furthermore, our results reveal that income from self-employment slightly reduces individual earnings losses. Severance payments buffer the earnings drop considerably in the year of displacement and slightly one year later, but are only received by every third displaced worker and — as expected — have no impact in the longer run. However, even when these additional income sources are considered, there is still only limited convergence observable because the earnings gap between displaced and non-displaced workers is only reduced by approximately one half within five years after displacement. This indicates that job displacement has a severe and long-lasting negative impact on earnings trajectories of affected individuals. These results for the individual level are in line with the bulk of previous literature showing that involuntary job loss causes severe and persistent individual earnings losses (e.g. Jacobson *et al.*, 1993; Couch and Placzek, 2010 for the United States; Upward and Wright, 2019 for the UK; Schmieder *et al.*, 2010, for Germany).

Looking at the household level reveals substantial and rather persistent losses in gross household income. With respect to the added worker effect, we find no statistically significant evidence for increased labour incomes of other household members or the female partners of displaced male workers. This is in line with some previous studies that do not find the added worker effect to be an important channel of compensation (see, e.g. Eliason, 2011; Hardoy and Schöne, 2014; Hilger, 2016). For dismissed workers, however, we find an added worker effect, which is in line with previous evidence for Germany (e.g. Triebe, 2015).

Estimates for net household income show that redistribution by the state through income and social security taxes considerably reduces the income gap after involuntary job loss. Finally, when we look at net household income plus transfers, we find that state transfers further reduce the remaining income gap between displaced and non-displaced workers substantially. In total, redistribution by the state reduces the gap in household income between displaced workers and their non-displaced counterparts by approximately 93 per cent in the short run (i.e. the first year after displacement) and by 72 per cent in the long run (five years after displacement). Of course, the buffering channels of some income sources considered in our study are somewhat mechanical. Nevertheless, we provide new evidence on their extent and persistence. When interpreting the results, one must further take into account that our estimates are rather imprecise because the number of observations in our analyses is much smaller than in studies using administrative data.

To sum up, our results reveal that the German tax and transfer system substantially mitigates income losses of families affected by job displacement whereas individual reactions contribute only little to the compensation of the earnings losses after job displacement. Despite the finding that the state considerably reduces income losses of displaced workers, it should also be noted that job loss has severe negative effects on non-monetary outcomes

as well. Moreover, one has to keep in mind that redistribution and transfers by the state may affect individual job search behaviour. Future research should therefore investigate the effects of compensation by the state in greater detail.

Notes

¹With respect to the role of the state, we distinguish the effects of income taxes, social security taxes, and state transfers such as unemployment benefits and social assistance.

²Recent surveys of the literature on the consequences of job displacement are provided by Brand (2015), the OECD (2013), and von Wachter (2010). An overview of the theoretical reasons for income losses after job displacement is provided by Carrington and Fallick (2017).

³Note that Couch (2001) considers only workers who are subsequently re-employed after displacement, which causes earnings losses to be comparably low.

⁴The comparably low wage losses found by Bender *et al.* (2002) might be due to problems regarding the identification of job displacements. In particular, they identified plant closures only via disappearing plant IDs, which might also occur, for instance, due to changes of ownership or legal form.

⁵In particular, we use the Socio-Economic Panel (SOEP), data for years 1984–2016, version 33.1, SOEP, 2016, 10.5684/soep.v33.1. For more detailed information on the SOEP, see Wagner *et al.* (2007).

⁶Note that many questions in the SOEP, such as earnings or time spent in, e.g. employment or unemployment, refer to the year preceding the interview. Concerning the recording of job changes, individuals can indicate that the job change occurred in the previous year or in the year when the interview was conducted. Accordingly, it can occur that job displacements refer to the year of the interview whereas information on incomes and earnings refers to the previous year. We account for this problem by recoding the displacement year in such a way that all relevant variables refer to the year preceding the interview.

⁷In the literature using administrative data, separations due to mass layoffs are often used to measure job displacement. In the SOEP, however, job losses due to mass layoff cannot be identified, which is why we only consider displacements due to plant closure.

⁸Because information on plant closures is lacking in the SOEP waves 1999 and 2000, we have to exclude these two displacement cohorts.

⁹The construction of our sample is similar to several previous papers about the consequences of job displacement (e.g. Davis and von Wachter, 2011; Huttunen *et al.*, 2018; Krolikowski, 2018).

¹⁰Note that we do not restrict age from below in our sample. However, only less than 1% of individuals are aged 22 or less in the year of displacement and only 5% are younger than 25 in that year.

¹¹More specifically, the covariates for the computation of the propensity score include age, age squared, gender, marital status, number of children, household size, an indicator for living in an urban or rural area and the federal state someone is currently living in, level of education, work experience in full-time and part-time employment, work experience in full-time and part-time employment squared, years of unemployment, years of unemployment squared, firm tenure, firm tenure squared, 2-digit industry, ISCO 2-digit occupations, and firm size.

¹²It should be noted that the number of displaced workers in our sample is lower than in some other surveys mainly because our analysis is restricted to plant closures. Other surveys like the Displaced Workers Survey (DWS) or the Survey of Income and Program Participation (SIPP) include more nuanced differentiations of job losses than the SOEP, which makes it possible to include further job losses that are unrelated to worker performance.

¹³The standardised bias (SB) for the matched sample is calculated as follows:

$$SB = 100 * \frac{X_{1M} - X_{0M}}{\sqrt{0.5 * (V_{1M}(X) + V_{0M}(X))}}$$
 where X_{1M} (V_{1M}) is the mean (variance) for the treatment group in the matched sample and X_{0M} (V_{0M}) the mean (variance) of the control group in the matched sample

(see, e.g., Caliendo and Kopeinig, 2008, p. 48). Caliendo and Kopeinig (2008) further state that a standardized bias below 5% can be regarded as sufficient. More detailed results of the balancing tests are available on request.

¹⁴The percentage loss for each year relative to displacement is obtained by dividing the absolute income loss of the treatment group (given by δ_k) by the income of the control group in the respective year k , which is given by the sum of the respective γ_k coefficient and the intercept. More formally, the percentage loss is given by $\delta_k/(\gamma_k + \text{intercept}) * 100\%$.

¹⁵Note that the self-employment share is zero in the year prior to displacement because we dropped workers reporting self-employment as their main job before displacement. In contrast, receiving income from self-employment may also indicate self-employment as a side job.

¹⁶Turning a self-employed side job into a main job after job loss could be one explanation for the buffering function of self-employment if displaced workers had self-employed side jobs more frequently than non-displaced workers before job loss. The results in Figure A3, however, do not support this conjecture.

¹⁷Severance payments are unequally distributed with few very high payments so that the mean amounts to approximately 26,000 Euros in our sample. The incidence we find is in line with Grund (2006) who also uses the SOEP. However, the amount of severance payments in our study is higher. Reasons for this difference are the different time spans and the fact that we only look at collective displacements that are usually accompanied by higher severance payments than individual dismissals.

¹⁸In this context, Flaaen *et al.* (2019) report that the bulk of workers who receive severance payments separate from their employers due to economic distress and only very few workers report quits. By focusing on workers reporting separations due to plant closures, we ensure that all workers in our treatment group separate due to economic distress.

¹⁹We further evaluated the statistical significance of the buffering effect of each additional income source, which reveals that self-employment significantly reduces the income loss in the second year after job loss only and severance payments in the year of job loss and one year thereafter. Results are available on request.

²⁰Descriptive statistics on earnings of female partners are depicted in Figure A5.

²¹In Germany, unemployment insurance benefits usually expire after one year of unemployment. Older workers may be entitled to longer benefit receipt (the precise legislation has changed several times during the observation period). After the expiration of unemployment insurance benefits, means tested benefits are provided that are usually substantially lower, but paid for an unlimited time period. Hence, it could be expected that an added worker effect starts to come into effect one year after job loss if the affected worker has not managed to find new employment at that time. However, our results in Figures 4 and 5 do not point to any to any relationship between the expiration of unemployment insurance benefits and an added worker effect.

²²The average amounts of taxes and state transfers for displaced and non-displaced workers are depicted in Figure A6. It should be noted that public transfers also comprise benefits that are not related to non-employment such as child allowances or parental allowances.

²³Besides unemployment benefits and social assistance, state transfers further include, e.g. housing allowances, child and maternity benefits, and student assistance.

²⁴Note that severance payments are not subject to social security taxes in Germany.

²⁵The finding that state transfers play an important role in buffering earnings losses after job loss at first sight stands in contrast to Schmieder *et al.* (2010) who find that unemployment benefits only play a minor role in compensating earnings losses after job loss in Germany. However, they only look at individual gross labour earnings and unemployment insurance benefits that are paid for a limited time. In our analysis, we additionally consider redistribution through taxes as well as all kinds of state transfers in addition to unemployment insurance benefits, which can explain these different findings.

²⁶These figures are obtained by dividing the loss in net household income plus transfers by the loss in gross household income.

²⁷ Evaluating the statistical significance of the buffering effects reveals that income taxes do not significantly reduce the income gap of displaced workers. Social security taxes and state transfers, in contrast, significantly reduce the income gap of displaced workers in the short run and in the long run. Results are available on request.

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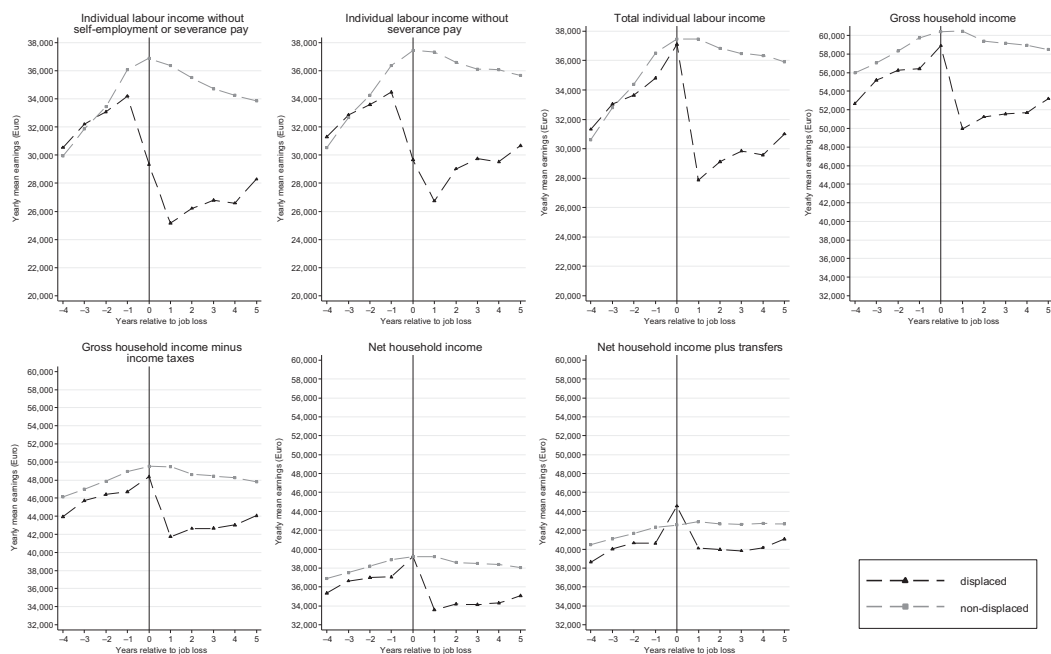
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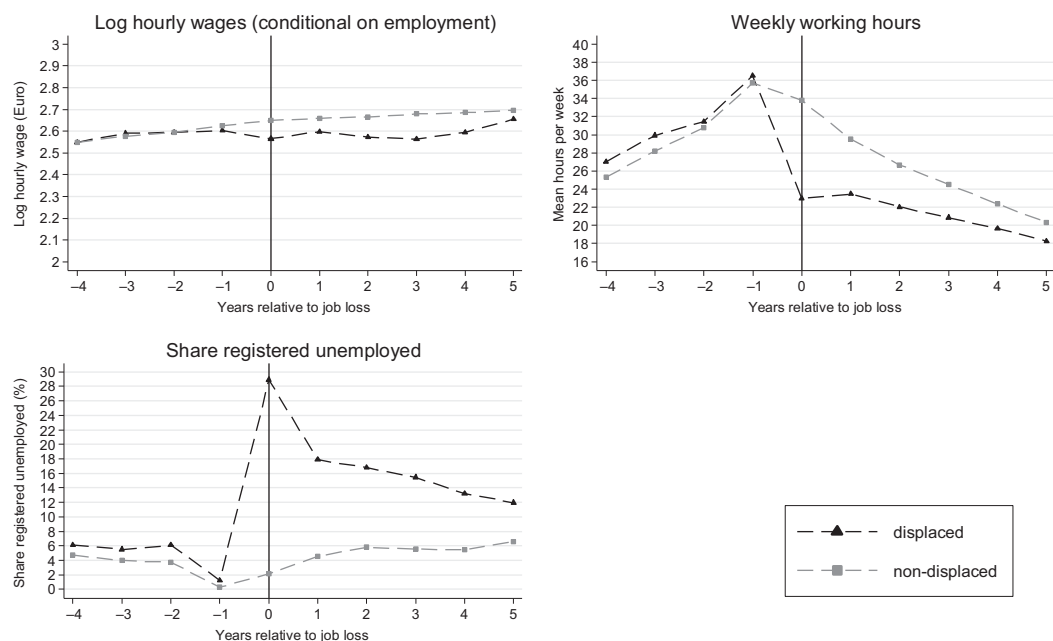
Appendix

Figure A1. Incomes (means) of displaced and non-displaced workers over time (matched sample).



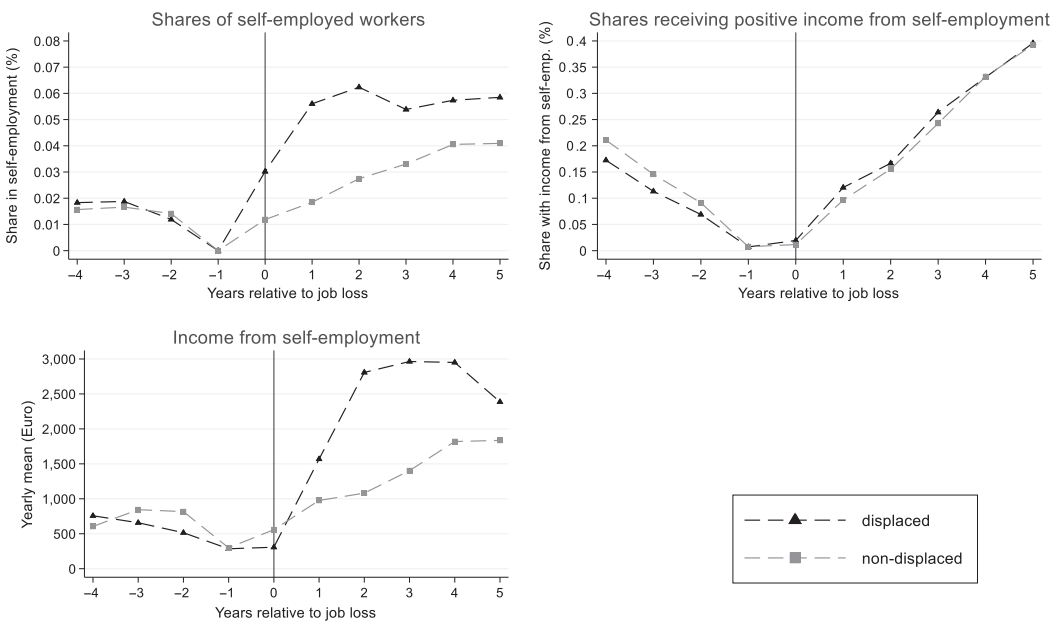
Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; incomes in Euro deflated to prices in 2010.

Figure A2. Wages, working hours, and unemployment shares (means) of displaced and non-displaced workers over time (matched sample).



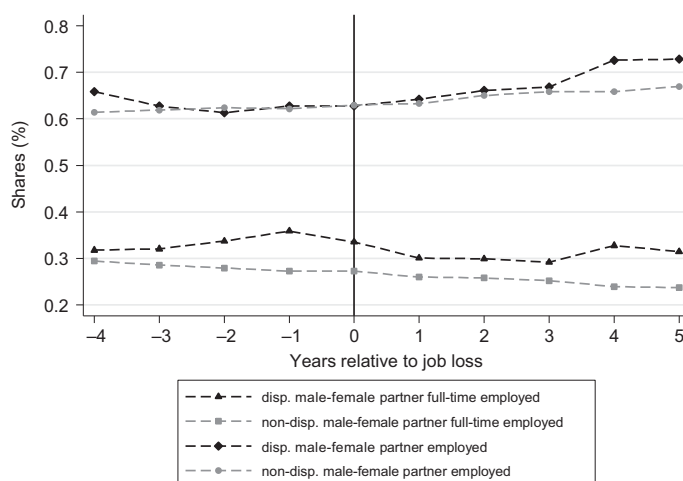
Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; log wages in Euro deflated to prices in 2010.

Figure A3. Self-employment (means) for displaced and non-displaced workers over time (matched sample).



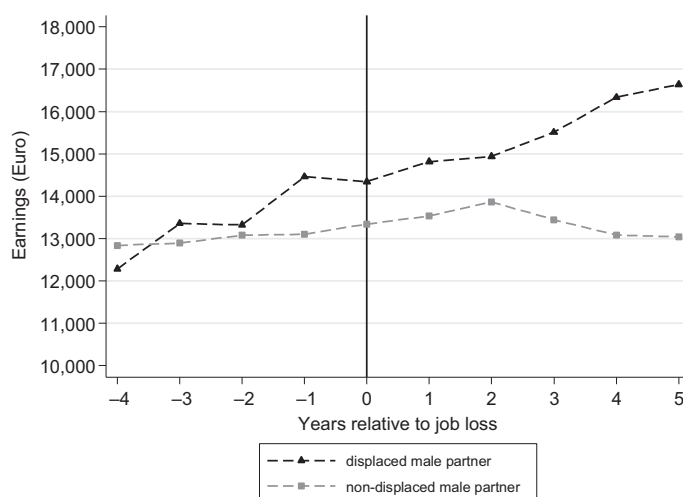
Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; income in Euro deflated to prices in 2010; shares of workers in self-employment refer to workers who indicate self-employment as their main job; shares receiving positive income from self-employment refer to all workers who earn money from self-employed main or side jobs; income from self-employment is the amount of money earned from self-employed main or side jobs.

Figure A4. Employment shares of female partners (means) of displaced and non-displaced workers over time (matched sample).



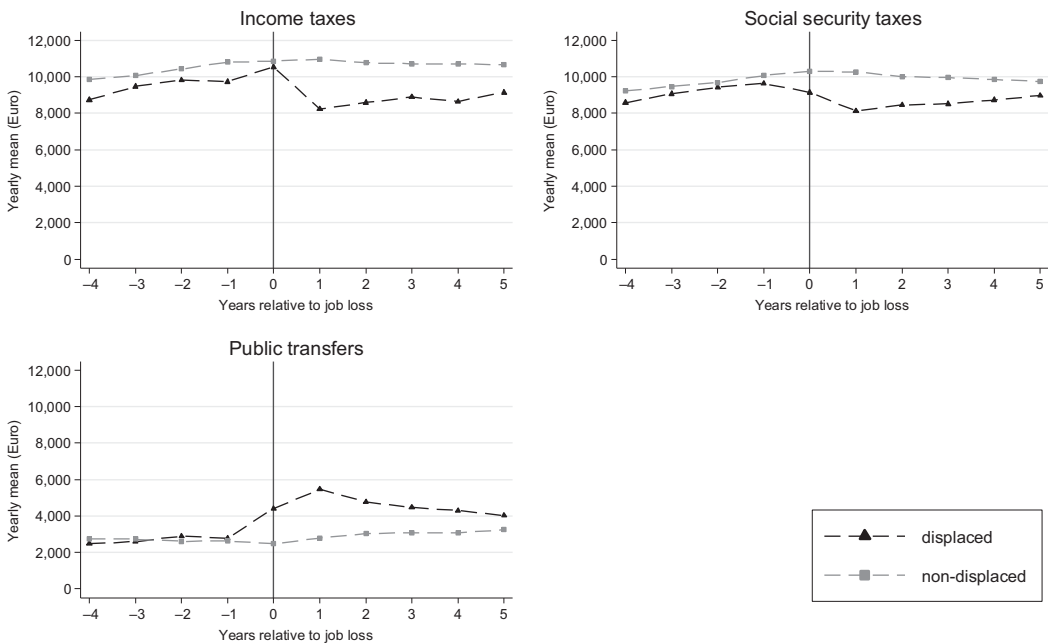
Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to female partners of male full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$.

Figure A5. Labour income (means) of female partners of displaced and non-displaced workers over time (matched sample).



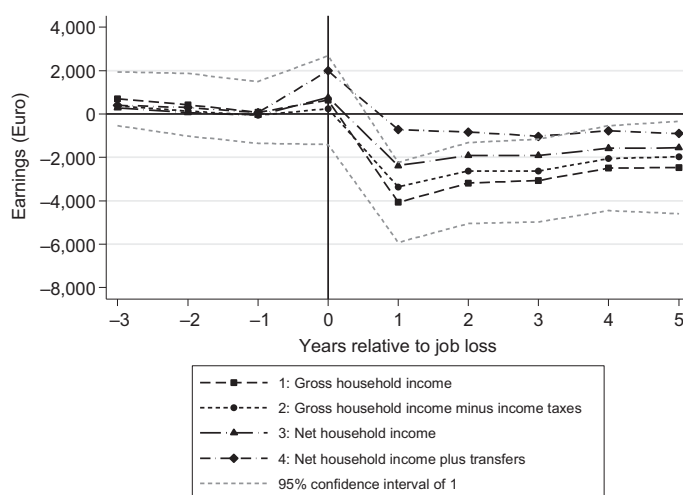
Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to female partners of male full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; income in Euro deflated to prices in 2010.

Figure A6. Taxes and transfers (means) of displaced and non-displaced workers over time (matched sample).



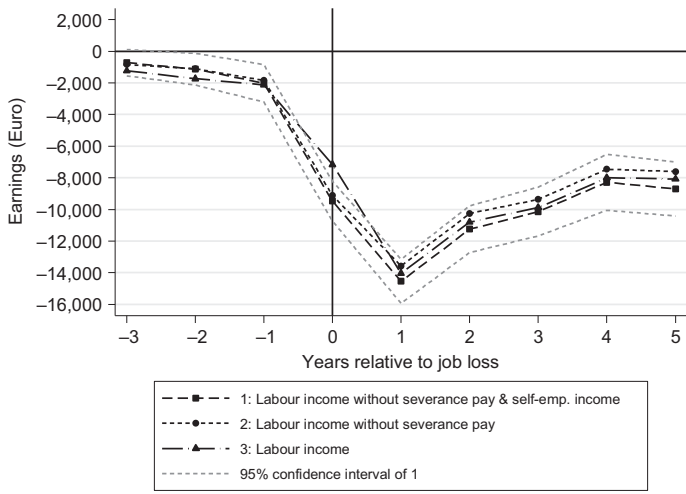
Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; taxes and state transfers in Euro deflated to prices in 2010.

Figure A7. Equivalence weighted household incomes of displaced relative to non-displaced workers over time.



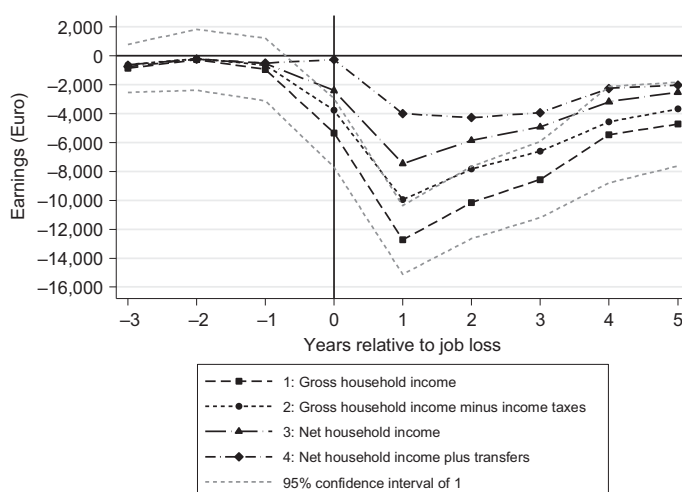
Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level; equivalence weighted income using the OECD-modified equivalence scale.

Figure A8. Individual labour incomes of dismissed relative to non-dismissed workers over time.



Notes: Fixed effects estimates, estimating equation as described in Section 4.1; dismissal cohorts 1991–2011, job loss due to layoff; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample of 1,178 dismissed and 8,728 non-dismissed workers; incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

Figure A9. Household incomes of dismissed relative to non-dismissed workers over time.



Notes: Fixed effects estimates, estimating equation as described in Section 4.1; dismissal cohorts 1991–2011, job loss due to layoff; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample of 1,178 dismissed and 8,728 non-dismissed workers; incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

Table A1. Number of displaced and non-displaced individuals over time (matched sample)

Years before/after displacement	Displaced individuals	Non-displaced individuals
$k = -4$	386	4,254
$k = -3$	428	4,607
$k = -2$	506	4,917
$k = -1$	565	5,316
$k = 0$	565	5,316
$k = 1$	486	4,875
$k = 2$	441	4,585
$k = 3$	411	4,147
$k = 4$	367	3,691
$k = 5$	307	3,361

Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$.

Table A2. Effects of job loss on individual labour income without income from self-employment and severance pay

<i>Years before/after displacement</i>	<i>Coefficient</i>	<i>t-value</i>	<i>95% Conf. interval</i>	
3 years before*displaced	76.74	0.14	−998.66	1,152.14
2 years before*displaced	−223.04	−0.29	−1,745.61	1,299.53
1 year before*displaced	−1,418.81*	−1.77	−2,993.97	156.35
Year of displacement*displaced	−7,011.85***	−7.93	−8,745.77	−5,277.92
1 year after*displaced	−10,066.13***	−9.72	−12,097.40	−8,034.85
2 years after*displaced	−8,824.55***	−7.83	−11,034.83	−6,614.27
3 years after*displaced	−7,737.50***	−7.03	−9,896.81	−5,578.19
4 years after*displaced	−7,266.17***	−5.94	−9,663.83	−4,868.52
5 years after*displaced	−5,967.59***	−4.39	−8,630.49	−3,304.69
3 years before	1,149.67***	5.72	755.36	1,543.98
2 years before	2,391.22***	8.76	1,856.11	2,926.33
1 year before	4,636.08***	14.33	4,001.87	5,270.29
Year of non-displacement	5,235.78***	14.26	4,515.87	5,955.69
1 year after	4,317.85***	10.19	3,487.22	5,148.47
2 years after	3,486.69***	7.27	2,546.46	4,426.93
3 years after	2,917.55***	5.16	1,808.66	4,026.45
4 years after	2,764.02***	4.15	1,457.90	4,070.15
5 years after	2,655.79***	3.44	1,143.68	4,167.89
age ²	−31.94***	−4.02	−47.51	−16.36
age ³	−0.023	−0.06	−0.55	0.51
age ⁴	−0.05**	−2.52	−0.09	−0.01
Constant	34,953***	49.88	33,579.25	36,326.74
No. of observations	49,531			
No. of groups	5,881			
R ²	0.0408			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A3. Effects of job loss on individual labour income without severance pay

<i>Years before/after displacement</i>	<i>Coefficient</i>	<i>t-value</i>	<i>95% Conf. interval</i>	
3 years before*displaced	−300.21	−0.56	−1,345.85	745.44
2 years before*displaced	−857.15	−1.13	−2,342.83	628.53
1 year before*displaced	−1,582.19**	−2.04	−3,103.88	−60.49
Year of displacement*displaced	−7,443.58***	−8.79	−9,103.04	−5,784.12
1 year after*displaced	−9,834.20***	−10.16	−11,731.4	−7,936.96
2 years after*displaced	−7,299.89***	−7.24	−9,277.14	−5,322.63
3 years after*displaced	−6,409.16***	−6.02	−8,495.56	−4,322.77
4 years after*displaced	−6,541.69***	−6.24	−8,596.13	−4,487.24
5 years after*displaced	−5,896.49***	−5.01	−8,204.09	−3,588.90
3 years before	1,425.27***	6.50	995.58	1,854.97
2 years before	2,713.45***	9.67	2,163.19	3,263.70
1 year before	4,422.15***	13.73	3,790.78	5,053.51
Year of non-displacement	5,375.01***	15.31	4,686.91	6,063.12
1 year after	4,993.96***	12.41	4,204.87	5,783.06
2 years after	4,330.76***	9.36	3,424.11	5,237.41
3 years after	4,215.40***	7.82	3,158.67	5,272.14
4 years after	4,525.77***	7.03	3,264.39	5,787.14
5 years after	4,659.37***	6.54	3,263.47	6,055.27
age ²	−31.07***	−4.39	−44.96	−17.19
age ³	−0.30	−1.14	−0.80	0.21
age ⁴	−0.05***	−3.09	−0.09	−0.02
Constant	35,430.37***	60.92	34,290.13	36,570.61
No. of observations	49,531			
No. of groups	5,881			
R ²	0.0339			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A4. Effects of job loss on individual labour income

<i>Years before/after displacement</i>	Coefficient	t-value	95% Conf. interval	
3 years before*displaced	128.09	0.22	−1,026.42	1,282.60
2 years before*displaced	−403.03	−0.51	−1,956.33	1,150.27
1 year before*displaced	−954.99	−1.15	−2,578.22	668.23
Year of displacement*displaced	457.15	0.25	−3,156.23	4,070.53
1 year after*displaced	−8,000.44***	−6.87	−10,283.48	−5,717.40
2 years after*displaced	−6,882.31***	−6.34	−9,011.97	−4,752.65
3 years after*displaced	−6,183.32***	−5.62	−8,340.20	−4,026.43
4 years after*displaced	−6,017.78***	−5.3	−8,242.20	−3,793.37
5 years after*displaced	−4,965.37***	−4.00	−7,398.40	−2,532.35
3 years before	1,526.14***	6.90	1,092.43	1,959.84
2 years before	2,874.85***	9.99	2,310.55	3,439.14
1 year before	4,673.81***	13.85	4,012.39	5,335.23
Year of non-displacement	5,519.47***	14.95	4,795.71	6,243.23
1 year after	5,286.48***	12.39	4,449.68	6,123.28
2 years after	4,752.49***	9.59	3,780.54	5,724.43
3 years after	4,771.58***	7.54	3,531.65	6,011.50
4 years after	5,036.92***	7.33	3,689.90	6,383.94
5 years after	5,164.30***	6.83	3,680.94	6,647.67
age ²	−33.03***	−4.55	−47.28	−18.79
age ³	−0.41	−1.49	−0.95	0.13
age ⁴	−0.05***	−2.56	−0.08	−0.01
Constant	35,081.63***	51.91	33,756.78	36,406.47
No. of observations	49,531			
No. of groups	5,881			
R ²	0.0285			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A5. Effects of job loss on log hourly wages

<i>Years before/after displacement</i>	Coefficient	t-value	95% Conf. interval	
3 years before*displaced	−0.0041	−0.17	−0.0520	0.0438
2 years before*displaced	−0.0184	−0.84	−0.0616	0.0247
1 year before*displaced	−0.0307	−1.25	−0.0788	0.0175
Year of displacement*displaced	−0.0924***	−3.48	−0.1445	−0.0403
1 year after*displaced	−0.0887***	−2.94	−0.1479	−0.0296
2 years after*displaced	−0.1084***	−3.47	−0.1696	−0.0471
3 years after*displaced	−0.1378***	−4.63	−0.1961	−0.0794
4 years after*displaced	−0.1084***	−3.47	−0.1697	−0.0472
5 years after*displaced	−0.0742**	−2.43	−0.1341	−0.0144
3 years before	0.0166**	2.46	0.0034	0.0299
2 years before	0.0284***	3.65	0.0131	0.0436
1 year before	0.0536***	6.13	0.0365	0.0708
Year of non-displacement	0.0645***	6.56	0.0453	0.0838
1 year after	0.0513***	4.56	0.0293	0.0733
2 years after	0.0388***	3.15	0.0147	0.0630
3 years after	0.0398***	2.86	0.0125	0.0672
4 years after	0.0383**	2.55	0.0089	0.0677
5 years after	0.0428**	2.54	0.0097	0.0758
age ²	−0.0001	−0.36	−0.0004	0.0003
age ³	0.0000***	6.85	0.0000	0.0001
age ⁴	−0.0000***	−4.92	−0.0000	−0.0000
Constant	2.6579***	186.54	2.6299	2.6858
No. of observations	45,763			
No. of groups	5,878			
R ²	0.1027			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A6. Effects of job loss on weekly working hours

<i>Years before/after displacement</i>	Coefficient	t-value	95% Conf. interval	
3 years before*displaced	−0.0318	−0.04	−1.5063	1.4427
2 years before*displaced	−0.7026	−0.77	−2.4978	1.0925
1 year before*displaced	0.2449	0.29	−1.4333	1.9231
Year of displacement*displaced	−11.3345***	−10.26	−13.4994	−9.1696
1 year after*displaced	−7.2372***	−6.49	−9.4240	−5.0505
2 years after*displaced	−6.6696***	−5.71	−8.9585	−4.3807
3 years after*displaced	−6.0097***	−5.01	−8.3619	−3.6575
4 years after*displaced	−5.8811***	−4.94	−8.2138	−3.5483
5 years after*displaced	−4.6694***	0	−2.1409	2.1409
3 years before	1.0134***	4.2	0.5409	1.4860
2 years before	2.1408***	7.35	1.5699	2.7117
1 year before	4.7926***	13.98	4.1206	5.4646
Year of non-displacement	2.9358***	7.6	2.1780	3.6936
1 year after	1.4338***	3.24	0.5671	2.3006
2 years after	0.3709	0.74	−0.6166	1.3585
3 years after	−0.0277	−0.05	−1.1469	1.0916
4 years after	−0.2955	−0.46	−1.5623	0.9713
5 years after	−0.7704	−1.07	−2.1866	0.6459
age ²	0.0068	8.50	−0.0089	0.0225
age ³	−0.0010***	−3.66	−0.0015	−0.0004
age ⁴	−0.0001***	−3.53	−0.0001	−0.0000
Constant	31.3534***	48.59	30.0883	32.6184
No. of observations	49,531			
No. of groups	5,881			
R ²	0.0292			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A7. Effects of job loss on the probability to be registered unemployed

<i>Years before/after displacement</i>	Coefficient	t-value	95% Conf. interval	
3 years before*displaced	−0.0025	−0.18	−0.0294	0.0244
2 years before*displaced	−0.0009	−0.05	−0.0335	0.0317
1 year before*displaced	−0.0099	−0.71	−0.0377	0.0177
Year of displacement*displaced	0.2451***	11.35	0.2027	0.2874
1 year after*displaced	0.1140***	5.31	0.0719	0.1561
2 years after*displaced	0.0944***	4.47	0.0530	0.1358
3 years after*displaced	0.0831***	3.89	0.0413	0.1250
4 years after*displaced	0.0610***	2.92	0.0200	0.1020
5 years after*displaced	0.0378*	1.68	−0.0064	0.0819
3 years before	−0.0083**	−2.14	−0.0157	−0.0007
2 years before	−0.0138***	−3.02	−0.0227	−0.0048
1 year before	−0.0530***	−10.98	−0.0625	−0.0436
Year of non-displacement	−0.0355***	−6.18	−0.0468	−0.0243
1 year after	−0.0153**	−2.23	−0.0288	−0.0018
2 years after	−0.0063	−0.78	−0.0221	0.0095
3 years after	−0.0131	−1.41	−0.0314	0.0051
4 years after	−0.0193*	−1.78	−0.0405	0.0020
5 years after	−0.0159	−1.25	−0.0409	0.0091
age ²	0.0001	1.03	−0.0001	0.0004
age ³	0.0000***	2.93	0.0000	0.0000
age ⁴	0.0000	1.46	−0.0000	0.0000
Constant	0.0508***	4.74	0.0298	0.0718
No. of observations	49,652			
No. of groups	5,881			
R ²	0.0290			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A8. Means of selected variables for displaced workers with and without receiving severance payments after job loss

	Severance payments		No severance payments	
	Mean	Std. Dev.	Mean	Std. Dev.
Age	39.9245	8.9347	37.6256	9.1102
Female	0.3648	0.4829	0.2759	0.4475
Firm tenure (years)	10.3478	8.8583	6.6443	7.8261
Job experience (years)	17.1535	9.4575	14.5852	9.1202
Unemployment experience (years)	0.3906	1.0086	0.6549	1.4457
Firm size (dummies)				
≤20	0.0943	0.2932	0.3892	0.4882
21–199	0.3836	0.4878	0.3276	0.4699
200–1,999	0.2642	0.4423	0.1158	0.3203
2,000 or more	0.2453	0.4316	0.1478	0.3553
Level of education (dummies)				
General Elementary	0.1572	0.3652	0.1281	0.3346
Middle Vocational	0.4591	0.4999	0.5813	0.4940
Vocational training plus high school diploma	0.0629	0.2435	0.0640	0.2451
Higher Vocational	0.0881	0.2843	0.0665	0.2495
Higher Education	0.1698	0.3767	0.1133	0.3174
Number of observations	159		406	

Notes: Displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to displaced workers with and without severance payments who are full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; displacements due to firm closure; all variables refer to the year before displacement.

Table A9. Effects of job loss on gross household income

<i>Years before/after displacement</i>	Coefficient	t-value	95% Conf. interval	
3 years before*displaced	1,595.33	1.42	−605.44	3,796.11
2 years before*displaced	1,789.77	1.34	−828.72	4,408.26
1 year before*displaced	751.66	0.58	−1,810.56	3,313.89
Year of displacement*displaced	2,650.71	1.30	−1,348.00	6,649.42
1 year after*displaced	−5,700.89***	−3.46	−8,932.49	−2,469.29
2 years after*displaced	−4,774.01***	−2.93	−7,966.98	−1,581.05
3 years after*displaced	−4,345.63**	−2.54	−7,697.12	−994.15
4 years after*displaced	−4,051.16**	−2.34	−7,445.31	−657.01
5 years after*displaced	−3,123.80	−1.64	−6,860.62	613.01
3 years before	1,401.34**	2.03	47.89	2,754.78
2 years before	3,195.73***	4.17	1,692.64	4,698.82
1 year before	5,094.79***	6.09	3,454.87	6,734.71
Year of non-displacement	6,311.21***	7.17	4,584.43	8,037.99
1 year after	6,559.10***	6.62	4,615.31	8,502.90
2 years after	6,230.85***	5.98	4,187.12	8,274.58
3 years after	6,468.64***	5.43	4,131.57	8,805.71
4 years after	7,312.96***	5.87	4,869.30	9,756.62
5 years after	8,073.20***	5.94	5,410.24	10,736.16
age ²	−15.15	−1.17	−40.58	10.28
age ³	−2.84***	−6.72	−3.67	−2.01
age ⁴	−0.02	−0.64	−0.09	0.05
Constant	53,449.24***	52.85	51,466.55	55,431.93
No. of observations	49,531			
No. of groups	5,881			
R ²	0.0042			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A10. Effects of job loss on gross household income minus income taxes

<i>Years before/after displacement</i>	<i>Coefficient</i>	<i>t-value</i>	<i>95% Conf. interval</i>	
3 years before*displaced	909.09	1.17	−619.31	2,437.49
2 years before*displaced	1,046.62	1.11	−808.53	2,901.77
1 year before*displaced	436.27	0.46	−1,420.78	2,293.31
Year of displacement*displaced	1,544.18	1.22	−937.13	4,025.49
1 year after*displaced	−4,732.48***	−4.01	−7,043.55	−2,421.41
2 years after*displaced	−3,912.72***	−3.27	−6,256.51	−1,568.93
3 years after*displaced	−3,767.23***	−3.01	−6,224.72	−1,309.75
4 years after*displaced	−3,256.21**	−2.55	−5,761.21	−751.20
5 years after*displaced	−2,421.84*	−1.72	−5,174.51	330.82
3 years before	1,221.34***	2.93	403.75	2,038.93
2 years before	2,619.78***	5.41	1,670.26	3,569.30
1 year before	4,154.53***	7.55	3,075.39	5,233.66
Year of non-displacement	5,234.74***	8.71	4,055.96	6,413.52
1 year after	5,381.30***	7.91	4,048.10	6,714.49
2 years after	5,103.40***	6.99	3,671.17	6,535.62
3 years after	5,337.67***	6.49	3,724.28	6,951.06
4 years after	5,962.02***	6.71	4,218.93	7,705.10
5 years after	6,514.79***	6.71	4,611.06	8,418.51
age ²	−6.10	−0.61	−25.75	13.55
age ³	−2.28***	−7.03	−2.92	−1.65
age ⁴	−0.02	−0.81	−0.07	0.03
Constant	43,643.77***	59.02	42,193.91	45,093.63
No. of observations	49,531			
No. of groups	5,881			
R ²	0.0039			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A11. Effects of job loss on net household income

<i>Years before/after displacement</i>	<i>Coefficient</i>	<i>t-value</i>	<i>95% Conf. interval</i>	
3 years before*displaced	751.22	1.09	−604.93	2,107.37
2 years before*displaced	807.47	0.98	−811.40	2,426.34
1 year before*displaced	365.49	0.45	−1,234.24	1,965.23
Year of displacement*displaced	2,201.35	1.91	−60.98	4,463.69
1 year after*displaced	−3,223.56***	−3.18	−5,212.11	−1,235.00
2 years after*displaced	−2,811.73***	−2.77	−4,801.90	−821.57
3 years after*displaced	−2,679.15**	−2.47	−4,805.42	−552.87
4 years after*displaced	−2,471.67**	−2.24	−4,638.38	−304.97
5 years after*displaced	−1,861.35	−1.51	−4,274.18	551.49
3 years before	976.69**	2.47	200.94	1,752.43
2 years before	2,089.27***	4.66	1,210.17	2,968.37
1 year before	3,147.71***	6.28	2,165.06	4,130.36
Year of non-displacement	3,929.76***	7.29	2,873.09	4,986.42
1 year after	4,132.49***	6.77	2,936.06	5,328.93
2 years after	4,005.93***	6.16	2,731.87	5,279.98
3 years after	4,251.01***	5.78	2,809.67	5,692.36
4 years after	4,856.69***	6.17	3,314.59	6,398.80
5 years after	5,359.46***	6.26	3,681.08	7,037.85
age ²	−5.51	−0.65	−22.12	11.11
age ³	−1.96***	−7.07	−2.51	−1.42
age ⁴	−0.01	−0.5	−0.06	0.03
Constant	34,690.57***	54.25	33,436.86	35,944.27
No. of observations	49,531			
No. of groups	5,881			
R ²	0.0038			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table A12. Effects of job loss on net household income plus transfers

<i>Years before/after displacement</i>	Coefficient	t-value	95% Conf. interval	
3 years before*displaced	896.13	1.31	−448.65	2,240.91
2 years before*displaced	1,127.52	1.36	−502.34	2,757.38
1 year before*displaced	466.04	0.57	−1,146.29	2,078.37
Year of displacement*displaced	4,225.64***	3.63	1,940.55	6,510.73
1 year after*displaced	−418.76	−0.43	−2,346.13	1,508.61
2 years after*displaced	−1,050.65	−1.07	−2,978.72	877.43
3 years after*displaced	−1,315.85	−1.23	−3,419.76	788.07
4 years after*displaced	−1,304.24	−1.2	−3,442.30	833.81
5 years after*displaced	−898.12	−0.74	−3,275.23	1,478.99
3 years before	873.11**	2.21	100.03	1,646.19
2 years before	1,830.89***	4.11	957.45	2,704.32
1 year before	2,758.43***	5.56	1,786.04	3,730.81
Year of non-displacement	3,309.68***	6.24	2,270.09	4,349.26
1 year after	3,847.18***	6.43	2,673.80	5,020.57
2 years after	3,975.89***	6.27	2,733.58	5,218.20
3 years after	4,249.38***	5.92	2,842.87	5,655.89
4 years after	4,843.51***	6.36	3,350.27	6,336.75
5 years after	5,425.97***	6.58	3,808.23	7,043.71
age ²	−14.22*	−1.72	−30.43	1.99
age ³	−1.55***	−5.98	−2.06	−1.04
age ⁴	0.02	0.96	−0.02	0.06
Constant	38,959.05***	62.82	37,743.11	40,175.00
No. of observations	49,531			
No. of groups	5,881			
R ²	0.0039			

Notes: Fixed effects estimates, estimating equation as described in Section 4.1; displacement cohorts 1991–2011, displacements due to firm closure; sample restricted to full-time employed non-civil servant workers aged up to 55 years in the year $k = -1$; matched sample; yearly incomes in Euro deflated to prices in 2010; standard errors are adjusted for clustering at the personal level.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.