The Long-Term Impact of Job Displacement in Germany During the 1982 Recession on Earnings, Income, and Employment[1]

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Abstract

We show that workers displaced from their stable jobs during mass-layoffs in 1982 recession in Germany suffered permanent earnings losses of 10-15% lasting at least 15 years. These estimates are obtained using data and methodology comparable to similar studies for the United States. Exploiting advantages of the German data, we also show that while reduction and recovery in time worked plays a role in explaining earnings losses during the first ten years, the majority of the long-run loss is due to a decline in wages. We also show that even the generous German unemployment insurance system replaced only a small fraction of the total earnings loss. These findings suggest that job displacements can lead to large and lasting reductions in income even in labor markets with tighter social safety nets and lower earnings inequality.

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1. Introduction

Mounting evidence from the United States suggests that the cost of recessions is highly unequally distributed across the labor force. In particular, several papers suggest that workers displaced during the 1982 recession suffered large losses in annual earnings lasting over 15 years (Jacobson, Lalonde and Sullivan 1993, von Wachter, Song, and Manchester 2009). With displacement rates reaching ten to fifteen percent of employment in large recessions, this implies that a substantial fraction of workers suffers large permanent reductions in their life-time earnings. In comparison, the decline of total earnings of workers who remain employed is relatively small.

It is an important question whether this is a phenomenon mostly relevant in the United States. Is it the case that displaced workers in European countries with lower earnings inequality, more generous social safety nets, and more managed labor market transitions fare better in recessions? Yet, despite the importance of the question, there is little evidence on the long-term effect of layoffs during the recession of the early 1980s in Europe that is comparable with U.S. studies.[2] While a longstanding literature suggests European labor markets may have responded differently to the recession in the early 1980s because of their labor market institutions, the focus of that literature has been mainly on the macro-economic evolution of unemployment and wages. On the other hand, there is no direct evidence from the U.S. on the effect of institutions such as unemployment insurance on the long-term income losses of displaced workers.

In this paper we study the long-term effect of job displacement in Germany using an exceptional data source with longitudinal information on workers and their employers covering 30 years. This rich data source allows us to closely replicate existing U.S. studies on the long-term effect of job displacement during the early 1980s recession on annual earnings. As a result, we obtain state-of-the-art estimates of the effect of displacement during recessions for Germany that are also comparable to similar studies from the United States. In addition, two key advantages of the German data over comparable data sources from the U.S. allow us to further improve our understanding of the effects of job displacement. First, we exploit direct measures of days worked to examine the role of reductions in employment and wages in explaining long-term earnings losses. Second, we can directly study whether unemployment insurance payments

[2] While by now there are several European studies analyzing job displacement, they either do not focus on the long-term effect from displacement in recessions, or they are hard to compare to U.S. studies or amongst each other because of differences in methodology or data limitations. For a brief overview of studies of job displacement in the United States and the EU see von Wachter (2009).

help to significantly buffer the effect of job displacement on workers disposable income. Neither aspect has been studied to this extent before because of a lack of appropriate data.

As comparable studies in the U.S., we find that workers in stable jobs separating from their main employer in the course of a mass-layoff in the early 1980s suffer reductions in annual earnings of 10-15% lasting at least 15 years. This suggests that job displacement has highly detrimental effects on earnings even in a labor market with a tighter safety net and lower earnings inequality. Exploiting features unique to the German data we also find that although temporary reductions in time worked explain part of the reductions in earnings, the majority of the long-term effect is driven by a lasting decline in daily wages. This suggests that some of the loss and recovery in earnings in the U.S. may be driven by reductions in time worked, information not readily available in the administrative data there. This is despite the fact that unemployment insurance is more generous in Germany and therefore non-employment durations likely longer after job loss so that we would expect the role of employment to be even smaller in the United States.

Finally, we show that payments from the generous German unemployment insurance system only replace a small fraction of displaced workers' lost earnings. This evidence, not available from similar U.S. data, suggests that unemployment insurance is unable to significantly smooth the large earnings losses associated with displacement. This effect is likely to be even smaller in the American labor market, where unemployment insurance is shorter lived and covers a smaller fraction of the unemployed. Thus, it appears that independent of the institutional environment of the labor market, job displacement leads to large and lasting declines in affected workers' disposable income.

The rest of the paper is organized as follows. Section 2 gives an overview of our definitions of job displacement and describes the data. There, we also provide basic descriptive estimates of the effect of job displacement on earnings, wages, and time worked. Section 3 presents results from a regression-based comparison of displaced workers' earnings with the evolution of earnings of a control group of non-displaced workers. We also discuss the role of unemployment insurance receipt as a means to smooth long-term displacement-related earnings losses. Section 4 puts our study in relation to the existing literature, Section 5 presents preliminary conclusions.

2. Methodology and Basic Patterns

2.1 Measuring Job Displacement at Mass-Layoffs

The goal of our empirical approach is to remain as comparable as possible to state-of-the-art studies from the U.S. literature, while exploiting advantages specific to the German data we use. In particular, availability of daily information on both earnings and unemployment insurance receipt will allow us to better date job separations and analyze time worked and other sources of income as additional outcomes.

We analyze the short- and long-term effects of an unexpected involuntary loss of a stable job in difficult economic times. As in recent studies using administrative data from the U.S. (e.g., Jacobson, Lalonde, and Sullivan 1993, von Wachter, Song and Manchester 2009), we focus on involuntary job loss (henceforth, job displacement) occurring during the recession of the early 1980s. The recession of the early 1980s recession is interesting because it is the last large recession in most Western economies, including Germany and the U.S., involving a large number of layoffs and high rates of unemployment. It is also a period during which many countries a paradigm shift in labor markets appears to have taken place, leading to persistent increases in unemployment in Germany and in earnings inequality in the U.S.. Finally, focusing on the early 1980s enables us to follow workers for a long period of time after job displacement.[3]

To study the long-term effects of job displacement during the early 1980s, we exploit a large administrative data base containing longitudinal information on workers and firms since 1975. This data base has high-quality information on earnings, employment transitions, and firm characteristics. However, as for comparable data sources in the U.S. and other countries, there is no direct information regarding the reason of a job separation.

We follow the existing U.S. literature and define a job displacement as the event that a high-tenured worker leaves his main employer in the course of a mass-layoff event. The analysis of workers leaving stable jobs has several advantages. It focuses on workers who in all likelihood expected to remain in their job in the absence of a mass-layoff, and thus were likely to be surprised by being displaced. Moreover, given the steep reduction in job mobility with even a few years of job tenure in Germany, very few of these workers were likely to have moved voluntarily. This reduces the potential measurement error in the definition of job displacement.

[3] Since in most countries large-scale administrative data bases were instituted in the mid- to late-1970s studying the long-term effect of layoffs before the early 1980s is difficult.

We work with two definitions of a mass-layoff event. First, we define a mass-layoff to occur either when the firm's employment permanently declines by thirty or more percent over a short period of time. Second, we also consider the case when firms permanently close.[4] To make these definitions meaningful, we consider only workers whose employers had at least 50 employees in the year prior to the employment drop and did not have large employment fluctuations in the years before.. This definition allows us to replicate findings in the U.S. literature. Smaller firms are subject to larger percentage fluctuations, such that these measures of mass-layoff are less meaningful.[5]

A key step in measuring mass-layoff events is to distinguish between actual permanent reductions in firms' employment and events such as mergers, takeovers, outsourcing, or changes in firm identification numbers. Since such events occur frequently in administrative data, we have constructed a complete cross-flow matrix of worker flows between establishments. Using this flow matrix, we only consider a reduction an employment a mass-layoff event, if the majority of laid-off workers is dispersed among new employer (i.e., if there is no large flow of workers to a different establishment). This is a common methodology used, say, by the U.S. Census to adjust longitudinal firm-level employment information.[6] Not adjusting our mass-layoff data in this way would imply potentially serious measurement-error, likely biasing our results towards finding no effect of displacement on earnings.

By focusing on job separations of high-tenured workers during mass-layoffs at medium-sized to large employers we obtain a very clean measure of job displacement that is comparable with the existing literature. A common criticism is that this may focus on workers that are more likely to have larger earnings losses at displacement. Von Wachter et al. (2009) and Hildreth et al. (2009) have shown that this is not the case for the restriction on higher-tenured workers. However, it is well known that larger firms pay more, and loss in a wage premium associated with firm size may be one explanation of the larger earnings losses we find (von Wachter and Bender 2006).

[4] We have experimented with other definitions of mass-layoffs. See Hildreth, von Wachter, and Weber (2009) for additional robustness analysis and discussion.
[5] Our method of identifying mass-layoffs is described in detail in the appendix.
[6] The data we use contains only information on establishments; however, we will use the terms firms and establishment interchangeably even though we cannot merge units from multi-establishments firms.

2.2 German Administrative Data

The data consist of the all workers that were ever employed at a firm experiencing a mass-layoff event as just described occurring from 1981-1985. This data has been combined with a large random sample of workers that were not present during a mass-layoff in that period. For these workers, we have complete information on career histories running from 1975 to 2005 from the Employment History File (Beschäftigtenstatistik) of the IAB. This data consists of complete day-to-day information on earnings and time worked in each employment spell occurring in employment covered by social security.[7] The data also contains basic demographic characteristics including education, as well as information on occupation and industry. This data has been complemented with information on receipt of unemployment (from the Leistungsempfängerdatei). In addition, the worker-level data has been merged with information on employers (obtained from the Betriebshistorikdatei).

From this data, the main outcomes we consider in this study are total annual earnings, total annual income (consisting of earnings plus payments form unemployment insurance), the daily wage at a given calendar date, and days worked or in unemployment per year. All earnings, income, and wage measures have been deflated using the Consumer Price Index and thus represent Euros in 2000 prices. Our main outcome variable, total annual earnings, is comparable to similar measures available in administrative U.S. data.[8] Detailed information on unemployment insurance and days worked is typically not available in comparable U.S. data sources.

Following the existing literature, we make a few additional restrictions. Most notably, we drop workers younger than age 25, since they may not have fully entered the labor force. We also drop workers older than age 53, who had access to partial retirement programs in Germany during that period. We also only use information on individuals that work in covered employment or receive unemployment benefits for at least one day in a given year, since otherwise we have little information on individuals' activities. This is likely to *understate* our wage losses, since some workers may exit the labor force for more than a year in response to

[7] Roughly 80% of the labor force is covered by social security; the remainder consists of students, self-employed, and government employees.

[8] In contrast to earnings data used in U.S. studies, the German data is top-coded. However, there is no reason why the presence of the top-code should affect displaced workers more than non-displaced workers; in fact, we suspect it would be vice versa, leading us to understate the earnings losses at job displacement.

earnings losses. Here, we depart from von Wachter et al. (2009), whose study of U.S. earnings losses includes zero earnings even if an individual drops out of the labor force for multiple years.

Our main sample thus consists of workers displaced in middle age. This is shown in Table 1, which displays basic sample characteristics for workers separating and not separating from their employer.[9] In the year prior to separation, it is apparent that job separators are slightly younger and slightly lower job tenure. Correspondingly, as found by others, separators have somewhat lower baseline annual earnings. However, there is no difference in the number of days worked or days spent in unemployment among the two groups.

The small initial differences increase markedly after separation. The difference in earnings among separators and non-separators increases from about 10% to 30% in 1982, the year of separation. This difference remains high in 1983, the year after job separation, but declines to about 13% in 1990, eight years after separation. As we will see in the next section, little further recovery occurs afterwards. If we only consider earnings for workers employed (i.e., excluding zero earnings), the discrepancy is smaller, especially in around separation. Initial earnings losses appear partly driven by reductions in employment. However, it is important to note that differences in age or education remain roughly stable, such that there is no strong indication that the least skilled job separators systematically drop out of the labor force.

2.3 Descriptive Analysis

Given the longitudinal data at our disposition, we can follow the outcomes of displaced workers and their non-displaced counterparts before and after the layoff event. For our main outcome, annual earnings, this is shown in Figure 2. The Figure shows the evolution of earnings for workers displaced during a mass-layoff of 30% and those not displaced in 1982, the through of the early 1980s recession. Note that to be comparable with similar estimates for the U.S. labor market in von Wachter et al. (2009), this includes zero earnings. Below, we will address the role of zero earnings and unemployment receipt explicitly.

The figure contains three core messages. First, displacement leads to a large initial drop in annual earnings of 8000 to 9000 Euros. This constitutes a decline of 25-30% relative to baseline average earnings of displaced workers. Second, while earnings recover, this recovery is parallel to earnings growth occurring for the control group of non-displaced workers as well. Thus, while displaced workers' earnings recover to the level of their own earnings prior to

[9] The differences among displaced and non-displaced workers are very similar.

displacement within five to ten years, even twenty years after job displacement a large gap in earnings relative to the control group remains. Third, there is an initial difference in average earnings between displaced and non-displaced workers, which we will address in our regression analysis below. However, there do not appear to be substantial differences in prior earnings *trends*, something which will become important below.

These results are comparable to the long-term effect of displacement in the U.S., which also show a substantial and very persistent decline in earnings for workers displaced in the recession of the early 1980s. As in the U.S., displaced workers in Germany can be subject to very long lasting earnings penalties. This finding is very robust to the definition of mass-layoff event, and also holds if we widen our displacement period from 1980-1985.

These earnings losses are not only due to reduction in days worked. In fact, the long-run decline in earnings is almost entirely driven by a reduction in the average daily wage. However, part of the large initial drop in total annual earnings and the ensuing increase appear to be driven by a reduction and recovery in the total number of days worked. These patterns are shown in Figure 3. Figure 3A shows daily wages measured on June 30th of each year for the displaced sample of workers and the control group. As for annual earnings wages the trends in wages up to one year before displacement are very similar in shape although the level is lower among the displaced workers. After job loss, the workers in the displaced sample experience a lasting decline in wages. However while earnings begin to rebound in the second year, wages for the displaced workers continue to diverge in year 2 and 3 after displacement. This may indicate that the workers who are the first to be employed again have relatively smaller wage drops.

A key question is whether the decline in annual earnings shown in Figure 2 also leads to corresponding decline in disposable income. This is an important question because in most countries unemployment insurance is meant to provide significant income transfers to displaced workers. However, in the U.S., this is very difficult to answer because information on receipt of unemployment insurance is often not merged to administrative data on earnings. Figure 4A shows the number of days workers in our sample receive unemployment insurance (Arbeitslosengeld (ALG) or Arbeitslosenhilfe (ALH)).[10] Figure 4B shows the amount received in

[10] During the early 1980s a worker is eligible to receive unemployment insurance benefits (Arbeitslosengeld ALG) after having worked for at least 12 months in the previous 3 years. Potential ALG durations depend on work experience but in our sample of high tenure workers everyone is eligible for the maximum of 12 months of ALG (after 1984 this maximum duration was increased for older workers). ALG offers replacement rates of 68 percent on the last gross wage. After the 12 month period workers may qualify for means tested unemployment assistance

Euros. According to bother measures, it appears that displaced workers receive a significant amount of unemployment insurance in the first years after job loss. Unemployment insurance receipt remains higher up to eight years after displacement. However, while this constitutes an important transfer, it is apparent that this does not buffer the long-term effect of displacement on income. Moreover, as will be apparent below, total transfers from the unemployment insurance system on average cover only a small portion of lost earnings. As a result, the total loss in annual earnings closely approximates the total loss in personal income.

3. Earnings Losses Relative to Control Group

3.1 Methodology

As documented in Table 1 and apparent from Figures 1 and 2, systematic differences in average earnings and age exist between workers who separate from their long-term employment in the early 1980s and workers who keep their jobs. It is also apparent that strong cyclical swings and trends in earnings may confound the effects of job loss. To get a complete picture of the long-term earnings losses of job separators, we need to make a comparison to a control group but at the same time explicitly account for possible systematic differences among workers in a regression framework.

We will estimate various specifications of the following distributed lag model

$$y_{it} = \alpha_i + \gamma_t + \beta X_{it} + \sum_{k \geq -m,} \delta_k D_{it}^k + u_{it} \qquad (1)$$

where the outcome variable y_{it} represents a measure of annual earnings, the year dummies γ_t are identified by the presence of workers not separating from their job (the control group), and the error u_{it} represents truly random components affecting the outcome. The coefficients δ_k on the dummies indicating the k-th period before, during, or after job separation (D_{it}^k) measure the time path of earnings changes of job separators before and after a displacement relative to the baseline and the control group. The ability to estimate the dynamic effect of job separation is of particular interest since it will allow us to obtain summary measures of the overall lifetime cost of job separation.

(Arbeitslosenhilfe ALH) which has no maximum duration and provides a replacement rate of 58 percent on the previous gross wage, however other income (such as capital or spousal income is deducted). For more information on the German UI system see Hunt (1995).

The displacement effect is identified by the inclusion of workers staying at their employers throughout the period under study (the control group). To interpret the estimated effects δ_k as the causal impact of job separation on earnings, however, we have to assume that conditional on worker fixed effects and included observable baseline characteristics, displaced workers are observationally equal to those workers in the control group. This is the strategy chosen by most classic studies of the effect of job loss (e.g., Ruhm 1990, Jacobson, Lalonde, and Sullivan 1993). If workers are on average remunerated according to their productivity, then the long-run average of earnings should be a good index of their overall earnings potential. In this case, comparing a job separator and a non-separator with similar worker fixed effects yields a valid estimate of the effect of job loss.

Given the large change in earnings for job separators, this approach is most persuasive in the presence of a long window of observation prior to the job separation. Similarly, it is most appropriate for mature workers whose earnings represent their productivity. For example, in the case of younger workers, wages often do not yet reflect their long-term earnings potential and fixed effect strategies are not viable (e.g., von Wachter and Bender 2006). Since our observation window covers a long time period prior to job separation and the average age of workers in our sample is close to 40, we believe our fixed effect estimation strategy will uncover estimates that yield good first approximations of the causal effect of job separations on earnings.

A potential concern with estimates obtained from the model in equation (1) is that they do not allow for differential trends among displaced workers and workers in the control group. As a result, we may attribute negative trends in earnings in industries experiencing high rates of layoff to the event of job displacement itself. In both cases, our approach would lead us to overestimate the effect of displacement. Similarly, it might be that firms chose to layoff workers with lower average earnings growth, or that firms suffering mass-layoff had lower average growth rates. Using different strategies Jacobson et al. (1993) and Von Wachter et al. (2009) address these potential threats to internal validity, and find that the main strategy in equation (1) gives a good estimate of the long-term effect of job displacements.[11] To some degree, this is apparent from the pattern shown in Figures 2 to 4, which do show significant differences in pre-

[11] Including worker-specific linear trends, Jacobson et al. (1993) find that the model in equation (1) *underestimates* the effect of displacement on earnings; allowing for differential flexible yearly trends for 2-digit industry and prior average earnings, von Wachter et al. (2009) find that the model slightly *overestimates* the effect.

displacement earnings trends. Instead, there seems to be a sudden sharp earnings decline at the time of layoff.

3.2 Main Findings

The results of the regression analysis for the difference in annual earnings of displaced workers relative to the baseline period compared to the regular evolution of earnings of the control group are shown in Figure 5. The figure clearly demonstrates the basic patterns already noted in the descriptive analysis. The figure displays a slight decline in annual earnings prior to the layoff year (denoted as zero). There is a large drop in earnings at displacement. Earnings bounce back, an effect partly due to a recovery in the number of days worked (see below). Earnings continue to recover for another few years. However, starting at five years after displacement, the recovery rate slows. A week recovery continues until ten years after displacement, after which the earnings loss settles at a level of about 3500 Euro, a long term loss relative to pre-displacement earnings of about 12%. This pattern is very similar if we consider establishment closures instead of a permanent decline in establishment employment.

As noted above, these patterns are quite similar to what has been found in the United States. Clearly, the exact long-term percentage loss differs slightly, and appears somewhat higher in the U.S. (von Wachter et al (2009) find long-term losses of about 15-20% with a similar methodology. The pattern in the German data show a weaker decline in earnings prior to job loss, a steeper drop at displacement, and smoother recovery. This is likely to be due to our larger samples and the better dating of job separations using daily data. We should stress that the findings in Figure 5 are robust to alternative definitions of mass-layoff or different sample restrictions.

A key question is whether the declines in annual earnings are due to reductions in daily wages or in days worked. In the U.S., the majority of the long-term effect appears to be due to a decline in wages, but the direct evidence on time worked is scant. In Germany on the other hand, it is often suspected that lasting reductions in employment play an important role. We also replicated the regression analysis for the daily wage, shown in Figure 6. The decline in daily wages is permanent and large – relative to initial average earnings of 80 Euros for displaced workers the long-term drop is about 10%, with little signs of recovery.

The recovery in total annual earnings we find in Figure 5 appears thus mainly driven by recovery in days worked. As Figure 3 suggests, recovery in time worked matters mostly in the

first 10 years after displacement, with the majority of the development concentrated in the first five years. This is an important finding for two reasons. On the one hand, it implies that even in Germany the long-run earnings loss is to an important extent driven by reductions in wages. On the other hand, it complements studies for the U.S. without information on days worked. The result suggests that part of the initial recovery in the U.S. is also likely to be due to changes in time worked, though the magnitude is likely to be lower due to less generous unemployment insurance benefits. In fact, Figure 4 had shown that an important part of the variation in time worked is due to increases in days spent in unemployment insurance.

A related question is how important unemployment insurance (UI) benefits are in smoothing the decline in earnings. Since UI benefits in Germany are on average longer than the U.S., this should yield an upper bound on the potential effect of UI in helping to smooth income for displaced workers. This question is addressed in Figure 7, which displays average annual *income*, defined as the sum of earnings and UI benefits. As a comparison, the figure also shows the evolution of total annual earnings. Not surprisingly, it appears that UI benefits make the biggest difference in the first few years after a job loss. However, a large fraction of earnings losses do not appear to be buffered by UI, partly because not all displaced workers receive UI and partly because replacement rates are well below unity. This is an important finding, since although ALG is of limited duration, the typical duration of ALH is much longer. Thus, even though Germany has very generous UI benefits relative to the U.S., these benefits cannot prevent large declines in income.[12] We also replicated the figure excluding zero values for earnings and income (not shown). It appears that excluding zeros does not make a large difference, suggesting that we are unlikely to underestimate displaced workers' income from other sources (such as disability benefits or welfare).

Overall, independent of the institutional environment, displaced workers suffer long-term earnings and wage losses lasting 15 years, without signs of significant recovery. The magnitude of these earnings losses is substantial, and on the order of 10-15% in Germany, and 15-20% in

[12] There are several potential explanations for the small impact of unemployment insurance benefits *on average*; first, only a minority of displaced workers becomes unemployed; of those unemployed, not all file for unemployment insurance; of those who file, the typical duration of benefit receipt is quite short; for those receiving benefits, replacement rates are about 60%. The findings here are consistent with results from North America suggesting that unemployment insurance only partly insulates workers against consumption declines during unemployment spells (e.g., Gruber 1997). An important qualification is that we refer only to the role of unemployment insurance benefits in providing short term transfer income; it could still be that more generous unemployment insurance allows workers to find better job matches.

the United States. The losses result partly from reductions in employment. But especially over the long run, they arise due to a large extent from lasting declines in the wage.

The similarity in the patterns for Germany with those of the U.S. is not surprising, since similar mechanisms are likely to be at play. On the one hand, displaced workers are believed to lose skills associated with their prior industry or occupation. On the other hand, firm or industry specific wage premiums may be lost at displacement. Both phenomena have been found to be relevant in Germany and the United States labor market, although possibly with different degree of importance.

4. Relation to Prior Literature

A number of previous studies have explored the earnings and employment histories of displaced workers in Germany. A common theme in these studies is that they find earnings losses that are at the lower end of estimates for the US and in particular are much lower than the wage and earnings losses that we find in this paper. For example Couch (2001) finds that workers' earnings two years after displacement are around 6.5 percent lower relative to previous earnings. Burda and Mertens (2001) report long run wage losses of 2 to 3 percent. Bender et. al. (2002) find wages to be around 1-2 percent lower after displacement, but workers that are not observed in employment in the year after displacement face an additional wage loss of 19 percent.[13] Here we briefly discuss the main differences of these studies that likely explain the differences in the findings.

A striking difference is that all three studies analyze job loss during the late 1980s (Burda and Mertens 2001 and Bender et. al. 2002) and early 1990s (Couch 2001), a period of strong economic growth and declining unemployment rates, while in this paper we analyze workers who were displaced in the recession year 1982.[14] This different macro environment is likely the most important reason for the fact that we find much larger earnings losses.[15]

Apart from different time periods, the other studies also differ with respect to the datasets used, the definition of displacement, the sample of workers and the definitions of dependent

[13] An exception to this group is a recent paper by von Wachter and Bender (2008), who report that job separations in car manufacturing leading to a spell of unemployment of at least 30 days carry a long-term penalty of 5-10 years; this penalty is much larger for workers with medium or higher pre-displacement wages.
[14] Unemployment rates in West Germany fell from 9.1 to 6.4 percent from 1985 to 1992 and only started rising again during the 1993 recession. On the other hand over the interval 1981 to 1983 the unemployment rate rose from 5.5 to 9.1 percent.
[15] We replicated our analysis for workers displaced in 1990 and found earnings losses of much smaller magnitude.

variables. Couch (2001) uses data from the German Socio-Economic Panel (GSOEP). The displacement definition is based on workers indicating that they lost a job because the company closed down or were laid off. Burda and Mertens (2001) use the GSOEP to impute which separations in the IAB social security data can be considered displacements.[16] Finally Bender et. al. (2002) use similar data as we do: the IAB social security data merged with establishment level information. They define workers as displaced if they leave an establishment just before it closes or during a more than 40 percent reduction in employment.[17] While there are many small differences in sample restrictions and definitions across these studies and our own, two differences seem crucial: First, while these studies have no restrictions on establishment or firm size, due to our displacement definition, our study only investigates workers who lose their job in relatively large and stable establishments (with at least 50 employees in the previous year and only small changes in employment before that). Furthermore our main estimates are for workers who have been continuously employed at the same establishment for 5 years. Our sample thus consists of highly attached workers in large establishment who are likely from the upper part of the earnings distribution, which is consistent with the observation in Burda and Mertens (2001) that wage losses are much higher for the top half of the earnings distribution. Secondly we define workers as displaced if they permanently separate from an employer. Burda and Mertens (2001) show that nearly 50 percent of all unemployed workers return to their previous employer and that for these workers wage losses are very close to zero. By excluding such recalls we are also likely to get higher estimates of earnings and wage losses.

Finally differences in specifications also make direct comparisons a little bit difficult. For example Bender et al (2002) report regression estimates that effectively split up earnings losses by workers who are re-employed within a year and workers who take more than 1 year to be employed again. For this last group they find large permanent wage losses of about 20 percent, while for the group that is re-employed relatively fast the earnings losses are very small. It seems

[16] In their SOEP sample the imputation predicts layoffs with about 50 percent accuracy and they assume this accuracy also holds for their imputation in the IABS in order to scale the coefficients correctly. It seems at least possible that the out of sample prediction is less accurate, which would downward bias their results (since implicitly more voluntary quits are counted as displacements).

[17] Bender et al. (2002) did not have access to the Flow data that we used in this study to identify mass-layoffs and plant closings. In particular restructuring of firms, take-overs or establishment ID-changes may be classified falsely as large layoffs or plant closings. This leads to classifying workers who are continuously employed at the same workplace as displaced workers and thus likely down biases the estimated earnings losses. Hethey and Schmieder (2009) provide evidence that this misclassification problem is quite sizable, for example of all incidences of disappearing establishment IDs only about two third appear to be true plant closings.

plausible that the differences in displacement and sample definitions are most important for the group of workers that are employed quickly again and in particular that our sample has much fewer workers in this group and more workers that take more than a year to find employment again.

5. Summary and Conclusion

In this paper we have analyzed the long-term consequences of job displacement in Germany during the early 1980s recession. Our empirical approach replicates that of recent similar studies in the United States, obtaining state-of-the art estimates of the impact of displacement that should be as comparable across countries as possible. We apply this methodology to a large longitudinal sample from German social security records spanning over 30 years that is comparable to and in several ways superior to similar U.S. data sets.

Our findings imply that separation from a stable job at a medium to large firm during a mass-layoff leads to persistent losses in annual earnings lasting at least 15 years. The long-term loss in earnings is about 10-15%, which matches similar estimates from the United States. These results are robust across several different specifications of displacement or mass-layoff. This implies that independently of the institutional environment in the labor market job displacement in a recession leads to substantial reductions in life time earnings for affected workers.

The German data allows us to obtain two additional findings not usually available in common U.S. data sources. As in the U.S., the short-term loss in annual earnings we find is larger than the long-term loss. From our results it appears this is due largely to a reduction in time worked lasting for up to ten years after displacement. In contrast, we find that the decline in the daily wage (conditional on employment) is permanent without any recovery. Thus, on the one hand, it does not appear to be the case that a decline in time worked explains the majority of long-term earnings losses of displaced workers in Germany. On the other hand, the findings imply that some of the recovery in annual earnings in the U.S. during the first years after displacement is likely due to improvements in time worked.

A second additional finding is that despite the long duration and relative generosity of German unemployment insurance (combining the two tiers, ALG and ALH), unemployment insurance benefits do not help to smooth a substantial fraction of the large earnings losses we find. Moreover, once we include information on unemployment insurance, we appear not to be missing many additional sources of income such as disability payments or social welfare. Thus,

our results imply that displacement leads to large losses in both earnings and total disposable income. Since this implies for Germany, this is likely also to be the case in the U.S., even though different programs are likely to have a different weight in replacing displaced workers' earnings.

References

Bender, S., C. Dustmann, D. Margolis, and C. Meghir, "Worker displacement in France and Germany", *Losing work, moving on: international perspectives on worker displacement*, (2002), pp. 375–470.

Blanchard, Olivier and Justin Wolfers (2000). 'The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence.' *Economic Journal* 110(462): C1-33.

Burda, M. and A. Mertens, "Estimating wage losses of displaced workers in Germany", *Labour Economics*, 8 (2001), pp. 15–41.

Couch, K. "Earnings losses and unemployment of displaced workers in Germany", *Industrial and Labor Relations Review*, 54 (2001), pp. 559–572.

Couch, Kenneth A. and Dana W. Placzek (2007). 'Earnings Losses of Displaced Workers in Connecticut.' Connecticut Department of Labor Occasional Paper Series 2007-1 (forthcoming, *American Economic Review*).

Hethey, T. and J. Schmieder, "Using Worker Flows in the Analysis of Establishment Turnover: Evidence from Germany", (2009), *mimeo.*

Hildreth, Andrew, Till von Wachter, and Elizabeth Weber (2009). 'Estimating the 'True' Cost of Job Loss: Evidence Using Matched Data from California 1991-2000.' Center for Economic Studies Discussion Paper CES-WP-09-14.

Hunt, Jennifer (1995) 'The effect of unemployment compensation on unemployment duration in Germany', *Journal of Labor Economics.*

Gruber, Jonathan (1997). 'The consumption smoothing benefit of unemployment insurance.' *American Economic Review* 87 (1): 192–205.

Jacobson, Louis, Robert LaLonde and Daniel Sullivan (1993). 'Earnings Losses of Displaced Workers.' *American Economic Review* 83(4): 685-709.

Kodrzycki, Yolanda K. (2007). 'Using Unexpected Recalls to Examine the Long-Term Earnings Effects of Job Displacement.' Federal Reserve Bank Working Paper W07-2.

Ruhm, Christopher (1991). 'Are Workers Permanently Scarred by Job Displacements?' *American Economic Review* 81: 319-23.

Sargent, Thomas J. and Lars Ljunqvist (1998). 'The European Unemployment Dilemma.' *Journal of Political Economy*, 1998, vol. 106, no. 3.

Schoeni, Robert and Michael Dardia (2003). "Estimates of Earnings Losses of Displaced Workers Using California Administrative Data." PSC Research Report No. 03-543.

Stevens, Ann Huff (1997). 'Persistent Effects of Job Displacement: The Importance of Multiple Job Losses.' *Journal of Labor Economics*, Vol. 15, No. 1, Part 1, pp. 165-188

von Wachter, Till and Stefan Bender (2006) 'At the Right Place at the Wrong Time: The Role of Firms and Luck in Young Workers' Careers.' *American Economic Review* 96(5), 2006, pp. 1679-1705.

von Wachter, Till and Stefan Bender (2008). 'Entry-Cohort Effects at the Firm Level: Testing for Permanent vs. Transitory Effects using Evidence from Job Changers.' In: J. Lane, S. Bender, S. Bender, J. Lane, K. Shaw, F. Andersson, and T. von Wachter (eds.), *The Analysis of Firms and Employees: Quantitative and Qualitative Approaches*, Chicago: University of Chicago Press.

von Wachter, Till, Jae Song, and Joyce Manchester (2009). 'Long-Term Earnings Losses due to Mass-Layoffs During the 1982 Recession: An Analysis Using Longitudinal Administrative Data from 1974 to 2004.' Mimeo, Columbia University.

von Wachter, Till (2009). 'Summary of the Literature on Job Displacement in the US and EU: What we know and what we would like to know.' Forthcoming in: David Marsden and François Ryxc (eds.), *Wage Structures, Employment Adjustments and Globalization: Evidence from Linked and Firm-level Panel Data*, Applied Econometrics Association Series, Palgrave Macmillan.

Data Appendix

In order to identify mass-layoffs and plant closings in the German administrative data we used the following approach. After merging the establishment history panel with information on all year to year cross establishment worker flows, we defined mass layoffs as a drop in employment from one year to the next of at least 30 percent in an establishment with at least 50 employees in the year before the employment drop. To assure that these establishments were relatively stable prior to the drop and that the drop did not constitute just temporary fluctuations, we also required that employment did not increase by more than 30 percent in either of the two years before the employment drop and did not re-bounce in the two years after the drop. Furthermore to avoid identifying restructuring of the firm (such as outsourcing of larger parts) as a mass-layoff, we required that not more than 20 percent of the leaving workers were re-employed together at a single establishment in the following year (thus the leaving workers are either unemployed or dispersed over many different establishments). Similarly we defined a plant-closing as a drop in employment of at least 80 percent, again requiring that not more than 20 percent of the leaving workers were re-employed together in the following year.

The establishment history panel and the flow data provide information on the workforce of the establishments on June 30th of each year. We thus consider a mass-layoff as happening in 1982 if a plant loses 30 percent of its workforce between 1981 and 1982. We consider a worker as displaced in 1982 if he permanently left an establishment in 1982 and this establishment had a mass-layoff either in 1982 or 1983.

In order to get precise estimates of how individual earnings histories are affected by mass-layoffs, we created a special random sample of work histories from the universe of the German security data (the Employment History File of the IAB complemented with information on unemployment insurance recipiency). The sampling design was such that in each year 40 percent of all establishments that had a Mass-layoff in that year were randomly selected. In addition, in each year 0.4 percent of all establishments that did not have a mass-layoff in that year were selected. Since the sample is drawn for each year independently, an establishment that exists for several years without a MLF has a relatively high chance of entering the sample. We then extracted employment and unemployment histories for all workers who ever worked in any

of these establishments. These workers represent about 50 percent of the total social security data over this period. In order to be in our main analysis sample of workers displaced in 1982 and the control group, workers had to be continuously employed for at least 5 years at an establishment that was at risk of a mass-layoff in 1982 (according to our definition). Furthermore we only selected male workers age 25 to 52.

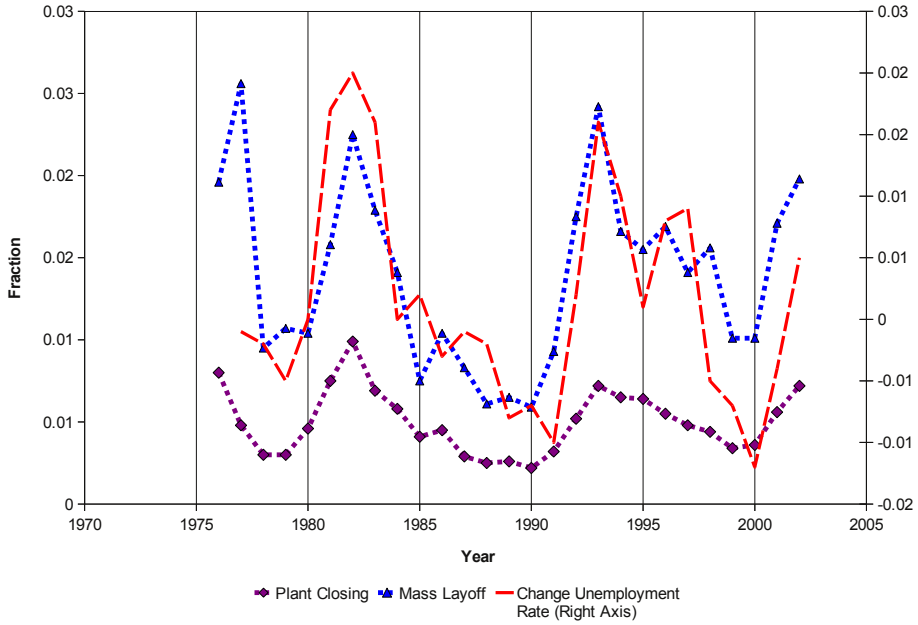
Yearly earnings were calculated as the sum of all wages during that year measured Euro and deflated to prices of 2000. For these calculations we only used workers who in a given year had at least one observation (either because they were employed for at least one day or they received unemployment benefits

Table 1: Average Characteristics in High Attachment Workers by Mobility Status in 1982

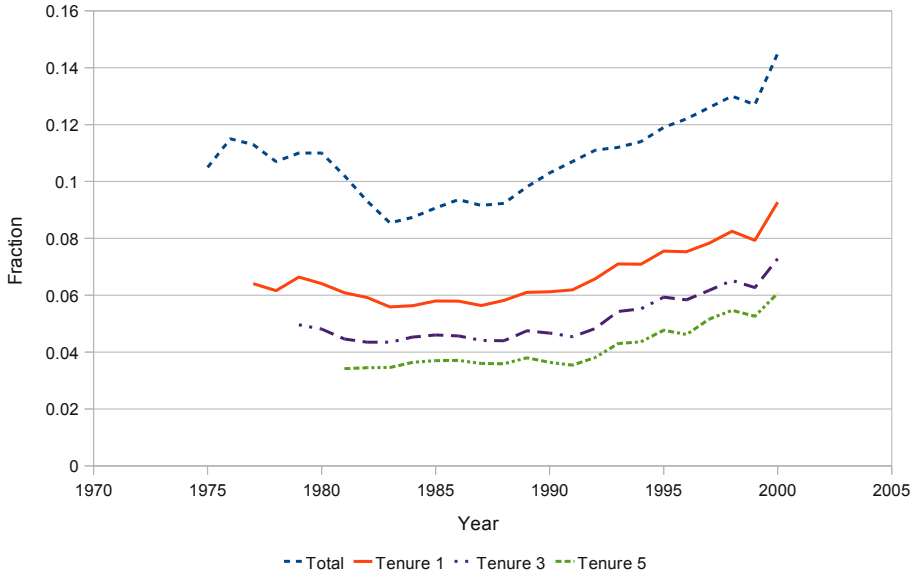
	Full Sample	Not Displaced in 1982	Displaced during Mass-Layoff in 1982	*Difference Between Separators and Non-Separators*
1981				
Age	40.3	40.3	40.8	*0.6*
Tenure with Current Employer	5.7	5.7	5.6	*-0.1*
Education years	10.5	10.5	10.3	*-0.2*
Total yearly earnings	30400	30407	28799	*-1608*
Total yearly earnings excluding zeros	30497	30502	29033	*-1470*
Wages (June 30th)	84.5	84.5	80.3	*-4*
Number of days working fulltime	363.9	363.9	363.8	*0*
Number of days receiving UE Benefits	0.2	0.2	0.2	*0.0*
Probability of working fulltime	1	1	1	*0.0*
1982				
Age	41.3	41.3	41.8	*0.6*
Tenure with Current Employer	6.7	6.7	5.2	*-1.5*
Education years	10.5	10.5	10.3	*-0.2*
Total yearly earnings	29895	29927	21944	*-7983*
Total yearly earnings excluding zeros	30029	30061	22033	*-8028*
Wages (June 30th)	83.9	83.9	78.2	*-6*
Number of days working fulltime	360.3	360.6	287.9	*-73*
Number of days receiving UE Benefits	2.5	2.1	95.0	*92.9*
Probability of working fulltime	1	1	0.82	*-0.2*
1983				
Age	42.3	42.2	43.0	*0.7*
Tenure with Current Employer	7.3	7.6	0.5	*-7.1*
Education years	10.5	10.5	10.3	*-0.2*
Total yearly earnings	29650	29689	18809	*-10880*
Total yearly earnings excluding zeros	30068	30090	22758	*-7332*
Wages (June 30th)	84.4	84.5	78.1	*-6*
Number of days working fulltime	356.6	357.0	246.2	*-111*
Number of days receiving UE Benefits	4.9	4.6	81.2	*76.7*
Probability of working fulltime	0.99	0.99	0.74	*-0.2*
1990				
Age	48.7	48.7	48.9	*0.3*
Tenure with Current Employer	11.6	11.9	4.6	*-7.3*
Education years	10.5	10.5	10.4	*-0.1*
Total yearly earnings	35706	35722	31436	*-4286*
Total yearly earnings excluding zeros	36795	36808	33173	*-3635*
Wages (June 30th)	101.6	101.6	91.4	*-10*
Number of days working fulltime	358.9	358.9	347.8	*-11*
Number of days receiving UE Benefits	9.7	9.7	23.8	*14.1*
Probability of working fulltime	0.97	0.97	0.94	*0.0*

Notes: The table shows characteristics of workers who were with the same employer for at least 3 years in 1982 and who were between 25 and 52 years old for different years. The first column shows characteristics for workers who stayed with their employer

Figures



(a) Fraction of Large Establishments with Mass Layoffs or Plant Closings per Year



(b) Job Separations by Tenure and Year

Figure 1: The Incidence of Separations, Mass-Layoffs and Plant Closings over Time

Notes: The top figure shows the fraction of establishments with more than 100 employees that close down or have a mass layoff in each year. Plant Closing (Mass-Layoff) is defined as a drop in employment from the previous year of at least 80 (30) percent and of the leaving workers, less than 20 percent are employed at a common employer at their next job. Data source is the Establishment History Panel (BHP) merged with information on all between-establishment worker flows. For comparison the figure also displays the change in the unemployment rate. The bottom figure shows the fraction of workers who permanently separate from their employer in a given year, overall and by different tenure categories.

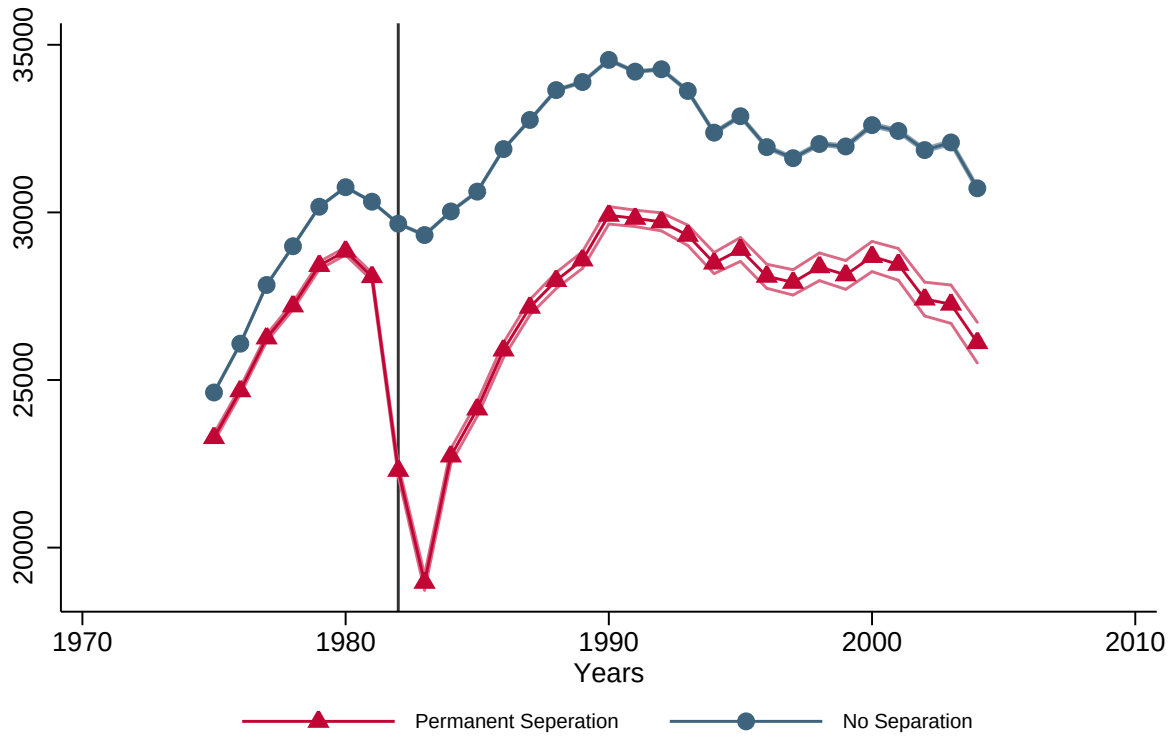
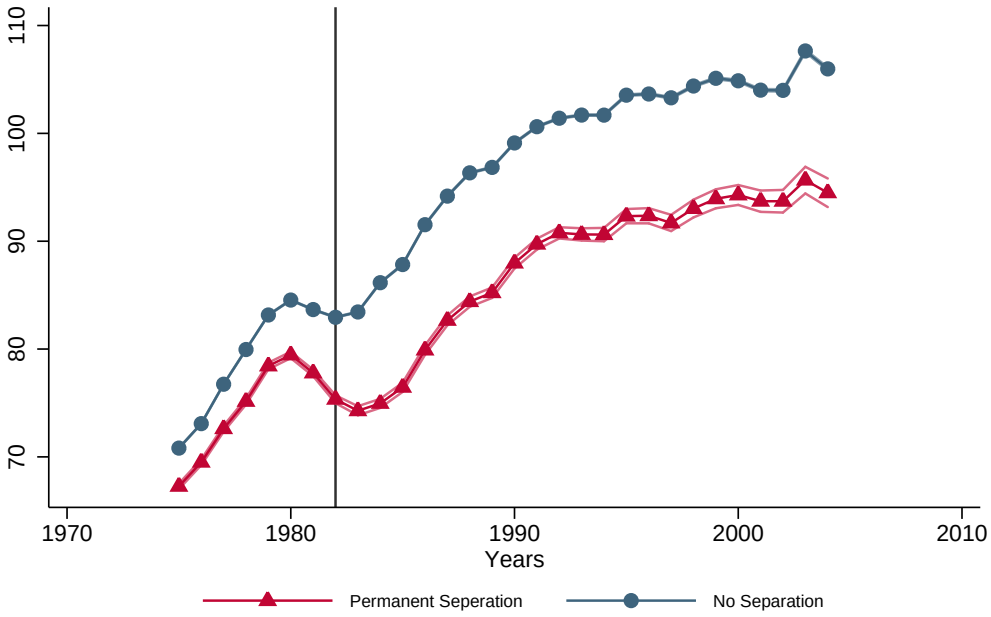
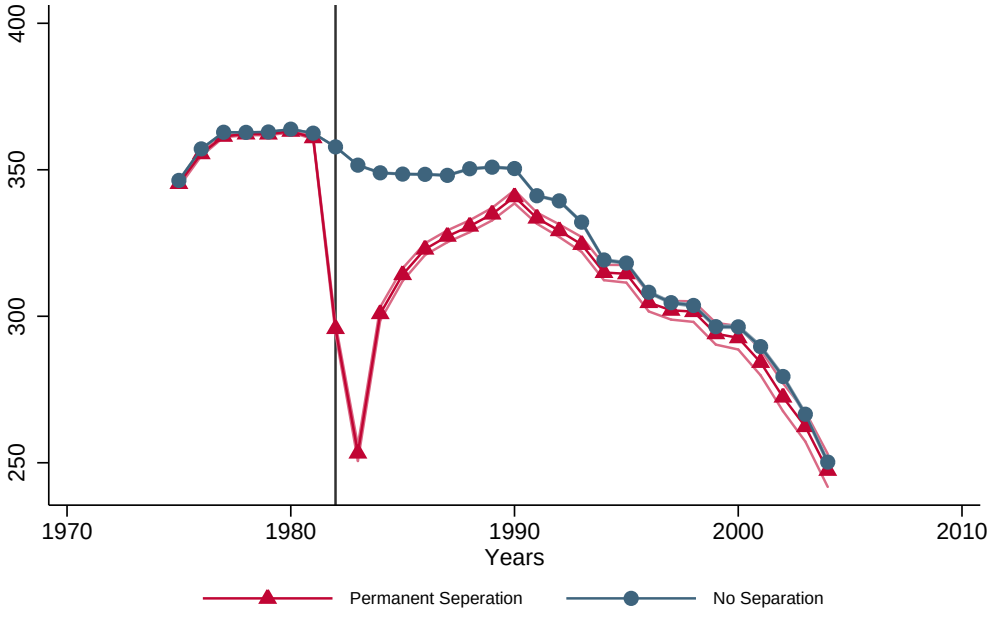


Figure 2: Total Yearly Earnings of Displaced and Non−Displaced Workers

Notes: The figure shows total earnings in Euro (in 2000 prices) by year for workers who were employed at an establishment with at least 100 employees in 1982 and who had been employed at this establishment for at least 5 years. The top line shows total earnings for workers who were continued to be employed at the same establishment in 1983, while the bottom line shows total earnings for workers who permanently separated from their job in 1982 during a mass layoff.



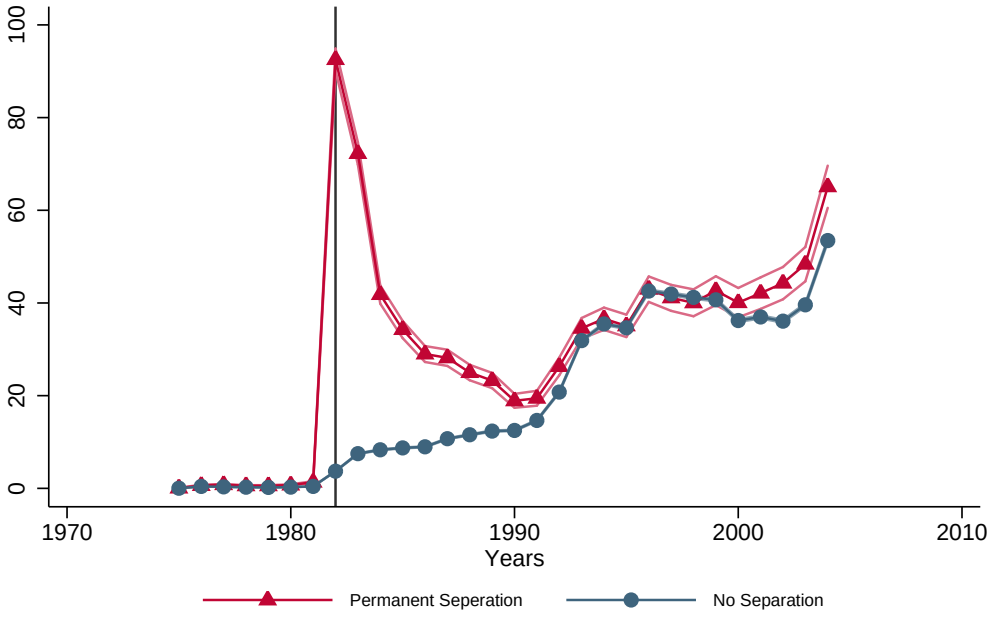
(a) Daily Wage in Euro



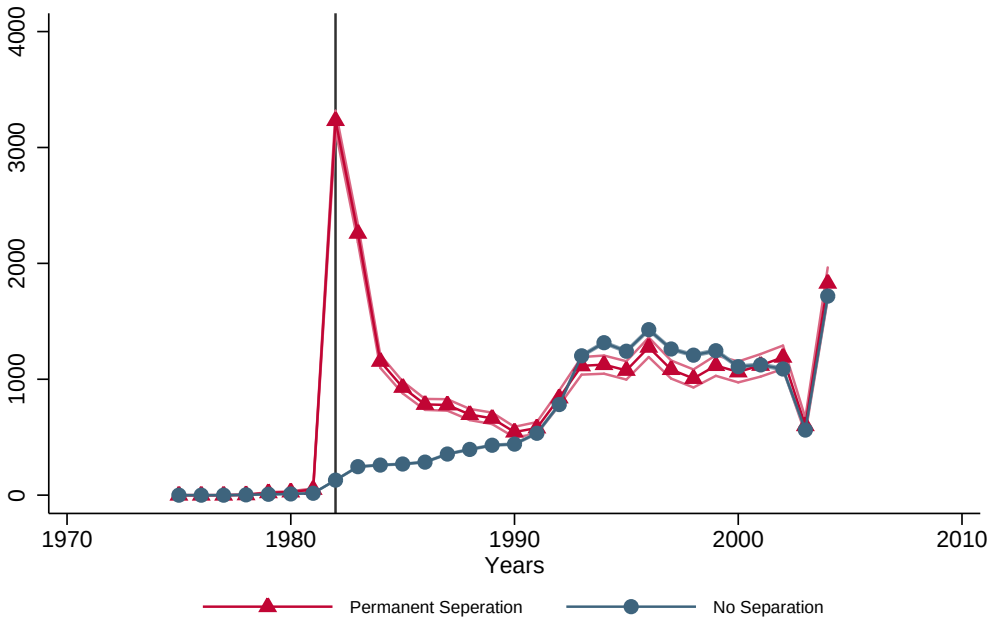
(b) Days employed full-time

Figure 3: Wage and Employment of Displaced and Non−Displaced Workers

Notes: For the sample description see Figure 2. The top figures shows the daily wage in Euro for workers who were displaced during a mass layoff in 1982 and the control group. The bottom figure shows the number of days employed full time per year for both groups.



(a) Days of Receiving Unemployment Insurance Benefits (ALG/ALH)



(b) Total Amount of Unemployment Insurance Benefits in Euro

Figure 4: Unemployment of Displaced and Non−Displaced Workers

Notes: For the sample description see Figure 2. The top figures shows the number of days of receiving unemployment insurance benefits (ALG or ALH) for workers who were displaced during a mass layoff in 1982 and the control group. The bottom figure shows the total amount of unemployment insurance benefits (ALG and ALH) per year for both groups.

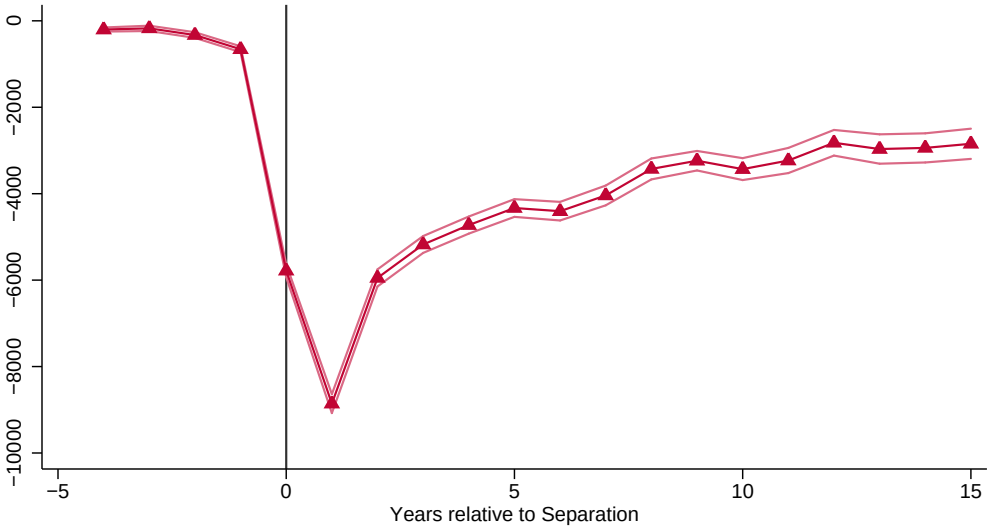


Figure 5: Total Yearly Earnings of Displaced Workers relative to Non−Displaced

Notes: For the sample description see Figure 2. The figure shows total yearly earnings of displaced workers relative to non-displaced workers after displacement. Each point is the dummy from a regression of earnings on years since 1982 interacted with a dummy for whether the person was displaced in 1982. The regression controls for year fixed effects (identified by the control group), individual fixed effects and experience.

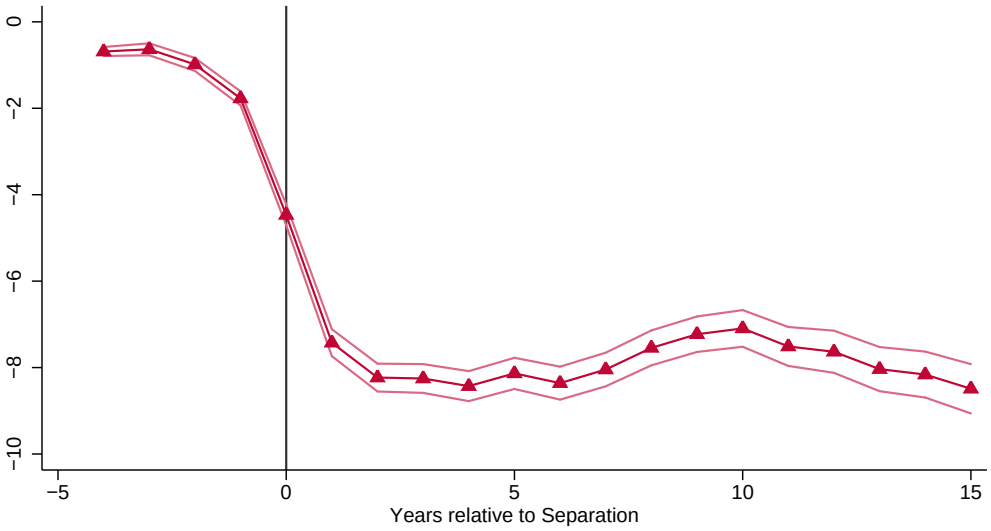


Figure 6: Daily Wage of Displaced Workers relative to Non−Displaced

Notes: The Figure is generated the same way as Figure 5, but with daily wage on the left hand side and is conditional on being employed.

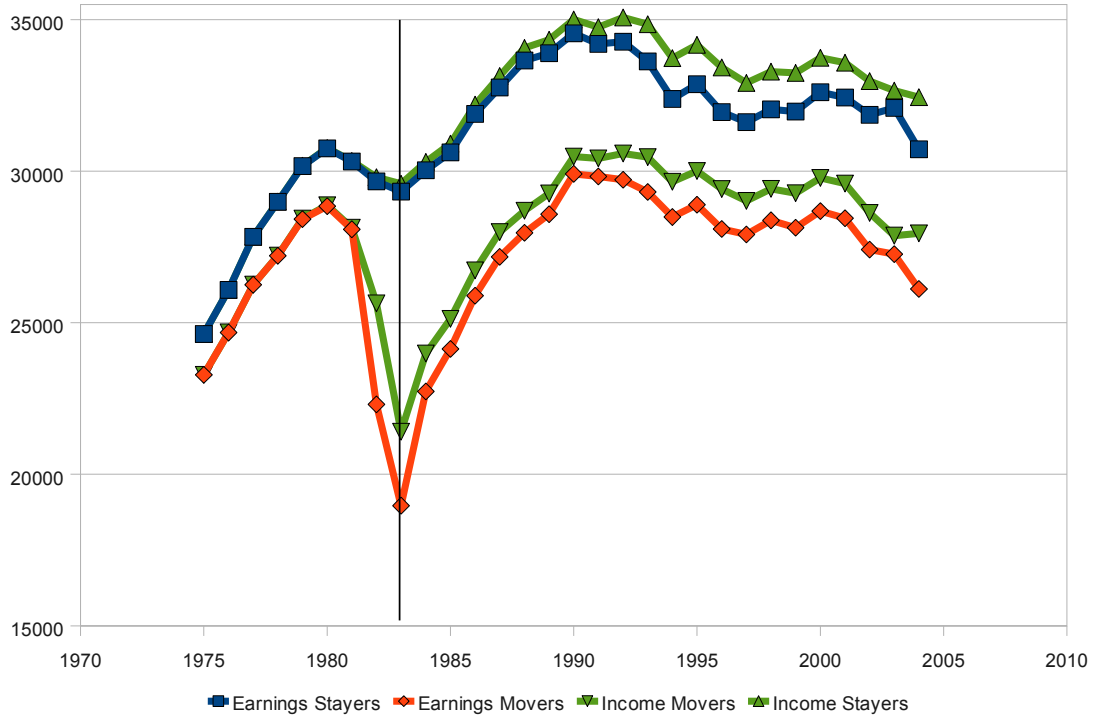


Figure 7: Earnings and Income (Earnings + UI Benefits) of Displaced Workers relative to Non−Displaced

Notes: For the sample description see Figure 2. The figure shows total yearly earnings and total yearly income of displaced workers relative to non-displaced workers after displacement. Income is defined as earnings from employment plus unemployment insurance benefits.