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**Jobless Now, Sick Later?
Investigating the Long-term Consequences of Involuntary Job Loss on Health**

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Abstract

In the light of the current economic crises which in many countries lead to business closures and mass lay-offs, the consequences of job loss are important on various dimensions. They have to be investigated not only in consideration of a few years, but with a long-term perspective as well, because early life course events may prove important for later life outcomes. This paper uses data from SHARELIFE to shed light on the long-term consequences of involuntary job loss on health.

The paper distinguishes between two different reasons for involuntary job loss: plant closures, which in the literature are considered to be exogenous to the individual, and lay-offs, where the causal direction of health and unemployment is ambiguous. These groups are separately compared to those who never experienced a job loss. The paper uses eleven different measures of health to assess long-term health consequences of job loss, which has to have occurred at least 25 years before the current interview. As panel data cannot be employed, a large body of variables, including childhood health and socio-economic conditions, is used to control for the initial conditions.

The findings suggest that individuals with an exogenous job loss suffer in the long run: men are significantly more likely to be depressed and they have more trouble knowing the current date. Women report poorer general health and more chronic conditions and are also affected in their physical health: they are more likely to be obese or overweight, and to have any limitations in their (instrumental) activities of daily living. In the comparison group of laid-off individuals, controlling for the initial conditions reduces the effects of job loss on health – proving that controlling for childhood conditions is important.

1. Introduction

Involuntary job loss potentially reduces a person's wellbeing on various dimensions. The most obvious effect is the reduction in earnings, but areas such as family life or health can be affected by direct or indirect means of a job loss. The effects also vary in terms of their persistence: for example, Ruhm (1991) and Jacobson, LaLonde, and Sullivan (1993) show that earnings from subsequent jobs after an involuntary job change remain significantly lower in comparison to a group without job loss. Other long lasting effects of involuntary job loss appear in the realm of the family, where significant increases in divorce probability have been found (Charles and Stephens, 2004) or fertility decisions are affected as children are being born later or not at all (Bono, Weber, and Winter-Ebmer, 2008).

The effects of involuntary job loss on an individual's health have been studied at least since Jahoda, Lazarsfeld and Zeisel (1933), who investigated the socio-psychological effects of unemployment in the Great Depression. Many studies have contributed to this literature since, where the basic relationship hinges on the assumption that both direct (e.g. higher anxiety and stress levels caused by unemployment) and indirect effects (e.g. lower investments in health due to lower income) may cause health to deteriorate (see Björklund, 1985). In a review, Bartley et al. (2006) report three reasons that relate involuntary job loss and subsequent unemployment to health deterioration: the first is poverty, where low levels of a variety of wealth measures were always associated with worse health. The second is that unemployment itself is stressful, as individuals lose self-esteem, important net-working possibilities, and a time structure to their days. Thirdly, unemployed individuals show more self-destructive behaviour, from increased levels of smoking and drinking to self-destructive behaviour like (attempted) suicide.

In the relationship of job loss and any outcome variable the direction of causation is a point of debate (e.g. Björklund, 1985; Eliason and Storrie, 2009; Smith, 1999). For example, being less productive leads to a higher likelihood of being laid off and at the same time leads to lower wages compared to those people who are more productive and not laid off. Similarly, bad health may lead to job loss and then unemployment: *ceteris paribus*, individuals in worse health are likely to be less productive, which increases the likelihood of a job loss. While the following unemployment period may perpetuate or even amplify the deterioration of health, it is not causal to it. This issue of endogeneity is solved in the literature by using a category of job loss which is (arguably) exogenous to individual characteristics: plant closures. When a large business is closed, the individual's performance does not matter enough to have caused the closure. The following "displacement" is then interpreted to be causal for changes in the

outcome variable of interest. This approach still has drawbacks: firms can be too small, or more productive individuals could leave the “sinking ship” before the plant is actually shut down. However, for investigating the consequences of job loss it is clearly superior to using all individuals who lost their jobs without differentiating for the reason.

Ruhm (1991) and Jacobson, LaLonde, and Sullivan (1993) used job loss due to plant closures when investigating the effects of involuntary job loss on wages, finding that there are long-term reductions in earnings for those who had lost their job. Sullivan and von Wachter (2009) transferred the approach to investigate the health consequences of displacement. They report mortality rates for the displaced workers which are 50-100% higher than for the non-displaced in the first year after displacement. Strully (2009) elicits how different job loss categories affect health, distinguishing between *no-fault, fired or laid off, voluntary*, and *other* types of job loss. She finds substantial and significant short-term effects of a *no-fault* job loss on health, even though they are stronger for fired individuals. In a study based on the Health and Retirement Study (HRS), Gallo et al. (2009) report gender specific influences of lay-offs and plant closures: while displaced married women were not affected negatively, displaced unmarried women and displaced men in general had higher scores on a disability index. Some studies, also using plant closures to identify exogenous job loss, do not find any significant effects of job loss on health. Salm (2009) considers several subjective and objective health measures in his study of individuals in the HRS. Using a difference-in-differences approach, he does not find any significant effects of plant closure (or of being laid off) on health. Browning, Moller Dano, and Heinesen (2006) use a 10% random sample of the Danish male population to investigate how job loss is associated with medical stress indicators. They apply different definitions of displacement to the administrative business and hospital records they use and find that displacement does not lead to hospitalization for stress-related illnesses. In comparison to the United States, they speculate that the generous welfare scheme in Denmark may have offset any negative effects of displacement on health. However, a different study using administrative data from Sweden reports a higher mortality of those who are displaced (Gerdtham and Johannesson, 2003) and thus finds significant effects for a country more similar to Denmark than to the US.

This brief review shows that there is no consensus in the literature on whether there is an effect of job loss on health. There are some methodological concerns: Gallo et al. (2009), for example, use a panel study, but do not consider a fixed effects approach to control for unobserved heterogeneity. Salm (2009) considers health effects that emerge within a two-year window, which could attenuate effects appearing only later. The study by Sullivan and

Wachter (2009) may suffer from sample selectivity, as only workers in Pennsylvania were taken into account. In addition, the various ways to measure health may lead to differences in results. Administrative health records provide good data quality, but can also suffer from selectivity if some individuals do not go to the doctor or hospital when they are ill. Self-reported health measures are always subjective, and may suffer from response style differences (Jürges, 2007) or recall bias (e.g. reporting doctor visits, Means et al., 1989). Except for mortality, which is hard to come by in regular survey data, it seems likely that using a wide range of health measures provides a broader picture of health consequences than concentrating on just one specific outcome.

Especially in the light of the current economic crises which in many countries lead to business closures and mass lay-offs, the consequences of job loss are important. But they have to be investigated not only in consideration of a few years, but with a long-term perspective as well, shedding light on links between relatively early life-course events with later life outcomes. A short time horizon, e.g. two years as in Salm (2009), may understate the effects, which also may not necessarily be extrapolated to the long-run. In addition, some health consequences may not even be measurable in a short period. If there are long-term consequences of job loss on health, avoiding these could increase a country's productivity and reduce health care expenditures for the elderly. Due to lack of suitable data, long-term effects of involuntary job loss on health have only been investigated very little. Sullivan and von Wachter (2009) were able to look at mortality rates 20 years after the job loss, showing that they are still 10-15% higher compared to those without a job loss. In earlier related work, Schroeder (2011a) found negative effects of job loss on long-term health, but focused more on the differences in the country-specific welfare state approaches that reduce these negative effects in the population. This paper adds to the literature by explicitly investigating the long-term effects of involuntary job loss on health. While most of the previous literature considered the effect for men, women are considered separately in this analysis. In addition, the wide range of health measures used allows drawing a clearer picture of where health consequences are to be expected. The results suggest that the (negative) effects are different for men and women: compared to those who never lose their job, men with an earlier involuntary job loss are significantly more likely to show depressive symptoms and have worse orientation in time, whereas women experience negative health consequences predominantly in their physical health.

The next section provides details on the data and the sample definitions. Section 3 then develops the model and describes the variables used, whereas section 4 shows the results. The final section then discusses the results and compares the findings.

2. Data

The data used in this paper are taken from the Survey of Health, Ageing, and Retirement in Europe, SHARE, which is a data collection effort in answer to a call by the European Union. In 2004, data were first collected in 11 countries of Northern, Central and Southern Europe to describe the ageing process of the population aged 50+ (see Börsch-Supan & Jürges, 2005 for a detailed description). Respondents were visited again in 2006 to start a longitudinal panel, where two former communist countries were added. In 2008/2009, the third wave commenced with the goal to “fill the gaps”: this round of the SHARE survey was designed as a completely retrospective survey to collect the respondents’ life histories, hence the project name “SHARELIFE”. To reach optimal data quality, data were collected using a “Life History Calendar” (Blane, 1996; Belli 1998), which was programmed in the CAPI questionnaire (for programming details, see Das et al., 2011; for concepts and topics, see Schroeder, 2011b). Due to their retrospective nature, the data are specifically well suited to relate events in a person’s life course to long-term outcomes (Börsch-Supan and Schroeder, 2011).

In the SHARELIFE questionnaire, respondents are taken through their own life history step by step. The most salient information is related to children and partners, which are asked about first. The dates of births and marriages are then already filled into the Life History Calendar to provide the respondent with anchor points for her memory. After the accommodation module, a short module on childhood living conditions is followed by the employment history module. Here, every major job is collected with start and end date, the type of job, its industry and on what terms it ended. The questionnaire then continues with an assessment of major illnesses in life and concludes with reports on general life events. For details on the questionnaire, see Schroeder (2011c).

The data have been restricted in line with previous research to build a rather homogenous sample. Of course, only individuals who are employed are at risk of losing their job, so all never-employed individuals are not considered. As the intention is to draw conclusions on the effect of individuals who follow a somewhat regular employment, only individuals who have started their first employment by the age of 30 are included. The circumstances of coming into employment during and shortly after the World War II may

have been difficult or at least very different to how it was after 1950. Hence individuals are not considered if they started to work before 1950. Because the interest of this paper is in the long-term consequences on health, the first job loss for a person who ever lost her job involuntarily has to have occurred in 1984 or earlier. Those in the control group (i.e. those without involuntary job loss) are required to have worked at least 25 years at the time of the survey (i.e. at least since 1984). This setting would ensure that the effect of the fall of the Iron Curtain in the early 1990s in the Czech Republic, Poland and East Germany does not influence the results. However, this effectively leads to the exclusion of these cases, as during communism plant closures were extremely rare. Hence, observations from the former East Block cannot be included. In addition, those who ever worked in the agricultural sector are not taken into account, as this industry has undergone very different trends in employment during the last century. Because the jobs of civil servants are usually not subject to plant closures, individuals who were civil servants are not included. Because the risk of facing a plant closure as a self-employed person is not exogenous, those who were self-employed are not considered, either.

The key information for the distinction of job loss in this paper comes from the SHARELIFE questionnaire, where each person provides information about each job that has ended, regardless of the situation thereafter. Three mutually exclusive groups of individuals are specified from this information: (1) those individuals who always left their job voluntarily; (2) those who, if they were forced to leave their job, were subject to plant closure and never laid off, and (3) those who, if they were forced to leave their job, were laid off and never experienced a plant closure. Respondents who experienced both lay-off(s) and plant closure(s) are not considered in the analyses. For the analyses following in section 4, the groups (2) and (3) are always separately compared to group (1).

The resulting sample amounts to 5,746 cases, which split into 2,462 men and 3,284 women. Group (1), with a total of 4,936 cases, is divided among 2,134 men and 2,802 women, the 308 cases in group (2) belong to 136 men and 172 women, whereas 192 men and 310 women comprise the 502 cases in group (3). Most of the involuntary job losses happen relatively early in the career: for those in group (2), 90% were displaced for the first time before the age of 39; for those in group (3), the corresponding age is 37. Involuntary job loss in both groups has occurred by the age of 55 at the latest.

The data are augmented by information from the first and second wave of SHARE. For the most part, these are outcome variables measuring the respondent's health in the

respective wave. However, some control variables regarding the parents' longevity and the individual's citizen status are added from the first two waves as well.

3. Model and Variables

The aim of the analysis is to see whether involuntary job loss leads to health differences in the long run. Hence the outcome variables y are put in relationship to an indicator D of job loss, which is set to "1" if the individual in question has lost a job involuntarily due to plant closure (group 2) or to lay-off (group 3). In case a person always voluntarily left their job (group 1), the indicator is set to "0". All estimations of the effect of D on the respective health measure y are using groups 1 and 2, if the interest is in the effect of plant closures on health, and groups 1 and 3, if the interest is in the effect of lay-offs on health. Groups 2 and 3 are thus never used in the same regression. All estimations are performed separately for men and women to allow for any differential gender effects.

Since the data are cross sectional, person fixed effects cannot be used, which would be desirable to control for unobserved heterogeneity. This makes the (choice of) control variables X important in order to reduce a possible bias on the estimated coefficient on the indicator D . The principle model used looks like this:

$$y_i = \alpha + \beta D_i + \gamma X_i + \varepsilon_i$$

As the model is estimated with a logistic, a linear, or a negative binomial regression, depending on the respective dependent variable, the actual model setup varies accordingly. Robust standard errors are always used in the estimation. The coefficient on D , β , specifies whether current health is influenced by a job loss which happened at least 25 years ago. It measures the total effect of all things that might have been different after the job loss occurred – for example, individuals with a job loss may have had worse health care and are now in worse health. To the extent that the explanatory variables X control for any differences in the individuals *before* the job loss occurred, this is an effect attributable to the job loss.

Beyond the split by gender, the control variables consist of the usual individual **demographic characteristics**: age and age-square at the time of the interview are used to adjust the health measure, as age is one of the main factors of deteriorating health. The years of education (up to the first job) provide a further demographic variable, as the relationship between education and health has been shown in several studies (see Cutler and Lleras-Muney

2008, for an overview). The information of whether the respondent is a citizen of the country she lives in is added to capture any effects of migration on health.

A second block of variables consists of the **childhood health** (as reported retrospectively by the respondent), which also fits into the notion of “predisposition” mentioned by Gallo et al. (2009). The first of these variables is the respondent’s health status as a child¹, while further variables related to childhood health are whether the respondent reported to have spent at least one month in a hospital during childhood, and whether she reported to have had one or more of a list of more serious illnesses until the of age 15.² While some individuals have to retrieve this information from more than 50 years ago, Smith (2009) for the HRS and Havari and Mazzonna (2011) for SHARE show that retrospectively collected health data is quite reliable and may indeed be powerful in explaining current health status.

A third block of variables is provided by the **childhood socio-economic conditions** which influence health status up to old age. Here an indicator for bad conditions of the accommodation is set to “1” if the home did neither have a fixed bath, nor running water, nor an inside toilet, nor central heating. A good correlate of the socio-economic conditions has been shown to be the number of books in the household (Cavapozzi et al., 2011). Here, an indicator is set to “1” if the respondent reports that there have been very few books in the household. The respondent’s living arrangements in terms of number of people per room is used by adding indicators for being in the middle or upper third of the distribution (and thus having less room per person than the first third). Because parental health behavior is reflected in own health behavior, a final indicator for parental influences is set to “1” if the respondent’s parents smoked, drank heavily, or had mental health problems.

In addition to the socio-economic situation as a child, current health is clearly influenced by **parental genes**. While those cannot be controlled for, longevity is related to good health in general. Thus the age of the respondent’s parents is included as a proxy for their longevity, which takes the value of the current age, if they are still alive or provides their age at the time of their death. In addition, an indicator for whether the respondent’s parents are still alive is added.

¹ Note that the use of this variable bears the problem of endogeneity, as the measurement error in this variable may be correlated with the dependent health variable(s) of interest, especially with the current reported health status. However, instrumenting childhood health with the reported number of illnesses as a child and whether the person reported having been in the hospital at least a month during childhood instead of including them in the regression leaves the coefficient on displacement virtually unaffected.

² Specifically, these are: polio, asthma, severe diarrhea, meningitis, chronic ear problems, speech impairments, eye problems (beyond wearing glasses), migraines, epilepsy, psychiatric problems, childhood diabetes, heart trouble, leukemia or cancer.

The previously described variables control for the initial conditions before an individual starts to work. However, as job loss only ends a job and may then be correlated with everything that comes thereafter, **variables at the beginning of the first job** can be used as controls to further reduce the unobserved heterogeneity. The industry of the first job is added coded as dummy variables, because industries may affect the individual's health differently (e.g. miners may suffer from worse health in later life than those in education, because the job may have been more demanding physically). Part-time workers are usually easier to let go, hence a corresponding indicator is added. Workers with a family may select into less risky jobs, hence indicators on whether the individual was married and/or had children at the start of the first job are added in addition to the respondent's age at the first job and its square. Because these variables are restricted to the first job for causality reasons, they may not describe the situation at the time of job loss accurately. However, only this way they are comparable to the individuals without involuntary job loss. Finally, because of possible differences in reporting the dependent variables (Jürges, 2007), country fixed effects are included to adjust for this country specific variation. These country fixed effects also control for any time-invariant welfare state differences which may affect the consequences of unemployment on health.

The dependent variables y capture several different areas of the respondent's health. They can loosely be classified into objective and subjective health measures, where subjective measures may suffer from the respondent's perception and reporting style, whereas objective measures are either more factual (like a grip strength measure) or validated to account for response styles (like the EURO-D scale). Respondents are asked to report their health status in each SHARE wave on a 5 point scale. This variable (taken from SHARELIFE) is recoded to a variable indicating whether the respondent reports fair or poor health (= "1") or not (= "0"). For this general measure the full model with all variables is discussed in the next section, while for the other health measures, only the coefficients on the respective displacement indicator are reported. Other more subjective health measures are whether the respondent applied for disability insurance payments, whether she reports to be limited in general (severely or moderately) and the number of chronic conditions³ (as asserted by a doctor) reported overall.

The more objective measures start with the respondent's maximum grip strength in wave 3 (coming from a maximum of four different measures). The subjective measure of

³ These chronic conditions are hypertension, high blood cholesterol, a stroke, diabetes, chronic lung disease, asthma, arthritis, osteoporosis, cancers, ulcers, Parkinson's disease, and cataracts.

application for a disability insurance above is complemented here by an indicator of whether the insurance payments were actually granted, assuming that before insurance payments occur, a professional assesses the respondent's health. The body mass index (BMI) is calculated from the respondent's reported height and weight and a variable is generated for whether the BMI is larger than 25 (i.e. overweight by WHO standards). The report of any limitations in the activities of daily living (ADL)⁴ and in the instrumental activities of daily living (IADL)⁵ can be viewed as more objective, as the individual has no reason to relate this rather factual information directly to her health. As a measure for clinical depression, the EURO-D scale (see Prince et al., 1999a) has been implemented in SHARE, where, as was validated in Prince et al. (1999b), an indicator for a score of at least four on the scale is taken as a measure for clinical depression. The final objective measure is orientation in time, capturing whether the respondent is not able to specify the correct date (day of the week, month and year) at the time of the interview.⁶

4. Results

Before going into the multivariate analyses, Tables 1 and 2 show some basic comparisons between the three groups defined in section 2. Comparing the groups gives a first indication of whether they are different both in their initial conditions (i.e. the explanatory variables) and their outcomes (i.e. health measures). Table 1 shows the comparison of the control variables, without the split by gender. There are some significant differences between the groups: Individuals who were subjected to plant closures (group 2) or who were fired (group 3) spent less time in school, lower by 1.5 years and 1 year, respectively. In terms of childhood health, individuals in group 2 are not different to those in group 1, whereas those in group 3 were in significantly worse health as a child. Those in the groups 2 and 3 come from poorer households, while the distribution of the number of people per room shows no significant difference. Parental longevity is not different between the groups (except for the lower age of the father in group 3), while there are some differences in the first job: group 1 individuals were significantly older when they started to work, which corresponds also to their generally longer education, and they were also more likely to be married than group 2

⁴ ADLs include dressing, walking across a room, bathing, eating, getting in and out of bed, and using the toilet.

⁵ IADLs include using a map, preparing a meal, shopping for groceries, making a phone call, taking medications, doing work around the garden, and keeping track of expenses.

⁶ Of these measures, current health status, maximum grip strength, whether the respondent applied for disability insurance and whether it was granted are measured in the third wave. All other dependent variables come from wave 1 or wave 2. Here the implicit assumption is that the condition is still present in wave 3. This seems likely for the given measures – if at all, the presence of the conditions is underestimated in the estimation sample.

individuals. As for the industry of the first job, group 1 individuals are less likely to have started in manufacturing or sales, but more likely to have worked in public administration, education, or health and social work.

Table 1 suggests that certain industries may have higher risks of suffering from plant closures or lay-offs. Because selection into these industries is not independent of the individual's characteristics, there is an indirect link of the characteristic to the risk of being displaced or not. This shows that the multivariate analyses need the control variables to not suffer from omitted variable bias on the variable of interest. In addition, childhood health is not different between groups 1 and 2, while laid-off individuals report significantly worse childhood health. This is an indication that causation for being fired is indeed related to health prior to job loss and hence being laid off is not exogenous to health. This finding is similar to what Strully (2009) reports to validate her measure of plant closure.

Table 2 shows the raw differences between the groups in the discussed health measures, split by male (in the top panel) and female respondents (in the bottom panel). Although the table reflects that individuals who have suffered from involuntary job loss are in worse health, there are clear differences between men and women and between those who were subjected to plant closures and those who were laid off. Men who experienced plant closures only show significant differences in depressive symptoms and orientation in time. Women who experienced plant closures on the other hand are more likely to report worse current health, more chronic conditions, more ADLs and IADLs and also are more likely to be overweight. There are more significant differences between the laid-off group and those continuously employed, which shows for both men and women that laid-off individuals are in worse health. The only exception is grip strength, where there are no significant differences. Groups 2 and 3 are not really different in their outcomes – sometimes those subjected to plant closures have worse health outcomes, sometimes it is the other way around, but none of the differences are significant. However, as Table 1 suggests, before concluding that the differences between group 1 and groups 2 and 3 are “real”, one has to see whether they still persist in a multivariate analysis.

The first multivariate analysis is shown in Table 3. The health status reported by the respondents in wave 3 is regressed on the indicator of having been subjected to plant closure and on the control variables discussed in the previous section. This model shows the effect of the control variables for the remaining models in Tables 4 and 5, while the indicator variable changes from group 2 (plant closure) to group 3 (laid off) and the dependent variable varies over all health measures. The gender difference visible in Table 2 is also present in Table 3, as

women who experienced a plant closure are significantly more likely to report fair or poor health. For men, this effect is not significant. The marginal effect for women (shown in Table 4) is quite substantial: the likelihood to be in bad health increases by 7.2 percentage points if a woman has experienced a plant closure as an employee.

The control variables also explain the current health of the individual: for both sexes, the coefficients on age and its square (jointly significant at the 1% level) show that there is a U-shaped influence of age on health. Education reduces the likelihood to be in bad health, whereas being a foreigner is associated with worse health compared to citizens of the respective country only for men. Current health is strongly related to the reported childhood health conditions: this holds not only for the reported “general” health as a child, but also for the factual information of hospital stays and serious illnesses. Childhood economic conditions as a whole are influential, especially the measure for socio-economic conditions in the number of books at home shows that individuals from deprived childhood households have worse health as adults. Men from households with more than 1.25 persons per room during their childhood are also in worse health. Parental longevity translates significantly into current health, as having parents that live(d) longer yields a lower likelihood of being in bad health. Interestingly, this effect is gender specific: for men, the father’s age is significant, while for women, it is the mother’s age. The characteristics of the first job do not explain much of the variation in current health – however, those women who were married at the time of the first job report worse health. The reduction of the log-likelihood is 8.8% for men and 9.2% for women (as shown in Table 4). Overall, Table 3 suggests that for women, even though the gap of 12.1 percentage points between the two groups (Table 2) can be reduced by controlling for the initial conditions, job loss through plant closure is a major driver of the overall difference in health.

Table 4 shows the results of estimating the same model as in Table 3 with the different dependent variables mentioned in section 3. Again, the results for males are presented in the top panel, the results for females are shown in the bottom panel. Each row shows the estimated effect of having been subjected to a plant closure on the respective health measure, with the first row being identical to the results from Table 3. Marginal effects are provided to make comparisons easier. The explanatory power as measured by the (pseudo) R^2 is added in the last column. The eleven different models shown in Table 4 provide evidence that there are some long-lasting effects of involuntary job loss on health in different dimensions, although they differ by gender in their significance. For men, two health measures are affected significantly by job loss through plant closure: they are 7.1 percentage points more likely to

be depressed and 4.7 percentage points more likely to have difficulties with respect to their knowledge of the current date. For the other health measures, the results for men are not significant. For women, the picture is a little clearer – all point estimates show that women, who experienced plant closures, are in worse health than their counterparts who never lost their job involuntarily. Significant effects are found for the number of chronic conditions (0.166 more), the probability of being overweight (increased by 14.6 percentage points), the likelihood to report at least on ADL (increased by 3.3 percentage points) or IADL (increased by 5.3 percentage points).

Table 5 repeats the estimation comparing group 1 with group 3, the individuals who experienced lay-offs. The results differ from those who have lost their jobs through plant closure. For men, only the effect on chronic conditions is significant, showing that those who were fired report 0.168 more chronic conditions than those never laid off. For women, some of the effects shown in Table 4 are replicated here: women who were laid off are more likely to report fair or poor health (increase of 8.8 percentage points) and to be overweight (increase by 5.3 percentage points). However, laid-off women are also more depressed (8.7 percentage point increase), more likely to report an application for disability insurance (by 1.8 percentage points) and feel limited in their activities (by 5.1 percentage points). Again, however, all effects point in the direction that women, who have been fired, are in worse health than the comparison group without job losses.

5. Summary and Discussion

The goal of this paper was to shed light on the long-term consequences of job loss on health by using a broad spectrum of health indicators and two mutually exclusive definitions of job loss: an (arguably) exogenous measure when individuals have experienced plant closures (and only those), and a potentially endogenous one where individuals report to have been fired or laid off (and never experienced a plant closure). By restricting the sample appropriately and controlling for the initial conditions, the observed effects can be related to a job loss that occurred at least 25 years prior to the interview.

The findings suggest that individuals with the experience of a plant closure suffer in the long run: men are significantly more likely to be depressed, and they have more trouble knowing the current date. Women report poorer health in their general health status and a higher number of chronic conditions. But also some physical health measures are worse for this group: women are more likely to be obese or overweight, and to have any limitations in ADLs or IADLs. However, for both sexes the grip strength is not affected and also the

likelihood of applying and receiving disability insurance is not changed. The interpretation of these findings points towards an effect of job loss on mental health for men, who, as measured by the EURO-D scale, are much more likely to be depressed, whereas physical health is not affected. For women, the effects on BMI, on ADLs and IADLS as well as on the number of chronic conditions show a larger effect on the physical side (even though grip strength and disability insurance are not affected), which is reflected in a higher likelihood to report poor or fair health for those women who were subject to a plant closure. Taken together, plant closures and subsequent involuntary job loss leads to health deterioration in later life for both men and women, but in rather different ways.

The findings for the comparison group of those who were laid off point in a slightly different direction: for men, only the number of chronic conditions seems to be negatively affected, while for all other health measures, there is no significant difference. For women, there are strong effects on depression and general health, and some effects on applying for disability insurance, having limitations and being overweight. Considering the significant differences observed initially in Table 2 for both men and women who were laid-off compared to those without an involuntary job loss, the control variables (especially those for initial conditions) are important for assessing these differences. In comparison to the plant-closure sample, where the significant differences in Table 2 “survived” the inclusion of the controls, it is likely that the sample of laid-off individuals is not ideal to measure the effects of involuntary job loss on health, as predispositions matter for this group. The analyses hence provide further evidence for the exogeneity of plant closures.

The differential effects of plant closures on men and women’s long-term health are striking and have not been documented in a similar fashion in the literature yet. The explanations for the differences may at least be partially of a structural nature. The individuals under investigation had their main working life during a time where the male breadwinner model was predominant in society. Not being able to fulfill this role may not only affect psychological health in the short run, as documented by Bartley et al. (2006), but may also lead to lower mental well-being in the long-run, as shown by the higher likelihood of male depression in this paper. As the women of this generation were not expected to support a family, the effect on long-term mental health may be not as severe. On the other hand, the findings on women’s health provide evidence of a higher morbidity for women exposed to involuntary job loss compared to women without this experience. If unemployed, the duration of unemployment for women of this generation has been generally longer than for men (Brugianvini et al., 2011). If the pathways shown by Bartley et al. (2006) hold, the mix of

increased poverty, stressful unemployment and health-damaging behavior, which women with an involuntary job loss are exposed to longer than unemployed men, may have led to these higher levels of long-term morbidity.

A general limitation to this study is the potential selection problem: as shown by Sullivan and von Wachter (2009), men suffering from job loss have a higher mortality. When looking at the long run experience in SHARELIFE, those who are affected more heavily may have already died or are no longer able to participate in the survey. However, the effects of an increase in mortality on the sample selection are likely to be small: Assuming an increase in mortality as estimated by Sullivan and Wachter had affected the current samples, probably no more than five to ten men and women would have died because of the involuntary job loss through plant closures.⁷ It seems unlikely that the addition of these cases would change the results dramatically – if at all, the negative effects on health should become stronger because of the increased morbidity.

One may also wonder about another selection with regard to the time lag of 25 years and the restriction of job losses that occurred between 1950 and 1984 only. To some extent, the sample benefited from the rather good economic conditions throughout their work life, with higher probabilities of a fast re-employment after an involuntary job loss, especially for men. Although the effects of unemployment duration are not considered in this paper, it is likely that a longer period of unemployment affects health more seriously than a short one. In this regard, the effects in this paper again have to be regarded as lower bounds.

Another limitation of the study is clearly the lack of panel data, which prohibits the use of individual fixed effects to control for unobserved heterogeneity. Even though this issue was addressed by using a wide range of variables to control for the initial conditions, some unobserved characteristics might remain and could influence the estimates of the involuntary job loss on health. Using the approach by Altonji et al. (2005), which allows identifying upper bounds on the bias coming from unobserved heterogeneity, provides evidence that in the worst case, the results could be completely explained by selection on unobservable

⁷ These numbers are based on rough calculations using German (former West) mortality rates from 2008/2010 for 65 year-olds. Displacement is assumed to have taken place 35 years ago, at age 30. Considering differential mortality as calculated by Sullivan and Wachter (short-term increase by 100%, gradually decreasing to a long-term differential of 13%), allows deriving the “initial” displaced sample size recursively. Applying the mortality rates of the general population to this sample leads to the sample size as if no displacement had occurred. At German mortality rates, this would amount to four men and three women who have died due to plant closures. While larger mortality rates in other countries could increase these numbers, the estimated effects are based on increases in mortality rates in the United States. European welfare state support for the unemployed is more generous than in the U.S., which could decrease the negative effects of job loss on mortality.

characteristics.⁸ However, this issue cannot be solved easily, because a regular panel of survey respondents would be unlikely to provide as many observations spanning such a long period. Administrative data are not the best solution either: while they potentially cover individuals over their whole lifespan, in most countries, they are not readily accessible and employment records are not necessarily linked or linkable to the respective health records. Hence retrospective records – even though they are not perfect – provide a relatively simple way to address the question of how long-term health is affected by job loss.

Another explanation of the results may be a “justification bias”, which would lead respondents to report plant closures or lay-offs to justify their bad health status. This explanation is rather unlikely: some of the health measures (notably: depression, obesity) are taken from different waves, where there was no mentioning of how previous jobs ended. Even if asked in the same wave, the questions are quite far apart – separated by a module on work quality and financial investments. It is also hard to imagine that individuals feel the need to justify bad health – usually, these effects may be expected when looking at (bad) test scores and similar topics.

Overall, this paper suggests that, controlling for initial conditions, men and women experience differential long-term effects of involuntary job loss on health. Especially with the current economic crises in mind, policy makers should be aware of the long-run effects of mass lay-offs on productivity and health care costs.

⁸ Altonji et al. (2005) report ratios of the coefficient of interest to the possible bias up 3.55, meaning that the selection on unobservable characteristics would have to be 3.55 times higher than the selection on observables to conclude that there is no true effect. In the estimations used in this paper (using linear regressions instead of logistic models), the implied ratios range from 0.07 to 0.38 for men and 0.06 to 0.27 for women. Note that these ratios are derived assuming that selection on observables is as large as the selection on unobservables.

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Table 1: Differences in Explanatory Variables by Group

	Group 1 Never Laid off or subject to plant closure	Group 2 Exposed to plant closure	Group 3 Was laid off or fired
<i>Demographic</i>			
Age	63.8	63.5	63.4
Age squared	4118	4081	4063
Is female	0.568	0.558	0.618 *
Years of Education	11.7	10.3 *	10.8 *
Foreign	0.016	0.036	0.014
<i>Childhood Conditions</i>			
Bad Childhood Health	0.082	0.084	0.120 *
In Hospital as Child for at least 1 month	0.060	0.045	0.092 *
Had any serious illness as a child	0.141	0.195 *	0.151
Home as a child was poorly equipped	0.171	0.240 *	0.203
Household had only few books as a child	0.376	0.487 *	0.424 *
Parents smoked, drank, or had mental problems	0.686	0.727	0.737 *
more than 1.25, less than 2 people per room	0.355	0.318	0.369
more than 2 people per room	0.287	0.315	0.287
<i>Parental Longevity</i>			
Age of mother	77.6	77.3	76.8
Age of father	72.8	71.3	70.5 *
Mother still alive	0.294	0.299	0.287
Father still alive	0.123	0.094	0.106
<i>Characteristics at First Job</i>			
Married at first job	0.093	0.052 *	0.094
Children at first job	0.047	0.029	0.066
Age at first job	19.0	17.5 *	17.9 *
Age squared at first job	377	317 *	331 *
First job part-time	0.039	0.049	0.036
<i>First Job Industry</i>			
Manufacturing	0.220	0.357 *	0.313 *
Electricity, gas and water supply	0.023	0.016	0.028
Construction	0.089	0.110	0.092
Wholesale and retail trade	0.161	0.214 *	0.207 *
Hotels and restaurants	0.024	0.032	0.012 *
Transport, storage and communication	0.042	0.016 *	0.032
Financial intermediation	0.045	0.029	0.030
Real estate, renting and business activities	0.007	0.003	0.006
Public administration and defence	0.047	0.026 *	0.026 *
Education	0.068	0.013 *	0.022 *
Health and social work	0.115	0.049 *	0.066 *
Other community	0.145	0.123	0.151
Observations	4936	308	502

Notes:

Table shows means of three groups: those were never exposed to plant closures or lay-offs, those who were displaced, and those who were fired.

* marks significant differences (5% level) between group 1 and groups 2 and 3, respectively.

Reference category on first job industry is "mining and quarrying".

Table 2: Differences in Dependent Variables by Group and Gender

	Group 1	Group 2	Group 3
	Never Laid off or subject to plant closure	Exposed to plant closure	Was laid off or fired
Male			
Fair or poor health in SHARELIFE	0.278	0.338	0.370 *
Ever applied for disability insurance	0.052	0.103	0.073 *
Limited in activities in general (severe or moderate)	0.294	0.294	0.370 *
Number of chronic conditions	1.133	1.257	1.380 *
Maximum grip strength	44.9	45.8	45.5
Application for disability insurance successful	0.047	0.088	0.063 *
Body Mass Index greater 25 (overweight)	0.686	0.632	0.651
At least one limitation with activities of daily living (ADL)	0.042	0.051	0.068 *
At least one limitation with instrumental ADL	0.056	0.044	0.089 *
Depressed (four or more items on EURO-D scale)	0.118	0.228 *	0.120
Does not know current day-month-year	0.100	0.169 *	0.115
Observations	2134	136	192
Female			
Fair or poor health in SHARELIFE	0.286	0.407 *	0.403 *
Ever applied for disability insurance	0.040	0.070	0.084 *
Limited in activities in general (severe or moderate)	0.333	0.384	0.410 *
Number of chronic conditions	1.139	1.517 *	1.394 *
Maximum grip strength	27.8	27.4	27.3
Application for disability insurance successful	0.036	0.064	0.071 *
Body Mass Index greater 25 (overweight)	0.516	0.692 *	0.610 *
At least one limitation with activities of daily living (ADL)	0.044	0.099 *	0.077 *
At least one limitation with instrumental ADL	0.091	0.169 *	0.135 *
Depressed (four or more items on EURO-D scale)	0.245	0.314	0.361 *
Does not know current day-month-year	0.089	0.134	0.100
Observations	2802	172	310

Notes:

Table shows means of three groups, those never exposed to plant closures or lay-offs, those who were displaced, and those who were fired.

* marks significant differences (5% level) between group 1 and groups 2 and 3, respectively.

Table 3: Multivariate Model of “Current Health Poor or Fair” by Gender

	Male		Female	
	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
Displacement	0.160	(0.201)	0.391	(0.178)**
<i>Demographic</i>				
Age	-0.075	(0.117)	-0.023	(0.096)
Age squared	0.001	(0.001)	0.000	(0.001)
Years of Education	-0.053	(0.019)***	-0.068	(0.019)***
Foreign	0.926	(0.358)***	0.166	(0.343)
<i>Childhood Conditions</i>				
Bad Childhood Health	0.589	(0.188)***	0.989	(0.148)***
In Hospital as Child for at least 1 month	0.380	(0.223)*	0.419	(0.175)**
Had any serious illness as a child	0.147	(0.154)	0.249	(0.119)**
Home as a child was poorly equipped	-0.059	(0.137)	0.039	(0.125)
Household had only few books as a child	0.433	(0.117)***	0.180	(0.101)*
Parents smoked, drank, or had mental problems	0.069	(0.113)	0.017	(0.094)
more than 1.25, less than 2 people per room	0.281	(0.123)**	-0.073	(0.106)
more than 2 people per room	0.249	(0.143)*	0.114	(0.122)
<i>Parental Longevity</i>				
Age of mother	-0.006	(0.004)	-0.007	(0.004)*
Age of father	-0.006	(0.004)*	-0.003	(0.003)
Mother still alive	-0.288	(0.143)**	-0.001	(0.115)
Father still alive	-0.246	(0.216)	-0.187	(0.156)
<i>Characteristics at First Job</i>				
Married at first job	0.124	(0.252)	0.402	(0.201)**
Children at first job	-0.332	(0.395)	0.049	(0.273)
Age at first job	-0.067	(0.113)	0.045	(0.106)
Age squared at first job	0.001	(0.003)	-0.001	(0.003)
First job part-time	0.504	(0.415)	-0.424	(0.198)**

Notes: *, **, *** depict significance on the 10, 5, and 1% level, respectively.

Estimation includes country dummies and indicators for the industry at the first job (see Table 1).

Dependent variable is coded as "0: not in poor or fair health"/"1: in poor or fair health". Model is estimated as a logistic regression with robust standard errors. Included are individuals who have never lost their job involuntarily and those who were affected by a plant closure only. The models are estimated with 4,936 group (1) cases, divided into 2,134 men and 2,802 women who never left their jobs involuntarily, and 308 cases from group (2), with 136 men and 172 women who were subjected to plant closure.

Table 4: Multivariate Models of Health Outcomes on Job Loss through Plant Closure

Dependent Variable	Coefficient	Robust Standard Error	Marginal Effect	(pseudo) R ²
Men				
Fair or poor health in SHARELIFE	0.160	(0.201)	0.029	0.088
Ever applied for disability insurance	0.454	(0.339)	0.024	0.097
Limited in activities in general (severe or moderate)	-0.080	(0.201)	-0.016	0.053
Number of chronic conditions	0.069	(0.087)	0.078	0.041
Maximum grip strength	0.279	(0.725)	0.279	0.203
Application for disability insurance successful	0.400	(0.371)	0.019	0.096
Body Mass Index greater 25 (overweight)	-0.231	(0.196)	-0.048	0.036
At least one limitation with activities of daily living (ADL)	0.104	(0.414)	0.004	0.098
At least one limitation with instrumental ADL	-0.261	(0.429)	-0.013	0.103
Depressed (four or more items on EURO-D scale)	0.681	(0.224)***	0.071	0.056
Does not know current day-month-year	0.527	(0.258)**	0.047	0.047
Women				
Fair or poor health in SHARELIFE	0.391	(0.178)**	0.072	0.092
Ever applied for disability insurance	0.266	(0.346)	0.010	0.120
Limited in activities in general (severe or moderate)	0.123	(0.172)	0.025	0.063
Number of chronic conditions	0.143	(0.072)**	0.166	0.055
Maximum grip strength	-0.344	(0.461)	-0.344	0.164
Application for disability insurance successful	0.335	(0.357)	0.012	0.145
Body Mass Index greater 25 (overweight)	0.631	(0.179)***	0.146	0.053
At least one limitation with activities of daily living (ADL)	0.765	(0.310)**	0.033	0.101
At least one limitation with instrumental ADL	0.654	(0.232)***	0.053	0.082
Depressed (four or more items on EURO-D scale)	0.187	(0.183)	0.032	0.061
Does not know current day-month-year	0.375	(0.239)	0.030	0.050

Notes: *, **, *** depict significance on the 10, 5, and 1% level, respectively.

Each row shows results of estimating the effect of job loss (plant closure) on the respective dependent variable. Estimations include the control variables depicted in Table 3 as well as industry and country dummies.

The model for "Number of chronic conditions" is estimated with a negative binomial regression model, "Maximum grip strength" with a linear regression. All other models are estimated with a logistic regression model.

Marginal effects are calculated using the delta method.

"R²" applies to "Maximum grip strength", "pseudo R²" (the decrease in log-likelihood) to all other models.

The models are estimated with 4,936 group (1) cases, divided into 2,134 men and 2,802 women who never left their jobs involuntarily, and 308 cases from group (2), with 136 men and 172 women who were subjected to plant closure.

Table 5: Multivariate Models of Health Outcomes on Job Loss through Lay-off

Dependent Variable	Coefficient	Robust Standard Error	Marginal Effect	(pseudo) R ²
Men				
Fair or poor health in SHARELIFE	0.228	(0.173)	0.042	0.087
Ever applied for disability insurance	-0.006	(0.335)	0.000	0.096
Limited in activities in general (severe or moderate)	0.131	(0.164)	0.026	0.055
Number of chronic conditions	0.146	(0.069) **	0.168	0.043
Maximum grip strength	0.031	(0.682)	0.031	0.197
Application for disability insurance successful	-0.158	(0.363)	-0.007	0.098
Body Mass Index greater 25 (overweight)	-0.078	(0.168)	-0.016	0.035
At least one limitation with activities of daily living (ADL)	0.262	(0.337)	0.011	0.097
At least one limitation with instrumental ADL	0.283	(0.294)	0.015	0.098
Depressed (four or more items on EURO-D scale)	-0.164	(0.245)	-0.017	0.047
Does not know current day-month-year	-0.008	(0.248)	-0.001	0.044
Women				
Fair or poor health in SHARELIFE	0.473	(0.139) ***	0.088	0.092
Ever applied for disability insurance	0.451	(0.265) *	0.018	0.142
Limited in activities in general (severe or moderate)	0.245	(0.133) *	0.051	0.060
Number of chronic conditions	0.084	(0.054)	0.098	0.055
Maximum grip strength	-0.475	(0.385)	-0.475	0.169
Application for disability insurance successful	0.333	(0.289)	0.012	0.158
Body Mass Index greater 25 (overweight)	0.228	(0.133) *	0.053	0.049
At least one limitation with activities of daily living (ADL)	0.390	(0.263)	0.017	0.096
At least one limitation with instrumental ADL	0.299	(0.194)	0.024	0.080
Depressed (four or more items on EURO-D scale)	0.493	(0.138) ***	0.087	0.067
Does not know current day-month-year	0.044	(0.219)	0.004	0.041

Notes: *, **, *** depict significance on the 10, 5, and 1% level, respectively.

Each row shows results of estimating the effect of job loss (lay-off) on the respective dependent variable. Estimations include the control variables depicted in Table 3 as well as industry and country dummies.

The model for "Number of chronic conditions" is estimated with a negative binomial regression model, "Maximum grip strength" with a linear regression. All other models are estimated with a logistic regression model.

Marginal effects are calculated using the delta method.

"R²" applies to "Maximum grip strength", "pseudo R²" (the decrease in log-likelihood) to all other models.

The models are estimated with 4,936 group (1) cases, divided into 2,134 men and 2,802 women who never left their jobs involuntarily, and 308 cases from group (2), with 192 men and 310 women who were laid off.