Who suffers during recessions? Economic downturns, job loss, and cardiovascular disease in older Americans

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WHO SUFFERS DURING RECESSIONS? ECONOMIC DOWNTURNS, JOB LOSS AND CARDIOVASCULAR DISEASE IN OLDER AMERICANS

Job loss in the years before retirement is found to increase risk of cardiovascular disease (CVD), but some studies suggest that CVD mortality among older workers declines during recessions. We hypothesized that recessionary labor market conditions are associated with reduced CVD risk among individuals not experiencing job loss and increased CVD risk among individuals losing their job. Our analyses use longitudinal, nationally representative data for Americans aged 50+ in the Health and Retirement Study assessed every two years from 1992 to 2010 on their employment status and onset of stroke or myocardial infarction. To measure local labor market conditions, Health and Retirement Study data was linked to county unemployment rates. Among workers experiencing job loss, recessionary labor market conditions at the time of job loss were associated with a significant increase in CVD risk (Hazard Ratio [HR] = 2.54, 95% Confidence Interval [CI] = 1.39, 4.65). In contrast, among workers not experiencing job loss, recessionary labor market conditions were associated with a decline in CVD risk (HR = 0.50, 95% CI = 0.31, 0.78). These results suggest that recessions may be protective in the absence of job loss, but they are hazardous for individuals losing their job.

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Abbreviations: CVD, cardiovascular disease; HRS, Health and Retirement Study; MI, myocardial infarction.

Job loss in the years before retirement is associated with increased risk of cardiovascular disease (CVD) and mortality (1–8). Intuitively, CVD risk for older workers should also increase during economic recessions, when many individuals lose their jobs and households suffer financial hardship (9). Yet, empirical findings have been inconsistent. Most U.S. studies report that CVD mortality declines during recessions (10–17), while studies on European countries either yield results similar to U.S. studies (18), or find no association or increases in CVD mortality during economic downturns (19–21).

To advance our understanding of job loss and recessions as joint causes of CVD, this study examines whether reductions in labor demand that occur during recessions have different effects on workers experiencing job loss and workers who do not experience job loss. Likewise, we examine whether recessionary labor market conditions magnify the hazardous effect of job loss on CVD risk.

Our study relates to earlier work suggesting that job loss increases CVD risk (1–4). These studies, however, did not consider the business cycle or labor demand as potential moderators. Comparing individuals losing their job during a recession and an economic expansion in Finland, Martikainnen et al. found that the effect of job loss on all-cause mortality is weaker during recession (22). This is attributed to compositional mechanisms: Individuals losing their job during expansions may be more adversely selected in terms of health compared to individuals losing their job during recessions, when even very healthy and productive workers can lose their job for economic reasons. As a consequence, one would observe a weaker association between job loss and mortality during recessions compared to expansions, reflecting the on average healthier pool of jobless during recessions (22). The detailed health information in our data allows us to assess the role of compositional differences in explaining variation in the association

between job loss and CVD risk across labor market contexts. Furthermore, earlier studies have examined the association between recessions and cause-specific mortality for different age groups, but did not examine variation in associations by labor market status (10–14,16,23). While two recent studies examine interactive effects of labor market conditions and labor market status on all-cause mortality in the U.S. (5,6), to our knowledge, no other study has examined the joint association of job loss and labor market conditions on CVD risk in the U.S.

Our hypothesis is that the association between job loss and CVD risk is stronger during economic recessions than normal economic times. Compared to job loss in normal times or booms, job loss during recessions occurs in periods of low labor demand, which prolongs unemployment spells and reduces chances of re-employment and post-job loss earnings (24–27). Because re-employment prospects are low, older workers are more likely to exit the labor force and collect social security benefits early, which may result in financial hardship later in life (28–32). Recessions may thus magnify the adverse economic and psychosocial consequences of job loss (33–37) and via these mechanisms disproportionately increase risk of CVD.

In contrast, economic downturns may lower CVD risk for individuals not experiencing job loss. For employed workers, reductions in labor demand entail reduced working hours, which in turn makes time available for health-promoting activities such as exercising or medical check-ups (10,11,13,16,38,39). Fewer working hours and reduced commercial activity may also reduce risk of workplace accidents, exposure to pollution and pathogens (14,40,41). Furthermore, adults who are both working and providing care to elderly dependents may spend more time doing care work during recessions (39), which may lower CVD risk for dependents.

Our empirical analysis uses longitudinal data from the Health and Retirement Study (HRS) for the period 1992-2010. We contribute to earlier literature by exploiting individual-level panel data to examine not only short-term, but also long-term effects of job loss and economic recessions on the onset of myocardial infarction or stroke using discrete-time survival analysis. We distinguish workers that experienced involuntary job loss due to either firm closures or layoff from those that did not, and draw on variation in county unemployment rates over a 20-year period as a natural experiment to examine how recessionary labor market conditions and job loss jointly affect CVD risk.

METHODS

Sample

The HRS is a multi-cohort panel survey representative of the U.S. population aged 50+. Since 1992, it has recorded individual socio-economic and health outcomes every two years (42). Our analysis sample comprised all individuals observed in a dependent employment relationship between ages 45 and 66 and therefore at risk of job loss over the observation period (1992-2010). We excluded individuals who reported having had either a stroke or heart attack before the baseline interview. To limit the sample to job spells that were a significant source of status and income, we excluded jobs lasting less than one year, or paid zero earning, or entailed less than 36 weeks of work per year, or less than 16 hours of work per week (1,2). The resulting sample included 8837 individuals, who were on average 53 years old at baseline and were followed for on average 11.9 years.

We classified individuals as experiencing job loss, referred to as ‘treated’, if they reported having lost their job due to lay-off or business closure between age 45 and their cohort-

specific full retirement age (around age 66). All other individuals were considered to be part of the comparison group ('controls'), which included workers who remained employed throughout the observation period, or had other labor force transitions, e.g., retirement, transitions to disability, or health-related work exits. For controls, we disregarded spells that ended before age 45 or started after individual's full retirement age to set a common age range over which treated and controls were observed. Web Table 1 lists additional descriptive statistics for our analysis sample.

HRS Measurements

Our outcome is onset of myocardial infarction or stroke. At each survey, respondents were asked "Did you have a heart attack or myocardial infarction" and "Has a doctor ever told you that you had a stroke?" as well as the year of the respective event. If respondents were not available, e.g., following a fatal myocardial infarction (MI) or stroke, the information was obtained from proxy informants, predominantly spouses. We observe 666 MIs and 541 strokes. The combined number of events was 990, which included 59 individuals that reported suffering both a stroke and an MI in the same year.

We controlled for socio-economic, behavioral and health risk factors. Demographic covariates included birth cohort, place of birth, gender, ethnicity, and parental education. Socioeconomic covariates included respondent's educational level, marital status, household wealth, household income, individual earnings, hours worked, weeks worked, and state of residence. Monetary quantities were adjusted for inflation using the Consumer Price Index for All Urban Consumers (Bureau of Labor Statistics). Household wealth and income were furthermore adjusted for differences in household size by dividing by the square root of the

number of household members. Risk factors included current and former smoking, Body Mass Index, and number of alcoholic drinks per day. Health conditions included self-rated health, depressive symptoms (Center for Epidemiologic Studies of Depression 8 item scale), self-rated memory function, and reports of a previous diagnosis of cancer, diabetes, heart problems or high blood pressure. All covariates were measured either at entry into survey or the first interview belonging to the employment spell that made individuals eligible for inclusion into the analysis sample.

Measuring Recessionary Labor Market Conditions

We use annual county unemployment rates for the period from 1992 to 2010 (Bureau of Labor Statistics, Local Area Unemployment Statistics) to measure fluctuations in economic conditions at a local level, capturing both opportunities for re-employment for unemployed workers and levels of commercial activity and demand for work hours for employed workers. Previous studies have similarly used unemployment rates to measure cyclical variation, since they are highly correlated with fluctuations in aggregate demand (10,16). To isolate cyclical variation *within* counties, we obtained the residuals from a regression of county unemployment on county fixed effects and county-specific linear trends:

$$(1) \qquad U_{ct} = I_c + I_c \times Year + \varepsilon_{ct},$$

U_{ct} is the unemployment rate in county c and year t, I_c are county fixed effects, and $Year$ is an integer variable defined over the interval from 1992 to 2010. County fixed effects eliminate unobserved, time-constant, county-specific factors that could be confounded with unobserved, time-constant determinants of CVD, such as unobserved cross-county differences in average health levels. County-specific trends $I_c \times Year$ eliminate non-cyclical, long-run changes in

unemployment within counties over time that could be correlated with changes in health. For example, as a county's population ages, unemployment declines because older individuals are less likely to be unemployed, while CVD risks increases, inducing a spurious negative correlation between unemployment rates and CVD risk.

We obtained the residuals ε_{ct} from this regression, which measure the deviation in unemployment rates in year t from its long-run trend in county c. We ignore any variation in unemployment that is between counties, or that follows a long-run, linear trend, and therefore identify the effects of local labor market conditions from short-term, cyclical variation in labor demand within counties. We split this measure of cyclical local labor demand into 5 quintiles to allow for non-linear effects on CVD risk (43). Individuals observed in the fifth quintile (Q5) experienced recessionary local labor market conditions similar to those observed in the Great Recession, while those observed in the first quintile (Q1) experience labor market boom conditions that were typical of, e.g., the late 1990s. Web Appendix 1 includes further details on indicator construction and descriptive information (Web Figures 1-3). Web Appendix 2 reports results of robustness checks using different approaches to indicator construction (Web Tables 2 and 3).

Statistical Analysis

We modeled time in years from entry into survey to stroke or MI in a discrete-time framework using complementary log-log regression. We first performed separate analyses for individuals who experienced job loss and individuals who did not lose their job. Our baseline model is specified as follows:

(2) $h(z) = 1 - \exp[-\exp(z)]$, where

(3) $$z = \alpha + \sum_{k=1}^{17} \beta_k D_k + \sum_{j=2}^{5} \gamma_j BC_{jt} + \partial_1 Age + \partial_2 Age^2 + \partial_3 Age^3 + \partial_4 Age^4$$

h(z) is the discrete-time hazard rate for having an MI or stroke, α is a constant and D_k are 17 annual baseline hazard dummy variables (omitting k=0). We include an age quartic to flexibly adjust for the impact of age on CVD risk. BC_{jt} are four indicators of local labor demand, with j=1 as the reference category corresponding to labor demand conditions prevalent in boom periods. Exponentiated parameter estimates from this model have a hazard ratio interpretation.(44) In subsequent analyses, we pool treated and controls and include a set of interaction terms between job loss and labor demand indicators.

For individuals experiencing job loss, the labor demand indicator varies from year to year, i.e., we expect that fluctuations in labor demand have contemporaneous effects on CVD risk. This is consistent with our theoretical framework and previous studies (10,11,16). For individuals experiencing job loss, we expected labor market conditions at the time of job loss to modify the impact of job loss on CVD risk. Accordingly, we "freeze" the labor demand indicator at the time of job loss, i.e. it retains the value at the time of job loss for the remainder of the observation period. This approach allows us to capture both short-term effect of job loss in a given economic environment and potentially cumulative, long-term effects.

We controlled for year fixed effects to adjust for unobserved causes of cardiovascular disease that change uniformly from year to year. We also adjusted for numerous socio-economic, behavioral and health variables. We assessed balance on these variables for treated and controls observed in recessionary vs. non-recessionary conditions in order to test whether compositional differences may account for variation in the effect of recessionary labor market conditions on both groups.

We found no systematic imbalance in the covariate distribution among controls. For treated individuals, we used Coarsened Exact Matching (45,46) to exactly balance the sample on less balanced covariates across labor market states (Q1-Q4 vs. Q5). Coarsened Exact Matching sorts individuals into strata defined by unique values of coarsened covariates and then only retains observations in strata that include individuals observed in both recessionary and non-recessionary conditions. We match on birth cohort (7 categories), age at first interview (3 categories) and year of first interview (3 categories). These variables jointly define 24 strata, 19 of which contain individuals observed in recessionary and non-recessionary conditions. After dropping 11 unmatched observations, cohort and age distributions are practically identical for job losers observed in recessionary (Q5) vs. non-recessionary conditions (Q1-Q4). Additional information is given in Web Appendix 3. Analyses were conducted in Stata 13 (StataCorp, College Station, TX).

RESULTS

We observe 1,480 job losses before the onset of stroke or heart attack in our analysis sample, 299 (20%) of which occurred in years characterized by recessionary labor market conditions (Table 1). While the early 1990s recession ended in March 1991 (NBER Business Cycle Dating Committee), the following two years still witnessed some of the highest unemployment rates in our observation period, with 91.4% (1992) and 60.4% (1993) of individuals in our sample experiencing recessionary labor market conditions. Unemployment reached similar levels only during the Great Recession in 2009 and 2010. Compared to these two recessions, the increase in unemployment observed in the 2001 recession was less severe.

[Table 1 here]

Table 2 shows descriptive statistics for a subset of potential confounders across recessionary (Q5) and non-recessionary (Q1-Q4) local labor market conditions. Web Tables 4-6 contain results for the full set of variables used in the analysis. We calculated the percentage of individuals with a certain characteristic for recessionary and non-recessionary conditions. Columns 3, 6, and 7 report bias statistics, which quantify the difference in percentages as a standardized difference (formula in Web Appendix 3). For individual not experiencing job loss (controls), we find small differences across many variables, but no systematic pattern. It therefore seems unlikely that compositional differences across labor market states should influence our results for this group. However, for individuals experiencing job loss either due to business closure or lay-off (treated), certain birth cohorts are more likely to be exposed to recessionary conditions. We corrected these imbalances using Coarsened Exact Matching, which exactly balanced select characteristics (birth cohort, age at first interview, and year of first interview) across recessionary and non-recessionary conditions.

[Table 2 here]

Table 3 reports associations between labor market conditions and CVD risk for individuals who experienced job loss ('treated') and who did not experience job loss ('controls'). The upper panel shows that recessionary labor demand conditions were associated with an increased risk of CVD among treated even after controlling for a large set of potential confounders (M4: hazard ratio = 2.54, 95% confidence interval = 1.39, 4.65). These hazardous effects persist after restricting the sample to matched observations. Among treated, estimated effect sizes increase after adjusting for potential confounders, reflecting positive selection into job loss during recessions compared to booms (22,47). In contrast, the bottom panel of Table 3 shows that among controls, recessionary labor market conditions are associated with lower CVD

risk (M4: hazard ratio=0.50, 95% confidence interval = 0.31, 0.78). Estimated hazard ratios are robust to the inclusion of covariates, suggesting that observed characteristics are uncorrelated with fluctuations in local labor demand in this group.

[Table 3 here]

Table 4 shows estimates from an analysis that pools treated and controls and includes a set of interaction terms between job loss and labor demand indicators. Results show that – on average – recessions are protective and job loss is hazardous, though either estimate only reaches statistical significance at the 10% level (M1). However, after allowing job loss and labor demand to interact (M2-M4), we observe that recessionary labor demand conditions are only protective in the absence of job loss, while job loss significantly increases CVD risk only if experienced during recessionary labor demand conditions.

[Table 4 here]

These results illustrate the role of local labor demand conditions as moderators of the effect of job loss on CVD risk. To illustrate this interaction, Figure 1 shows simulated effects of job loss across different labor market contexts based on the estimates from M4 (Table 4), alongside effect estimates of labor demand in the split sample (Table 3, M4). Compared to individuals not experiencing job loss, we observe a statistically significant, hazardous effect of job loss only during recessionary labor demand conditions (hazard ratio = 1.93, 95% confidence interval = 1.23, 3.04).

[Figure 1 here]

We also ran separate models for strokes and myocardial infarctions. Estimates for main and interaction effects of job loss and business cycle were very similar across both outcomes, and close to those for the models that used a combined CVD outcome (Web Table 7).

DISCUSSION

Previous research has shown that among older Americans recessions are associated with lower mortality from cardiovascular disease (CVD) (10–17). Using data from the Health and Retirement Study, we find that recessionary local labor market conditions increase the long term hazard of cardiovascular disease (CVD) for older workers losing their job, while cutting in half CVD hazards for older workers who do not experience job loss. Ecological studies likely reflect the protective effect of recessions for individuals not losing their job, which outnumber job losers by 5:1 in our sample. We also show that job loss only increases CVD risk if it occurs under recessionary conditions.

There are several possible explanations for the protective effect of reductions in labor demand on CVD for individuals not affected by job loss. Although empirical findings are contradictory (38,48–50), some workers may be less likely to engage in risky or unhealthy behaviors (e.g. smoking or drinking) during recessions. Recessions may also reduce work hours and workplace stress for employed workers, while freeing up time to invest in healthy behaviors, such as medical check-ups, physical exercise, and sleep, all of which may lower CVD risks (10,16,38,39,51,52). By reducing commercial activity and working hours, recessions may also reduce exposure to pathogens (41) and pollution, which has been linked to declining CVD mortality during recessions (40). Finally, reductions in economic activity may increase worker's

time availability to care for dependent elderly (39), which may potentially reduce dependents' CVD risk.

While cyclical downturns in labor demand may be protective for the majority of individuals, our results indicate that they are hazardous for individuals losing their job. The latter result is consistent with evidence that recessions make job loss more economically scarring (24–27) and magnify the hazardous effect of job loss on mortality risks (5). Recession may exacerbate the psychosocial stress from job loss (33–36,53) and thereby amplify CVD risk. Earlier studies also suggest that unemployed worker feel a of lack of control over their lives (54,55), which may be exacerbated by a scarcity of jobs. Job loss may also increase unhealthy behaviors such as alcohol-drinking or smoking relapse,(48,56) which might be more pronounced and sustained during recessions given poor prospects of re-employment.

While our study has several strengths, some limitations should be considered. Incidence of heart disease and stroke was based on self- or proxy reports of a doctor's diagnosis, which may have led to misclassification bias.(57) However, validation studies for the U.S. generally suggest good agreement between physician-provided diagnoses and self-reports, with true positive rates of 70-80% and true negative rates of 99% for both outcomes.(58–60) A study comparing the effects of important stroke predictors on stroke incidence in HRS and datasets with medically verified strokes yielded very similar relative risk estimates.(61)

Effects of job loss on CVD risk could be driven by adverse selection.(62,63) However, studies addressing selection still find sizeable negative health effects of job loss in the U.S.(1,8,64) Comparing individuals experiencing and not experiencing job loss across many potential confounders, we found both groups to be similar in their observed characteristics (Web

Table 8). Adjusting for potential confounders also yielded no evidence of adverse selection. We also checked whether job losses due to business closure during recessions, which may be less selective in terms of unobserved characteristics (64), have different effects than job losses due to lay-offs during recession, which we did not find to be the case (Web Table 7).

Individuals observed as treated/controls under recessionary conditions may be systematically different from those observed as treated/controls during normal times (22). We therefore controlled for year fixed effects to rule out confounding by compositional differences across individuals observed in different years. Furthermore, we found no evidence of systematic compositional difference over the labor demand states among controls and regression results were generally unaffected by adjustment for potential confounders. For treated, we found some differences in covariate distributions between individuals observed in business cycle states that were addressed using Coarsened Exact Matching. The covariate-adjusted regressions results indicated that there is positive selection into job loss during recessions, which has been suggested by previous research.(22,47)

While more evidence is needed to disentangle the underlying mechanisms, our results highlight the potential of targeting public health interventions according to the state of the business cycle and the labor force status of individuals. Health professionals should routinely screen for recent job losses in particular during recessions. In contrast, health promotion interventions for the employed may need to be intensified during times of economic expansion.

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TABLES

Table 1. Aggregate Unemployment Rates, Recessionary Local Labor Market Conditions[a] and Job Losses among Respondents in the Analysis Sample. Health and Retirement Study, 1992-2010.

Year	Unemployment Rate 45-66 Year Olds (%)[b]	% of Respondents Observed in Recessionary Conditions (Q5)[c]	Number of Job Losses[d]	Number of Job Losses in Recessionary Conditions (Q5)
1992	5.5	91.4	54	53
1993	5.2	60.4	149	108
1994	4.6	18.6	136	33
1995	3.9	5.9	109	3
1996	3.8	6.9	91	4
1997	3.4	5.9	85	2
1998	3.2	5.6	74	3
1999	2.9	2.7	89	0
2000	2.6	2.7	72	0
2001	3.0	2.7	78	0
2002	4.1	4.4	73	1
2003	4.6	4.6	61	1
2004	4.2	2.2	43	0
2005	3.8	2.1	86	0
2006	3.2	2.0	57	0
2007	3.4	2.0	57	0
2008	3.7	1.8	68	0
2009	7.1	78.0	88	81
2010	8.0	80.0	10	10

[a]Local market conditions are measured by demeaned and detrended county unemployment rates. The transformed unemployment rates were split into quintiles, with the fifth quintile (Q5) capturing recessionary local labor demand conditions.

[b]The unemployment rate for 45-66 year olds was calculated from the Current Population Survey.

[c]The correlation coefficient between the unemployment rate for 45-66 year olds and the % of respondents observed in recessionary labor market conditions is 0.85.

[d]The total number of job losses that occur before either stroke or heart attack is 1480, with 299 (20%) occurring under recessionary (Q5) conditions.

Table 2. Selected Characteristics[a] of Individuals not Experiencing and Experiencing Job Loss Observed Under Non-Recessionary (Q1-Q4) and Recessionary (Q5) Labor Market Conditions. Health and Retirement Study 1992-2010. 8837 Individuals, 105 417 Person-Years.

		Individuals Not Experiencing Job Loss (N=7,226)			Individuals Experiencing Job Loss (N=1,571)			
		Q5, %	Q1-Q4, %	Bias[b]	Q5, %	Q1-Q4, %	Bias[b]	Bias[b] after Matching
Birth Year								
	1919-1930	3.2	2.6	3.4	0.9	0.5	5.3	0.0
	1931-1935	23.6	21.3	5.3	27.9	11.1	43.2	0.0
	1936-1940	34.0	31.2	6.0	42.2	31.3	22.6	0.0
	1941-1945	18.5	21.4	-7.2	20.7	27.4	-15.7	0.0
	1946-1950	11.3	13.8	-7.8	6.1	19.7	-41.3	0.0
	1951-1955	7.2	7.3	-0.3	1.6	7.7	-29.1	0.0
	1956-1966	2.3	2.3	-0.2	0.6	2.3	-14.1	0.0
Female		43.6	43.1	0.9	44.3	43.4	1.9	-0.5
Ethnicity								
	White	71.2	74.8	-8.1	71.5	74.7	-7.3	-8.1
	Black	17.1	15.9	3.4	14.8	13.3	4.2	3.6
	Hispanic	9.8	7.8	7.0	11.1	9.6	4.7	7.3
	Other, not known	1.9	1.6	2.9	2.6	2.3	2.1	0.9
Education								
	Less than high school	16.3	14.6	4.7	20.1	17.6	6.6	-0.9
	GED	4.2	4.4	-1.3	9.1	6.6	9.3	6.2
	High school	50.0	50.0	0.1	48.9	54.5	-11.4	-10.3
	Some college	5.4	5.3	0.5	4.8	4.3	2.8	7.8
	Bachelor	12.8	13.5	-2.0	13.1	11.6	4.5	6.9
	Postgraduate	11.3	12.2	-2.9	3.9	5.4	-7.0	0.1
Ever Smoked		58.7	58.4	0.7	69.4	61.8	16.1	12.3
Current Smoker		22.8	22.3	1.2	31.3	29.2	4.7	5.4
Ever Diagnosed With Diabetes		6.6	6.3	1.2	4.5	6.2	-7.2	-6.7
Ever Diagnosed With Heart Problems		4.4	4.2	1.0	3.4	4.3	-4.7	-1.1
Ever Diagnosed With High Blood Pressure		29.2	28.5	1.6	26.1	26.7	-1.4	0.1
Number of Depressive Symptoms								
	0-2	91.2	90.5	2.4	91.6	85.9	18.4	8.7
	3-5	6.4	6.7	-1.3	6.0	9.8	-14.1	-6.5
	6-8	1.7	1.8	-0.9	2.0	3.1	-6.7	-5.1
	missing	0.8	1.1	-2.8	0.3	1.2	-10.6	-2.5
Self-Reported Health								
	Excellent	27.9	27.6	0.6	25.8	22.7	7.1	2.3
	Very Good	32.9	34.0	-2.2	32.5	34.0	-3.2	-0.5
	Good	28.8	28.6	0.4	32.0	32.3	-0.6	-1.4
	Fair	9.2	8.7	1.9	8.4	9.8	-4.8	-1.9
	Poor	1.1	1.1	0.7	1.3	1.2	1.2	4.0

Abbreviations: GED, General Educational Development Credential.

[a]All numbers are sample % unless otherwise noted.

[b]Bias is the standardized mean difference (formula in Web Appendix 3).

Table 3. Recessionary Labor Demand Conditions[a] and Risk of Heart Attack or Stroke Among Individuals Experiencing vs. not Experiencing Job Loss. Health and Retirement Study, 1992-2010. Exponentiated Coefficient Estimates from Complementary Log-Log Regression.[b]

	Model 1[c] Baseline		Model 2[d] Model 1 + Demographic Controls and Year FE		Model 3[e] Model 2 + Socioeconomic Risk Factors and State FE		Model 4[f] Model 3 + Behavioral Risk Factors and Health Conditions	
	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI
				Individuals Experiencing Job Loss[g]				
Q1 = Boom (Ref.)								
Q2	1.24	0.75, 2.07	1.28	0.76, 2.16	1.32	0.77, 2.27	1.53	0.88, 2.69
Q3	1.35	0.82, 2.23	1.39	0.81, 2.38	1.43	0.81, 2.50	1.69	0.95, 3.01
Q4	1.22	0.75, 2.00	1.32	0.76, 2.30	1.40	0.79, 2.51	1.63	0.90, 2.95
Q5 = Recession	1.66	1.04, 2.68	1.76	1.00, 3.09	2.20	1.23, 3.95	2.54	1.39, 4.65
				Individuals Experiencing Job Loss, Matched Sample[h]				
Q1 – Q4 (Ref.)								
Q5 = Recession	1.39	0.99, 1.95	1.46	1.03, 2.08	1.64	1.12, 2.41	1.65	1.10, 2.49
				Individuals not Experiencing Job Loss[i]				
Q1 = Boom (Ref.)								
Q2	0.88	0.73, 1.07	0.86	0.70, 1.05	0.84	0.69, 1.04	0.83	0.68, 1.03
Q3	0.94	0.76, 1.17	0.89	0.70, 1.13	0.85	0.66, 1.10	0.85	0.66, 1.09
Q4	0.79	0.62, 1.01	0.67	0.50, 0.91	0.62	0.46, 0.85	0.61	0.45, 0.83
Q5 = Recession	0.61	0.46, 0.82	0.49	0.31, 0.78	0.49	0.31, 0.76	0.50	0.31, 0.78

Abbreviations: exp(b), exponentiated beta coefficient estimates; CI, confidence interval; FE, fixed effects; Ref., reference group.

[a]Labor demand conditions were measured using county unemployment rates, which were transformed into an indicator variable with five categories: Q1 corresponds to conditions observed during expansions, Q5 corresponds to conditions observed in recessions (see Methods section for further details).

[b]Exponentiated coefficient estimates from complementary log-log regression can be interpreted as hazard ratios.

[c]Model 1 adjusts for a baseline hazard and an age quartic.

[d]Model 2: Model 1 + birth cohort, year of first interview, gender, ethnicity, birth place, parental education, own education, and year FE.

[e]Model 3: Model 2 + state FE, household wealth, household income, individual earnings, weeks worked, hours worked, health insurance coverage, marital status.

[f]Model 4: Model 3 + BMI, ever smoked, currently smoking, drinks per day, depression symptoms, self-rated health, self-rated memory, ever diagnosed with cancer, diabetes, high blood pressure, heart problems.

[g]N=1,571 individuals, 185 events.

[h]N=1,560 individuals, 185 events.

[i]N=7,266 individuals, 805 events.

Table 4. Recessionary Labor Demand Conditions[a], Job Loss and Risk of Heart Attack or Stroke. Health and Retirement Study, 1992-2010. Exponentiated Coefficient Estimates from Complementary Log-Log Regression.[b]

	Model 1[c] Baseline		Model 2[d] Model 1 + Demographic Controls and Year FE		Model 3[e] Model 2 + Socioeconomic Risk Factors and State FE		Model 4[f] Model 3 + Behavioral Risk Factors and Health Conditions	
	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI
Q1 = Boom (Ref.)								
Q2	0.93	0.78, 1.12	0.90	0.75, 1.09	0.89	0.73, 1.08	0.85	0.70, 1.04
Q3	1.02	0.84, 1.23	1.00	0.81, 1.23	0.96	0.77, 1.20	0.91	0.72, 1.15
Q4	0.86	0.69, 1.07	0.81	0.64, 1.02	0.72	0.54, 0.95	0.66	0.50, 0.88
Q5 = Recession	0.81	0.64, 1.03	0.67	0.51, 0.88	0.60	0.41, 0.89	0.62	0.42, 0.91
No job loss (Ref.)								
Job loss	1.20	1.00, 1.46	0.77	0.47, 1.26	0.77	0.47, 1.26	0.63	0.38, 1.05
Q2 x Job loss			1.53	0.80, 2.95	1.53	0.79, 2.95	1.88	0.97, 3.65
Q3 x Job loss			1.30	0.67, 2.52	1.22	0.63, 2.38	1.46	0.74, 2.86
Q4 x Job loss			1.69	0.89, 3.20	1.69	0.88, 3.24	2.17	1.13, 4.18
Q5 x Job loss			2.58	1.38, 4.85	2.54	1.29, 5.01	3.05	1.54, 6.04

Abbreviations: exp(b), exponentiated beta coefficient estimates; CI, confidence interval; FE, fixed effects; Ref., reference group.

[a]Labor demand conditions were measured using county unemployment rates, which were transformed into an indicator variable with five categories: Q1 corresponds to conditions observed during expansions, Q5 corresponds to conditions observed in recessions (see Methods section for further details).

[b]Exponentiated coefficient estimates from complementary log-log regression can be interpreted as hazard ratios.

[c]Model 1 adjusts for a baseline hazard and an age quartic.

[d]Model 2: Model 1 + birth cohort, year of first interview, gender, ethnicity, birth place, parental education, own education, and year FE.

[e]Model 3: Model 2 + state FE, household wealth, household income, individual earnings, weeks worked, hours worked, health insurance coverage, marital status.

[f]Model 4: Model 3 + BMI, ever smoked, currently smoking, drinks per day, depression symptoms, self-rated health, self-rated memory, ever diagnosed with cancer, diabetes, high blood pressure, heart problems

FIGURE LEGEND

Figure 1. Recessionary labor demand conditions, job loss and risk of heart attack or stroke, Health and Retirement Study, 1992-2010. Labor demand conditions were measured using county unemployment rates, which were transformed into an indicator variable with five categories: 1 corresponds to conditions observed during expansions, 5 corresponds to conditions observed in recessions. A) Estimated association between job loss at different levels of local labor demand and risk of heart attack or stroke. Reference group: Individuals not experiencing job loss. B) Individuals experiencing job loss only. Estimated association between local labor demand conditions at the time of job loss and risk of heart attack or stroke. Reference group: Quintile 1. C) Individuals not experiencing job loss only. Estimated association between local labor demand conditions and risk of heart attack or stroke Reference group: Quintile 1.

SUPPLEMENTARY MATERIAL

Who Suffers During Recessions? Economic Downturns, Job Loss and Cardiovascular Disease in Older Americans

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Web Table 1. Characteristics of the Analysis Sample by Treatment Status. Health and Retirement Study (HRS) 1992-2010.

	Individuals Not Experiencing Job Loss	Individuals Experiencing Job Loss
Individuals	7,266	1,571
Person years	85,510	19,907
Number of Myocardial Infarctions (MI) and Strokes	805	185
Mean years of follow-up	11.8	12.7
Incidence of MI/Strokes per 1000 person-years	9.4	9.3
Mean age at baseline in years	53.8	52.7

WEB APPENDIX 1

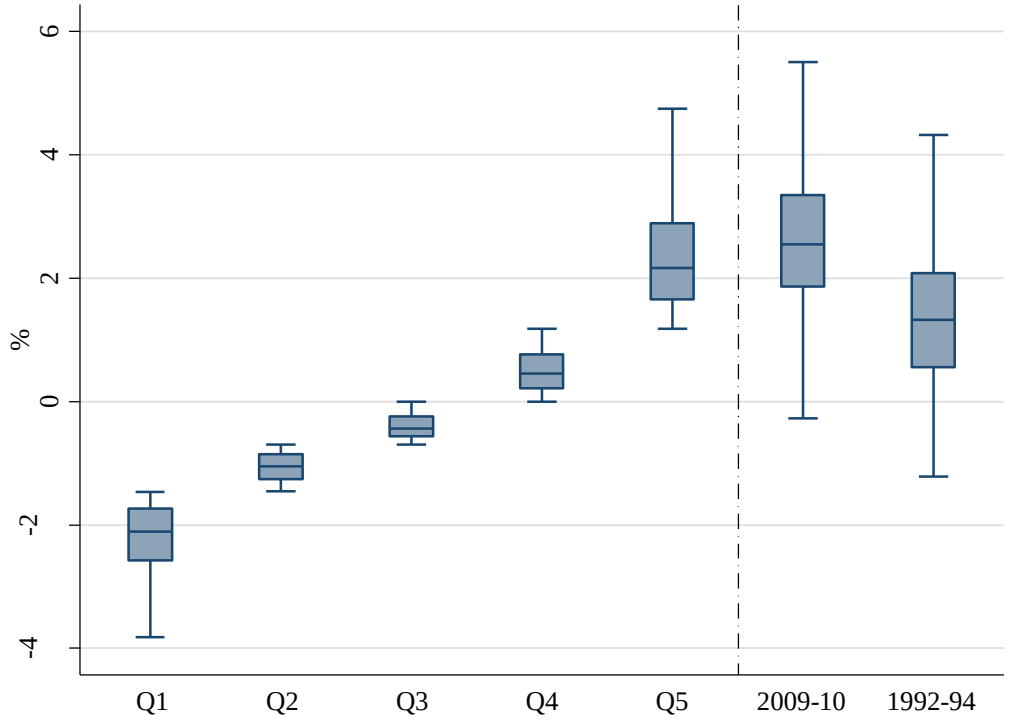
We use a dataset of annual county unemployment rates for all U.S. counties for the period from 1992 to 2010 (BLS, Local Area Unemployment Statistics) to measure fluctuations in economic conditions at a local level, reflecting changing opportunities for re-employment for unemployed workers and changing levels of commercial activity and demand for working hours for employed workers. Previous studies have similarly used unemployment rates to measure cyclical variation, since they are highly correlated with fluctuations in aggregate demand (1,2). To isolate cyclical variation within counties, we obtained the residuals from a regression of county unemployment on county fixed effects and county-specific linear trends:

$$(1) \qquad U_{ct} = I_c + I_c \times Year + \varepsilon_{ct},$$

U_{ct} is the unemployment rate in county c and year t, I_c are county fixed effects, and Year is an integer variable defined over the interval from 1992 to 2010. County fixed effects eliminate unobserved, time-constant, county-specific factors that could be confounded with unobserved, time-constant determinants of CVD, such as cross-county differences in unobserved health. County-specific trends $I_c \times$ Year eliminate non-cyclical, long-run changes in unemployment within counties over time that could be correlated with changes in health. For example, as a county's population ages, unemployment declines because older individuals are less likely to be unemployed, while CVD risks increase, inducing a spurious negative correlation between unemployment rates and CVD risk. We obtained the residuals ε_{ct} from this regression, which measure the deviation in unemployment rates in year t from its long-run trend in county c.

Web Figure 1 charts the distribution of the residuals within ε_{ct} from equation 1 in the five quintiles. Individuals observed in the fifth quintile (Q5) experienced recessionary local labor market conditions similar to those observed in the Great Recession, where county unemployment rates were substantially above their long-run trend. In contrast, individuals observed in the first quintile first quintile (Q1) experience local labor market booms.

Web Figure 1. Distribution of Transformed County Unemployment Rates Across Quintiles, 1992-2010.

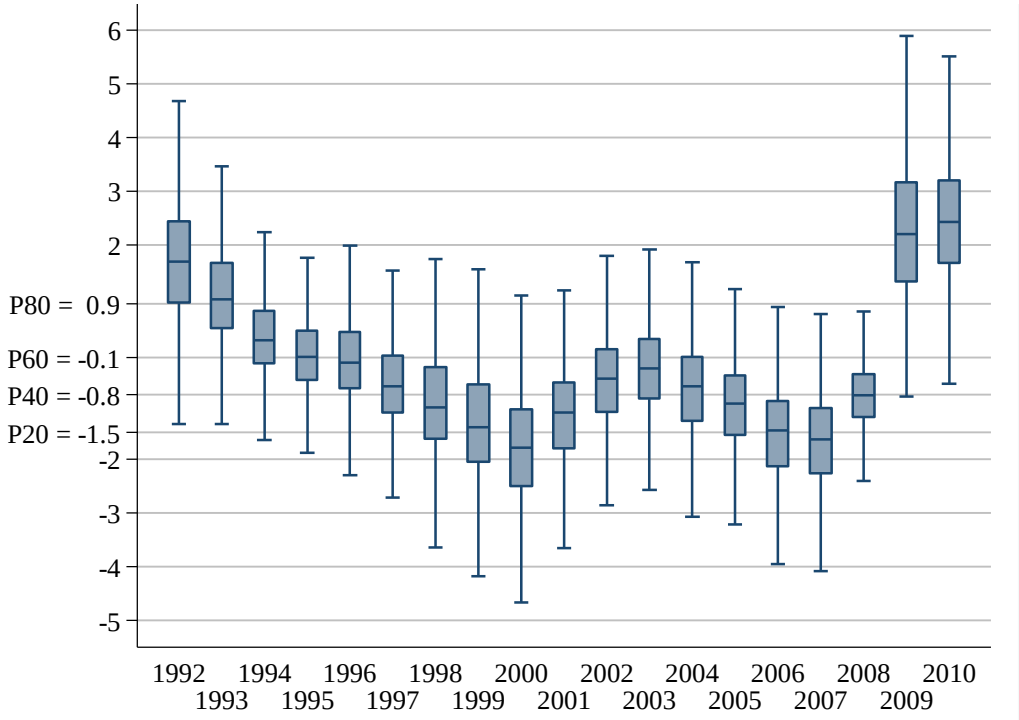


Note. The box plots display the distribution of the county unemployment rate variable used to construct the business cycle categories, which are quintiles of the demeaned, detrended county unemployment rate. The box plots labeled "Q1" through "Q5" display the distribution of the transformed county unemployment rate within its quintiles. The groups of box plots to the right of the dashed line display the distribution of the unemployment variables for two periods during which we observe recessionary labor market conditions (Table 1): the aftermath of the early 1990s recession, January 1992 (beginning of observation period) to December 1994, and the Great Recession, January 2009 to December 2010 (end of observation period).

Web Figure 2 charts the distribution of the residuals ε_{ct} from equation 1 across each year together with horizontal lines marking the 20th, 40th, 60th and 80th percentile of their distribution.

Values above the 80th percentile make up the the 5th quintile, observations above the 60th percentile and at or below the 80th percentile make up the 4th quintile and so forth. Again, it can be seen that the 5th quintile, which we interpret as recessionary labor market conditions, is mainly comprised of observations from 1992-4 and 2009-10. The 4th quintile draws observations from many years including 1993 and the early 2000s recession. The 1st quintile draws its observations mainly from the late 1990s and 2006-7. We also observe that within years, there is still considerable spread in county unemployment rates, which allows us to identify the effect of the business cycle indicators net of year fixed effects (e.g. Table 3, Models 2-4).

Web Figure 2. Distribution of Transformed County Unemployment Rates. 1992-2010.

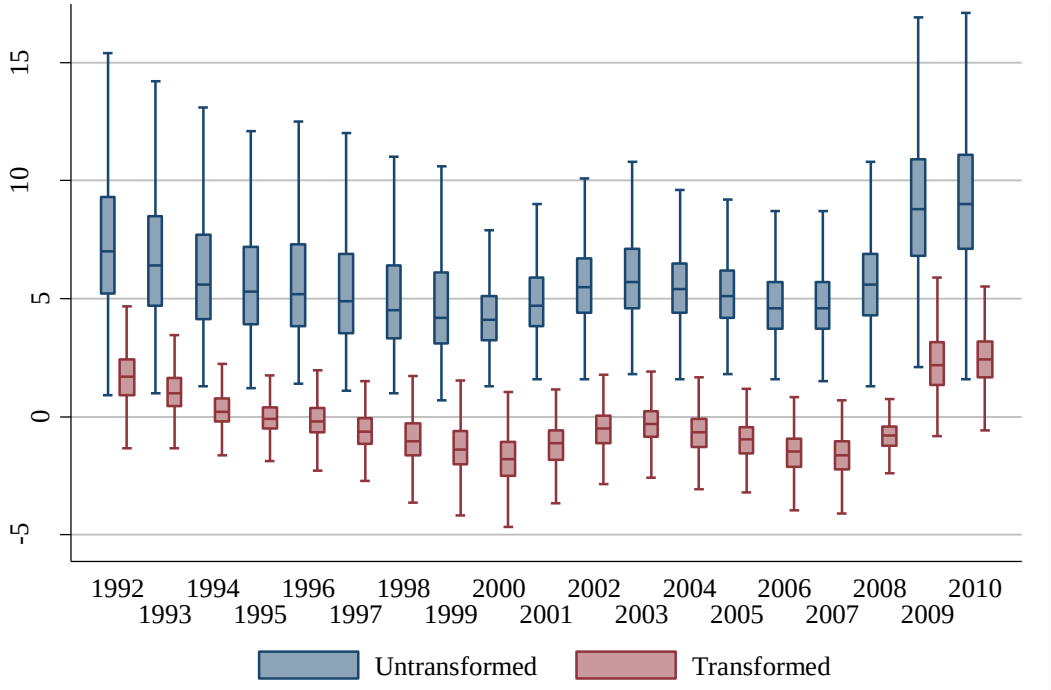


Note. The box plots display the distribution of the transformed county unemployment rate variable used to construct the business cycle categories within each year. The transformed unemployment rates are the residual from a regression of county unemployment rates on county fixed effects and a county specific linear trend. For details, see text above. Outside values are not shown.

Web Figure 3 compares the distribution of the transformed and untransformed unemployment rate over time. We observe that the transformation has preserved the pattern of

change over time. The main difference between both series is due to the county fixed effects in equation 1, which has shifted the mean value of the transformed unemployment rates to zero for each county. Furthermore, the transformed unemployment rate has lower variance within years, which is due to detrending.

Web Figure 3. Distribution of Untransformed and Transformed County Unemployment Rates Over Years. 1992-2010.



Note. The box plots display the distribution of the untransformed and transformed county unemployment rate variable across years. The transformed unemployment rates are the residuals from a regression of county unemployment rates on county fixed effects and county specific linear trends. For details, see text above. Outside values are not shown.

WEB APPENDIX 2

In the following, we conduct robustness checks to assess whether key results are robust to using different approaches to constructing the business cycle indicator. First, we constructed the indicator without detrending unemployment rate series, i.e. omitting the term $I_c \times Year$ in equation 1. Second, we constructed business cycle indicators at the level of commuting zones. Third, instead of quintiles, we split the transformed unemployment rate (ε_{ct}) into tertiles.

Using a 2010 cross-walk by the U.S. Department of Housing and Urban Development, we aggregate counties into commuting zones. Commuting zones are groups of counties that form local labor markets and are defined on the basis of commuting patterns recorded in Census data, i.e. information on the county in which individuals reside and county in which they work.(3)

The pattern of effects is overall consistent with the results reported in the main manuscript (Web Tables 2 and 3). Across analyses, effect sizes are larger when we measure unemployment at the commuting zone level, perhaps reflecting that commuting zones better capture the geographic area defining individual economic opportunities and local labor markets.

Column 1 in Web Table 2 reproduces our results from the main manuscript in Table 4, M3. These analysis are based on the pooled sample (job losers and non-job losers) and use demeaned and detrended county unemployment rates to construct the business cycle indicator. Column 2 reports results using demeaned and detrended commuting zone unemployment rates. Using demeaned county unemployment rates (column 3), the interaction effects between job loss and business cycle indicators lose statistical significance, but the effect pattern is preserved, i.e. job losses under recessionary labor market conditions have stronger effects on CVD risk than job losses under non-recessionary conditions. If we use demeaned commuting zone unemployment

rates, the interactions between job loss and recessionary labor market conditions remains sizeable (regardless of the transformation used), statistically significant ($p<0.01$), and consistent with the results reported in the manuscript.

Web Table 3 repeats this analysis, but instead of splitting the transformed unemployment rates into quintiles, we have split them into tertiles. By performing a coarser grouping, resulting effect sizes are smaller, but the effect pattern is again consistent with the results reported in the main manuscript. Across indicators, we observe that compared to boom periods recessionary local labor market conditions significantly reduce CVD risks among individuals not experiencing job loss. Effect sizes are larger when we measure unemployment at the commuting zone level rather than the county level. Furthermore, across indicators, recessionary labor market conditions are associated with worse outcomes for individuals losing their job. Again, effects are larger when we measure unemployment at the commuting zone level rather than the county level

Web Table 2. Recessionary Labor Demand Conditions, Job Loss and Risk of Heart Attack or Stroke. Health and Retirement Study, 1992-2010. Exponentiated Coefficient Estimates from Complementary Log-Log Regression. Different Indicators of Local Labor Demand, in Quintiles.

	Results from Table 4, Model 3; Demeaned & detrended county unemployment rates (1)		Demeaned & detrended commuting zone unemployment rates (2)		Demeaned county unemployment rates (3)		Demeaned commuting zone unemployment rates (4)	
	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI
Q1 = Boom (Ref.)								
Q2	0.89	(0.73, 1.08)	0.92	(0.76, 1.13)	0.89	(0.73, 1.09)	0.91	(0.75, 1.11)
Q3	0.96	(0.77, 1.20)	1.09	(0.87, 1.36)	0.89	(0.72, 1.10)	0.84	(0.68, 1.04)
Q4	0.72	(0.54, 0.95)	0.71	(0.53, 0.94)	0.79	(0.62, 1.00)	0.80	(0.63, 1.03)
Q5 = Recession	0.60	(0.41, 0.89)	0.52	(0.35, 0.79)	0.72	(0.52, 1.00)	0.70	(0.50, 0.97)
No job loss (Ref.)								
Job loss	0.77	(0.47, 1.26)	0.88	(0.56, 1.40)	0.96	(0.65, 1.42)	0.82	(0.55, 1.23)
Q2 x Job loss	1.53	(0.79, 2.95)	1.17	(0.61, 2.25)	1.10	(0.63, 1.92)	1.47	(0.85, 2.56)
Q3 x Job loss	1.22	(0.63, 2.38)	0.81	(0.41, 1.60)	1.28	(0.72, 2.27)	0.82	(0.40, 1.68)
Q4 x Job loss	1.69	(0.88, 3.24)	1.69	(0.91, 3.13)	1.18	(0.67, 2.10)	1.61	(0.91, 2.86)
Q5 x Job loss	2.54	(1.29, 5.01)	2.58	(1.33, 5.00)	1.58	(0.84, 2.98)	2.22	(1.21, 4.07)

Note. CI = confidence interval; FE = fixed effects. Estimates from complementary log-log regression. Exponentiated coefficient estimates can be interpreted as hazard ratios. The business cycle is operationalized as local labor demand and measures by county unemployment rate, which were transformed into an indicator variable with five categories. All models adjust for baseline hazard, age quartic, birth cohort, year of first interview, gender, ethnicity, birth place, parental education, own education, and year fixed effects. The results in columns 1-4 are based on different ways of calculating the business cycle indicator variable. In column 1, we display again results from Table 4 in the main manuscript. For this and the remaining results reported in the main mansucript, we used demeaned and detrended county unemployment rates, split into 5 quintiles. For columns 2-4, we measure unemployment at the commuting zone level and/or do not detrend the respective unemployment series. A joint Wald test comparing the estimates in column 1 and column 3 rejected the null hypothesis of no coefficient difference ($p<0.01$).

Web Table 3. Recessionary Labor Demand Conditions, Job Loss and Risk of Heart Attack or Stroke. Health and Retirement Study, 1992-2010. Exponentiated Coefficient Estimates from Complementary Log-Log Regression. Different Indicators of Local Labor Demand, in Tertiles.

	Results from Table 4, Model 3; Demeaned & detrended county unemployment rates (1)		Demeaned & detrended commuting zone unemployment rates (2)		Demeaned county unemployment rates (3)		Demeaned commuting zone unemployment rates (4)	
	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI
Q1 = Boom (Ref.)								
Q2	1.02	(0.85, 1.22)	1.02	(0.85, 1.23)	0.89	(0.75, 1.05)	0.85	(0.71, 1.01)
Q3 = Recession	0.75	(0.56, 0.99)	0.67	(0.50, 0.89)	0.75	(0.60, 0.95)	0.71	(0.56, 0.90)
No job loss (Ref.)								
Job loss	0.95	(0.66, 1.38)	0.93	(0.65, 1.34)	0.90	(0.65, 1.24)	0.97	(0.71, 1.31)
Q2 x Job loss	1.11	(0.68, 1.82)	1.08	(0.66, 1.79)	1.26	(0.80, 1.99)	0.93	(0.57, 1.52)
Q3 x Job loss	1.55	(0.93, 2.59)	1.80	(1.09, 2.98)	1.65	(1.03, 2.64)	1.72	(1.09, 2.70)

Note. CI = confidence interval; FE = fixed effects. Estimates from complementary log-log regression. Exponentiated coefficient estimates can be interpreted as hazard ratios. The business cycle is operationalized as local labor demand and measures by county unemployment rate, which were transformed into an indicator variable with five categories. All models adjust for baseline hazard, age quartic, birth cohort, year of first interview, gender, ethnicity, birth place, parental education, own education, and year fixed effects. The results in columns 1-4 are based on different ways of calculating the business cycle indicator variable. In column 1, we used demeaned and detrended county unemployment rates, split into tertiles. For columns 2-4, we measure unemployment at the commuting zone level and/or do not detrend the respective unemployment series.

WEB APPENDIX 3

Table 2 in the main text compared individuals not experiencing job loss, i.e. controls, observed in normal times and booms (Q1-Q4) vs. recessions (Q5), and individual losing their job in normal times (Q1-Q4) vs. recessions (Q5). For a given group, e.g. controls, we calculated the percentage of individuals with a certain characteristic, e.g. the percent female, in normal times and booms. By comparing these percentages across business cycle states, we can assess how different individuals observed in different states of the business cycle are on observed characteristics. For controls, we find small differences across many variables, which one would expect in any finite sample, but without any clear pattern, which suggests that individuals are not systematically different across states. Since, we find this pattern over many important potential confounders, we are confident that we can rule out that compositional differences across business cycle states are driving the results for controls. Web Tables 4-6 below contain the full results from the balance analysis reported in Table 2.

In addition to comparing proportions, we also calculate a bias statistic, which is a conventional statistic to diagnose covariate imbalance. The bias statistic is a normalized difference of covariate means (or proportions). It is calculated as follows:

$$bias = 100\left(\bar{x}_T - \bar{x}_C\right) / \left[\left(s_T^2 + s_C^2\right)/2\right]^{1/2}$$

where $\bar{x}_T$ and $\bar{x}_C$ are the sample means for treated and control observations and s_T^2 and s_C^2. are the corresponding sample variances, see Rosenbaum and Rubin (1985). Essentially, the difference in covariate means is adjusted for the variability in the respective subsample.

As a rule of thumb, Imbens and Wooldridge state that regression methods can become sensitive to changes in the covariate specification for bias values larger than 25 (4). We never reach values that size among the controls, but exceed it among job losers in some instances: Because we observe recessionary conditions only in specific years, certain birth cohorts are more likely to be exposed to them. In particular cohorts born before 1940 are more likely to have experienced the early 1990s recession. Both job losers and controls show similar imbalances in this regard, but in particular job losers.

We found no systematic imbalance in the covariate distribution among controls. For the treated, we used Coarsened Exact Matching (5,6), a statistical matching technique, to exactly balance individuals on less balanced covariates across labor market states (Q1-Q4 vs. Q5). Coarsened Exact Matching (CEM) sorts individuals into strata defined by unique values of coarsened covariates and then only retains observations in strata that include individuals observed in both recessionary and non-recessionary conditions. We match on birth cohort (7 categories), age at first interview (3 categories) and year of first interview (3 categories). These variables jointly define 24 strata, 19 of which contain individuals observed in recessionary and non-recessionary conditions. After dropping 11 unmatched observations, cohort and age distributions are practically identical for job losers observed in recessions (Q5) vs. non-recessionary times (Q1-Q4). Importantly, we have not only balanced the two groups in terms of covariate means, but also in terms of *all* interactions and nonlinearities, which is an attractive feature of CEM compared to propensity score matching.

Web Table 4. Characteristics of Individuals Not Experiencing Job Loss Observed under Recessionary and Non-Recessionary Labor Market Conditions. Health and Retirement Study 1992-2010. 7266 Individuals, 85510 Person-Years

		Recessionary Conditions, Q5 (1)	Non-Recessionary Conditions, Q1-Q4 (2)	(1) – (2)	Standardized Bias
Birth Year	1919-1930	3.2	2.6	0.6	3.4
	1931-1935	23.6	21.3	2.2	5.3
	1936-1940	34.0	31.2	2.8	6.0
	1941-1945	18.5	21.4	-2.9	-7.2
	1946-1950	11.3	13.8	-2.6	-7.8
	1951-1955	7.2	7.3	-0.1	-0.3
	1956-1966	2.3	2.3	0.0	-0.2
First Interview Year: 1992-1997		80.7	73.7	7.0	16.7
	1998-2003	8.5	16.6	-8.1	-24.7
	2004-2008	10.8	9.6	1.2	3.8
Age at First Interview in Years		54.0	53.7	0.2	4.5
Female		43.6	43.1	0.5	0.9
Ethnicity	White	71.2	74.8	-3.6	-8.1
	Black	17.1	15.9	1.2	3.4
	Hispanic	9.8	7.8	2.0	7.0
	Other, not obtained	1.9	1.6	0.4	2.9
Place of Birth: New England		5.0	4.5	0.5	2.4
	Mid Atlantic	15.6	14.3	1.3	3.5
	East North Central	17.3	17.2	0.2	0.4
	West North Central	7.2	11.2	-4.0	-14.0
	South Atlantic	17.2	16.8	0.4	1.1
	East South Central	8.0	9.1	-1.1	-3.9
	West South Central	8.4	9.5	-1.2	-4.0
	Mountain	3.1	3.4	-0.4	-2.0
	Pacific	7.3	5.4	1.9	7.9
	Outside U.S.	10.9	8.6	2.3	7.9
Parental Education: <High School		43.2	42.1	1.1	2.3
	=High school	32.6	33.1	-0.5	-1.0
	>High school	19.5	20.3	-0.8	-2.1
	Missing	4.7	4.5	0.2	1.0
Own Education: <High School		16.3	14.6	1.7	4.7
	GED	4.2	4.4	-0.3	-1.3
	High school	50.0	50.0	0.1	0.1
	Some college	5.4	5.3	0.1	0.5
	Bachelor	12.8	13.5	-0.7	-2.0
	Postgraduate	11.3	12.2	-0.9	-2.9
Average Weeks Employed per Year		50.6	50.5	0.1	2.6
Average Hours Worked per Week		40.8	41.1	-0.3	-3.2
Individual Earnings :Q1		19.7	19.2	0.5	1.3
	Q2	19.3	19.1	0.3	0.7
	Q3	19.9	19.8	0.0	0.1
	Q4	20.7	20.8	-0.1	-0.3
	Q5	20.3	21.0	-0.7	-1.7

(continued)

(Web Table 4, continued)

	Recessionary Conditions, Q5 (1)	Non-Recessionary Conditions, Q1-Q4 (2)	(1) – (2)	Standardized Bias
Household Wealth: Q1	25.6	24.6	0.9	2.1
Q2	14.1	13.9	0.2	0.4
Q3	20.3	20.4	-0.1	-0.2
Q4	20.4	20.3	0.1	0.2
Q5	19.7	20.7	-1.0	-2.6
Household Income: Q1	20.3	18.6	1.7	4.2
Q2	19.6	19.4	0.1	0.3
Q3	20.2	20.1	0.1	0.3
Q4	20.2	20.7	-0.5	-1.2
Q5	19.7	21.2	-1.4	-3.6
Health Insurance Coverage: None	9.3	8.8	0.5	1.7
Any	89.9	90.4	-0.5	-1.6
Missing	0.8	0.8	0.0	-0.1
Married, Partnered	78.1	79.5	-1.4	-3.5
Divorced, Separated	13.2	12.5	0.7	2.2
Widowed	5.4	4.7	0.7	3.1
Never Married	3.4	3.4	0.0	0.1
Body Mass Index: <18.5	1.0	1.0	0.0	0.0
[18.5-25.0)	34.3	34.0	0.3	0.7
[25.0-30.0)	40.4	41.0	-0.6	-1.3
[30.0-35.0)	17.8	17.4	0.4	1.0
>=35.0	6.4	6.5	-0.1	-0.4
Number of Drinks per Day: <1	77.7	77.0	0.7	1.7
1-2	15.7	16.5	-0.7	-1.9
3-4	4.8	4.8	0.0	-0.1
>4	1.8	1.8	0.0	0.3
Ever Smoked	58.7	58.4	0.3	0.7
Current Smoker	22.8	22.3	0.5	1.2
Self-Rated Memory: Excellent	18.9	18.2	0.7	1.7
Very Good	37.5	37.9	-0.4	-0.7
Good	31.8	32.1	-0.3	-0.7
Fair	9.5	9.2	0.3	1.1
Poor	1.1	1.2	-0.1	-0.8
Missing	1.2	1.4	-0.2	-1.6
Ever Diagnosed With: Cancer	4.2	4.2	0.0	0.0
Diabetes	6.6	6.3	0.3	1.2
Heart Problems	4.4	4.2	0.2	1.0
High Blood Pressure	29.2	28.5	0.7	1.6
Number of Depressive Symptoms: 0-2	91.2	90.5	0.7	2.4
3-5	6.4	6.7	-0.3	-1.3
6-8	1.7	1.8	-0.1	-0.9
missing	0.8	1.1	-0.3	-2.8
Self-Reported Health: Excellent	27.9	27.6	0.2	0.6
Very Good	32.9	34.0	-1.1	-2.2
Good	28.8	28.6	0.2	0.4
Fair	9.2	8.7	0.5	1.9
Poor	1.1	1.1	0.1	0.7

Note: Numbers in table are sample percentages unless otherwise noted. Bias is the standardized difference in sample means between treated and controls for a given covariates (Rosenbaum and Rubin 1985). The formula is given in the text above.

Web Table 5. Characteristics of Individuals Experiencing Job Loss Observed under Recessionary and Non-Recessionary Labor Market Conditions. Health and Retirement Study 1992-2010. 1571 Individuals, 19907 Person-Years

		Recessionary Conditions, Q5 (1)	Non-Recessionary Conditions, Q1-Q4 (2)	(1) – (2)	Standardized Bias
Birth Year	1919-1930	0.9	0.5	0.4	5.3
	1931-1935	27.9	11.1	16.7	43.2
	1936-1940	42.2	31.3	10.8	22.6
	1941-1945	20.7	27.4	-6.7	-15.7
	1946-1950	6.1	19.7	-13.6	-41.3
	1951-1955	1.6	7.7	-6.1	-29.1
	1956-1966	0.6	2.3	-1.7	-14.1
First Interview Year: 1992-1997		96.6	70.2	26.4	75.7
	1998-2003	1.0	20.2	-19.2	-65.5
	2004-2008	2.4	9.6	-7.2	-30.5
Age at First Interview in Years		53.9	52.3	1.6	37.5
Female		44.3	43.4	0.9	1.9
Ethnicity	White	71.5	74.7	-3.2	-7.3
	Black	14.8	13.3	1.5	4.2
	Hispanic	11.1	9.6	1.4	4.7
	Other, not obtained	2.6	2.3	0.3	2.1
Place of Birth: New England		5.4	5.2	0.2	0.9
	Mid Atlantic	19.5	14.4	5.1	13.6
	East North Central	18.1	17.3	0.8	2.1
	West North Central	3.9	8.6	-4.7	-19.5
	South Atlantic	13.1	17.6	-4.5	-12.5
	East South Central	6.5	9.7	-3.3	-12.0
	West South Central	9.8	7.6	2.2	7.9
	Mountain	2.3	3.2	-0.9	-5.5
	Pacific	8.3	5.4	2.9	11.4
	Outside U.S.	13.0	10.8	2.2	6.8
Parental Education: <High School		47.6	42.4	5.2	10.4
	=High school	28.8	35.4	-6.6	-14.2
	>High school	16.9	17.3	-0.5	-1.3
	Missing	6.8	4.8	1.9	8.3
Own Education: <High School		20.1	17.6	2.6	6.6
	GED	9.1	6.6	2.5	9.3
	High school	48.9	54.5	-5.7	-11.4
	Some college	4.8	4.3	0.6	2.8
	Bachelor	13.1	11.6	1.5	4.5
	Postgraduate	3.9	5.4	-1.5	-7.0
Average Weeks Employed per Year		51.2	51.4	-0.2	-8.6
Average Hours Worked per Week		40.8	41.1	-0.4	-3.8
Individual Earnings :Q1		27.1	23.6	3.5	8.0
	Q2	18.9	24.7	-5.8	-14.2
	Q3	20.7	19.7	1.0	2.6
	Q4	17.4	16.1	1.3	3.4
	Q5	16.0	15.9	0.1	0.2

(continued)

(Web Table 5, continued)

	Recessionary Conditions, Q5 (1)	Non-Recessionary Conditions, Q1-Q4 (2)	(1) – (2)	Standardized Bias
Household Wealth: Q1	30.7	29.5	1.2	2.6
Q2	14.8	16.0	-1.2	-3.4
Q3	17.9	18.7	-0.8	-2.1
Q4	19.3	18.2	1.1	2.8
Q5	17.3	17.6	-0.2	-0.6
Household Income: Q1	27.5	24.2	3.3	7.6
Q2	22.2	22.5	-0.4	-0.9
Q3	18.6	19.9	-1.3	-3.4
Q4	16.9	17.2	-0.2	-0.5
Q5	14.8	16.2	-1.4	-3.9
Health Insurance Coverage: None	17.7	16.9	0.8	2.2
Any	80.3	82.3	-2.0	-5.2
Missing	2.0	0.8	1.2	10.4
Married, Partnered	76.4	77.8	-1.4	-3.2
Divorced, Separated	14.6	14.4	0.2	0.6
Widowed	5.4	4.7	0.7	3.2
Never Married	3.5	3.1	0.5	2.5
Body Mass Index: <18.5	0.8	0.4	0.4	5.0
[18.5-25.0)	29.5	30.6	-1.2	-2.6
[25.0-30.0)	42.6	41.1	1.5	3.0
[30.0-35.0)	18.4	18.9	-0.5	-1.3
>=35.0	8.7	8.9	-0.2	-0.7
Number of Drinks per Day: <1	79.9	73.8	6.1	14.4
1-2	14.6	17.8	-3.2	-8.7
3-4	4.1	6.1	-2.0	-9.1
>4	1.4	2.2	-0.9	-6.5
Ever Smoked	69.4	61.8	7.6	16.1
Current Smoker	31.3	29.2	2.1	4.7
Self-Rated Memory: Excellent	21.1	15.2	5.9	15.3
Very Good	36.9	35.4	1.5	3.1
Good	30.0	35.6	-5.6	-11.9
Fair	9.0	10.8	-1.7	-5.9
Poor	2.7	1.7	0.9	6.4
Missing	0.4	1.3	-1.0	-10.7
Ever Diagnosed With: Cancer	4.4	3.5	0.9	4.8
Diabetes	4.5	6.2	-1.6	-7.2
Heart Problems	3.4	4.3	-0.9	-4.7
High Blood Pressure	26.1	26.7	-0.6	-1.4
Number of Depressive Symptoms: 0-2	91.6	85.9	5.8	18.4
3-5	6.0	9.8	-3.8	-14.1
6-8	2.0	3.1	-1.1	-6.7
missing	0.3	1.2	-0.9	-10.6
Self-Reported Health: Excellent	25.8	22.7	3.0	7.1
Very Good	32.5	34.0	-1.5	-3.2
Good	32.0	32.3	-0.3	-0.6
Fair	8.4	9.8	-1.4	-4.8
Poor	1.3	1.2	0.1	1.2

Note: Numbers in table are sample percentages unless otherwise noted. Bias is the standardized difference in sample means between treated and controls for a given covariates (Rosenbaum and Rubin 1985). The formula is given in the text above.

Web Table 6. Characteristics of Individuals Experiencing Job Loss Observed under Recessionary (Q5) and Non-Recessionary (Q1-Q4) Labor Market Conditions. Health and Retirement Study 1992-2010. Matched Sample. 1560 Individuals, 19802 Person-Years.

		Recessionary Conditions, Q5 (1)	Non-Recessionary Conditions, Q1-Q4 (2)	(1) – (2)	Standardized Bias
Birth Year	1919-1930	0.9	0.9	0.0	0.0
	1931-1935	27.9	27.9	0.0	0.0
	1936-1940	42.2	42.2	0.0	0.0
	1941-1945	20.7	20.7	0.0	0.0
	1946-1950	6.1	6.1	0.0	0.0
	1951-1955	1.6	1.6	0.0	0.0
	1956-1966	0.6	0.6	0.0	0.0
First Interview Year: 1992-1997		96.6	96.6	0.0	0.0
	1998-2003	1.0	1.0	0.0	0.0
	2004-2008	2.4	2.4	0.0	0.0
Age at First Interview in Years		53.9	54.0	0.0	-1.1
Female		44.3	44.6	-0.3	-0.5
Ethnicity	White	71.5	75.1	-3.6	-8.1
	Black	14.8	13.6	1.2	3.6
	Hispanic	11.1	8.9	2.2	7.3
	Other, not obtained	2.6	2.5	0.1	0.9
Place of Birth: New England		5.4	4.8	0.7	3.0
	Mid Atlantic	19.5	15.2	4.3	11.4
	East North Central	18.1	15.0	3.1	8.3
	West North Central	3.9	8.9	-5.0	-20.4
	South Atlantic	13.1	19.0	-5.8	-15.9
	East South Central	6.5	10.2	-3.7	-13.4
	West South Central	9.8	8.8	1.0	3.4
	Mountain	2.3	3.2	-0.9	-5.5
	Pacific	8.3	3.8	4.5	18.9
	Outside U.S.	13.0	11.1	1.9	5.7
Parental Education: <High School		47.6	47.6	-0.1	-0.1
	=High school	28.8	33.9	-5.1	-10.9
	>High school	16.9	14.1	2.7	7.5
	Missing	6.8	4.4	2.4	10.6
Own Education: <High School		20.1	20.5	-0.4	-0.9
	GED	9.1	7.4	1.7	6.2
	High school	48.9	54.0	-5.1	-10.3
	Some college	4.8	3.3	1.5	7.8
	Bachelor	13.1	10.9	2.2	6.9
	Postgraduate	3.9	3.9	0.0	0.1
Average Weeks Employed per Year		51.2	51.3	-0.2	-7.0
Average Hours Worked per Week		40.8	40.7	0.1	1.2
Individual Earnings :Q1		22.3	20.9	1.3	3.3
	Q2	17.9	21.8	-3.9	-9.7
	Q3	20.1	19.0	1.1	2.7
	Q4	18.8	20.2	-1.4	-3.6
	Q5	20.9	18.0	2.9	7.3

(continued)

(Web Table 6, continued)

	Recessionary Conditions, Q5 (1)	Non-Recessionary Conditions, Q1-Q4 (2)	(1) – (2)	Standardized Bias
Household Wealth: Q1	21.1	17.6	3.5	8.9
Q2	19.6	19.9	-0.3	-0.7
Q3	18.4	21.5	-3.2	-7.9
Q4	21.5	21.0	0.5	1.1
Q5	19.4	19.9	-0.5	-1.3
Household Income: Q1	22.7	20.5	2.2	5.4
Q2	20.7	19.8	0.9	2.2
Q3	19.6	21.7	-2.0	-5.1
Q4	17.5	20.9	-3.3	-8.4
Q5	19.5	17.2	2.3	5.9
Health Insurance Coverage: None	17.7	18.0	-0.2	-0.6
Any	80.3	80.5	-0.2	-0.4
Missing	2.0	1.6	0.4	2.9
Married, Partnered	76.4	76.1	0.4	0.9
Divorced, Separated	14.6	14.4	0.2	0.7
Widowed	5.4	6.7	-1.3	-5.5
Never Married	3.5	2.9	0.7	3.9
Body Mass Index: <18.5	0.8	0.5	0.3	3.7
[18.5-25.0)	29.5	32.2	-2.8	-6.0
[25.0-30.0)	42.6	43.9	-1.3	-2.7
[30.0-35.0)	18.4	16.7	1.7	4.5
>=35.0	8.7	6.6	2.1	7.9
Number of Drinks per Day: <1	79.9	79.8	0.1	0.2
1-2	14.6	13.8	0.8	2.4
3-4	4.1	4.6	-0.5	-2.6
>4	1.4	1.7	-0.4	-3.0
Ever Smoked	69.4	63.7	5.8	12.3
Current Smoker	31.3	28.8	2.5	5.4
Self-Rated Memory: Excellent	21.1	16.3	4.8	12.4
Very Good	36.9	38.0	-1.1	-2.3
Good	30.0	32.9	-2.9	-6.2
Fair	9.0	10.9	-1.8	-6.1
Poor	2.7	1.4	1.3	8.9
Missing	0.4	0.6	-0.2	-3.5
Ever Diagnosed With: Cancer	4.4	3.0	1.4	7.2
Diabetes	4.5	6.0	-1.5	-6.7
Heart Problems	3.4	3.6	-0.2	-1.1
High Blood Pressure	26.1	26.0	0.1	0.1
Number of Depressive Symptoms: 0-2	91.6	89.1	2.6	8.7
3-5	6.0	7.7	-1.6	-6.5
6-8	2.0	2.8	-0.8	-5.1
missing	0.3	0.5	-0.2	-2.5
Self-Reported Health: Excellent	25.8	24.8	1.0	2.3
Very Good	32.5	32.7	-0.2	-0.5
Good	32.0	32.7	-0.7	-1.4
Fair	8.4	8.9	-0.5	-1.9
Poor	1.3	0.9	0.4	4.0

Note: Numbers in table are sample percentages unless otherwise noted. Bias is the standardized difference in sample means between treated and controls for a given covariates (Rosenbaum and Rubin 1985). The formula is given in the text above.

Web Table 7. Recessionary Labor Demand Conditions, Job Loss and Risk of Heart Attack or Stroke. Health and Retirement Study, 1992-2010. Exponentiated Coefficient Estimates from Complementary Log-Log Regression. Robustness Checks.

	Results from Table 4, Model 3 (1)		Displacements Only (2)		Layoffs Only (3)		Strokes Only (4)		Myocardial Infarctions Only (5)	
	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI	exp(b)	95% CI
Q1 = Boom (Ref.)										
Q2	0.89	(0.73, 1.08)	0.86	(0.71, 1.05)	0.89	(0.73, 1.08)	0.92	(0.68, 1.25)	0.94	(0.71, 1.25)
Q3	0.96	(0.77, 1.20)	0.94	(0.74, 1.19)	0.93	(0.74, 1.17)	0.90	(0.62, 1.29)	1.11	(0.80, 1.53)
Q4	0.72*	(0.54, 0.95)	0.71*	(0.53, 0.94)	0.71*	(0.53, 0.94)	0.87	(0.56, 1.34)	0.71	(0.48, 1.06)
Q5 = Recession	0.60*	(0.41, 0.89)	0.51**	(0.33, 0.79)	0.64*	(0.43, 0.97)	0.61	(0.33, 1.14)	0.67	(0.37, 1.19)
No job loss (Ref.)										
Job loss	0.77	(0.47, 1.26)	0.76	(0.36, 1.62)	0.77	(0.41, 1.45)	0.77	(0.37, 1.60)	0.85	(0.41, 1.75)
Q2 x Job loss	1.53	(0.79, 2.95)	1.25	(0.44, 3.51)	1.75	(0.77, 4.00)	1.85	(0.74, 4.65)	0.71	(0.22, 2.26)
Q3 x Job loss	1.22	(0.63, 2.38)	0.71	(0.22, 2.28)	1.58	(0.71, 3.55)	1.42	(0.53, 3.79)	0.88	(0.32, 2.40)
Q4 x Job loss	1.69	(0.88, 3.24)	1.77	(0.68, 4.57)	1.60	(0.70, 3.67)	1.60	(0.61, 4.19)	1.49	(0.57, 3.91)
Q5 x Job loss	2.54**	(1.29, 5.01)	2.48	(0.90, 6.79)	2.59*	(1.13, 5.90)	2.02	(0.68, 5.98)	2.35	(0.89, 6.22)

Note. CI = confidence interval; FE = fixed effects. Estimates from complementary log-log regression. Exponentiated coefficient estimates can be interpreted as hazard ratios. The business cycle is operationalized as local labor demand and measures by county unemployment rate, which were transformed into an indicator variable with five categories. All models adjust for baseline hazard, age quartic, birth cohort, year of first interview, gender, ethnicity, birth place, parental education, own education, and year fixed effects. A joint Wald test comparing the estimates in column 2 and column 3 did not reject the null hypothesis of no coefficient difference (p=0.12). A joint Wald test comparing the estimates in column 4 and column 5 did not reject the null hypothesis of no coefficient difference (p=0.70).

Web Table 8. Characteristics of Respondents in Analysis Sample by Treatment Status. Health and Retirement Study 1992-2010. 8837 Individuals, 105417 Person-Years

		Mean Job Losers (1)	Mean Non-Job Losers (2)	(1) – (2)	Standardized Bias
Business Cycle: Q1 = Boom		21.2	27.1	-5.9	-13.9
	Q2	18.6	23.9	-5.4	-13.2
	Q3	17.9	18.5	-0.7	-1.8
	Q4	21.1	15.2	6.0	15.5
	Q5 = Recession	21.3	15.3	6.0	15.5
Birth Year	1919-1930	0.6	2.7	-2.1	-16.9
	1931-1935	14.7	21.7	-7.0	-18.2
	1936-1940	33.6	31.6	2.0	4.3
	1941-1945	26.0	21.0	5.0	11.8
	1946-1950	16.8	13.5	3.4	9.4
	1951-1955	6.4	7.3	-0.9	-3.5
	1956-1966	1.9	2.3	-0.4	-2.9
First Interview Year: 1992-1997		75.8	74.8	1.0	2.3
	1998-2003	16.2	15.4	0.8	2.1
	2004-2008	8.0	9.8	-1.8	-6.3
Age at First Interview in Years		52.7	53.8	-1.1	-24.1
Female		43.6	43.2	0.4	0.8
Ethnicity	White	74.0	74.2	-0.2	-0.4
	Black	13.6	16.1	-2.4	-6.8
	Hispanic	9.9	8.1	1.8	6.4
	Other, not obtained	2.4	1.6	0.8	5.4
Place of Birth: New England		5.3	4.6	0.7	3.1
	Mid Atlantic	15.5	14.5	0.9	2.6
	East North Central	17.5	17.2	0.3	0.7
	West North Central	7.6	10.6	-3.0	-10.3
	South Atlantic	16.7	16.9	-0.2	-0.5
	East South Central	9.0	8.9	0.1	0.4
	West South Central	8.1	9.3	-1.3	-4.5
	Mountain	3.0	3.4	-0.3	-1.8
	Pacific	6.1	5.6	0.4	1.8
	Outside U.S.	11.3	8.9	2.3	7.7
Parental Education: <High School		43.5	42.2	1.3	2.6
	=High school	34.0	33.0	1.0	2.1
	>High school	17.2	20.2	-2.9	-7.5
	Missing	5.3	4.6	0.7	3.2
Own Education: <High School		18.1	14.9	3.2	8.7
	GED	7.2	4.4	2.8	11.9
	High school	53.3	50.0	3.4	6.7
	Some college	4.4	5.3	-0.9	-4.3
	Bachelor	11.9	13.4	-1.5	-4.4
	Postgraduate	5.1	12.1	-7.0	-25.0
Average Weeks Employed per Year		51.3	50.5	0.9	25.7
Average Hours Worked per Week		41.1	41.1	0.0	-0.2
Individual Earnings :Q1		24.3	19.3	5.0	12.2
	Q2	23.5	19.1	4.4	10.8
	Q3	19.9	19.9	0.0	0.1
	Q4	16.4	20.8	-4.5	-11.5
	Q5	15.9	20.9	-5.0	-12.9

(continued)

(Web Table 8, continued)

	Mean Job Losers (1)	Mean Non-Job Losers (2)	(1) – (2)	Standardized Bias
Household Wealth: Q1	29.8	24.8	5.0	11.2
Q2	15.8	13.9	1.8	5.1
Q3	18.5	20.4	-1.8	-4.6
Q4	18.4	20.4	-1.9	-4.9
Q5	17.5	20.6	-3.0	-7.8
Household Income: Q1	24.9	18.9	6.0	14.6
Q2	22.5	19.4	3.0	7.4
Q3	19.6	20.1	-0.4	-1.1
Q4	17.1	20.7	-3.6	-9.1
Q5	15.9	20.9	-5.1	-13.1
Health Insurance Coverage: None	17.1	8.9	8.2	24.5
Any	81.9	90.3	-8.4	-24.5
Missing	1.0	0.8	0.2	2.3
Married, Partnered	77.5	79.3	-1.8	-4.3
Divorced, Separated	14.5	12.6	1.9	5.6
Widowed	4.8	4.8	0.0	0.2
Never Married	3.2	3.4	-0.2	-1.1
Body Mass Index: <18.5	0.5	1.0	-0.5	-5.9
[18.5-25.0)	30.4	34.1	-3.7	-7.9
[25.0-30.0)	41.4	41.0	0.5	1.0
[30.0-35.0)	18.8	17.5	1.3	3.4
>=35.0	8.9	6.5	2.4	8.9
Number of Drinks per Day: <1	75.1	77.1	-2.0	-4.6
1-2	17.2	16.3	0.8	2.2
3-4	5.7	4.8	0.9	4.0
>4	2.0	1.8	0.2	1.8
Ever Smoked	63.4	58.4	5.0	10.3
Current Smoker	29.6	22.4	7.2	16.5
Self-Rated Memory: Excellent	16.5	18.3	-1.9	-5.0
Very Good	35.7	37.8	-2.1	-4.4
Good	34.4	32.1	2.3	5.0
Fair	10.4	9.2	1.2	4.0
Poor	1.9	1.2	0.8	6.2
Missing	1.1	1.4	-0.3	-2.4
Ever Diagnosed With: Cancer	3.7	4.2	-0.5	-2.8
Diabetes	5.8	6.4	-0.6	-2.3
Heart Problems	4.1	4.2	-0.1	-0.4
High Blood Pressure	26.6	28.6	-2.1	-4.6
Number of Depressive Symptoms: 0-2	87.1	90.6	-3.5	-11.1
3-5	9.0	6.6	2.4	8.9
6-8	2.9	1.8	1.1	7.3
missing	1.0	1.0	0.0	-0.1
Self-Reported Health: Excellent	23.4	27.7	-4.3	-9.9
Very Good	33.7	33.8	-0.2	-0.4
Good	32.3	28.7	3.6	7.8
Fair	9.5	8.7	0.7	2.5
Poor	1.2	1.1	0.2	1.4

Note: Numbers in table are sample percentages unless otherwise noted. Bias is the standardized difference in sample means between treated and controls for a given covariates (Rosenbaum and Rubin 1985). The formula is given in the text above.

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