NIH Public Access
Author Manuscript
B E J Econom Anal Policy. Author manuscript; available in PMC 2011 May 27.

Published in final edited form as:
B E J Econom Anal Policy. 2010 January 1; 10(1): . doi:10.2202/1935-1682.2259.

The Impact of Job Stress on Smoking and Quitting: Evidence from the HRS

Padmaja Ayyagari[*] and **Jody L. Sindelar**[†]

Padmaja Ayyagari: padmaja.ayyagari@yale.edu; Jody L. Sindelar: jody.sindelar@yale.edu

[*] Yale University

[†] Yale University

Abstract

Job-related stress might affect smoking behavior because smoking may relieve stress and stress can make individuals more present-focused. Alternatively, individuals may both self-select into stressful jobs and choose to smoke based on unobserved factors. We use data from the Health and Retirement Study to examine how job stress affects the probability that smokers quit and the number of cigarettes smoked for current smokers. To address the potential endogeneity of job stress based on time invariant factors, we include individual fixed effects, which control for factors such as ability to handle stress. Occupational fixed effects are also included to control for occupational characteristics other than stress; time dummies control for the secular decline in smoking rates. Using a sample of people who smoked in the previous wave, we find that job stress is positively related to continuing to smoke among recent smokers. The results indicate that the key impact of stress is on the extensive margin of smoking, as opposed to the number of cigarettes smoked.

Keywords

smoking; stress; occupation; aging

Introduction

Smoking is well-known to be a leading source of preventable morbidity and mortality. In response to the increasing evidence about the smoking-related health risks, to oneself and to others through second-hand smoke, many older individuals who smoked when they were young have quit. Yet about 20% of the population, including the older population that we examine, continues to smoke. Almost no one starts smoking after age 22. However, former smokers may relapse and start to smoke again while current smokers may change the number of cigarettes that they smoke or may try to quit. Some individuals will cycle in and out of smoking.

Older individuals are at higher risks than other ages for smoking-related health conditions, so they may be even more aware of the realities of adverse health outcomes as they, and other smokers that they know, suffer harmful consequences. For example, Falba (2005) and Keenan (2009) both find evidence that older individuals quit smoking in response to an adverse health event. Further, Khwaja, Sloan and Chung (2006) find that older smokers change their survival expectations and quit smoking in response to health shocks. However, older individuals may find it more difficult to quit smoking if they have been smoking for a

NIH-PA Author Manuscript
NIH-PA Author Manuscript
NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

long period of time. Importantly, they may continue to smoke to self-medicate to deal with stress. Yet, even at older ages, there are health gains to quitting (Surgeon General Report, 2007). For example, Taylor et al. (2002) find that male smokers who quit at age 65 gained 1.4 to 2 years of life while female smokers gained 2.7 to 3.7 years. Therefore, it is important to understand the factors that might prevent older smokers from quitting or former smokers from relapsing. Further, older smokers are a critical group to study because of the financial externalities that they impose on public insurance programs such as Medicare.

There is evidence that stress can cause smoking, yet some of this evidence comes from relatively small clinical studies that induce stress in experimental settings (Goeders and Guerin, 1994; Sinha, 2001). While these studies can assess causality directly, the results do not translate well into conclusions about populations of smokers. On the other hand, most studies of large populations are epidemiologic studies that examine only correlations. Further, they often use relatively small non-generalizable samples (e.g. Alexander et al., 1990; Cooper et al., 1989). A large number of the studies examine children only and examine the impact of life events on smoking initiation (e.g. Mates and Allison, 1992; Koval and Pederson, 1999; Koval et al., 2000).

While there is more literature, and perhaps greater concern about youth smoking, stress and smoking have been examined for adults as well. For example, relapse to smoking and inability to stop smoking, have been associated with stressful life events for adults (Wewers, 1988; Hymowitz et al., 1991; Mates & Allison, 1992; McKee et al., 2003; Colby et al., 1994; Khwaja et al., 2006). Life events include, for example, divorce, death of a relative, financial problem, illness or injury or a move to a new residence. Most of these studies use retrospective data and there may be problems with recall and reporting accuracy (Bonaguro and Bonaguro, 1987; McKee et al., 2003; Koval and Pederson, 1999; Koval et al., 2000). Some studies that use panel data examine primarily health events as the stress (Keenan, 2009; Falba, 2005).

Studies that examine job stress often examine only specific, stressful occupations such as nursing (Alexander et al., 1990) and medicine (Cooper et al., 1989). However, studies with larger more generalizable populations tend to find that job stress and job control (together considered to be job strain) harm health and that one of the mechanisms may be poor habits such as smoking. For example, Hellerstedt and Jeffery (1997), using a sample of 3,843 workers in Minnesota, find that job demands increase smoking intensity for men as well as for women. Taken together, these studies suggest that job stress could be causally related to smoking.

There are at least two ways by which job-stress may be causally related to smoking. One mechanism is that, stress presents physiological and psychological challenges to the body and that individuals respond by self-medicating through smoking to maintain homeostasis. Stress can be a result of real or perceived challenge to homeostasis (ability to maintain internal stability; Selye, 1956; McEwen, 2000; Seeman et al, 1997). That stress is a challenge to homeostasis has been documented in animal (Brandon, 1994; Wills & Shiffman, 1985) and clinical studies (Sinha, 2001). In response to stress, individuals try to maintain homeostasis through a number of mechanisms, one potential mechanism is to self-medicate by smoking (Koob and Moal, 1997).

Another mechanism is that stress can reduce self-control. While behavioral economists view ‘self-control’ through the lens of discount rates, specifically hyperbolic functions (e.g., Gruber and Koszegi, 2001; Laibson, 1997, 2001), psychologists view self-control as a personality trait (e.g. time invariant) akin to willpower (Sinha, 2001). Muraven and Baumeister (2000) find evidence that self control is a limited resource so that coping with

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

stress (e.g., inhibiting negative emotions at work) reduces the amount of self control available for subsequent tasks (e.g. controlling the urge to smoke). About 70% of smokers indicate that they would like to quit smoking,[1] but they lack the willpower to do so. About 40% try to quit each year but fail. Surprisingly, smokers tend to support higher tobacco taxes presumably as a method to help them quit as they lack self-control (Gruber and Mullainathan, 2002; Hersh, 2005; Kan, 2007).

This paper examines the effect of job-related stress on the smoking behavior of older workers. We use a self-reported measure of stress which is thought to capture the net impact of perception of, response to, and objective level of job related chronic or acute stress. We examine the extent to which job stress increases the likelihood that older working smokers relapse, continue to smoke and smoke more intensely. Using the Health and Retirement Survey (HRS), we examine workers and use separate samples of recent smokers and recent quitters reflecting the different decisions that they face. We also examine ever smokers in robustness checks. The HRS offers several advantages, including a fairly large sample of older workers with data on smoking and job stress. The HRS also contains information on usually unobserved factors such as financial planning horizon that could potentially affect stress and smoking decisions. In addition, the HRS is a panel survey which allows us to account for unobserved individual specific factors in our estimation. We are also able to study quitting and relapse of older individuals over time.

Data

We use data from the 1992 to 2004 Health and Retirement Study (HRS).[2] The HRS is a nationally representative longitudinal survey of individuals over 50 years and their spouses. The HRS initially sampled persons in birth cohorts 1931 through 1941 and conducted follow up interviews biennially. We combined the original HRS data with the RAND HRS (version H) data. The RAND HRS data is a subset of the HRS data containing cleaned versions of several variables. It was created by the RAND Center for the Study of Aging with the goal of making the data more accessible to researchers.

We restrict our sample to 10,775 individuals who were 50 to 64 years of age in 1992. In addition, we select only ever-smokers as almost no one starts to smoke after their twenties, thus our analytical sample becomes 6,910 individuals. In our sample, only 0.28% (n=57) of those who reported never smoking in any wave initiate smoking in subsequent waves of the survey; however, even these could have been long-time former smokers. Since our analysis focuses on the effects of job-related stress, we exclude observations for which the person reported not working at the time of the interview. We also exclude observations for which there are missing values on occupation codes, job stress or any of the demographic variables included in the analysis. This reduces our sample to 4,542 individuals. To exploit the panel nature of the HRS, we restrict the sample to individuals for whom at least two waves of data are available. Our final sample consists of 3,825 individuals and 17,043 person-year observations. In Table 1 we compare summary statistics in 1992 for the original HRS sample of 10,775 individuals and our final analysis sample of 3,825 individuals. Individuals in the analysis sample are more likely to be male and have slightly higher income levels than those in the HRS sample, but are very similar in terms of the other characteristics. These differences are to be expected because the analysis sample consists of only workers; workers are more likely to be male and to have higher income. As never smokers are excluded from

[1]Source: http://www.cdc.gov/tobacco/data_statistics/fact_sheets/cessation/quitting/index.htm

[2]Data from the 2006 HRS is also available. However, the occupation category codes used in 2006 were different from those in the previous years so that the original occupation codes were available only for persons who did not change jobs between waves. To maintain consistency and avoid any potential bias we did not use the 2006 data.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

our analytical sample, our sample necessarily has a much higher proportion of current and former smokers.

We separately analyze the effect of stress for three groups- 'recent smokers', 'recent quitters' and ever smokers. Ever smokers have reported smoking sometime in the waves or otherwise self-report to smoking sometime in their life. Recent smokers are defined to be persons who reported smoking at the previous interview wave and recent quitters are defined as persons who had smoked in at least one prior wave but reported having quit smoking by the previous interview. Because we will use individual FE estimation approaches, we require that recent smokers and ever smokers be in the data for at least two waves. For recent smokers, the first wave establishes their smoking status and the next wave is required to examine their change in smoking. For recent quitters, we need three waves; one to establish relatively recent smoking, the second to establish quitting and the third to examine change from the previous period.

We delineate these groups because, due to the highly addictive nature of cigarettes, we expect that those who smoked last period and those who did not, will react differently to a change in stress. Individuals who have quit smoking long ago may be less likely to respond to stress by smoking as compared to those who are recent quitters. Summary statistics for the subsamples of recent smokers, ever smokers, and recent quitters are shown in Table 2. The number of observations for recent smokers, ever smokers and recent quitters are, respectively, 1,551, 3,825 and 436 persons. These translate into 5,742, 17,043, and 1,390 person-wave observations respectively.

Owing to the fact that we focus on job stress, we restrict our sample to those who worked in the initial wave. About 20% of this initial sample retires over subsequent waves of the survey, while approximately 3% stops working for other reasons. Current job stress is missing for these individuals. To examine the potential impact of attrition bias, we also analyze a larger sample that includes data from subsequent survey waves and adds controls for retirement, part-time, and not-working status. Job stress and occupational codes are set to zero for persons who had retired or were not working.[3]

Dependent Variables

Our two dependent variables are: 1) a binary indicator for whether or not a person smokes at the time of the interview and 2) the number of cigarettes that a smoker usually smokes in a day. Data on smoking come from a survey question: "Do you smoke cigarettes now?" For those who report to be current smokers, they were asked the quantity of cigarettes smoked. This could be reported in number of cigarettes, packs or cartons. For individuals who reported the number of packs that they smoke in a day, we calculate the number of cigarettes by assuming that each pack contains 20 cigarettes. For individuals who reported the number of cartons smoked in a day, we assume that each carton contains 10 packs or 200 cigarettes.

Independent Variables

Job Stress

The main independent variable for our study is a measure of job-related stress. In each wave of the HRS, respondents were asked how much they agree or disagree with the statement "My job involves a lot of stress". The answers were coded on a four-point scale, with 1 representing "strongly agree" and 4 representing "strongly disagree". We created a binary

[3]We do not account for attrition bias due to mortality (4%), survey non-response (8%) or missing values (2%).

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

variable that took the value one if the individual reported that they strongly agree and zero otherwise.[4]

Most of the extant literature focuses on more objective measures of stress such as life events. However, psychologists often view stress as a process, separating it into steps involving: perception, appraisal, response and adaptation to harmful, threatening or challenging events (Lazarus and Folkman, 1984; Sinha, 2001). Thus individuals might perceive or interpret the same objective stressor (e.g. divorce or pressure at work) differently or could respond or adapt to it differently. One concern with using a self-reported measure is that it may be picking up objective stress, a point in the process (perception, appraisal, response, and adapt) or a combination of both. To the extent to which people respond (e.g. by changing the smoking pattern) to their own personalized view of the level of stress, self-reported stress is perhaps the most relevant variable for analyzing smoking decisions.

Table 3 reports means for stress levels and other factors by occupation. Occupations are listed in order of average level of stress in each occupation. Individuals in professional and technical support report the highest levels of stress, followed by managerial staff. Persons in farming, forestry or fishing report the lowest stress. This ranking of stress is almost the same as the ranking of occupation by educational attainment; the exception is that sales has a higher level of education than administration, but a slightly lower reported average stress. The most stressful occupations display the lowest smoking rates (farmers are slightly out of order with a lower smoking rate).[5] These raw averages reveal a negative relationship between stress and smoking status.

Demographics

We control for age, race, gender, marital status, household income and years of education. Household income is expressed in 10,000 1992 US dollars. For marital status, we create binary indicators for married, partnered and ‘no spouse’. The ‘no spouse’ category combines persons who are separated, divorced, widowed or whose spouse is absent. The reference group is never married.

Occupation Categories

Occupational dummies help to control for occupation-related factors other than job stress that vary systematically and that could affect smoking. Examples would include workplace smoking bans, other working conditions, and workplace decision latitude. In addition, smoking rates and smoking cues (e.g. seeing someone else smoke), may vary by occupation, affecting quitting and relapse.[6] We classify individuals into eight occupation categories which were created from the 17 original categories reported in the HRS. The categories included: 1) managerial; 2) clerical and administrative support; 3) sales; 4) mechanical, construction and precision production; 5) service including private household, protective, food preparation, health and personal service; 6) operators, fabricators and laborers; and 7) farming, forestry and fishing. The reference category is professional and technical support and armed forces. We combine these two groups since there were only eight persons (15 person-years) in the armed forces. To test the robustness of our results we re-estimate the

[4]In some preliminary specifications, we included indicators for ‘strongly agree’, ‘agree’ and ‘disagree’ with ‘strongly disagree’ being the omitted group. Since the results were very similar to those with the single binary variable we do not present them.

[5]The category of farmer is composed of different socio-economic types, ranging from farm owners to labors, which might explain the inconsistency.

[6]Occupation fixed effects may also adjust for the peer effects of workers smoking. While the smoking of worker-peers may be caused to some extent by common job stress, previous studies have found that being surrounded by others who smoke increases the likelihood of own smoking. For example, Fletcher (2009) finds that increasing the proportion of classmates who smoke by 10% increases the likelihood of individual smoking by 3 percentage points for a nationally representative sample of adolescents. Cutler and Glaeser (2007) find that individuals whose spouses smoke are 40% more likely to smoke.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

regression excluding these individuals. As expected, the results are almost identical to those with the full sample. We also re-estimate the regressions using the 17 original categories and combining professional and technical support and armed forces to form the reference group. The results are qualitatively similar and so are not presented here.[7]

Health

We create a binary variable for fair or poor health based on self-reported general health status. We also control for the count of chronic health conditions that the individual has at the time of the interview. The diseases list for health conditions includes: diabetes, high blood pressure, cancer, lung disease, heart problems, stroke, psychological problems and arthritis.

Financial Planning Horizon

Forward looking planning behavior may affect smoking; those with a longer planning horizon would be expected to smoke less. The HRS contains information on the financial planning horizon; the HRS asked respondents: “In deciding how much of their (family) income to spend or save, people are likely to think about different financial planning periods. In planning your (family’s) savings and spending, which of the time periods listed in the booklet is most important to you [and your (husband/wife/partner)]?” We create separate binary variables for each of the answers: “next few months”, “next year”, “next few years”, “next 5–10 years” and “longer than 10 years”. The shortest horizon “next few months” served as the reference group. These questions were not asked in the 1994 and 1996 waves or if the interview was by proxy. In 1998 and 2000 respondents were selected to answer this question based on a combination of their cohort and random selection[8]. In 2002, individuals who were 65 years and older were not asked this question. Primarily because these questions are not asked in all waves, we create a dummy variable indicating missing.

Job Characteristics

We control for the individual’s years of tenure and other characteristics of the individual’s job. Respondents were asked whether they agreed or disagreed with the following statements: “In decisions about promotion, my employer gives younger people preference over older people” and “In decisions about promotion, my employer gives younger people preference over older people.” Responses were on coded on a five point scale with 1 representing “strongly agree” and 5 representing “strongly disagree”.

Labor Force Status

To check for the presence of attrition bias, we analyze the labor force status of our sample over the survey waves. We create a dummy variable for whether or not a person was retired as well as a binary variable for part-time work status of the individual. We also create a variable (not working) that takes the value of one if the person reported being unemployed, not working due to disability or not in the labor force, and zero otherwise.

Description of within person changes—To be able to exploit the panel nature of the HRS in our estimation approach, there must be sufficient within person variation in stress and smoking status. Here we provide descriptive statistics on smoking status by changes in stress. Then for the sub-sample of those who change their stress level, we report smoking status by the source of changes in stress (change in job or change in stress within a specific job).

[7]Both sets of results are available upon request.
[8]For details see: http://www.rand.org/labor/aging/dataprod/randhrsh.pdf

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 4 displays the descriptive data on stress change and job change for recent smokers and Table 5 for recent quitters[9]. The corresponding table for ever smokers is in Appendix 1. The sample for recent smokers is 5,742 person-waves (1,551 people). As can be seen in Table 4a, almost 18% of these person-waves in the recent smoker category report a change in job stress. The corresponding percentages for ever smokers and recent quitters are similar at almost 17% and 15% respectively.

Just less than 15% of this sample changes their smoking status. One might expect the biggest response in terms of continuing to smoke (failing to quit) might be in the group that change from low stress to high stress; then possibly the group that remains in the high stress in both periods. The data indicate that those who are in the high stress group in the most recent wave are most likely to continue to smoke (only about 11 to 12 % of these quit) while about 15% of those who have low job stress in the most recent wave quit. Recall that the long term secular trend as well as the aging process is toward smokers quitting. These comparisons do not establish causality—the differences are small and they are raw data—but the direction is consistent with expectations. Similar results are displayed in the Appendix for ever smokers and in Table 5 for recent quitters.

In Table 4b, we examine the sources of change in stress for those 494 recent smokers who experience a change in stress and cross-tabulate this with smoking rates (similar tables are shown in Appendix Table 1a and b for ever smokers). About 44% of those who experience a change in stress, transition from low to high job stress from one period to the next. For those who transition to less stress, about 15% stopped smoking while only about 11% of those experiencing more stress stopped smoking. Smoking transition rates for those who change to less stress through a job change versus while remaining in the same job are similar.

Table 5 displays similar results for recent quitters. The data indicate that 17% of those who are in low stress jobs in period t+1 relapse to smoking regardless of whether they started in high or low stress in time t. However, 25% of those who moved to high stress from low stress relapse. Somewhat surprisingly, those who remain in high stress jobs in both periods have only 11% who relapse. However, the number of those who relapse is small, only 8 person waves out of 80. The cross-tabulations tend to be consistent with the idea that a reduction in stress is correlated with success in quitting. However, the number of observations is small for particular cells, even smaller for those who change stress, and too smallbe able to make meaningful comparisons.

Methods

We employ several empirical methods to analyze the effect of job related stress on smoking decisions. As a first step, we use ordinary least squares (OLS) to study the association between stress and smoking. The OLS regression controls for job stress and also demographics, occupation fixed effects and year fixed effects. The latter is important due to the secular decline in smoking as well as the decline with age. Since persons might select their occupation (and hence job stress) based on unobservable characteristics that also affect smoking, the OLS estimates cannot be interpreted as causal.

$$S_{it}=\alpha+\beta Stress_{it}+\gamma X_{it}+OC_{it}+T_t+\varepsilon_{it} \quad (1)$$

[9]Note that because we need two waves of data to calculate the differences between time periods t and t+1, the number of person waves in the tables add up to the number of person-waves minus the number of persons.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Where, S_{it} represents individual i's smoking status (or quantity of smoking) in period t; $Stress_{it}$ represents the individual's job related stress in period t; X_{it} represents a vector of observable factors that may affect the smoking decision; OC_{it} is an occupation fixed effect; T_t represents year fixed effects; and ε_{it} represents an idiosyncratic error term.

Equation (1) represents the effect of stress on smoking conditional on observable characteristics and unobserved occupation and time effects. However, there might be other unobserved individual specific factors such as preferences and abilities to cope with stress that affect both smoking decisions and job stress. To account for the presence of such factors, we estimate the following equation:

$$S_{it}=\alpha+\beta Stress_{it}+\gamma X_{it}+OC_{it}+T_t+\eta_i+\varepsilon_{it} \quad (2)$$

Where η_i represents an unobserved individual specific term that affects the decision to smoke. Equation 2 allows η_i to be correlated with $Stress_{it}$, so that certain individuals might systematically be more likely to be in jobs with (say) a high stress level and be more likely to smoke.

While the individual fixed effects model accounts for the endogeneity of job stress due to time-invariant person-specific factors, β might not represent the causal effect of stress on smoking because of two additional sources of potential endogeneity. The first is the presence of omitted time-varying unobservables that are correlated with both stress and smoking. We control for some of the relevant time-varying factors, but some will inevitably still be omitted. In our preferred specification, we are able to control for time varying factors such as health and job characteristics that are observable in the HRS. However, this does not rule out the presence of other factors that we are not able to observe. The second source of potential endogeneity is reverse causation. Smoking may alleviate stress (Aronson et al., 2008; Kassel, Stroud and Paronis, 2003) or smokers who are unable to quit may report higher stress to justify their decision to continue smoking.

Results

Table 6 reports the OLS and fixed effects regression results for recent smokers. Column 1 presents the results from the baseline specification that controls for demographics, occupation and year fixed effects. In Column 2, we add individual fixed effects. Column 3 is similar to Column 1 in that we use OLS to estimate but we also include time-varying factors such as self reported health, number of chronic health condition, job tenure and other job characteristics. In Column 4 we add individual level FE and this is our preferred specification as it includes time-varying factors and FE. Because these time-varying factors are not available for our full sample, the sample used in Columns 3 and 4 are somewhat smaller than those for the first two columns.

We find that being in a high job stress is positively and significantly associated with being a smoker for these recent smokers in all specifications. Accounting for individual FE increases the magnitude and significance of the coefficient indicating that the OLS estimates are biased downwards. This suggests that individuals who are less likely to smoke might also be more likely to select a high stress job. There are several potential person-specific time-invariant omitted variables that could explain the negative bias of OLS. Unmeasured differences in family background, quality of education, cognitive function, level of self-control, ability to handle stress, mental health problems[10] or anxious personality could all result in this bias. Higher levels in all but the last in this list would likely lead to a willingness to accept the greater stress associated with a challenging occupation and would also tend to result in lower smoking rates. From these results, we have to be agnostic as to

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

which factor or set of factors account for the bias in the OLS results. We can however determine the magnitude and direction of the bias.

Being black, more educated and male[11] significantly reduces the probability of being a smoker. The first two are consistent with extant studies; the latter, the positive impact of being male, is not found across all ages, but our sample is composed of older workers, as compared to general populations. Presence of chronic health conditions significantly reduces the probability of smoking as has been found in other studies. Financial planning with a time frame of 5–10 years also reduces smoker probabilities significantly. Financial planning horizon serves as a proxy for an individual's forward looking attitudes. Consistent with previous literature, we find that individuals with longer planning horizons are less likely to continue smoking, however, adding this variable to our specification does not change the coefficient on stress. In addition, the results reflect a time trend towards a lower smoking rate in the population as can be seen in the significance levels of the year dummies. This time trend becomes weaker once we include individual fixed effects and time varying factors. Age also reduces the probability of smoking.

In results not shown here (but available on request), we also examine the impact of job stress for males and females separately using our preferred specification that controls for time varying factors and individual fixed effects. Males appear to react more strongly to stress with an estimated coefficient of 0.0668 (significant at 5% level) as compared to females who have an estimated coefficient of 0.0274 (not significant).

In Table 7, we examine the impact of job stress on the number of cigarettes smoked conditional on being a smoker. A recent smoker in a high stress job smokes more cigarettes per day compared to one in a low stress job as can be seen in column 1 of Table 7. However, the impact is significant only in the OLS specification without time-varying variables. It appears that the primary impact of job stress is on whether or not the smoker continues to smoke, not the number of cigarettes. Quitting seems to be the pivotal event[12]. The control variables are similar in their impacts across the decisions to smoke or not and in regressions of the number of cigarettes for smokers only. The exception is for male smokers who are less likely to smoke as compared to female smokers, but conditional on smoking, consume a larger number of cigarettes.

Table 8 presents the estimated coefficient on stress from three sets of regressions; each set is composed of results for OLS and FE that include the time-varying variables such as health. The FE regression including time-varying variables is our preferred specification as it is most comprehensive. The first set of regressions examines the effect of stress on smoking status for the full sample of ever-smokers. The second set examines the number of cigarettes smoked by ever-smokers who currently smoke.[13] The third set of regressions analyzes the smoking status of recent quitters. We only display the coefficient on stress in each regression as stress is the key variable of interest; the coefficients on the control variables are qualitatively similar to those in columns 3 and 4 of Tables 6 and 7.

[10]There are high rates of smoking in schizophrenia and mental health problems in general. There is evidence that those with schizophrenia smoke to alleviate attention deficits. Smoking may help to address cognitive deficits in those with schizophrenia or other mental health problems. See for instance Sacco et al. 2005.

[11]In general populations, more males than females smoke. Also regressions using these data typical reflect this and find a positive impact of being male on smoking. However, our data set is composed of workers only and there is likely selection by females into working that may affect the sign of the coefficient on gender. In addition, by selecting on smokers, we no longer have a general population.

[12]Although there is evidence that cutting back on the number of cigarettes is predictive of quitting (Falba et al 2004).

[13]Note that the set of current smokers from the sample of ever-smokers overlaps with but is not identical to current smokers from the set of recent smokers. This is because recent smokers have to report smoking in the previous wave by definition while ever-smokers do not as the information on ever-smoking comes from retrospective questions.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Job stress positively affects the smoking status of ever-smokers in both OLS and FE regressions. Accounting for some of the endogeneity of stress by controlling for time-invariant personal characteristics (FE regressions), reduces the magnitude of the estimated coefficient for this group. These results suggest that the source of the endogeneity bias for the ever-smokers is different from that for the recent smokers. For the recent smokers, the coefficient on stress was larger for the FE regressions than for the OLS regressions. The differences between the OLS and FE impacts across ever-smokers and recent smokers could occur for several reasons. Current smokers in this set do not overlap completely with the smokers in recent smokers (see footnote 13). Further, the sample of ever smokers also includes former smokers. As can be seen in Table 2, 68% of the ever-smokers have already quit. This sample would have been between 22 and 36 years of age when the first surgeon general's report on smoking as an important health hazard came out in 1964. Many of these smokers probably started smoking when they were teenagers, which would have been prior to the barrage of information on the health hazards of smoking. When they initially became aware of the harms of smoking they might have responded by quitting. Those who quit in response are likely to be systematically different from those who continued smoking into their 50s and 60s. This systematic difference could account for the differential effect.

As can be seen in Table 8, for ever smokers as for recent smokers, stress does not have a significant impact on the number of cigarettes smoked. Also seen in Table 8 is that recent quitters do not significantly change their smoking behavior in response to stress. This lower level of significance may be in part due to the small percentage of this sample that starts to smoke – about 12% report smoking over the study time period (see Table 2).

In Table 9, we examine potential bias introduced by sample attrition related to labor force status. We include dummy variables for whether or not a person was retired, otherwise not working, or working part time in period t+1 with full time employment as the reference category. Their work stress is set to zero when they are not working. Thus, the sample size is larger and is composed of non-workers in time t+1. With these changes, the results do not change qualitatively; the coefficient on stress is significant for all specifications except that for the recent quitters. However, in these specifications, stress also significantly affects the number of cigarettes smoked for recent and ever smokers, but only at the 10% level of significance; the magnitude of the impact is larger. The coefficients for retired, full time and part-time are insignificant. Thus by expanding the data to include non-workers and setting their work-related stress to zero, the impact of stress is more significant and of greater magnitude for the number of cigarettes. Note that attrition bias might still be a concern if, for example, individuals who have retired are less able to cope with stress relative to those who have not retired.

Discussion

Examining older workers, overall we find that job stress prevents smokers from quitting. In our estimates for recent smokers, we find that compared to OLS regressions, individual FE regressions display coefficients on stress that are larger in magnitude and significance. Because all time-invariant factors are essentially controlled for in the individual FE regressions, the OLS bias seems to occur due to time-invariant personal characteristics that were omitted from regressions. While we include key time-varying factors, there might be some important, still unobserved time-varying characteristics. In contrast, for ever smokers, the OLS results are greater than the FE estimates. The number of cigarettes is not affected by stress in our primary results for either recent or ever smokers, however, stress is significant when non-workers are included. Stress does not significantly affect whether recent quitters relapse to smoking, but this lack of significance may be attributed to a smaller sample.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Our study advances the literature in several ways. First, we focus on older workers and job stress. Older smokers are those most at risk for smoking-related morbidity and mortality. Quitting, even at later ages, improves health and functioning and can prevent some of the adverse consequences. Second, we explicitly address the fact that older individuals are not likely to newly initiate smoking but will have different decisions to make based on whether they are recent quitters or recent smokers. Third, we compare results from OLS and individual fixed effects to assess the impact of otherwise omitted time-invariant factors. Fourth, because the FE approach does not address potential time-varying factors that could bias our results, we examine various time varying measures of health and job characteristics. We note, however, that our efforts do not preclude the existence of other time-varying factors that are correlated with both job stress and the propensity to smoke. Fifth, we use occupational fixed effects to control for occupational specific characteristics other than stress. Sixth, we examine the potential impact of attrition bias; however, we are unable to account for selection into the sample based on working status because we cannot identify factors that would influence the decision to work, but not the decision to smoke. Lastly, while much of the extant literature examines life-events to measure stress, we examine job stress. Job stress has the potential to be ameliorated through workplace programs, thus findings may be policy oriented. In addition, the chronic nature allows a longer time window in which to address its effect on smoking.

The self-reported measure of stress that we use has strengths and weaknesses. To the extent that people respond to their own personalized view of their level of stress and not only the objective measure, self reported stress is a relevant variable for analyzing smoking decisions. Further, our measure may correspond to the psychologists' view of stress as a process of perception, appraisal, response and adaptation to challenging events. However, individuals might have different definitions of what constitutes "a lot of stress" and could also vary in their response to a stressful event. The alternative of using an external measure of stress would introduce new and different problems. The respondent may not even perceive the objectively measured stress to be aversive, that is, what is stressful for the average person, is not necessarily stressful for the specific respondent. The measure that we use is more akin to the personalized recognition of an aversive situation; we think that this is an appropriate measure for our purposes.

Our results have implications for both private and public policy to help smokers quit. Such policies could be warranted on several criteria. One is that smoking imposes externalities on others through passive smoke and shared financial arrangements such as Medicare. Another motivation could be that smokers want to stop smoking but cannot and so require help to quit. There is evidence in the US that many smokers want to quit but cannot. Smokers tend to support higher tobacco taxes presumably as a method to help them quit because they lack self-control (Gruber and Mullainathan, 2002; Hersh, 2005, Kan, 2007). Thus we believe that most are smoking because they are addicted, do not have the willpower to quit, would like help and stress may exacerbate the problem. If continued smoking is not desired but rather due to low willpower, or hyperbolic discounting (Laibson 1997, 2001), then public or private intervention might enhance welfare. Studies in behavioral economics are increasingly positing that policies in such situations can be welfare enhancing (Thaler and Sunstein, 2003; O'Donoghue and Rabin, 2003; Camerer, et al. 2003, Bernheim and Rangel, 2006).

On the other hand, smoking may be 'productive' in terms of self medication or benefitting compensating wage differentials for accepting stress. However, there may be better alternatives to coping with stress than smoking even in these situations. For example, it may be productive for schizophrenics to smoke to treat attention deficit problems (Sacco et al, 2005). However, they might be better off medicating and handling their stress in other ways;

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

the nicotine patch, for example, provides nicotine without the harm associated with tobacco. Development of coping skills and mitigating the causes of stress would be other approaches as well.

The results of this paper suggest that high stress workers, cet. par., may be at risk for continued use of tobacco. Helping smokers who want to quit and preventing relapse may be priorities, and might be addressed through the workplace. Efforts by the public or private sector to reduce the stress, while maintaining productivity, could improve the health of the workers through reduced smoking. Another approach could be to teach methods to bolster self-control, as psychologists are making strides in teaching self-control (Muraven et al., 1999; Muraven and Baumeister, 2000; Mischel and Mischel, 1983; Mischel et al., 1996). This could have positive spillovers to productivity as well to the extent that willpower is generalizable.. In addition, it might be productive for firms, for example, to offer programs that help workers cope with stress as well as quit smoking and prevent former smokers from relapsing. Smokers could also be helped by ensuring that health insurance covers tobacco cessation services and products. Smoking bans levied at the firm might be particularly helpful to smokers in high stress jobs in the absence of government bans on smoking indoors and out. Smokers could find ways of coping with stress that do not compromise their health so greatly.

Acknowledgments

This work was supported by Grant Number RL1AA017542 from the National Institute on Alcohol Abuse and Alcoholism to Yale University and Grant Number R01AG027045 from the National Institute on Aging to Yale University.

References

Aronson KR, Almeida DM, Stawski RS, Klein LC, Kozlowski LT. Smoking is associated with worse mood on stressful days: Results from a national dairy study. Annals of Behavioral Medicine. 2008; 36:259–269. [PubMed: 19067100]

Baumeister, R.; Vohs, K. Willpower, choice, and self-control. In: Loewenstein, G.; Read, D.; Baumeister, R., editors. Time and Decision. New York: Russell Sage Foundation; 2003. p. 201-216.

Baumeister RF, Bratslavsky E, Muraven M, Tice D. Ego depletion: Is the active self a limited resource? Journal of Personality and Social Psychology. 1998; 74(5):1252–65. [PubMed: 9599441]

Benabou R, Tirole J. Willpower and personal rules. Journal of Political Economy. 2004; 112(4):848–87.

Benhabib J, Bisin A. Modeling internal commitment mechanisms and self-control: A neuroeconomics approach to consumption-saving decisions. Games and Economic Behavior. 2005; 52(2):460–492.

Bernheim, BD.; Rangel, A. Swedish Economic Policy Review. Vol. 12. 2005. From neuroscience to public policy: A new economic view of addiction.

Bhattacharya, J.; Lakdawalla, D. Time-inconsistency and welfare. NBER working paper No. W10345. 2004 March. Available at SSRN: http://ssm.com/abstract=515239

Bonaguro JA, Bonaguro EW. Self-concept, stress symptomatology, and tobacco use. Journal of School Health. 1987; 57(2):56–58. [PubMed: 3644084]

Brandon TH. Negative affect as motivation to smoke. Current Directions in Psychological Science. 1994; 3(2):33–37.

Camerer C, Issacharoff S, Loewenstein G, O'Donoghue T, Rabin M. Regulation for conservatives: behavioral economics and the case for "asymmetric paternalism". University of Pennsylvania Law Review. 2003; 151(3):1211–1254.

Chaloupka FJ. Rational addictive behavior and cigarette smoking. J Political Economy. 1991; 99(4): 722–742.

Chaloupka, FJ.; Warner, KE. The economics of smoking. In: Culyer, AJ.; Newhouse, JP., editors. Handbook of Health Economics. Vol. 1B. Elsevier; North-Holland: 2000. p. 1539-1627.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Colby JP Jr, Linsky AS, Straus MA. Social stress and state-to-state differences in smoking and smoking related mortality in the United States. Social Science Medicine. 1994; 38(2):373–381. [PubMed: 8140464]

Cooper CL, Rout U, Faragher B. Mental health, job satisfaction, and job stress among general practitioners. British Medical Journal. 1989; 298(6670):366–70. [PubMed: 2493939]

Cutler D, Glaeser E. Social interactions and smoking. Harvard Institute of Economic Research Discussion Paper No. 2153. 2007

Douglas SM. The duration of the smoking habit. Economic Inquiry. 1998; 36(1):49–64.

Falba T, Jofre-Bonet M, Busch S, Duchovny N, Sindelar JL. Reduction of Quantity Smoked Predicts Future Cessation Among Older Smokers. Addiction. 2004 Jan; 99(1):93–102. [PubMed: 14678067]

Falba TA. Effects of Health Events on the Smoking Cessation of Middle Aged Americans. Journal of Behavioral Medicine. 2005; 28(1):21–33. [PubMed: 15887873]

Fletcher J. Social interactions and smoking: Evidence using multiple student cohorts, instrumental variables, and school fixed effects. Health Economics. 2009 (forthcoming).

Forster M, Jones AM. The role of tobacco taxes in starting and quitting smoking: Duration analysis of British data. Journal of the Royal Statistical Society (Series A). 2001; 164:517–547.

Frederick S, Loewenstein G, O'Donoghue T. Time discounting and time preference: A critical review. Journal of Economic Literature. 2002; 40(2):350–401.

Geoders NE, Guerin GF. Non-contingent electric footshock facilitates the acquisition of intravenous cocaine self-administration in rats. Psychopharmacology. 1994; 21:13–33.

Gruber J, Koszegi B. Tax incidence when individuals are time inconsistent: The case of cigarette excise taxes. Journal of Public Economics. 2004; 88(9–10):1959–1988.

Gruber J, Koszegi B. Is addiction 'rational'? Theory and evidence. Quarterly Journal of Economics. 2001; 116(4):1261–1303.

Gruber, J.; Mullainathan, S. NBER Working Paper No. W887. 2002. Do cigarette taxes make smokers happier?.

Gul F, Pesendorfer W. Temptation and self-control. Econometrica. 2001; 69(6):1403–35.

Gul F, Pesendorfer W. Harmful addiction. Review of Economic Studies. 2007; 74(1):147–172.

Hellerstedt WL, Jeffery RW. The association of job strain and health behaviours in men and women. International Journal of Epidemiology. 1997; 26(3):575–83. [PubMed: 9222783]

Hersch J. Smoking restrictions as a self-control mechanism. Journal of Risk and Uncertainty. 2005; 31(1):5–21.

Hymowitz N, Sexton M, Ockene J, Grandits G. Baseline factors associated with smoking cessation and relapse. Preventive Medicine. 1991; 20(5):590–601. [PubMed: 1758840]

Kan K. Cigarette smoking and self-control. Journal of Health Economics. 2007; 26(1):61–81. [PubMed: 16950529]

Kassel JD, Stroud LR, Paronis CA. Smoking, stress, and negative affect: Correlation, causation and context across stages of smoking. Psychological Bulletin. 2003; 129(2):270–304. [PubMed: 12696841]

Keenan PS. Smoking and Weight Change Following New Health Conditions in Middle Age and Older Adults. Arch Intern Med. 2009; 169(3):237–242. [PubMed: 19204214]

Khwaja A, Sloan F, Chung S. Learning about individual risk and the decision to smoke. International Journal of Industrial Organization. 2006; 24(4):683–699.

Kim K. Peers and adolescent smoking. Review article for Addiction. 2003; 98(S1):37–55.

Koob GF, Le Moal M. Drug abuse: Hedonic homeostatic dysregulation. Science. 1997; 278:52–58. [PubMed: 9311926]

Koval JJ, Pederson LL, Mills CA, McGrady GA, Carvajal SC. Models of the relationship of stress, depression, and other psychosocial factors to smoking behavior: A comparison of a cohort of students in grades 6 and 8. Preventive Medicine. 2000; 30(6):463–477. [PubMed: 10901489]

Laibson D. A cue-theory of consumption. Quarterly Journal of Economics. 2001; 116(1):81–119.

Laibson D. Golden eggs and hyperbolic discounting. Quarterly Journal of Economics. 1997; 112(2): 443–77.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Lasser K, Boyd JW, Woolhandler S, Himmelstein DU, McCormick D, Bor DH. Smoking and mental illness: A population-based prevalence study. Journal of the American Medical Association. 2000; 284(20):2606–2610. [PubMed: 11086367]

Lazarus, RS.; Folkman, S. Stress, Appraisal and Coping. New York: Springer; 1984.

Llena-Nozal A, Lindeboom M, Portrait F. The effect of work on mental health: Does occupation matter? Health Economics. 2004; 13(10):1045–1062. [PubMed: 15386691]

Loewenstein G. Willpower: A decision-theorist's perspective. Law and Philosophy. 2000; 19(1):51–76.

Marlatt, GA.; Gordon, J. Relapse Prevention. New York: Guilford Press; 1985.

Mates D, Allison KR. Sources of stress and coping responses of high school students. Adolescence. 1992; 27(106):461–474. [PubMed: 1621576]

McEwen BS. Allostasis and allostatic load: Implications for neuro-psychopharmacology. Neuropsychopharmacology. 2000; 22 (2):108–24. [PubMed: 10649824]

McKee S. Developing human labortory models of smoking lapse behavior for medical screening. Addiction Biology. forthcoming.

Mischel H, Mischel W. The development of children's knowledge of self-control strategies. Child Development. 1983; 54(3):603–619.

Mischel, W.; Cantor, N.; Feldman, S. Principles of self-regulation: the nature of willpower and self-control. In: Higgins, ET.; Kruglanski, AW., editors. Social Psychology: Handbook of Basic Principles. New York: Guilford Press; 1996. p. 329-360.

Muraven M, Baumeister RF. Self-regulation and depletion of limited resources: Does self-control resemble a muscle? Psychological Bulletin. 2000; 126(2):247–259. [PubMed: 10748642]

Muraven M, Baumeister RF, Tice DM. Longitudinal improvement of self-regulation through practice: Building self-control strength through repeated exercise. Journal of Social Psychology. 1999; 139(4):446–457. [PubMed: 10457761]

Niaura R, Shadel WG, Britt DM, Abrams DB. Response to social stress, urge to smoke, and smoking cessation. Addictive Behaviors. 2002; 27(2):241–250. [PubMed: 11817765]

O'Donoghue T, Rabin M. Studying optimal paternalism, illustrated with a model of Sin Taxes. AER papers and proceedings. 2003; 93(2):191.

Rubinstein A. Economics and psychology? The case of hyperbolic discounting. International Economic Review. 2003; 44(4):1207–1216.

Sacco KA, Termine A, Seyal AA, Dudas MM, Vessicchio JC, Krishnan-Sarin S, Jatlow PI, Wexler BE, George TP. Effects of cigarette smoking on spatial working memory and attentional deficits in schizophrenia: Involvement of nicotinic receptor mechanisms. Archives of General Psychiatry. 2005; 62:649–659. [PubMed: 15939842]

Selye, H. The Stress of Life. New York: McGraw Hill; 1976.

Seeman TE, Singer BH, Rowe JW, Horwitz RI, adn McEwan BS. Price of adoptation—allostatic looad and its health consequences. Macarthur studies of successful aging. Archives of Internal Medicine. 1997; 157(19):2259–2268. [PubMed: 9343003]

Sinha R. How does stress increase risk of drug abuse and relapse? Psychopharacology. 2001; 158:343–359.

Shiffman S, Balabanis MH, Paty JA, Engberg J, Gwaltney CJ, Liu KS, Gnys M, Hickcox M, Paton SM. Dynamic effects of self-efficacy on smoking lapse and relapse. Health Psychology. 2000; 19(4):315–323. [PubMed: 10907649]

Sloan, FA.; Osterman, J.; Picone, G.; Conover, C.; Taylor, DH. The Price of Smoking. Cambridge, Massachusetts: The MIT Press; 2004.

Surgeon General. The Health Consequences of Smoking: A Report of the Surgeon General. Centers for Disease Control and Prevention, Office on Smoking and Health; 2004. http://www.surgeongeneral.gov/library/smokingconsequences/index.html

Sterling, P.; Eyer, J. Allostasis: A new paradigm to explain arousal pathology. In: Fisher, S.; Reason, J., editors. Handbook of Life Stress, Cognition and Health. New York: John Wiley & Sons; 1988.

Taylor DH, Hasselblad V, Henley SJ, Thun MJ, Sloan FA. Benefits of smoking cessation for longevity. American Journal of Public Health. 2002; 92(6):990–996. [PubMed: 12036794]

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Thaler R, Shefrin HM. An economic theory of self-control. Journal of Political Economy. 1988; 89(2): 392–406.

Thaler R, Sunstein CR. Libertarian paternalism. AER Papers and Proceedings. 2003; 93(02):175–79.

US Department of Health and Human Services. Reducing Tobacco Use: A Report of the Surgeon General. Atlanta: U.S. Department of .Health and Human Services, Public Health Service, Centers Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2000.

US Department of Health and Human Services. The Health Consequences of Smoking: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004.

Weaver GD, Turner NH, O'Dell KJ. Depressive symptoms, stress, and coping among women recovering from addiction. Journal of Substance Abuse Treatment. 2000; 18(2):161–167. [PubMed: 10716099]

Wewers ME. The role of postcessation factors in tobacco abstinence: Stressful events and coping responses. Addictive Behaviors. 1988; 13(3):297–302. [PubMed: 3177074]

Wills, TA.; Shiffman, S. Coping behavior and its relationship to substance abuse: a conceptual framework. In: Shiffman, S.; Wills, TA., editors. Coping and Substance Use. New York: Academic Press; 1985. p. 3-24.

Appendix

Table 10

Transition Probabilities for Ever Smokers

a. Ever Smoker Sample : Obs=17,043, N=3,825

		Stress in period t+1	
		0	1
Stress in period t	0	%sample=75.738, %smoke=29.118	%sample=7.528, %smoke=32.663
	1	%sample=8.988, %smoke=33.418	%sample=7.747, %smoke=34.277

b. Job Change Transitions: Obs=2,183, N=1,278

		Low to High Job Stress	High to Low Job Stress
Job Change	0	%sample=83.803, %smoke=32.053	%sample=74.071, %smoke=32.725
	1	%sample=16.197, %smoke=36.025	%sample=25.929, %smoke=35.831

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 1

Summary statistics in 1992 for HRS sample and analysis sample

	HRS Sample		Analysis Sample	
	Mean	**Std. Dev**	**Mean**	**Std. Dev.**
Former smoker	0.367		0.601	
Current smoker	0.271		0.399	
High stress*	0.191		0.191	
Age	55.865	(3.641)	55.225	(3.440)
Black	0.169		0.152	
Other race	0.037		0.028	
Male	0.486		0.618	
Married	0.751		0.756	
Household income (‘0,000 1992 USD)	4.660	(5.072)	5.281	(4.841)
Years of education	12.019	(3.237)	12.452	(2.970)
Professional*	0.155		0.138	
Managerial*	0.152		0.154	
Administrative*	0.150		0.136	
Sales*	0.099		0.102	
Mechanical*	0.112		0.128	
Service*	0.150		0.146	
Operator*	0.149		0.166	
Farm*	0.033		0.030	
N (persons)	10,775		3,825	

*Note, the number of observations for the variables high stress and occupation dummies in the HRS sample are less than 10,775 due to missing values. Thus the means across the two columns are similar for these variables.

NIH-PA Author Manuscript NIH-PA Author Manuscript NIH-PA Author Manuscript

Table 2

Summary statistics for the three samples of smokers

	Recent Smokers [a]		Ever-smokers [a]		Recent Quitters [a]	
	Mean	**Std. Dev**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Former smoker	0.103		0.677		0.883	
Current smoker	0.897		0.324		0.117	
High stress	0.178		0.161		0.148	
Age	58.289	(4.513)	59.264	(4.780)	61.265	(4.411)
Black	0.159		0.144		0.184	
Other race	0.030		0.030		0.043	
Male	0.556		0.620		0.606	
Married	0.661		0.736		0.657	
Household income (‘0,000 1992 USD)	4.762	(5.705)	5.783	(6.715)	5.511	(6.787)
Years of education	12.092	(2.719)	12.626	(2.906)	12.682	(2.822)
Professional	0.095		0.144		0.125	
Managerial	0.124		0.150		0.138	
Administrative	0.153		0.136		0.149	
Sales	0.102		0.106		0.105	
Mechanical	0.119		0.116		0.116	
Service	0.189		0.152		0.175	
Operator	0.190		0.163		0.155	
Farm	0.029		0.034		0.037	
Obs. (person-year)	5,742		17,043		1,390	
N (persons)	1,551		3,825		436	

[a]Recent smokers are defined to be persons who reported smoking at the previous interview wave and recent quitters are defined as persons who reported smoking at least once during prior waves and reported having quit smoking by the previous interview wave. Ever smokers are those who have reported smoking sometime in their life. In this table we list the means for the person-wave observations; in Table 1 the means were for persons in Wave 1 who were ever smokers.

B E J Econom Anal Policy. Author manuscript; available in PMC 2011 May 27.

NIH-PA Author Manuscript
NIH-PA Author Manuscript
NIH-PA Author Manuscript

Table 3

Means and standard deviations by occupation for ever-smokers*

	Stress	Yrs of education		Household income		Male	Smoker	Obs.
	Mean	Mean	S.D.	Mean	S.D.	Mean	Mean	N
Professional	0.230	15.423	(1.957)	8.301	(8.277)	0.556	0.211	2,447
Managerial	0.223	14.035	(2.381)	8.956	(9.620)	0.720	0.268	2,552
Administrative	0.173	12.866	(1.769)	5.337	(6.931)	0.248	0.359	2,309
Sales	0.149	13.119	(2.369)	6.206	(7.210)	0.622	0.311	1,811
Mechanical	0.119	11.515	(2.475)	4.718	(3.739)	0.945	0.329	1,979
Service	0.129	11.443	(2.490)	3.375	(3.220)	0.389	0.400	2,592
Operator	0.120	10.823	(2.811)	4.053	(2.769)	0.808	0.393	2,782
Farm	0.081	9.823	(3.775)	4.318	(5.149)	0.946	0.280	571

*Standard deviations for non-binary variables are reported in parentheses.

B E J Econom Anal Policy. Author manuscript; available in PMC 2011 May 27.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 4

Transition Probabilities for Recent Smokers: Stress and Job Changes

a. Stress transitions: Obs=5,742, N=1,551

		Stress in period t+1	
		0	1
Stress in period t	0	%sample=73.181, %smoke=85.621	%sample=8.017, %smoke=89.286
	1	%sample=10.212, %smoke=84.579	%sample=8.590, %smoke=88.056

b. Job Change Transitions Obs=764, N=494

		Low to High Job Stress	**High to Low Job Stress**
Job Change	0	%sample=81.845, %smoke=89.091	%sample=73.131, %smoke=84.345
	1	%sample=18.155, %smoke=90.164	%sample=26.869, %smoke=85.217

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 5

Transition Probabilities for Recent Quitters: Stress and Job Changes

a) Recent Quitter Sample : Obs=1,390, N=436

		Stress in period t+1	
		0	1
Stress in period t	0	%sample=77.359, %smoke=16.667	%sample=7.652, %smoke=24.658
	1	%sample=7.442, %smoke=16.901	%sample=7.547, %smoke=11.111

b) Job Change Transitions: Obs=144, N=98

		Low to High Job Stress	**High to Low Job Stress**
Job Change	0	%sample=84.722, %smoke=26.230	%sample=82.857, %smoke=17.241
	1	%sample=15.278, %smoke=18.182	%sample=17.143, %smoke=16.667

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 6

Effect of job stress on smoking decisions (binary) of recent smokers

	(1) OLS	(2) FE	(3) OLS	(4) FE
High stress	0.0230** (0.00952)	0.0454*** (0.0137)	0.0273** (0.0108)	0.0441*** (0.0156)
Age	0.0226 (0.0197)	0.0606** (0.0294)	0.0217 (0.0239)	0.0461 (0.0341)
Age squared	−0.000209 (0.000171)	−0.000388* (0.000222)	−0.000205 (0.000208)	−0.000361 (0.000265)
Black	−0.0270** (0.0116)	- -	−0.0277** (0.0128)	- -
Other race	−0.0378 (0.0260)	- -	−0.0731** (0.0319)	- -
Male	−0.0160* (0.00957)	- -	−0.0272** (0.0109)	- -
Married	0.0169 (0.0275)	−0.0537 (0.0693)	0.0163 (0.0296)	-0.00462 (0.0939)
Partnered	0.0388 (0.0324)	−0.0433 (0.0690)	0.0321 (0.0364)	0.0265 (0.0932)
No spouse	0.0231 (0.0279)	0.00350 (0.0654)	0.0122 (0.0300)	0.0537 (0.0890)
Household income	−5.15e-05 (0.000763)	0.000598 (0.00125)	−0.00108 (0.00141)	0.00129 (0.00196)
Years of education	−0.00487*** (0.00181)	- -	−0.00469** (0.00214)	- -
Managerial	0.00496 (0.0186)	−0.0207 (0.0469)	0.0129 (0.0217)	0.0463 (0.0538)
Administrative	0.0113 (0.0182)	0.0189 (0.0506)	0.0102 (0.0201)	0.0997* (0.0563)
Sales	0.00576 (0.0195)	−0.0502 (0.0499)	0.0170 (0.0231)	0.0131 (0.0570)
Mechanical	0.00651 (0.0198)	−0.0598 (0.0515)	0.00545 (0.0231)	0.0386 (0.0672)
Service	0.0119 (0.0184)	0.0119 (0.0516)	0.0149 (0.0208)	0.0755 (0.0547)
Operator	0.0387** (0.0184)	−0.0178 (0.0495)	0.0407** (0.0207)	0.0522 (0.0545)
Farm	0.0142 (0.0300)	−0.114 (0.0750)	0.0418 (0.0401)	−0.145 (0.113)
Year 1994	−0.155*** (0.0102)	−0.183*** (0.0281)	−0.133*** (0.0213)	−0.107*** (0.0388)
Year 1996	−0.0961*** (0.0108)	−0.223*** (0.0552)	−0.0831*** (0.0217)	−0.121* (0.0677)
Year 1998	−0.119*** (0.0133)	−0.283*** (0.0815)	−0.0957*** (0.0223)	−0.144 (0.0961)
Year 2000	−0.133*** (0.0174)	−0.350*** (0.109)	−0.104*** (0.0247)	−0.172 (0.129)
Year 2002	−0.125*** (0.0216)	−0.393*** (0.139)	−0.118*** (0.0260)	−0.215 (0.163)

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

	(1) OLS	(2) FE	(3) OLS	(4) FE
Year 2004	−0.152*** (0.0282)	−0.462*** (0.165)	−0.111*** (0.0332)	−0.221 (0.198)
Fair/poor health			0.0112 (0.0131)	−0.00244 (0.0191)
Number of health conditions			−0.0236*** (0.00482)	−0.0819*** (0.0146)
Job tenure			−0.000116 (0.000426)	−0.00110 (0.00104)
Pressure to retire			0.00283 (0.00831)	0.00998 (0.00982)
Preference to younger workers			0.00484 (0.00725)	0.00569 (0.00853)
Planning – next year			−0.0228 (0.0198)	−0.0280 (0.0300)
Planning – next few years			0.000173 (0.0107)	0.0142 (0.0227)
Planning – next 5 to 10 years			−0.0326*** (0.0125)	−0.0287 (0.0230)
Planning – longer than 10 years			−0.0346 (0.0226)	−0.0332 (0.0343)
Planning missing			−0.0265 (0.0195)	−0.0459 (0.0281)
Constant	0.426 (0.566)	−1.068 (1.068)	0.489 (0.682)	−0.424 (1.231)
Observations	5,742	5,742	4,326	4,326
Number of persons	1,551	1,551	1,330	1,330
R-squared	0.053	0.110	0.063	0.129

Robust standard errors in parentheses;

*** p<0.01,

** p<0.05,

* p<0.1

NIH-PA Author Manuscript
NIH-PA Author Manuscript
NIH-PA Author Manuscript

Table 7

Effect of job stress on number of cigarettes smoked by recent smokers, conditional on smoking

	(1) OLS	(2) FE	(3) OLS	(4) FE
High stress	1.233**	0.679	0.568	0.318
	(0.509)	(0.462)	(0.487)	(0.408)
Age	0.352	−0.780	0.870	0.633
	(0.842)	(0.839)	(0.880)	(0.983)
Age squared	−0.00562	0.00930	−0.00996	0.00172
	(0.00712)	(0.00624)	(0.00743)	(0.00732)
Black	−8.054***	-	−7.792***	-
	(0.382)	-	(0.405)	-
Other race	−7.318***	-	−8.975***	-
	(0.908)	-	(0.789)	-
Male	5.674***	-	4.966***	-
	(0.442)	-	(0.452)	-
Married	−0.284	2.570	0.0560	0.839
	(1.144)	(2.734)	(1.087)	(2.303)
Partnered	0.264	1.656	2.510*	2.379
	(1.439)	(3.023)	(1.438)	(2.802)
No spouse	−0.208	2.011	0.460	1.900
	(1.150)	(2.483)	(1.099)	(2.138)
Household income	0.00395	0.00687	0.00914	−0.0315
	(0.0347)	(0.0313)	(0.0603)	(0.0457)
Years of education	−0.108	-	−0.0588	-
	(0.0887)	-	(0.0929)	-
Managerial	0.979	−0.972	0.607	−1.978
	(0.754)	(1.283)	(0.848)	(1.927)
Administrative	1.303*	−0.891	1.439*	−0.988
	(0.717)	(1.474)	(0.766)	(1.911)
Sales	3.045***	−0.231	1.522*	−0.0707
	(0.808)	(1.316)	(0.856)	(1.642)
Mechanical	2.576***	−0.859	2.550***	−1.407
	(0.860)	(1.440)	(0.945)	(2.022)
Service	1.947**	−0.0735	1.668**	0.703
	(0.763)	(1.274)	(0.771)	(1.625)
Operator	2.476***	−1.454	2.012**	−2.803
	(0.787)	(1.334)	(0.804)	(1.715)
Farm	−1.636	−0.603	−0.565	−2.228
	(1.183)	(1.535)	(1.343)	(1.771)
Year 1994	0.497	−0.774	−0.171	−2.441**
	(0.535)	(0.798)	(0.988)	(1.166)
Year 1996	−0.506	−2.886*	−1.178	−5.824***
	(0.591)	(1.590)	(1.040)	(2.001)
Year 1998	−0.907	−4.681**	−1.352	−8.450***
	(0.671)	(2.324)	(1.056)	(2.799)
Year 2000	−1.016	−5.434*	−1.581	−9.822***
	(0.739)	(3.092)	(1.049)	(3.703)
Year 2002	−2.541***	−8.568**	−3.080***	−13.14***
	(0.895)	(3.966)	(0.947)	(4.701)

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

	(1) OLS	(2) FE	(3) OLS	(4) FE
Year 2004	−2.283**	−9.318**	−2.562**	−15.14***
	(0.968)	(4.698)	(1.104)	(5.610)
Fair/poor health			0.407	−0.794
			(0.563)	(0.534)
Number of health conditions			0.187	−0.576*
			(0.184)	(0.336)
Job tenure			−0.0246	0.0326
			(0.0175)	(0.0328)
Pressure to retire			−0.0774	0.307
			(0.364)	(0.276)
Preference for younger workers			−0.441	−0.370
			(0.329)	(0.305)
Planning – next year			−1.168	0.108
			(1.252)	(0.932)
Planning – next few years			0.218	0.687
			(0.922)	(0.710)
Planning – next 5 to 10 years			−0.727	0.167
			(0.942)	(0.764)
Planning – longer than 10 years			−1.445	−1.595
			(1.393)	(1.253)
Planning missing			−0.171	0.782
			(1.192)	(0.855)
Constant	16.84	34.55	2.148	−18.81
	(24.76)	(30.78)	(25.87)	(36.06)
Observations	4,931	4,931	3,733	3,733
Number of persons	1,349	1,349	1,167	1,167
R-squared	0.139	0.053	0.154	0.068

Robust standard errors in parentheses;

*** p<0.01,

** p<0.05,

* p<0

NIH-PA Author Manuscript NIH-PA Author Manuscript NIH-PA Author Manuscript

Table 8

Effect of job stress on ever-smokers and recent quitters[a, b]

	Ever smokers				Recent Quitters	
	Smoking status OLS	**Smoking status FE**	**Num of cigarettes OLS**	**Num of cigarettes FE**	**Smoking status OLS**	**Smoking status FE**
High stress	0.0498*** (0.0116)	0.0216*** (0.00762)	0.393 (0.473)	0.164 (0.409)	0.0331 (0.0327)	0.0554 (0.0433)
Observations	12,362	12,362	3,938	3,938	1,001	1,001
N	3,286	3,286	1,219	1,219	346	346
R-squared	0.081	0.056	0.155	0.065	0.061	0.082

Robust standard errors in parentheses;

*** p<0.01,

** p<0.05,

* p<0.1

[a] Recent quitters are defined as persons who were reported smoking at least once during prior interview waves and reported having quit smoking by the previous interview wave. Ever smokers are those who have reported smoking sometime in their life.

[b] Control variables include age, age squared, race, gender, marital status, household income, years of education, occupation dummies, year dummies, fair/poor health, number of health conditions, job tenure, pressure to retire, preference to younger workers, and financial planning horizon. Inclusion of these time varying variables reduces the sample size of ever smokers; in particular, the variables pressure to retire and preference for younger workers are missing a number of observations.

NIH-PA Author Manuscript NIH-PA Author Manuscript NIH-PA Author Manuscript

Table 9

Accounting for attrition due to retirement and not working: Fixed effects regressions

	Recent Smokers Smoke	Recent Smokers # cigarettes	Ever Smokers Smoke	Ever Smokers # cigarettes	Recent Quitters Smoke
High stress	0.0443*** (0.0130)	0.964* (0.500)	0.0177*** (0.00675)	0.825* (0.472)	0.00374 (0.0318)
Retired	−0.0886*** (0.0334)	0.314 (0.821)	−0.0113 (0.0111)	0.377 (0.761)	−0.00651 (0.0468)
Not working	−0.0783** (0.0381)	0.584 (1.231)	−0.0204 (0.0152)	0.715 (1.161)	−0.0300 (0.0530)
Part time	−0.0148 (0.0132)	−0.405 (0.426)	−0.00292 (0.00625)	−0.464 (0.406)	−0.00579 (0.0228)
Age	0.0557** (0.0219)	−0.352 (0.688)	−0.00579 (0.0111)	−0.251 (0.650)	0.00740 (0.0359)
Age squared	−0.000377** (0.000156)	0.00356 (0.00499)	3.66e-05 (7.87e-05)	0.00292 (0.00465)	−0.000335 (0.000238)
Married	−0.0499 (0.0570)	1.422 (1.626)	0.00929 (0.0428)	1.017 (1.506)	−0.180 (0.157)
Partnered	−0.00561 (0.0570)	0.732 (1.800)	0.0220 (0.0429)	0.685 (1.667)	−0.119 (0.164)
No spouse	−2.49e-05 (0.0556)	0.944 (1.467)	0.0421 (0.0415)	0.860 (1.346)	−0.136 (0.154)
Household income	0.000390 (0.00116)	0.0294 (0.0307)	−0.000400 (0.000440)	0.0315 (0.0303)	−0.00319* (0.00175)
Managerial	−0.0539 (0.0356)	0.239 (1.063)	0.00776 (0.0122)	0.854 (0.990)	0.0652 (0.0521)
Administrative	−0.0223 (0.0377)	−0.00937 (1.002)	0.0376** (0.0148)	0.312 (0.937)	0.00799 (0.0522)
Sales	−0.0793** (0.0375)	1.542 (0.973)	−0.000987 (0.0143)	1.678* (0.894)	0.00310 (0.0591)
Mechanical	−0.0698* (0.0370)	1.416 (1.049)	0.0104 (0.0145)	1.777* (0.962)	0.0504 (0.0558)
Service	−0.0101 (0.0366)	0.545 (1.090)	0.0437*** (0.0150)	0.761 (0.994)	0.0145 (0.0498)
Operator	−0.0465 (0.0356)	0.683 (0.916)	0.0174 (0.0135)	1.069 (0.853)	0.0404 (0.0548)
Farm	−0.104** (0.0525)	0.483 (1.136)	0.00540 (0.0243)	0.455 (1.053)	0.0394 (0.102)
Year 1994	−0.184*** (0.0238)	−0.108 (0.698)	−0.0362*** (0.0113)	−0.167 (0.675)	-
Year 1996	−0.216*** (0.0462)	−2.360* (1.384)	−0.0482** (0.0222)	−2.609** (1.321)	0.268*** (0.0505)
Year 1998	−0.268*** (0.0682)	−3.378* (2.010)	−0.0761** (0.0327)	−3.531* (1.927)	0.302*** (0.0861)
Year 2000	−0.315*** (0.0905)	−3.872 (2.666)	−0.0949** (0.0432)	−4.093 (2.560)	0.372*** (0.125)
Year 2002	0.356*** (0.116)	−6.179* (3.434)	−0.111** (0.0551)	−6.236* (3.290)	0.459*** (0.169)
Year 2004	−0.395*** (0.137)	−6.624 (4.043)	−0.129* (0.0659)	−6.916* (3.890)	0.563*** (0.212)
Constant	−0.796 (0.842)	28.26 (26.03)	0.567 (0.428)	24.25 (24.78)	0.773 (1.491)
Observations	8,382	7,080	25,610	7,581	2,959

NIH-PA Author Manuscript
NIH-PA Author Manuscript
NIH-PA Author Manuscript

	Recent Smokers Smoke	Recent Smokers # cigarettes	Ever Smokers Smoke	Ever Smokers # cigarettes	Recent Quitters Smoke
Number of persons	1,824	1,572	4,342	1,656	832
R-squared	0.114	0.065	0.058	0.067	0.046

Robust standard errors in parentheses;

*** p<0.01,

** p<0.05,

* p<0.1