

JOB SECURITY, STRESS AND HEALTH:
EVIDENCE FROM THE RUSSIAN PRIVATIZATION EXPERIENCE

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Abstract: In this paper, we examine the health consequences of concern over job loss. We use panel data from Russia that include measures of perceived likelihood of job loss and various measures of health status. In order to deal with concerns about reverse causality and unobservable differences between those with high and low likelihood of job loss, we instrument for changes in self-assessed likelihood of job loss using industry-by-region privatization rates which were announced between two rounds of the survey. For men, we find that an increased concern over job loss (a change from ‘not concerned’ to ‘very concerned’ on a scale of 1 to 4) is associated with a 5% increase in measured systolic and diastolic blood pressure, a 6 percentage point increased likelihood of reporting chest pains and a 3.5 percentage point increase in the likelihood of heart attack. Alcohol consumption also increases by 34 grams (about 1.5 “shots”) per week, and smoking increases by 2 cigarettes per day. For women, the effects are much smaller; increased concern over job loss increases blood pressure by 1-3% and the likelihood of chest pains and heart attack by 5 and 2 percentage points, respectively. We discuss how these results suggest that much of the Russian mortality crisis of the early 1990’s may be attributable to economic stress.

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I. INTRODUCTION

Concern over job security and the fear of losing one's job are widespread phenomena throughout the world. For example, a 1998 poll found that 37 percent of American workers were "very concerned" about job security (International Survey Research 1999), while in Russia 48 percent are similarly concerned.¹ These concerns both reflect and are fueled by regular reports of job cuts, layoffs, restructuring and 'downsizing,' and are likely to be particularly high when the economy slows or enters recession. They can also cause stress and anxiety, resulting from concerns over the possibility of a period of unemployment and lost income, and lower wages upon returning to work. In fact, job loss is ranked among the most stressful life events in the Social Readjustment Scale commonly used to assess stress (Holmes and Rahe 1967). Such concerns speak not only to the nature of job stability, worker satisfaction and the structure of employment relationships, but take on special significance in light of the increasing medical evidence of a link between stress and health. Numerous medical studies have established correlations between stress and the incidence and progression of many illnesses and conditions, from the common cold to heart disease and stroke (see Lovallo 1997 and Sapolsky 1998 for reviews). This raises the important question of whether concern over job loss, or other sources of economic stress, can lead to illness, or even death. In this paper, we use panel data from Russia to explore this issue. In particular, we explore the impact of self-perceived likelihood of job loss on health and health-related behaviors. We also discuss the role played by such concerns in the dramatic health crisis in Russia surrounding the period of privatization in the early 1990's.

The difficulties that arise in studying the link between concern over job loss and health are familiar ones; namely, reverse causality (for example, persons in poor health may be more likely to lose their job) and unobserved heterogeneity (factors that make a person both less healthy and more likely to face (and/or fear) job loss, for example substance abuse). Both effects would bias empirical analysis in favor of finding an impact of concern over job loss on health. While we could control for some

¹ The latter are the author's calculations using the 1998 Russian Longitudinal Monitoring Survey.

observable factors to deal with the latter, there could be systematic under-reporting of certain behaviors, or there may be factors that are typically not measured, or measurable, in surveys.

We deal with these problems (and isolate the impact of increased concern about job loss from other changes taking place in Russia at the same time) by making use of variation in concern over job loss that is exogenous to the individual (and their health). Between 1992 and 1994, Russia underwent a process of privatization of previously state-owned firms. Public opinion at the time generally reflected the belief that firms would respond to privatization by eliminating jobs or closing down altogether, thus creating concern over job security. However, the extent, distribution and patterns of privatization, in other words, which firms would be privatized and by how much, were largely unknown to the general public until mid-to-late 1992 and early 1993. A particularly important piece of information came in late 1992 when the State Property Committee (*Goskomimushchestvo*, GKI), the government agency set up to organize the privatization process, released the privatization plans for each industry, for each of the 89 regions of Russia. There was considerable variation in planned privatization rates; some sectors and/or regions were privatized only lightly, or not at all, while others were privatized completely, or nearly so. Therefore, over this period, many individuals received news about their job security, which was based largely on the region and industry in which they worked. We use the privatization rates contained in the report, believed to be the first public release of such information, as an instrument for changes in the self-assessed likelihood of job loss between two rounds of a panel survey (one collected just before the report and one just after) to overcome the empirical problems discussed above. This strategy amounts to the conceptual experiment of comparing changes in health for a worker in a particular industry and region (in a given occupation), with a worker in the same region, working at the same occupation, but in a different industry that was targeted for a different degree of privatization, or a worker in the same occupation and industry, but a different region. The underlying assumption is that other than the stress and uncertainty associated with the prospect of job loss, there wouldn't be any differential change in health for these different workers. In other words, there's no reason to expect, say, an accountant in an automobile factory in Kaluga *oblast* to experience a differential change in health than an accountant in a construction

company in Kaluga, or an accountant in an automobile factory in nearby Smolensk *oblast*. Further, we can also compare the changes in the health of the family members of these various workers, since there's no reason to expect they should experience differential changes in health, either. And by examining the family members, we can show that health changes are not the result of changes in workplace conditions which may be correlated with announced privatization rates. Finally, to further isolate concern over job loss from financial and lifestyle changes associated with actual job loss, we focus on individuals who do not lose or change jobs during the panel,² and control for changes in wages and income (though it should also be kept in mind that the report only *announced* the privatization rates; they were not actually implemented until much later).

Using data from the 1992-1994 Russia Longitudinal Monitoring Survey (RLMS), we find that concern over job loss is very high throughout this period. However, there is a substantial amount of change in concern; more than one-half of all respondents expressed either increased or decreased concern between rounds of the panel. Further, these changes in concern are correlated with privatization rates announced in the government report, and have a significant impact on health and health-related behaviors. For men, we find that changing from 'not at all concerned' about job loss to 'very concerned' is associated with a 5 percent increase in (measured) blood pressure, increased intake of 34 grams of alcohol (about 1.5 "shots") per week and 2 cigarettes per day, and an increased likelihood of reporting chest pains (6 percentage points) or having a heart attack (3.5 percentage points). For women, the effects are similar, but much smaller.

Russia between 1992-94 presents an important case for analysis. This two-year period represents the beginning and peak of a dramatic health crisis, during which adult mortality rates increased by 30 percent for women and 20 percent for men. During these two years alone, there were nearly one million more deaths than would have been expected, and life expectancy declined by about 4 years for men and 2 years for women. The causes of this episode have still not been firmly empirically established and are

² This proves not to be a significant restriction, since layoffs and job loss were minimal in the years immediately following privatization.

subject to debate (Brainerd 1998, Chen et. al 1996, Leon et. al 1997, Notzon et. al 1998, Shkolnikov et. al 1998). We discuss how our results suggest much of the mortality increase may be attributed to economic stress. And while Russia may seem a special case because of other social, political and economic changes taking place at the same time, our analysis isolates the role of concern over job loss and thus provides lessons on the effects of job security on health and well-being relevant for other countries as well.

The remainder of this paper proceeds as follows: in section II, we discuss the previous literature on stress and health. In section III, we discuss the data and examine the patterns of concern over job loss. Section IV outlines the empirical strategy and presents the results. Section V concludes by discussing the results in light of the Russian mortality crisis.

II. STRESS AND HEALTH: BACKGROUND

Numerous studies, retrospective, prospective and experimental, have established a connection between stress and health across a wide variety of afflictions and conditions (see Loyallo 1997 and Sapolsky 1998 for summaries of this vast literature). Some authors have in fact argued that stress may play a role in the incidence and progression of as much as 50 percent of all physical illnesses (Rice 1992). In one of the most dramatic demonstrations of this link, a series of experiments conducted by Sheldon Cohen and colleagues (1991, 1999) find that when given nasal drops containing various respiratory viruses, or when injected with the influenza A virus, individuals scoring higher on a psychological-stress index are significantly more likely to develop a clinical cold, respiratory illness or the flu than individuals with lower scores (or high-stress individuals exposed to saline drops without the viruses).

There are two main channels through which stress is thought to affect health. First, stress lead to changes in health-related behaviors, such as alcohol and tobacco use, substance abuse or diet. These behaviors lead to worse health both directly, for example through damage to major organs, and by making one more susceptible to contracting illnesses, for example through suppressing the immune system. Second, the field of *psychoneuroimmunology* has in the past decade begun to reveal direct, measurable links between the body's physiological reactions to stress, and health. Most notably, the work of Robert

Sapolsky³ has shown that stress triggers the release of steroid hormones (glucocorticoids) responsible for a series of physiological responses typically labeled the ‘fight-or-flight’ response. They do so, for example, by raising the heart rate, blood pressure and flow of blood to muscles. As a side-effect, the body’s resources are diverted away from less urgent needs such as muscle repair, tissue growth and the immune system. As such, long term-activation of these stress responses can lead to illness, or make one more susceptible to illness, for example by limiting production of key immune system cells. Kennedy et al. (1988) find that the stress of examinations among college students measurably decreased the presence of important immune system cells in the blood (T-helper lymphocytes), and Cohen et. al (1999) find stress-correlated differences in levels of a chemical pathway used by the immune system. Similar work has identified pathways through which stress responses affect processes and functions that can lead to or exacerbate serious illnesses such as heart failure and stroke (Sapolsky 1998).

There have, however, been few studies specifically on the impacts of economic stress or job security on health. Mattiasson et al. (1990) find increasing serum cholesterol concentrations among workers during the course of the closing of a Swedish shipyard. Also for Sweden, Domenighetti et al. (2000) find that individuals who report ‘high’ perceived job insecurity have lower scores on self-assessed health rankings. For Great Britain, the Whitehall II longitudinal studies find that individuals who fear job loss have worse self-reported health status and higher morbidity and mortality, even after controlling for drinking, smoking and exercise as pathways to these effects (Marmot et. al 1991, Ferrie et al. 1995). Across these studies, however, especially the latter two, the problems of reverse causality and unobserved heterogeneity are a concern.

While our interest is the role of concern over job loss rather than the impacts of actual job loss, there have been numerous studies of the health consequences of job loss, unemployment and recession (see Wilson and Walker 1993 for a summary). But again, many studies in this area, especially those using micro-data to study the health consequences of unemployment, are typically unable to treat the problems of reverse causality or unobserved heterogeneity. Ruhm (2000) and others have also pointed out that job

³ For example, Sapolsky (1993, 1996), with others summarized in Sapolsky (1998).

loss could in fact lead to health improvements, for example through the reduced opportunity cost of time-intensive, health-producing activities (such as exercise) or diminished exposure to the hazards of work.

III. DATA

The data for this paper come from the first three rounds of the Russia Longitudinal Monitoring Survey (RLMS), organized and coordinated by the Carolina Population Center at the University of North Carolina at Chapel Hill,⁴ conducted between 1992 and 1994. The data consist of a sample of approximately 15,000 individuals in 6,000 households, drawn using a multi-stage random sampling procedure from Russia's eight major geographic regions. We make use of the panel element of these data to track changes in health and concern over job loss during this period.

The data provide a series of useful health indicators, including self-reports of chest pains and whether the person has had a heart attack. And as part of the survey, trained enumerators also weighed, measured and administered blood pressure examinations to all respondents.⁵ Thus, we can assess hypertension, an important indicator of stress as well as a leading risk factor in heart attack and strokes, and construct the Body Mass Index (BMI).⁶ These measurements are also valuable in that we need not rely exclusively on self-reported health indicators.⁷ Finally, persons aged 55 and older were also asked a series of questions on their ability to perform various activities of daily living (ADL's), such as the ability to walk 1 kilometer or climb a flight of stairs. Respondents were asked to rate their ability on a scale of 1 to 5, where the possible responses were: "1. Not at all difficult; 2. Slightly difficult; 3. Somewhat difficult; 4. Very difficult, but possible; 5. Cannot do it." Thus, a higher score indicates greater functional limitations. We construct an index of the respondent's ability to perform these activities by summing the

⁴ The data, and further description, can be found at http://www.cpc.unc.edu/projects/rlms/rlms_home.html.

⁵ Blood pressure measurements were taken three times, in order to adhere to the clinical standard.

⁶ BMI is weight (in kilograms) divided by squared height (in meters).

⁷ The use of objective measures is important; for example, our data show that only 45% of people with measured high blood pressure report having ever been told so. Further, awareness is correlated with education and income.

values reported for 10 specific activities,⁸ creating an index that ranges from 0 to 50 and provides a general measure of physical status.

Respondents were also asked about their concern over job loss. In particular, all employed respondents were asked “How concerned are you about the possibility that in the next 12 months you might become unemployed?” with the following possible responses: “1. Very concerned, 2. A little concerned, 3. Rather unconcerned, 4. Not at all concerned.” All adults in the household, including non-employed persons, were also asked how concerned they were that *anyone* in the household might lose a job in the next 12 months, with the same response options.

Table 1 shows the responses to these questions in the 1992 and 1993 surveys, for individuals in the panel in both rounds. To reduce overall heterogeneity, we focus on men and women aged 30-65. We also restrict the sample to families where there was no job loss or job change between the two rounds, to avoid cases where moving from very concerned about job loss to not concerned is the result of having lost a job. However, this restriction reduces the sample by less than 5 percent, since both were uncommon during this time.

Overall, the level of concern over job loss is quite high. In the 1992 survey, 46 percent of respondents said they were very concerned about the possibility of job loss, compared to 29 percent who were either not at all concerned or rather unconcerned, with the remainder a little concerned. By 1993, there was an overall increase in the distribution of concern, with 52 percent very concerned and 26 percent not at all concerned or rather unconcerned. Additionally, behind these aggregate numbers is a great deal of individual movement between states of concern, as only 47 percent of the sample is in the same state in the two periods. About 32 percent of the sample has increased concern over this time period, including 20 percent who go from not at all concerned, rather unconcerned or a little concerned to very concerned. On the other side, concern decreases for about 22 percent of the sample, including 14 percent

⁸ Activities included: run 1 kilometer; walk 1 kilometer; walk 200 meters; walk across a room; sit for 2 hours; stand up after sitting; climb several flights of stairs; climb one flight of stairs; lift and carry a weight of about 5 kilograms; squat, crouch or kneel.

who were very concerned in 1992 but not in 1993. These changes in concern, the causes of which are explored below, will be the quantity of interest for the empirical analysis.

Who is Most Concerned About Job Loss? The Privatization Experience

During the 1992-94 period spanned by the survey, concern over job loss was often most directly related to whether one worked for a firm that was to be privatized.⁹ The timing of this privatization, and when information became public, is central to our identification strategy, so we provide additional detail here. Plans for compulsory privatization were begun in 1991, but only finalized when the parliament passed the *State Program for Privatization of State and Municipal Enterprises* in July of 1992. However, workers were in general unaware initially whether their particular firm would be privatized, as much of this information was revealed only over the course of the next year. One significant source of information came from a government report made public (through publication in newspapers) in late 1992, listing the mandatory privatization rates for each industry, for each of Russia's 89 regions (Rossiiskaia Gazeta 1992).¹⁰ The extent of mandatory privatization varied substantially across industries and regions. For example, it was revealed at this time that certain sectors would be privatized only partially or not at all, especially natural resources, defense-related industries, sciences, health and education. Therefore, many workers were protected from concerns over job loss, whereas others were subject to perhaps previously unknown threats to their jobs. Since there was little information prior to this time about which industries and regions would be most affected, the report caused changes in perceptions of job security. Of course, it is impossible to know exactly when particular individuals received information about their specific firms, or whether the information in the report was known before its release. However, below we show that the patterns of change in concern over job loss observed in table 1 between round 1 of the RLMS survey, collected between July and October of 1992, and round 3, collected between July and September of 1993, are highly correlated with the announced privatization plans. Thus, this report either provided or was

⁹ More on Russian privatization can be found in Boycko, Schleifer and Vishny (1995) and Lieberman (1995).

¹⁰ Though the report was from the central government, regional governments had much discretion and control over the implementation of privatization.

consistent with news about privatization that emerged between the two rounds of the survey, which workers incorporated into their beliefs about job security.¹¹ It should again be kept in mind that the report only *announced* the rates, actual privatization (and announcements of layoffs or job loss) did not take place at this time.

Table 2 confirms the distinct regional and industrial patterns behind concern over job loss, and changes in concern over time (for now, we classify individuals only by whether they were ‘very concerned’ or not). In 1992, the percent of currently employed persons reporting that they are very concerned about job loss is high across all sectors, but is highest in construction, followed by communications, housing, culture, manufacturing, and public health. However, by 1993, when the privatization rates had been announced and more information on specific firms had been revealed, the percentages shifted dramatically; in particular, concern increased in transportation, trade, and manufacturing, and was reduced sharply in construction, health, education, science and culture. The final column presents the mean and range (across the 89 regions) of the privatization rates for each sector. In general, the sectors where workers expressed increased concerns were those that were privatized the most.

There were also large shifts in concern by region (we aggregate Russia’s regions into 8 broader geographic categories). Regions that were more heavily subject to privatization experienced increases in concern, including the Central and Central Black-Earth areas and the Urals, while concern was reduced in Eastern Siberia and the Far East.¹² A regression where the dependent variable is a (-1, 0, 1) indicator for a decrease, no change or increase in concern over job loss, and the independent variables are industry, region and the privatization rate yields an *F*-statistic of 22.9. The announced privatization rate is statistically significant, and a 10 percentage point increase in the announced privatization rate increases the likelihood of increased concern over job loss by 4 percentage points. Therefore, while there may have also been other sources of information about job loss, overall the region and industry in which one works, as well as the announced privatization rates, are good predictors of changes in concern over job loss.

¹¹ We also gathered (and incorporated into the empirical analysis) information on privatization plans obtained from the State Property Committee (GKI) and available newspaper reports containing information on privatization.

However, quite aside from these industrial and regional patterns, persons expressing increased concern over job loss were similar in most demographic, socioeconomic and health-related characteristics as those with no change in concern. Table 3 shows the 1992 characteristics of men and women who were not very concerned about job loss in 1992, by whether they were very concerned in 1993. The sample is again restricted to persons aged 30 to 65 to reduce overall heterogeneity. For both men and women, there are no significant differences in age, family size, marital status or levels of education for the two groups. Income was on average about 10 percent lower for the group that would later be very concerned about job loss, some of which can be accounted for by the regional patterns of concern.

More importantly for the empirical analysis, table 4 shows that persons who reported increased concern over job loss were initially similar in terms of health indicators and health-related behaviors as persons who did not report increased concern. Columns 1 and 2 present 1992 and 1993 health indicators for men and women who were not very concerned about job loss in either 1992 or 1993, and columns 3 and 4 present the same data for persons who were not very concerned in 1992, but very concerned in 1993. In 1992, approximately 60-65 percent of men in both groups drink and 55-60 percent smoke, and conditional on drinking or smoking the reported amount of alcohol and number of cigarettes are comparable between groups.¹³ The levels are very high, consistent with other studies using different data sources (Prokhorov 1997 and Trembl 1997), with the average smoker smoking just under 1 pack of cigarettes per day, and the average drinker consuming about 390 grams (.35 liters) of alcohol per week. Smoking and drinking is less widespread among women, but again there are no differences in initial levels by whether the person later became very concerned about job loss, except that women who were not worried in either period initially smoked more cigarettes per day. For both men and women, in the initial period there are no significant differences between the two groups in BMI, or systolic and diastolic blood pressure (measured in millimeters of mercury (mm HG)).

¹² It should also be noted, however, that some of the regional variation is determined by the industrial patterns.

¹³ While data on alcohol and tobacco use from surveys must be treated cautiously due to reporting concerns, the estimates from the RLMS match well with per capita estimates from other sources (Prokhorov 1997, Trembl 1997), including production and sales data plus estimates of private/informal production.

The two groups were also similar in 1992 with regard to other health measures; in particular, 20-25 percent of both men and women in both groups have ever experienced chest pains, and 5 percent have had a heart attack. By sex, the two groups are also similar regarding functional limitations. The fact that there is little difference in the various demographic and health indicators for these various groups is not surprising, given that this period in Russia produced concern over job loss which was in general external to the individual, i.e., there is little reason to expect differential initial health based on industry or region of employment¹⁴ (though we deal with specific possibilities such as workplace conditions and pollution levels in the results section).

Table 4 also provides preliminary evidence on changes for the various health and health-related measures for persons who experienced increased concern over job loss. For men, there was a slight increase in the incidence of drinking for the group initially not very concerned but later very concerned (columns 3 and 4). And conditional on drinking, there was a large increase in amounts consumed; alcohol intake increased by 48 grams per week, which is 12% of the original amount and roughly equivalent to 2 additional “shots” of vodka per week. By contrast, for the group of men who were unconcerned in both periods (columns 1 and 2), there was a small change in the incidence of drinking. Both groups had only small changes in the incidence of smoking, though the group of men who became very concerned showed an increase of 1.7 cigarettes per day among those who smoke. For women, both groups show small increases in the incidence of drinking and smoking as well, though there is no differential change for the two groups. This is initial evidence that men and women may not respond to stress in the same way.

Among the group that is not very concerned about job loss in 1992, but very concerned in 1993, blood pressure increased by 5 mm HG systolic and 4 mm HG diastolic for men, and 3 and 2 mm HG for women. By contrast, there is little change for the group that was not very concerned in either period. Figure 1 presents nonparametric (kernel) estimates of the densities of blood pressure for employed men, which provide a more vivid depiction of the impact of concern over job loss. The vertical lines in the

¹⁴ This is further strengthened by the recognition that job choice and mobility were more limited in Russia than in Western economies, so it is less likely individuals sort into industries by health, job riskiness or other characteristics.

graphs differentiate various degrees of hypertension, from mild (140-159 systolic, 90-99 diastolic), to moderate (160-179, 100-109) and severe (180+, 110+), representing increasing risk of cardiovascular disease. For men, becoming very concerned over job loss (the two right-hand panels) leads to a dramatic rightward shift in the systolic and diastolic densities, with a greater percentage especially having mild or moderate high blood pressure. There is a cross-over at the upper extreme values of blood pressure, though the sample size in that part of the distribution is small. By contrast, the densities for the group of men who are not concerned (left-hand panels) is largely unchanged between the two periods. This latter result also demonstrates that among employed men, there was not a general increase in stress due to other factors associated with transition to a market economy during this time, and that any such increases are isolated to those individuals that reported increased concern over job loss.

Table 4 also shows that both men and women who later became more concerned about the possibility of job loss had large increases in the incidence of chest pains and heart attacks, and had greater declines in their ability to perform the various ADL's, becoming worse by 4.3 and 3.6 points out of 50 for men and women, corresponding to an average worsening of .36 - .43 steps on a scale of 1 to 5 for each of the 10 activities in the index (though the other group also experienced increased limitations).

IV. Empirical Strategy

To assess the effects of concern over job loss on health we estimate regressions of the form,

$$\Delta h_i = \beta_0 + \beta_1 \Delta \text{Concern}_i + \sum_j \beta_j \Delta X_{j,i} + \sum_k \beta_k \Delta X_{k,i} + \varepsilon_i$$

where Δh_i is the change in the various indicators of health status and health-related behaviors (systolic and diastolic blood pressure, ADL index, BMI, alcohol and tobacco use, incidence of chest pains, and whether had a heart attack). This strategy eliminates any time-invariant individual fixed-effects or common trends. We instrument for the change in concern over job loss using the announced region-by-industry privatization rates to deal with the problems of reverse causality and/or time-varying unobserved heterogeneity. For the measure of concern over job loss, we reduce the responses into 3 categories; since it is difficult to draw a distinction between 'rather unconcerned' and 'a little concerned,' we pool these

two categories into one. Thus, our underlying indicator has three designations, ‘not at all concerned,’ ‘a little concerned’ and ‘very concerned.’ For the dependent variable of interest, the change in concern over job loss, we assign a value 0 if there was no change (for both own job and that of anyone else in the household); a value of $\pm .5$ for an increase/decrease in concern of one ‘step,’ i.e., going from not concerned to a little concerned or from a little concerned to very concerned, and vice-versa; and a value of ± 1 for increases of 2 steps, from not at all concerned to very concerned, and vice-versa (sensitivity analysis for alternate specifications¹⁵ yielded results with comparable interpretation).¹⁶ We continue to restrict the sample to men and women aged 30-65 to reduce overall heterogeneity. We also restrict the sample to individuals living in households where job loss or job change did not take place, to remove any confounding effects of changes in income or living conditions and to avoid situations where losing a job is measured as a reduction in concern over job loss.¹⁷ However, as stated earlier, this restriction does not affect the sample much, since few individuals lost or changed jobs in the years immediately following economic transition. Finally, the sample is also restricted to individuals living in households with at least one employed person, since otherwise the question regarding concern over job loss is not asked.

We include age and initial values and changes in marital status, family size, and income as additional covariates. We also control for occupation, defined as own occupation for individuals who work, or the occupation of the primary earner for all other persons.¹⁸ Since smoking, drinking and BMI may themselves be influenced by stress and have an independent effect on health, we first exclude them from the regressions in order to get the reduced-form effect of concern on health. We then include these variables in order to isolate the effect of stress not attributable to these behavioral changes, which is independently of interest.

¹⁵ We do not use a fully-flexible specification with dummies for moving from any state of concern to any other state, because our empirical strategy requires as many instruments as variables to be instrumented.

¹⁶ For individuals who are workers and live in households with others who also work, we take the sum of changes in concern over one’s own job and their concern for others in the household.

¹⁷ As well as to deal with the issue that there may be a difference between people who stay in jobs with a high risk of job loss versus those who respond by changing jobs. But again, there was very little job change during this time.

¹⁸ If a worker experiences a change in concern about the loss of a job by someone else in the household, we use the occupation of the other primary earner. There were very few households with more than two workers, so there were few cases of uncertainty over which family member’s job was the cause of concern.

Results: Blood Pressure

Table 5 shows the results for men, focusing first on blood pressure. Columns 1 and 2 show the basic OLS regressions. An increase in concern over job loss is associated with increased blood pressure; going from not at all concerned to very concerned (an increase of 1 in the $\Delta concern$ independent variable) is associated with increased blood pressure of 6.7 and 5.1 mm HG systolic and diastolic. These numbers are large, representing increases of 5.4% and 6.3% respectively from the 1992 baselines of 124/80 seen in table 4. Columns 3 and 4 add variables for changes in other behaviors which may be correlated with increased stress and are expected to influence health. These variables all have the expected impact on blood pressure, with increases in BMI, alcohol and tobacco use associated with increases in blood pressure. For example, smoking an extra cigarette per day is associated with an increased blood pressure of .4 mm HG systolic and diastolic. The coefficients on concern over job loss are smaller than in columns 1 and 2, consistent with the hypothesis that such concern leads to increased alcohol and tobacco consumption, each of which in turn increases blood pressure. The results in columns 1 and 2 are still valid reduced-form estimates of the impact of stress on blood pressure; however, it is important to isolate the extent to which the experience of stress increases resting blood pressure directly through the physiological responses of the body, as opposed to through changes in health-related behaviors.¹⁹

Column 5 and 6 instrument for changes in stress with the announced privatization rates (and industry and region indicators). These variables are strong predictors of changes in concern over job loss in the first stage regression, with an F -statistic of 24.1. In the second stage, the coefficient estimates for concern are reduced; becoming very concerned after having been not at all concerned is now associated with increases of 5.3 and 4.2 mm HG systolic and diastolic. The standard errors are also larger, though the coefficients are still statistically significant at the 5 to 10 percent level. The reduction in these coefficients suggests that, aside from changes in concern caused by privatization, in the general population the relationship between stress and health is biased upwards, in part the result of reverse-causality and/or

unobservable, omitted variables correlated with job concern and higher blood pressure. If the I.V. results are taken as the valid estimates, the OLS results overstate the effects by 16 and 14 percent for systolic and diastolic pressure, respectively.

Table 6 presents the results for women. The basic OLS results are smaller than for men. Becoming very concerned is associated with an increase of 4.4 and 1.3 mm HG systolic and diastolic, respectively. The addition of the behavioral factors such as alcohol and tobacco does not change the results as much for women as it did for men; this is consistent with the results in the earlier tables which show that women do not change these behaviors in response to increased concern as much as men do. Finally, instrumenting again reduces the coefficients on blood pressure. Becoming very concerned about job loss increases blood pressure by 4.3 (3.5%) systolic and 1.3 (1.5%) diastolic, with the coefficients statistically significant at the 10 percent level. These results also indicate that stress has a different effect on women than men, consistent with other studies on stress and health (Kennedy et al. 1988).

Health-Related Behaviors and Health Conditions/Measures

Since smoking, (excessive) alcohol consumption and being overweight have all been linked to higher blood pressure, we can infer from the previous results where the exclusion of these behaviors biased upward the coefficients on job concern, that increased job concern was associated with an increase in at least one of smoking, drinking or BMI, especially for men. In table 7, for both men and women we present estimates of instrumental variables regressions where changes in these behaviors are the dependent variables, and the independent variable of interest is again the change in job concern. As expected from the previous results, for men increased concern over job loss is associated with increased drinking and smoking. Men who become very concerned about job loss increase alcohol intake on average by 34 grams (approximately 1.5 “shots”) per week and smoke 2 more cigarettes per day, both representing increases of nearly 10 percent over the initial baselines. However, for women the effects are small and not statistically significant. Unless women report drinking and smoking less accurately, these

¹⁹ It is possible, of course, that increased desire for alcohol and tobacco consumption are also related to the body's

results again suggest that women and men use different coping strategies for dealing with stress. For both men and women, BMI is not affected by concern.

In table 8 we present results for the various health conditions and measures, including the ADL index, whether the person has ever experienced chest pains and whether they had a heart attack between the two survey rounds. For the latter two, we estimate linear probability models so we can apply the instrumental variables strategy. We exclude changes in alcohol, tobacco and BMI, to focus on the reduced-form effects of concern on health. Columns 1 and 4 show that increased concern is associated with declining ability to perform basic physical activities for both men and women; the results are large, with an increase from not at all concerned to very concerned associated with an increase in the index of 2.5-3, equivalent to being .25-.3 steps worse on the 1 to 5 scale for each of the 10 basic activities. Increased job concern is also associated with an increased likelihood of chest pains of 6 percentage points for men and 5 for women. Similarly, the likelihood of having a heart attack increased by 3.5 percentage points for men and 2 for women. These effects are very large; for both men and women, the increased likelihood of chest pains and heart attack associated with increased concern over job loss is as large, and in some cases 1.5 times as large, as the effects of being a smoker.

Mortality

One concern is that the results could be affected by differential mortality between groups that experienced increases and decreases in concern over job loss. For example, since heart attacks lead to increased mortality and therefore attrition from the sample, we will have excluded some individuals who had a heart attack. Additionally, we would ideally prefer to estimate the effects of stress on mortality itself. However, in a sample of approximately 8,000 individuals²⁰ there are not a large number of deaths. Even at the peak of the Russian mortality crisis, the adult mortality rate was only 2,300 per 100, 000, so that in the sample there are fewer than 80 recorded deaths for each sex. Under these circumstances we do not estimate regressions for mortality, which would be very sensitive to changes in a small number of

physiological mechanisms for coping with stress, though such a link has yet to be established.

observations. However, we perform sensitivity analysis in which we assume that all cases of mortality reported in the survey²¹ were the result of heart attacks. Overall, the coefficient estimates for the effects of $\Delta\text{Concern}$ on the incidence of heart attacks increase, to 4.3 percentage points for men and 2.6 for women (both are statistically significant at the 5 percent level).

Increases in the coefficient on change in concern also arise when other health measures are similarly adjusted, though the effects are generally smaller than those for heart attacks. For example, if we assume that all persons who died would have reported chest pains, the coefficient on change in concern over job loss increases to 6.8 for men and 5.8 for women (coefficients statistically significant at the 5 percent levels). For blood pressure, we performed analysis in which all individuals who die are assumed to have had increased blood pressure, by taking their initial values of blood pressure and adding 5, 10 and 20% increments (different regressions for each). The results were again slightly changed, increasing the effects of concern over job loss by .55 systolic and .31 diastolic at the most extreme for men, and .14 and .09 for women (all coefficients on $\Delta\text{Concern}$ remain statistically significant at the 5 to 10 percent level).

Identifying Assumption: Workplace Conditions, and Pollution

The underlying assumption of the identification strategy is that the announced privatization rates do not affect changes in health other than through stress and concern over job loss. Since much of the variation in these rates across individuals is due to industry of employment, violations would most likely arise through a change in some attribute of an individual's job that is correlated with the announced rate. We have already excluded the possibility that the privatization rate affected health through changes in income or wages by controlling for these changes (though there was no differential change in income for individuals with increasing or decreasing concern over job loss during the years covered by the survey) and by excluding households that lose a job. We examine two additional specific issues. The first is workplace safety and conditions. If firms that were to be privatized changed workplace conditions, perhaps reducing safety controls, allowing workplace conditions (temperature, noise, etc.) to deteriorate,

²⁰ The sample is restricted to persons aged 30-65, with at least one working household member.

or by increasing work intensity, there would be independent effects on health, making the privatization rates an invalid instrument. To deal with this concern, we estimate the basic I.V. regressions where the sample is restricted to individuals who do not work and report changes in concern over job loss of other working family members, and thus are not directly affected by workplace conditions. Table 9, which presents the coefficients on the change in concern variable for the various regressions, shows that the effects are similar in magnitude to those in the full sample. The standard errors are larger, but in general they are still statistically significant at the 5 to 10 percent level. Thus, we conclude that the changes in health associated with increased concern over job loss are not attributable to changing work conditions.

The second hypothesis we deal with is whether pollution levels may have changed as a result of privatization. For example, firms that were to be privatized may cut back on pollution controls (internal or external); alternatively, they may slow production, thus reducing the amount of pollution released. In both cases, there would be correlation between the error term in the second stage regression and the instrument, possibly even for non-working family members. Unfortunately, disaggregated data on pollution is not available. Therefore, we test this hypothesis in two other ways. First, in later rounds of the RLMS surveys, individuals were asked to assess whether the air they breathe has gotten better, worse or stayed the same in the last few years. Overall, nearly 40 percent of people in 1995 reported that they felt the air had gotten worse in the past few years. However, in regressions in which the dependent variable is an indicator for whether the person reports the air got worse, the privatization rates (as well as indicators for concern over job loss) were small and not statistically significant, implying that there was no differential change correlated with the announced privatization rate. Our second approach examines infant mortality from respiratory illnesses. Since infants are typically the most sensitive to pollution, if privatization affected changes in health through changes in pollution, we would expect to see differential changes in infant mortality from respiratory illnesses in high and low privatization regions. As a test of this hypothesis, we estimated regressions using data on region-level changes in infant deaths from respiratory illnesses (from 1 year before to 1 year after the privatization rates were announced) obtained

²¹ If the household remains in the sample, they are asked to report on members who have died.

from records of deaths (Goskomstat 1998), and region-level privatization aggregates. These regressions (available from the author) show no correlation between privatization rates and infant respiratory deaths (or infant deaths more generally). Thus, overall we conclude that while pollution levels in Russia were bad, and getting worse, during this time, they do not appear to have affected health in a way that is related to privatization rates or concern over job loss.

V. Discussion and Conclusions: The Russian Mortality Crisis

In this paper, we find strong effects of concern over job loss on health and health-related behaviors, overcoming empirical problems that would otherwise have biased the results upward. The variety of stress we examine in this paper is likely to have played a significant role in the mortality crisis Russia experienced in the 1990's, a phenomenon for which researchers have been trying to find conclusive explanations (see Brainerd 1998, Chen et. al 1996, Leon et. al 1997, Notzon et al. 1998, Shapiro 1995, Shkolnikov et al. 1998). As shown in figure 2, during this period, spanned by our analysis of the RLMS data, standardized death rates (SDR's)²² increased suddenly and dramatically, then eventually began to decline. At the peak of the mortality crisis in 1994, SDR's were 30 percent higher for men and 21 percent higher for women than they had been in 1992. Analysis of vital statistics data (Goskomstat 1998) reveals that in 1992, there were 1,807,441 total deaths in Russia. Compared to that baseline, there were 321,898 additional deaths in 1993, and 493,925 in 1994. Thus, during the two-year period there were approximately 815,000 more deaths than would have been expected based on pre-crisis mortality rates.²³ Analyses of vital statistics records and other data sources have concluded that the increases cannot be attributed to data quality and completeness or changes in reporting (Chen et. al 1996, Leon et. al 1997, Notzon et al. 1998).

Some researchers have suggested that stress may have played a large role in the health crisis, but acknowledge the absence of concrete empirical evidence (Shapiro 1995, Leon and Shkolnikov 1998,

²² The SDR adjusts the crude death rate for age structure, to make them comparable across populations.

²³ Based on the age structure of the population and life expectancy in 1992, a crude estimate of the total number of person-years lost is between 15 and 20 million.

Notzon et al. 1998, Shkolnikov et al. 1998). Figure 3, which shows SDR's from 1985 to 1998 for the four largest causes of death, reveals why such arguments have received considerable attention. Much of the increase in overall death rates can be attributed to sudden increases in mortality from ischaemic heart disease and cerebrovascular causes (mostly strokes). These two causes alone, which are known to be very sensitive to stress and stress-related behaviors (alcohol and tobacco use), account for more than 50% of the total increase in death rates. Also consistent with the stress hypothesis, mortality due to 'external factors' which may be stress-related (suicide and accidents (especially accidental alcohol poisoning) were the largest increases within this category) also peaked during this time period, and can account for about 25 percent of the total mortality increase.²⁴ By contrast, malignant neoplasms (cancers), the least stress-sensitive of these causes of death, did not show any particular increase.²⁵ Further, the smaller increase in SDR's for stress-related causes of death for women are consistent with the smaller stress-responses for women found in this paper.

Without vital statistics data (merged with other demographic and economic data) or large scale longitudinal studies, it is difficult to undertake a more detailed analysis to determine the complete set of underlying causes of the crisis, which is why the causes of the crisis are still subject to debate. However, the analyses in this paper, and further analysis of the RLMS data, can provide some valuable insights.

The first point to mention is that the scope for stress to have played a role in the health crisis extends beyond households with working members. For those households, which our analysis has focused on so far, the concerns over job loss were presumably related to concerns over the potential loss of income and a decline in living standards. Viewed in this way, many other households had similar concerns as well, especially households dependent on state benefits. During the period we have analyzed, approximately 15 percent of all individuals in the RLMS sample lived in households where there were no workers, and approximately 29 percent relied on some form of state support (especially pensions) for more than half of their total household income. We can analyze the health effects of economic stress for

²⁴ Brainerd (2001) analyzes the determinants of the high suicide rates in the nations of Eastern Europe and the former Soviet Union and finds that (especially for men) they are very sensitive to macroeconomic conditions.

this group as well. Respondents were asked whether they thought in the next 12 months they would live better or worse than they are living right now (on a scale of 1 to 5, with possible responses “1. We will live much better; 2. We will live somewhat better; 3. Nothing will change; 4. We will live somewhat worse; 5. We will live much worse”). For households dependent on state benefits, the distribution of this variable worsens significantly over time. In 1992, 20 percent of such households said they expected to live much worse in the next 12 months. By 1993, amid increased concerns over the ability of the government to meet benefits obligations, over 41 percent said they expected to live much worse in the next 12 months. This increased concern could also be associated with worsened health through the same stress-channels as above. We undertake the same regression analysis as above to see whether concern over living standards has similar effects on health (though we do not have an instrument for changes in concern). However, concerns over unobserved heterogeneity and reverse causality are small, since programs like the old age pension use only age to determine eligibility (there is effectively no means test), and therefore it is unlikely that concern over pension receipt and levels is correlated with changes in health.²⁶ It is also important to note that non-payment of benefits did not occur during this time,²⁷ and in fact pensioners initially fared the best among all demographic groups in Russia (Lokshin and Popkin 1995, Mroz and Popkin 1999). And since we also control for changes in income, any effects of concern on health are not attributable to changes in income rather than concern over changes in income. Table 10 shows that the results from basic OLS change-on-change regressions yield qualitatively similar conclusions as the earlier analysis for working households. The effects on health indicators are generally larger (even though the effects on alcohol and tobacco use are smaller); however, they could be overstated because we have not instrumented, or they could be larger because this group is much older on average.²⁸

²⁵ Though there is some evidence that stress could even influence death from cancer (Sapolsky 1998).

²⁶ Though it is possible that in a fiscally-decentralized nation like Russia, greater concern over protection of pensions may be correlated with deterioration in local public health resources.

²⁷ There was a large pension crisis in 1995, which did lead to declining health among the elderly (Jensen and Richter 2001); however, this crisis occurred after the substantial mortality increase under study here.

²⁸ Above we restricted the sample to those aged 30 to 65, whereas most of this group are old age pensioners (women above the age of 55 and men above the age of 60).

It is likely that a variety of factors contributed in some measure to the large increase in mortality, and it is beyond the scope and purpose of this paper to provide an exact accounting for the role of each. However, most researchers have argued in favor of the stress hypothesis because the two other obvious candidates, economic downturn and a collapse of the health care system, appear unable to account for much of the large increase in mortality over such a short period. We briefly review these arguments, and provide additional supportive evidence from the RLMS.

We first explore the economic decline hypothesis. Although it is difficult to produce a consistent, reliable national accounting of GNP for Russia before the transition to a market economy, it is generally believed that between 1991 and 1994, Russia experienced a large economic decline, with per capita income declining between 20 and 30 percent. However, the notion that the economic decline was a significant factor in the health crisis has been disputed (Leon et. al 1997, Shkolnikov et. al 1998) on the grounds that, a) the causes of death were not ‘economic’ in nature, as shown above; b) the RLMS data show that incidence of malnutrition did not increase; c) the timing of the economic decline and the mortality increase do not coincide in their timing; and d) the largest increases in mortality were among prime-aged adults, not those typically most sensitive to economic conditions (children and the elderly). To approach this from a micro-level using the RLMS data, we note that the most often suggested link between living standards and health is that income is used to purchase inputs into health, including nutrition, medical services and medicines, and even home heating (the latter may be especially important for infants and the elderly).²⁹ However, the RLMS data suggest that such inputs into health did not decline dramatically during the time of the mortality increase. In particular, there is no change over this period in the percentage of persons reporting having had a checkup in the past 12 months, having seen a doctor conditional on having had chest pains, or taking medication conditional on having a medical condition (chest pains, diabetes or heart problems).

²⁹ Reverse causality is also likely to be important, though the empirical literature has not been able to untangle these effects. In the present case, the declining health of Russian workers most likely exacerbated the economic decline.

Researchers have also suggested that it is unlikely that much of the mortality increase can be attributed to a decline of the health care system (Chen et. al 1996, Shapiro 1995, 1997, Shkolnikov et. al 1998). For example, while health care was certainly not high quality, there is no evidence that it declined dramatically during this period, despite common beliefs. In particular, public expenditures on the health system did not suffer a steep decline during the period of the mortality increase (Davis 1997, Shapiro 1997). Also, as stated above, there was almost no change in the percent of people receiving checkups during this period, or a change in the percent of people with health conditions who report taking medication (though there are no data available on the quality of care). Further, since the health care system declined more later, this hypothesis could not account for why mortality began to decline.³⁰

While clearly not the only factor, overall there is evidence to suggest that stress examined in this paper played a large role in the surge in mortality immediately following the transition to a market economy. As a general conclusion, public health officials and policy makers should recognize that stress can have significant health consequences. Resources should be devoted to helping households cope with stress during periods of economic downturn or threats of widespread job loss (ex. plant closings). The evidence in this paper also suggests that at least part of the lower mortality of women in Russia during this period can be explained by the fact that they did not increase alcohol or tobacco consumption in response to concerns over job loss. Future research should focus on understanding the different coping strategies used by men and women and what lessons can be learned for helping men cope with stress. The results also have implications for the design of safety nets, and social policy for dealing with threats of job loss more generally. Finally, the results may also provide insight for research on the relationship between socioeconomic status and health (see, for example, Smith 1999 for a summary). Lower levels of job and financial security may help explain why the poor have worse health (as well as higher levels of alcohol and tobacco use, in some countries). Further research should explore the relationship between poverty, social stress and health, in order to explore this link.

³⁰ Though it is possible that mortality declined despite the worsening health system because the initial increase in mortality affected most those at with the greatest health risks, lowering the distribution of risk for the surviving

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Table 1. Distribution of Concern Over Job Loss

		1993				% 1992 Total
		Not at all concerned	Rather unconcerned	A little concerned	Very concerned	
1992	Not at all concerned	281 (4.1)	208 (3.1)	252 (3.7)	331 (4.9)	(15.8)
	Rather unconcerned	161 (2.4)	169 (2.5)	245 (3.6)	315 (4.6)	(13.1)
	A little concerned	177 (2.6)	229 (3.4)	584 (8.6)	708 (10.5)	(25.1)
	Very concerned	215 (3.2)	243 (3.6)	512 (7.6)	2145 (31.7)	(46.0)
% 1993 Total		(12.3)	(12.5)	(23.5)	(51.6)	

Responses to the question: “How concerned are you about the possibility that in the next 12 months you or someone in your household might become unemployed?” The numbers in parentheses are the percentages of the panel sample in a given cell. We focus only on the sample of individuals in which at least one household member is employed (approximately 88% of the total sample).

Table 2. Percentage of Workers ‘Very Concerned’ About Own Job Loss, by Industry, Region and Year

	<u>1992</u>		<u>1993</u>		<u>Announced</u> <u>Privatization Rates</u>	
<i>Industry</i>					<u>Range</u>	<u>Mean</u>
Manufacturing	.46	(.04)	.62	(.04)	.50-1.0	.64
Agriculture	.25	(.09)	.35	(.08)	0.0-1.0	.45
Construction	.69	(.13)	.39	(.12)	.10-.65	.39
Transportation	.29	(.17)	.48	(.19)	.50-1.0	.69
Trade	.40	(.10)	.53	(.09)	.50-.80	.57
Communications	.57	(.16)	.64	(.16)	.10-.60	.52
Housing/utilities	.51	(.12)	.53	(.12)	.20-.50	.43
Public Health	.43	(.08)	.32	(.07)	0.0-.20	.19
Education	.37	(.06)	.25	(.05)	0.0-.10	.09
Science	.44	(.16)	.34	(.15)	0.0-.20	.12
Government	.33	(.10)	.40	(.11)	--	--
Culture	.51	(.14)	.38	(.12)	.10-.30	.18
Other	.30	(.08)	.24	(.07)	--	--
<i>Region</i>						
Metropolitan	.55	(.05)	.62	(.05)		
Northern/North Western	.45	(.06)	.55	(.06)		
Central, Central Black-Earth	.31	(.09)	.44	(.16)		
Volga-Vaytski, Volga Basin	.41	(.07)	.38	(.06)		
North Caucasian	.41	(.06)	.39	(.05)		
Ural	.41	(.05)	.53	(.06)		
Western Siberia	.47	(.07)	.44	(.06)		
Eastern Siberia, Far Eastern	.44	(.08)	.38	(.06)		

Sample restricted to men and women aged 30-65. Numbers in parentheses are standard errors. Privatization rates based on Rossiiskaia gazeta 1992, and reports of the GKI.

**Table 3. 1992 Characteristics of all Persons Not ‘Very Concerned’ About Job Loss in 1992,
by Whether ‘Very Concerned’ in 1993**

	MALE		FEMALE	
	<u>Not Concerned 1992</u> <u>&</u> <u>Not Concerned 1993</u>	<u>Not Concerned 1992</u> <u>&</u> <u>Very Concerned 1993</u>	<u>Not Concerned 1992</u> <u>&</u> <u>Not Concerned 1993</u>	<u>Not Concerned 1992</u> <u>&</u> <u>Very Concerned 1993</u>
<i>Demographic</i>				
Age	43.0 [.36]	42.8 [.49]	43.6 [.39]	43.0 [.45]
Family size	3.4 [.05]	3.5 [.08]	3.2 [.06]	3.3 [.07]
Married	.86 [.01]	.87 [.02]	.75 [.02]	.72 [.02]
Divorced	.05 [.01]	.03 [.01]	.11 [.01]	.13 [.02]
<i>Socioeconomic Status</i>				
Income per capita	3083 [121]	2754 [185]	3131 [137]	2757 [234]
Level Education:				
Primary	.99 [.003]	.99 [.003]	.98 [.005]	.99 [.006]
Secondary	.77 [.02]	.77 [.03]	.80 [.02]	.82 [.02]
College	.22 [.02]	.18 [.02]	.23 [.02]	.23 [.02]
Rural	.69 [.02]	.68 [.03]	.67 [.02]	.67 [.02]

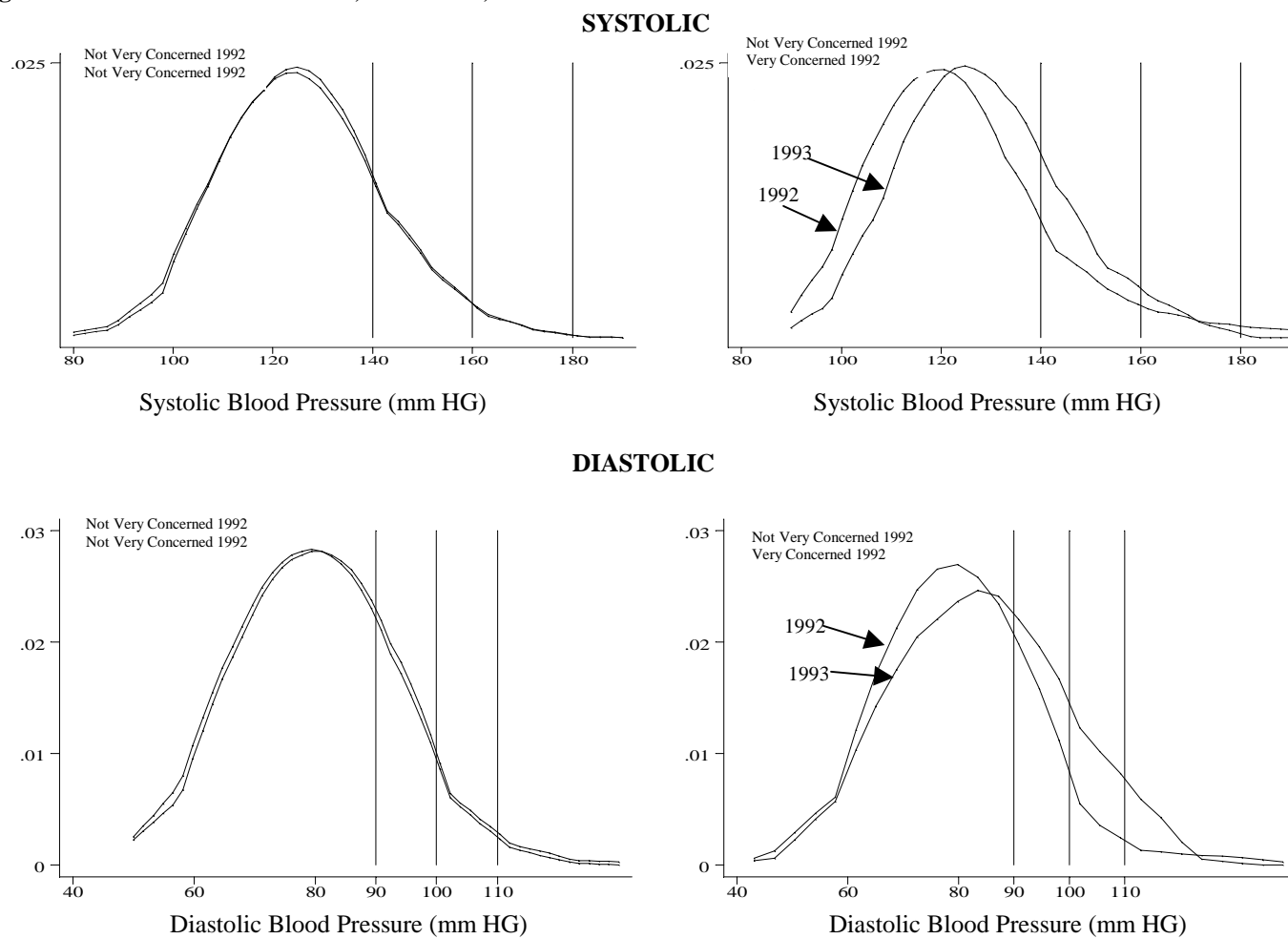
Sample restricted to persons aged 30-65. Standard errors in brackets. All columns restricted to persons not ‘very concerned’ about job loss in 1992.

Table 4. Health Status, By Whether Very Concerned About Job Loss

	<i>MEN</i>			
	<u>Not Concerned 1992</u>		<u>Not Concerned 1992</u>	
	<u>Not Concerned 1993</u>		<u>Very Concerned 1993</u>	
	1992	1993	1992	1993
BMI	24.8 [.31]	25.4 [.29]	24.9 [.53]	25.3 [.71]
Smoker?	.58 [.04]	.60 [.04]	.61 [.08]	.59 [.08]
# Cigarettes per day	17.8 [.77]	17.2 [.72]	18.7 [1.2]	20.2 [1.5]
Dinks?	.63 [.04]	.65 [.04]	.64 [.08]	.70 [.07]
Amount drink (g / week)	399 [23.4]	381 [18.4]	389 [58]	437 [25.0]
Systolic	125 [1.2]	125 [1.2]	124 [2.6]	129 [2.2]
Diastolic	80 [.84]	80 [.78]	80 [3.3]	84 [2.0]
Had Chest Pains?	.24 [.03]	.24 [.03]	.23 [.03]	.28 [.03]
Had heart attack?	.06 [.02]	.06 [.03]	.05 [.02]	.09 [.03]
ADL Index	16.5 [1.3]	17.4 [1.4]	17.3 [1.7]	21.6 [1.7]
	<i>WOMEN</i>			
	<u>Not Concerned 1992</u>		<u>Not Concerned 1992</u>	
	<u>Not Concerned 1993</u>		<u>Very Concerned 1993</u>	
	1992	1993	1992	1993
BMI	26.0 [.69]	26.4 [.61]	26.4 [.59]	26.3 [.53]
Smoker?	.12 [.04]	.13 [.04]	.10 [.03]	.13 [.03]
# Cigarettes per day	9.8 [1.9]	10.3 [2.2]	6.3 [1.3]	6.1 [1.5]
Dinks?	.25 [.05]	.28 [.06]	.25 [.04]	.28 [.05]
Amount drink (g / week)	80.4 [16.4]	83.3 [14.7]	83.2 [10.1]	84.7 [8.8]
Systolic	126 [2.5]	125 [2.0]	124 [1.8]	127 [1.6]
Diastolic	82 [2.6]	81 [1.4]	81 [1.6]	83 [1.0]
Had Chest Pains?	.23 [.03]	.24 [.04]	.22 [.02]	.27 [.03]
Had heart attack?	.06 [.03]	.06 [.03]	.05 [.03]	.08 [.03]
ADL Index	22.3 [2.0]	23.4 [2.3]	21.2 [2.4]	24.8 [2.4]

Sample restricted to persons aged 30-65. Columns 1 and 2 are the 1992 and 1993 characteristics of persons not very concerned in both 1992 and 1993. Columns 3 and 4 are the characteristics of persons not very concerned in 1992 but very concerned in 1993.

Figure 1. Blood Pressure Densities, Men 30-65, Before and After Announced Privatization Rates



Sample restricted to men who in 1992 are employed or who have an employed person in the household, and who report they are not concerned about the possibility of job loss in the next 12 months.

Table 5. Regression Results, Effects of Changes in Job Concern on Blood Pressure, Men aged 30-65

	(1) OLS Δ Systolic	(2) OLS Δ Diastolic	(3) OLS Δ Systolic	(4) OLS Δ Diastolic	(5) I.V. Δ Systolic	(6) I.V. Δ Diastolic
Change in Concern	6.67 (2.93)	5.13 (2.16)	6.29 (3.02)	4.87 (2.06)	5.29 (3.11)	4.18 (2.22)
Δ inc. per capita	-0.89 (1.67)	-1.51 (1.24)	-0.68 (1.66)	-1.98 (1.14)	-1.76 (2.11)	-0.98 (1.31)
Age	0.23 (0.17)	0.03 (0.12)	0.14 (0.17)	-0.01 (0.11)	0.11 (0.23)	-0.09 (0.11)
Family Size	2.0 (1.4)	0.04 (0.96)	2.10 (1.45)	-0.63 (0.87)	1.2 (1.3)	-0.81 (0.92)
Highest Educ. completed Secondary	6.9 (4.0)	0.45 (2.92)	4.33 (3.93)	-0.79 (2.65)	5.8 (4.39)	-0.68 (3.1)
College	-2.2 (2.8)	-2.37 (2.11)	-1.34 (2.82)	-1.67 (1.94)	-2.0 (3.01)	-0.27 (2.32)
Rural?	-1.87 (2.93)	-4.01 (2.14)	-1.01 (2.98)	-2.43 (2.01)	-2.2 (3.0)	-2.18 (2.16)
Δ BMI	--	--	0.56 (0.30)	0.50 (0.28)	0.51 (0.33)	0.44 (0.24)
Δ Alcohol	--	--	0.047 (0.021)	0.032 (0.013)	0.021 (0.014)	0.043 (0.014)
Δ Cigarettes	--	--	0.43 (0.25)	0.40 (0.22)	0.63 (0.29)	0.33 (0.18)
Constant	.54 (1.7)	.10 (.94)	.44 (1.05)	.93 (.72)	.75 (2.0)	.73 (.73)
R-squared	0.07	0.09	0.13	0.17	0.16	0.22

Heteroskedasticity-consistent standard errors in parentheses. The dependent variables are change in systolic and diastolic blood pressure, measured in mm HG. The sample is restricted to men who in 1992 are either employed or who have an employed person in the household. For the I.V. regressions, the F -statistic from the first-stage regression is 24.1.

Table 6. Effects of Changes in Job Concern on Blood Pressure, Women aged 30-65

	(1) OLS Δ Systolic	(2) OLS Δ Diastolic	(3) OLS Δ Systolic	(4) OLS Δ Diastolic	(5) I.V. Δ Systolic	(6) I.V. Δ Diastolic
Change in Concern	4.39 (2.07)	1.30 (0.71)	4.32 (2.21)	1.29 (.75)	4.25 (2.30)	1.26 (.77)
Δ inc. per capita	-0.58 (1.49)	-1.05 (1.15)	-1.33 (1.53)	-1.17 (1.12)	-2.13 (1.92)	-1.31 (1.42)
Age	0.32 (0.17)	0.02 (0.13)	0.11 (0.17)	0.02 (0.13)	0.18 (0.14)	0.08 (0.12)
Family Size	0.91 (1.16)	-0.11 (0.89)	0.43 (1.23)	-0.76 (0.90)	.45 (1.35)	-0.81 (1.11)
Highest complt educ Secondary	6.50 (3.89)	-2.03 (2.99)	9.07 (3.98)	0.60 (2.94)	5.2 (4.12)	-0.79 (3.62)
College	-1.50 (2.77)	-2.24 (2.15)	-1.27 (2.80)	-2.01 (2.06)	-1.37 (3.15)	-1.52 (2.48)
Rural?	-6.67 (3.01)	-0.34 (2.30)	-5.65 (3.10)	0.00 (2.26)	-6.01 (3.73)	0.14 (2.83)
Δ BMI	--	--	0.42 (0.24)	0.14 (0.18)	0.65 (0.32)	0.26 (0.15)
Δ Alcohol	--	--	0.02 (0.03)	0.01 (0.02)	0.035 (0.012)	0.01 (0.02)
Δ Cigarettes	--	--	0.45 (0.31)	0.58 (0.54)	0.48 (0.29)	0.73 (0.41)
Constant	2.2 (1.5)	1.6 (1.2)	1.2 (1.8)	1.5 (1.3)	.62 (2.1)	1.2 (1.3)
R-squared	0.14	0.03	0.14	0.05	0.14	0.05

Heteroskedasticity-consistent standard errors in parentheses. The dependent variables are change in systolic and diastolic blood pressure, measured in mm HG. The sample is restricted to women who in 1992 are either employed or who have an employed person in the household. For the I.V. regressions, the F-statistic from the first-stage regression is 16.6.

Table 7. Instrumental Variables Regression Results, Effects of Changes in Job Concern on Health-Related Behaviors, Men and Women aged 30-65

	MEN			WOMEN		
	(1) Δ BMI	(2) Δ Alcohol	(3) Δ Cigs	(4) Δ BMI	(5) Δ Alcohol	(6) Δ Cig.
Change in Concern	0.25 (0.57)	33.6 (12.5)	2.0 (1.1)	0.48 (0.80)	-1.1 (5.67)	-0.14 (0.25)
Δ inc. per capita	0.41 (0.32)	16.4 (58.4)	0.09 (0.43)	0.04 (0.49)	64.3 (34.2)	-0.05 (0.15)
Age	0.01 (0.03)	16.6 (5.84)	0.06 (0.05)	0.01 (0.05)	5.3 (3.8)	-0.01 (0.02)
Family Size	-0.27 (0.25)	26.2 (45.8)	0.44 (0.38)	0.22 (0.38)	25.3 (26.6)	-0.14 (0.12)
Highest comp educ Secondary	0.64 (0.77)	29.5 (140)	0.86 (1.18)	-0.08 (1.25)	84.0 (89.2)	-0.55 (0.40)
College	0.24 (0.55)	78.1 (99.9)	0.63 (0.84)	-0.54 (0.89)	-15.2 (63.2)	0.32 (0.28)
Rural	-1.26 (0.56)	19.3 (14.8)	0.27 (0.86)	-1.88 (0.97)	94.4 (68.9)	0.12 (0.31)
Constant	.11 (.20)	8.7 (3.6)	.53 (.40)	.23 (.47)	2.9 (.38)	.098 (.15)
R-squared	0.04	0.13	0.09	0.04	0.19	0.03

Heteroskedasticity-consistent standard errors in parentheses. The sample is restricted to men women who in 1992 are either employed or who have an employed person in the household. For the I.V. regressions, the F-statistic from the first-stage regression is 24.1 for men and 16.6 for women.

Table 8. Effects of Changes in Job Concern on Health Status, Men and Women aged 30-65

	MALE			FEMALE		
	(1) ADL Index	(2) Chest pains?	(3) Heart attack?	(4) ADL Index	(5) Chest pains?	(6) Heart attack?
Change Concern	2.78 (1.22)	.061 (.034)	.035 (.020)	2.45 (.98)	.053 (.031)	.020 (.008)
Δ inc. per capita	-.055 (.31)	.026 (.020)	.015 (.012)	-.038 (.20)	-.008 (.003)	.005 (.008)
Age	.23 (.10)	.014 (.0025)	.002 (.0007)	.29 (.13)	.009 (.002)	.001 (.0006)
Family Size	.09 (.12)	0.18 (.022)	-.0047 (.008)	.29 (.18)	-.035 (.021)	-.002 (.005)
Highest comp ed. Secondary	.29 (.23)	.013 (.071)	.011 (.024)	.31 (.28)	.073 (.068)	-.008 (.023)
College	-.27 (.15)	-.09 (.054)	-.021 (.015)	-.38 (.12)	-.045 (.066)	-.016 (.037)
Rural	-.19 (.13)	0.044 (.052)	-.023 (.023)	-.23 (.16)	-.031 (.055)	-.014 (.016)
BMI	.46 (.14)	0.018 (0.007)	.012 (.0003)	.61 (.13)	.018 (.004)	0.015 (0.010)
Drinks?	.21 (.17)	.015 (.010)	.007 (.008)	.26 (.18)	.016 (0.006)	0.018 (.010)
Smokes?	.88 (.29)	.067 (.022)	.023 (.013)	.98 (.36)	.039 (.005)	.018 (.006)

The sample is restricted to men and women who in 1992 are either employed or who have an employed person in the household.

Table 9. Effects of Changes in Job Concern on Health and Health-Related Behaviors
(Sample Restricted to Those Concerned About Job Loss of Other Family Member, Aged 30-65.)

	MALE	FEMALE
Δ Systolic	4.7 (3.0)	4.22 (2.41)
Δ Diastolic	4.4 (2.4)	1.82 (1.01)
Δ BMI	.16 (.10)	.10 (.53)
Δ Alcohol	30.1 (14.7)	6.7 (5.3)
Δ Cigarettes	1.9 (1.1)	.29 (.21)
Chest Pains?	.12 (.049)	.061 (.033)
Heart Attack?	.042 (.023)	.024 (.011)
Δ ADL	3.4 (1.2)	2.91 (1.08)

I.V. regression coefficients on the variable measuring change in concern over job loss. Heteroskedasticity-consistent standard errors in parentheses. The sample is restricted to men and women who in 1992 are either employed or who have an employed person in the household. Other coefficients included: change in income per capita, age, family size, indicators for completion of primary and secondary school and college, and an indicator for living in a rural area.

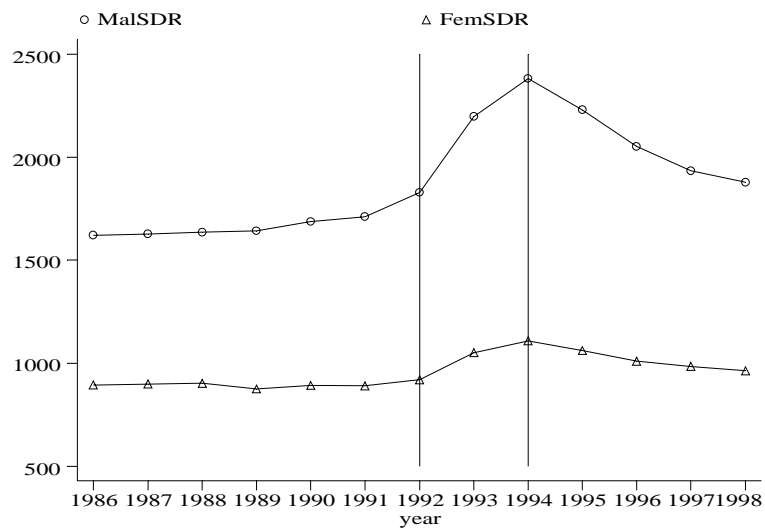
Table 10. Effects of Changes in Concern on Health and Health-Related Behaviors

(Sample restricted to households dependent on public income for at least 50% of total household income).

	MALE	FEMALE
Δ Systolic	6.2 (2.93)	4.50 (2.63)
Δ Diastolic	5.1 (2.41)	2.21 (1.18)
Δ BMI	.20 (.14)	.19 (.30)
Δ Alcohol	24.2 (12.8)	6.1 (4.31)
Δ Cigarettes	.95 (.89)	.35 (.30)
Chest Pains?	.14 (.054)	.068 (.038)
Heart Attack?	.085 (.039)	.051 (.029)
Δ ADL	4.9 (1.9)	3.24 (1.49)

Rows 1 to 5 are I.V. regression coefficients on the variable measuring change in concern over job loss. Heteroskedasticity-consistent standard errors in parentheses. The last two rows are marginal effects, $\partial\Phi(\cdot)/\partial X$, evaluated at sample means. The sample is restricted to men and women who in 1992 are either employed or who have an employed person in the household. Other coefficients included: change in income per capita, age, family size, indicators for completion of primary and secondary school and college, and an indicator for living in a rural area.

Figure 2. Trends in All-Cause Standardized Death Rates (per 100, 000) 1986-1998



Year	Male	Female
1986	1621	895
1987	1627	898
1988	1636	902
1989	1644	875
1990	1688	892
1991	1711	890
1992	1828	920
1993	2199	1051
1994	2382	1109
1995	2231	1061
1996	2053	1010
1997	1934	985
1998	1879	962

Figure 3. Cause-Specific Standardized Death Rates for Leading Causes of Death

