The Effects of Health Shocks on Labor Market Outcomes:

Evidence from UK Panel Data

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Abstract:

This study examines the link between health shocks and labor market outcomes in the United Kingdom. For sample periods of up to seven years, I use longitudinal data from the British Household Panel Survey (BHPS) to test how sudden declines in self-reported health as well as the onsets of health conditions affect a number of labor market outcomes, such as personal income, employment status, and hours worked. The study shows that sudden health declines lead to significant and persistent reductions in earnings, which are only partly driven by reductions in labor force participation. The results suggest that higher out-of-pocket expenditures for health care and reduced work productivity are potential mechanisms through which health shocks affect earnings. The observed income losses are substantially larger for males and for individuals with higher levels of education. Additionally, the study shows that health shocks significantly impact economic stress and uncertainty as well as general well-being.

Keywords: Health Shock; Labor Market; Mechanisms; United Kingdom.

JEL Classifications: C23; I10; I12; J60
(1) **Introduction:**

Despite being previously examined by several researchers, there is still uncertainty about the relationship between labor market and health outcomes. While the majority of existing studies has focused on examining health effects following changes in income and employment, there has been growing interest in learning more about the effects of health on labor market outcomes in recent years. Given the close link between employment status and both health and health insurance coverage, an improved understanding of how labor market outcomes are affected following health shocks is relevant for policymakers. If health shocks have significant long-term negative spillover effects on employment and earnings, policymakers should discuss ways to provide improved assistance to workers experiencing sudden declines in health in terms of dealing with the situation and allowing them to return to work. By using longitudinal data from the British Household Panel Survey (BHPS) for up to seven years, this study examines the effects of health shocks on several labor market outcomes. The study finds that health declines lead to significant and persistent reductions in income and employment. When examining potential mechanisms, I find that reduced productivity, increase usage and spending on health care, as well as higher levels of financial stress and reduced overall well-being can help explain the declines in labor market outcomes.

The analysis of this paper adds to the existing literature in three ways. First, the study uses longitudinal data from the UK. I am following the individuals over three different sample periods: 3 years, 5 years and 7 years. This allows testing for the immediate effects of health shocks on labor market outcomes and examining whether these effects are temporary or have lasting effects on people’s labor market positions. Second, this study expands on earlier work and examines the effects of health shocks on a number of labor market outcomes, such as annual
income, employment status and hours worked per week. Third, besides testing for the presence of a causal link from health to labor market outcomes, this study also provides evidence for potential mechanisms through which health shocks can affect labor market outcomes. Specifically, I examine four broad channels: 1) Changes in the frequency and the costs of health care usage; 2) Changes in the worker’s productivity; 3) Changes in perceived levels of economic stress; 4) Changes in general well-being. An examination of potential channels is important from a policy and a social welfare perspective since it provides evidence for how policymakers can potentially help prevent substantial losses in productivity following health shocks.

The study finds that health shocks, captured by declines in self-reported health status and the onset of health conditions, significantly affect labor market outcomes of affected individuals. Negative health events are shown to reduce annual income, the likelihood of being employed and the number of hours worked per week. The negative effects are found for all three variations of the sample length, suggesting that health shocks have lasting impacts on labor market outcomes. The analysis shows that health shocks have larger effects on the earnings of males and higher-educated individuals. When examining potential mechanisms underlying the link from health to earnings and employment, the study provides evidence that increased health care usage and out-of-pocket expenses for health services, reduced work productivity as well as increased economic stress and general well-being can explain the observed persistent negative effects of health shocks.

(2) Labor market outcomes and health: previous evidence

A number of previous studies have examined health effects of negative employment shocks on people’s health. It has been established that negative employment events such as mass layoffs, plant closings and job loss have significant negative effects on health outcomes of affected
individuals (Sullivan and von Wachter, 2009; Eliason and Storrie, 2009a and 2009b; Schmitz, 2011; Marcus, 2013; Schaller and Stevens, 2015). Furthermore, other studies have examined the association between worsened economic conditions and health outcomes. These findings are mixed: earlier work provides evidence that economic downturns actually improve health outcomes (Ruhm, 2000; Neumayer, 2004; Miller et al., 2009), while more recent work suggest that health declines along with the economy (McInerney and Mellor, 2012; McInerney et al., 2013; Currie et al., 2015).

A large number of studies have examined the relationship between income and health. Following the pioneering study by Case et al. (2002), several papers have also provided evidence for the presence of a strong positive association between household income and health. (Currie and Stabile, 2003; Currie et al., 2007; Propper et al., 2007, Adda et al., 2009; Khanam et al., 2009; Reinhold and Jürges, 2012). This phenomenon has become known as the income gradient in health. In more recent year, researchers have expressed the need to test for the causal nature between income and health by pointing out that the presence of a positive association could be the result of third factors that influence both health and income or due to reverse causality, which exists if health outcomes influence people’s employment status and therefore their income. A few recent studies have provided convincing evidence that income has a causal effect on improved health outcomes by examining exogenous variations of income (Evans and Garthwaite, 2014; Hoynes et al., 2015; Lenhart, 2017).

Several previous studies have examined the effects of health shocks on labor market outcomes. The majority of early work on the topic has focused on elderly groups of the population and the effects of health on retirement (Riphahn, 1999; Bound et al., 1999; Smith, 2004; Au et al., 2005; Jiménez-Martín et al., 2006; Disney et al., 2006; Zucchelli et al., 2007;
Hagan et al., 2008; Rice et al., 2010). These studies established that older adults are significantly less likely to be employed and more likely to retire following the occurrence of a health shock. Other studies additionally show that health shocks have negative labor market effects for younger individuals by examining several types of health shocks. These include the presence of permanent health conditions (Pelkowski and Berger, 2004), reduced psychological health (Contoyannis and Rice, 2001), injuries from road accidents (Dano, 2005), the onset of disability (Lindeboom et al., 2016; Charles, 2003), reduced physical health (García-Gómez, 2011; García-Gómez and López-Nicolás, 2006) and sudden illness (García-Gómez et al., 2013).

Van Doorslaer and Koolman (2004) find that income-related health inequalities in the UK are larger than in most other European countries. García-Gómez et al. (2013) suggest that differences in the provision of disability benefits could explain these differences across nation. The authors argue that relating the size of benefits to previous earnings, such as in the Netherlands, reduces the average income loss from health shocks compared to when benefits are paid at a flat rate like in the UK. Besides examining the effects of negative health events on labor market outcomes, this study also tests for several potential channels that could explain why income-related health differences are a big issue in the UK. These channels include changes in health care usage, health care expenditures, economic stress and psychological well-being following the onset of a health shock.

(3) Econometric Methods

3.1 DD Models

This study employs a Difference-in-Differences (DD) framework to test for the effects of health shocks on labor market outcomes. This setup is similar to the econometric models used by García-Gómez and López-Nicolás (2006), García-Gómez (2011) as well as Lechner and
Vázquez Álvarez (2011) in previous work. A crucial challenge when estimating the effects of health shocks on labor market outcomes is the fact that many health and labor market outcomes are potentially jointly determined by many people. The use of a DD model can overcome this concern by identifying arguably exogenous health shocks that are independent of employment status.

Table 1 shows the setup for the two groups used in the DD models estimated in this study, which analyzes three variations of sample length to test for both immediate and long-term effects of adverse health events on labor market outcomes. Despite different sample periods, all three models share the following characteristics:

1) Individuals from both treatment and control group are in excellent or very good health and are working in the pre-treatment period (Pre).

2) Individuals forming the treatment group experience a health shock in the treatment period (Shock), meaning their health status becomes fair, poor or very poor. Individuals in the control group remain in excellent or very good health. All members of the treatment and the control group are working during the period in which the treatment occurs.

3) Self-reported health status of individuals in the treatment group remains in fair, poor or very poor health in the first year after the health shock, while individuals in the control group remain in excellent or very good health throughout the post-treatment period (Post).

In an additional DD model, I use the onset of a health condition as the source of treatment (health shock), whereas the setup remains unchanged to the main model. Individuals forming the treatment group report the onset of a health condition in the treatment period, while those in the control group report no health conditions throughout the study period. Again, all individuals work in both the pre-treatment and the treatment period.
By examining a sample of individuals who are employed during both the pre-treatment period and the year of the health shock, the potentially simultaneous determination of health and labor market outcomes is accounted for and allows testing for the effects of experiencing health declines on labor market outcomes in the post-treatment period. One assumption of this framework is that there are no anticipation effects, meaning that people report declines in health because they expect negative employment shocks to occur in the future. In an additional model, I examine income effects following health shocks for individuals who are employed throughout the sample period.

The main DD equation estimated in this study is the following:

\[ Y_{it} = \beta_0 + \beta_1 \text{Treat}_{it} + \delta_{DD} \text{Post} \times \text{Treat} + \beta_2 X_{it} + \beta_3 \text{Area}_{it} + \beta_4 \text{Year}_{it} + \beta_5 \text{Month}_{it} + \alpha_i + \epsilon_{it}, \quad (1) \]

where \( Y_{it} \) represents labor market outcomes of individual \( i \) at time \( t \). The four outcomes examined in this study are (1) annual personal income, (2) whether individuals are employed, (3) hours worked per week, and (4) whether respondents have a second job.\(^1\) \text{Treat} equals one if an individual belongs to the treatment group, while \text{Post} is an indicator for the post-treatment. Thus, the estimate for \( \delta_{DD} \), is the main parameter of interest representing the effect of the health shock on labor market outcomes. \( X_{it} \) represents a set of time-varying individual and household characteristics that are controlled for in the analysis. These include marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview. The inclusion of \( \alpha_i \) captures unobserved individual heterogeneity and accounts for potential omitted variable bias. In an additional model, I furthermore test for annual treatment

\(^1\) In an additional specification, I also test for the effects on household income in order to examine whether health shocks of one household member potentially have spillover effects on the labor supply of other members of the household.
effects following health shocks to provide evidence on the magnitude of immediate and persistent effects.

In the later part of this study, I examine the role of potential mechanisms underlying the relationship between health shocks and labor market outcomes. In these models, I re-estimate equation (1) with $Y_{it}$ being different indicators for health care usage, health care expenditures, economic stress and psychological well-being of respondents.

3.2. Alternative DD Model

In addition to the standard DD model, I also estimate treatment effects by applying an alternative DD model that was introduced by Mora and Reggio (2015), which allows statistically testing for whether the parallel path assumption of the main DD setup is satisfied. Difference-in-Differences models require an assumption that trends in the variable of interest are similar for both treatment and control group in the absence of the policy intervention. This assumption implies that differences between the groups are assumed time-invariant in the absence of any treatment. Mora and Reggio (2015) point out the fact that the identification of treatment effects does not only depend on the parallel trends assumption, but also on the trend modeling strategy applied by researchers. The authors argue that researchers often overlook this.

They introduce an alternative DD estimator, which identifies the effect of the policy using a fully flexible dynamic specification as well as a number of alternative “parallel growth” assumptions. Estimating this model as an additional check for robustness allows testing for the validity of standard DD assumptions made in the baseline specification. Following Mora and Reggio (2015), who provide Stata code to implement their alternative DD specification, this alternative estimator is acquired in two steps: In the first step, standard least squares estimation
of the fully flexible model is conducted. In the second step, the solution of the equation in differences identifies the treatment effects. Finding that the estimates obtained from this model are consistent with the baseline estimates can provide evidence for additional robustness of the main DD estimates.

(4) Data

4.1. British Household Panel Survey (BHPS)

This study uses data from waves 10 to 16 (2000 to 2006) of the British Household Panel Survey (BHPS), a nationally representative panel survey of private households in Great Britain that started interviewing 10,300 individuals from 5,500 families in 1991.\(^2\) The use of the BHPS provides several advantages for the purpose of this study. Due to its longitudinal nature, the dataset allows accounting for time-invariant unobserved heterogeneity and compositional selection. The potential for measurement error in the self-reported health measure is reduced since each individual’s health is only compared to his or her own prior assessment. This allows controlling for the fact that each respondent may have their own scales in ranking their health (reference bias). Furthermore, in comparison to the two other commonly used UK datasets with detailed information on earnings (Labor Force Survey and New Earnings Survey), the BHPS also provides information on several health outcomes. Finally, the BHPS gives a complete representation of incomes across the pay distribution since it questions all individuals above 15 years of age who live in the household at the time of the interview. Given that individuals in the UK become eligible to receive state pensions at the age of 65, the sample is restricted to

\(^2\) Taylor (1998) provides a full description of the sampling strategy applied in the initial wave in order to design a nationally representative sample of the British population.
individuals between the ages 18 and 64 for whom information on health and labor market outcomes is available.

The analysis uses two different types of health shocks. In the main specification, which is presented in Table 1, health shocks are defined as a decline in self-reported health status. Self-assessed health is categorized from 1 (=excellent) to 5 (=very poor) in the BHPS. This measure of health has been shown to be a good predictor of other health outcomes, including mortality (Idler and Benyamini, 1997), future health care usage (van Doorslaer et al., 2000) and hospitalizations (Nielsen et al., 2016). In order to remove concerns about potential reporting heterogeneity of health status, Johnson et al. (2009) suggest the additional use of more objective health outcomes. In an additional specification, health shocks are defined as the onset of a new health condition. In each wave, the BHPS asks respondents whether they suffer from any of the following 15 health conditions: body pain, migraine, skin issues/allergy, asthma/chest pain, anxiety, health or blood pressure, hearing problems, stomach/liver/kidney pain, seeing problems, epilepsy, diabetes, alcohol or drug problems, stroke and cancer. As indicated by García-Gómez (2011), using the onset of health conditions as a health shock could provide evidence regarding any potential anticipation effects (García-Gómez, 2011).

4.2 Descriptive Statistics

Table 2 provides descriptive statistics for the three different sample periods used in the analysis. Overall, the statistics show very small differences in observable characteristics across the samples. Table 3 provides separate summary statistics for the treatment and control groups of the analysis for the year prior to the health shock in each sample. It is noticeable that, based on observable characteristics, the two groups are very similar in all three samples. The only variable for which statistically significant differences are observable in each sample is household income.
Prior to the onset of the health shock, individuals from both groups work similar hours and are equally likely to be working on a part-time basis. Personal monthly income is slightly lower for individuals forming the treatment group, while the difference between the groups is only statistically significant (p<0.05) in the 5-year sample.

Figures 1(a) and (b) provide graphical evidence for changes in annual personal income and employment for the sample period of seven years. Figure 1(a) shows that, while individuals in the control group earn more income in the pre-shock period, the positive trend is identical for both groups in this period. However, differences in trends are noticeable immediately after the health shock. While income of people forming the control group continues to grow at about the same rate as before, it slightly declines individuals in the treatment group. Based on the setup of the study, all individuals are employed throughout the pre-shock period and remain employed in the year of the shock. Figure 1(b) indicates that rates of employment decline for both groups starting one year after the health shock, with the decline being larger for individuals who suffered a decline in self-reported health. Three years after the health shock, employment rates are 90 and 76 percent for individuals in the control and treatment group, respectively.

(5) **Results**

5.1. *The Effects on Labor Market Outcomes*

Table 4 shows the main DD estimates for the effects of health shocks on labor markets outcomes for three different sample periods. Panel A presents results for the entire sample, while Panel B only looks at only individuals who are employed in all years. The results in column (1) indicate that adverse health events have large negative effects on annual income. The observed losses in earning range from £1,264.63 for the 5-year sample (p<0.05) to £2,772.69 for the 7-year sample (p<0.01). The estimate for the 7-year period corresponds to a annual income
reduction of 14.08 percent for affected individuals, which suggests that health shocks can have significant long-term effects on earnings. In an additional specification, I examine the effects of health shocks on household income, finding identical effects to those on personal income. This suggests that health shocks do not greatly affect the labor market supply of other household members.\footnote{The effects on household income are only larger in magnitude compared to those observed for personal income for the 7-year sample, suggesting that other household members might be potential spillover effects on the labor supply of other household members several years after the health shock. These additional results are not shown in the paper, but are available upon request. García-Gómez and López-Nicolás (2006) find evidence for potential immediate spillover effects using a sample of three years in Spain.}

Column (2) provides evidence that part of these income losses can be explained by changes on the extensive margin of employment. The DD estimates show that individuals who suffered from an adverse health event are less likely to have an employment following the health shock. Again, the largest effect is observed for the 7-year sample, which shows a 7.08 percentage point reduction in employment (p<0.01). Column (3) indicates that health shocks reduce the time individuals spend at work per week by up to three hours, which corresponds to changes of up to 8 percent. Finally, column (4) shows mixed effects for the impact of health shocks on the likelihood with which individuals have a second job. The estimate for the 5-year sample suggests an increase of 5.41 percent (p<0.01), while the estimates for the other two samples are imprecisely estimated.

Panel B provides estimates for individuals who remained employed throughout the sample period, even after the onset of a health shock. The effects for annual income show that earnings are significantly lower following adverse health events. The estimates are smaller than those in Panel A, which suggests that the observed losses in earnings in Panel A can only partly be explained by people leaving the work force following health shocks. In the next sections, I
examine potential other explanations, such as changes in health care usage, health care expenditures and changes in the worker’s productivity.

Figures 2(a) and (b) provide annual treatment effects for the sample of five and seven years, obtained by additional model using the full set of control variables. Both graphs show that the negative effects of the shock on personal income become larger as more time passes. For the sample of seven years, the analysis finds a reduction of annual income of £3,441.02 (p<0.01) three years after the health shock. Consistent with this, the annual effects on employment are found to increase with time after the negative health event (Figures 3a and b).

Overall, these results provide evidence that sudden decline in health have substantial and persistent negative effects on labor market outcomes. The findings for income and employment are consistent with previous estimates by García-Gómez and López-Nicolás (2006). Using a period of three years, the authors find that a sudden decline in self-assessed health reduces total annual personal income by €1,118 (measured in 2001 Euros, which corresponds to £1,763.31 using the 2001 €/£ conversion rate) and reduces the likelihood of employment by 5 percent in the year after the health shock in Spain. These findings are similar to my estimates for the sample period of three years, which suggest that total personal income reduces by £1,663.45 and the likelihood of employments declines by 6.78 percent.

5.2. The Effects on Health Care Usage

Table 5 presents estimates for the effects of health shocks on several indicators of health care usage as well as on health care expenditures. Panel A provides ordered logit results for changes in the frequency of doctor visits in the post-shock period. The findings provide clear evidence that individuals who suffer a decline in health have substantially more doctor visits in the following years. For the 7-year period sample, respondents are 39.12 percent more likely to have
more than five annual doctor visits, which suggests that the observed one-time health declines in health have persistent effects on people’s well-being.

The findings for increased health care usage are confirmed in Panel B. Individuals are much more likely to stay in a hospital overnight and to use any health care services, which includes physiotherapists, psychotherapists and health visitors at home. Furthermore, individuals are more likely to have paid for any health care services out of their own pockets in the years after experiencing a health shock. Two of the three estimates for this outcome are statistically significant, while the result for the 3-year sample correspond to an increase of 90.27 percent in the year after the shock compared to the pre-shock year. In the UK, the National Health Service (NHS) provides universal health care to the population. However, individuals have the option to purchase additional private care to forego long waiting times before seeing a doctor in some cases. While increased out-of-pocket expenditures on health can have direct effects on people’s financial well-being, persistent increases in health care usage can also impact labor market outcomes directly by taking away time from work.

5.3. The Effects on Worker’s Productivity

The next potential channel that is examined in Table 6 are changes to worker’s productivity following health shocks. The first two columns present DD effects on the likelihood that respondents are limited at work due to their health and whether they have difficulties concentrating. The results for all sample periods in column (1) indicate that individuals are more likely to report that their health is limiting their work (p<0.01). Additionally, two of the three estimates in column (2) show that respondents are having difficulties concentrating in the years after the health shock. These magnitudes of the observed effects suggest that health shocks have persistent effects on work performance and productivity.
Columns (3) and (4) additionally show that individuals are less likely to enjoy their day-to-day activities and are more likely to feel under strain constantly in the aftermath of a health shock. In the 7-year sample, which includes three periods after the health decline, affected individuals are 10.46 percentage points less likely to enjoy their day-to-day activities, which corresponds to a 53.56 percent change from the pre-shock period (p<0.01). These findings can potentially be interpreted as further evidence that productivity at work is negatively impacted since individuals who are less happy and under more stress might perform worse than other workers and worse than prior to the health shock.

5.4. The Effects on Economic Stress

Table 7 provides estimates for the effects of health shocks on several outcomes related to financial stress and economic uncertainty. Following the onset of a health shock, individuals are found to be less likely satisfied with their income, their work itself and as well as with their work hours (columns 1-3). While some estimates are lacking statistical significance, the direction and magnitude of the treatment effects suggest that people’s levels of comfort with their jobs is negatively affected. The fact that individuals are 19.17 percent less likely to report being satisfied with their income for the 7-year sample period indicates that these effects are persistent.

Columns (4) to (6) additionally show that respondents are more likely to report having difficulties dealing with their financial situations (for the sample periods of five and seven years), are less likely to report feeling job security and to think that they have a chance for future promotions at their current job. In the 7-year sample period, these effects correspond to changes of 65.66 percent (p<0.01), 8.70 percent (p<0.05) and 10.64 percent compared to the pre-shock period, respectively.
Finally, columns (7) and (8) show that individuals are less likely to save money (in two of the three samples) and reduce the amount of money spent on food eaten away from home in the year immediately after the health shock (p<0.05 for 3-year sample period). While lacking statistical significance and thus needed to be interpreted with caution, these estimates indicate that health shocks impact financial stress in the following years. Overall, the results in Table 7 indicate that negative health events lead to higher levels of financial stress and reduce economic uncertainty for people in the UK.

5.5. The Effects on General Well-Being

Next, I examine whether health shocks impact general well-being and happiness of people. The DD effects on four different indicators of well-being are presented in Table 8. The estimates in column (1) show that affected individuals are much less likely to be satisfied with their lives overall in the years following the health shock. The largest effect is observed for the 3-year sample, which indicates a 50.70 percent decline (p<0.01) in life satisfaction one year after the health shock. Columns (2)-(4) additionally show that people are more likely to feel depressed, less likely to feel happy and more likely to report that they feel like a worthless person in the aftermath of experiencing a bad health event, respectively. For the longest sample period, the treatment effect for the likelihood of feeling worthless corresponds to a 135.66 percent increase compared to prior to the health shock.

(6) Additional Specifications

6.1. Alternative Health Shock

In an alternative DD specification, I use the onset of a health condition as a health shock. Given that the presence of health conditions is likely to be more objective than self-reported health status, these estimates can provide evidence whether the effects differ depending on the
type of health shock being analyzed. The results are presented in Table 9. It is noticeable that the sample sizes are smaller for this health shock compared to the previous analysis. Panel A provides estimates for the effects of new health conditions on outcomes related to labor market outcomes, economic uncertainty and health care usage, while Panel B shows ordered logit results for the effects on the frequency of doctor visits.

The effects on annual income are smaller in magnitude compared to the results in Table 4, however, they again suggest that negative health events reduce annual earnings in the following years. Annual income is found to be reduced by £1,004.52 (p<0.05) and £919.12 (p<0.10) in the samples covering five and seven years, respectively (column 1). For all three sample periods, affected individuals are more likely to report that their work is limited by their health (all p<0.01). Additionally, they are more likely to spend a night at a hospital and to have paid for health care expenses out of their own pockets, while they also increasing the number of doctor visits in the years after having experienced a health shock. The results in Table 9 are consistent with those in the previous section, which provides additional credibility to the main estimates using declines in self-reported health status as a health shock.

6.2. Alternative DD Model

Table 10 provides estimates obtained by using the alternative DD model introduced by Mora and Reggio (2015), which allows testing for the validity of the parallel trends assumption of DD models. The first three columns show that the effects of health shocks on labor market outcomes are consistent with those from the standard DD model. Despite most estimates being smaller in magnitude, they provide further statistically significant evidence that labor market outcomes are hurt following the onset of health shocks. The remaining specifications in Table 10 also confirm the main estimates of the study by showing that health shocks affect health care usage, health
care expenses (sample periods of three and five years), work limitations related to health and financial stress (sample of seven years). The findings of the alternative DD model provide additional credibility for the results of the main DD model by confirming that they are robust to testing for the validity of the parallel trends assumption.

6.3. Heterogeneous Effects

In a number of final specifications, I examine whether the effects of sudden declines in self-reported health status differ across subgroups of the population. Table 11 presents DD estimates across gender, education, job classifications, and age. The estimates in Panel A and B provide evidence that health shocks have substantially larger negative effects on annual personal income for males and higher educated (at least completed A-levels) individuals, respectively. For the sample period of 7 years, the estimates for these two groups show than income is reduced by £4,267.13 for males and £3,231.90 for the group of higher educated people (both p<0.01) in the years following the negative health event. The results in Panel C suggest that there are only small differences in income effects across job classifications. Similarly, Panel D shows that the effects are similar for individuals below 40 and those at least 40 years of age. While the older group experiences larger income reductions in the year after the health shock (3-year sample), the effects are almost identical for the other two sample periods.

The observed differences in the effects of health shocks on income by gender are consistent with findings by García-Gómez et al. (2013). The authors explain this finding with the fact that males are still accounting for a greater shares of household earnings. My study confirms this – in the sample period of seven year, male respondents are earning £25,307.78, while females are only earning £16,348.16 in the pre-health shock period. Differences in income prior to the health shock are also the likely explanation for why earnings of individuals with high levels of
education are more affected by negative health events than income of people with no more than completed O-levels. Using US panel data, Charles (2003) provides evidence that the effects of health shocks on earnings are increasing with age. He provides two explanations for this: 1) older persons have accumulated more human capital that can be destroyed by negative health events; 2) any subsequent recovery in earnings will be weaker for older individuals. While my findings for the immediate income effects in the year after the health shock confirm Charles’ findings for the UK, the effects become more similar across age groups when examining more time following the health decline.

(7) Discussion and Conclusions

The findings in this study provide evidence that health shocks significantly affect the labor market outcomes of individuals in the UK for several years after the decline in health. Consistent with previous findings (see review by Currie and Madrian, 1999), the observed decline in total personal income is largely driven by reduced levels of employment following a health shock. As suggested by García-Gómez et al. (2013), the employment effect may be the result of incentives created by disability benefits or because of labor market institutions constraining the responsiveness of wages to reduced productivity.

Given that the disability benefit scheme in the UK provides benefits at a flat rate, it creates very little incentives for individuals to voluntarily reduce their employment compared to other countries, which provide disability benefits that are closely tied to previous earnings (van Doorslaer and Koolman, 2004). This suggests that the observed reductions in labor market participation following health shocks are not driven by incentives provides by disability benefits. Instead, my findings suggest that reduced productivity plays a role in explaining the observed changes in labor market outcomes. Individuals who suffer sudden health declines are shown to
be limited in work-related activities and to have difficulties concentrating in the following years, suggesting lower levels of work productivity and the inability to complete the same tasks they were able to perform before the health shock.

Additionally, despite the provision of universal health care through the NHS in the UK, I find significant increases of up to 90 percent in the likelihood with which individuals paid for health care services following the onset of a health shock. A likely explanation for this might be that individuals want to forego long waiting times before receiving treatment and decide to pay for private care. The NHS has been dealing with the issue of long waiting times for several decades. Using official data from the NHS, Murray (2016) shows that 2015 marked the first year since the introduction of the NHS in which the standard that at least 92 percent of patients receive their treatment within 18 weeks, suggesting that the issue is becoming worse over time. While my findings show that income reductions following health shocks are to a large extent driven by changes in employment status, my study also provides evidence for income losses for those who remain employed. Thus, policymakers in the UK should discuss ways on how to stop the trend of increasing waiting times since they can cause further harm to individuals suffering health shock by affecting their incomes, financial stress and overall well-being.

Previous data on the overall level of health for the UK population is mixed. A report of the Economist Intelligence Unit that compares healthcare inputs and outcomes across 166 countries ranked the UK 23rd in terms of performance (Economist Intelligence Unit, 2014). A report by the Commonwealth Fund in 2014 places the UK second to last in the ‘healthy lives’ category, which uses indicators of population health outcomes, including mortality, infant mortality and life expectancy (Davis et al., 2014). Evidence from the Global Burden of Disease Study shows that the leading risk factors for premature death in the UK are linked to lifestyle, in particular to
dietary risk, tobacco smoking, high blood pressure, and alcohol consumption (Institute for Health Metrics and Evaluation, 2015). Given that these causes are preventable, campaigns to promote healthier lifestyles and make people more aware of health risks could be successful in improving health outcomes and in preventing the onset of sudden health shocks for people in the workforce. Since 1998, the UK government has had success in reducing smoking of the population from 28 to 18 percent in 2015. It has done so by changing taxation, by increasing public awareness of the harm caused by smoking and by helping people quit. These policy interventions should be continued and expanded to other lifestyle choices that cause harm to people’s health.

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Figure 1(a): Changes in Income for Treatment and Control Group (7-Year Sample)

Figure 1(b): Changes in Employment for Treatment and Control Group (7-Year Sample)
Figure 2(a): Annual Treatment Effects on Income (5-Year Sample)

Figure 2(b): Annual Treatment Effects on Income (7-Year Sample)
Figure 3(a): Annual Treatment Effects on Employment (5-Year Sample)

Figure 3(b): Annual Treatment Effects on Employment (7-Year Sample)
### Table 1: DD Model Setup

|          | Treatment Group | Control Group |
|----------|-----------------|---------------|
| **Panel A:** |                 |               |
| **3-Year** |                 |               |
| 2000 (Pre) | Excellent/Very Good | Excellent/Very Good |
| 2001 (Shock) | Fair/Poor/Very Poor | Working |
| 2002 (Post) | Fair/Poor/Very Poor | Working |
| **Panel B:** |                 |               |
| **5-Year** |                 |               |
| 2000 (Pre) | Excellent/Very Good | Working |
| 2001 (Pre) | Excellent/Very Good | Working |
| 2002 (Shock) | Fair/Poor/Very Poor | Working |
| 2003 (Post) | Fair/Poor/Very Poor | Working |
| 2004 (Post) | Excellent/Very Good | Working |
| **Panel C:** |                 |               |
| **7-Year** |                 |               |
| 2000 (Pre) | Excellent/Very Good | Working |
| 2001 (Pre) | Excellent/Very Good | Working |
| 2002 (Pre) | Excellent/Very Good | Working |
| 2003 (Shock) | Fair/Poor/Very Poor | Working |
| 2004 (Post) | Fair/Poor/Very Poor | Working |
| 2005 (Post) | Excellent/Very Good | Working |
| 2006 (Post) | Excellent/Very Good | Working |
Table 2: Descriptive Statistics

| Variable                | 3-Year Sample (2000-2002) | 5-Year Sample (2000-2004) | 7-Year Sample (2000-2006) |
|------------------------|---------------------------|---------------------------|---------------------------|
|                        | Mean | Min | Max | N   | Mean | Min | Max | N   | Mean | Min | Max | N   |
| Age                    | 39.80| 18  | 64  | 10,311 | 40.95| 18  | 64  | 11,740 | 41.71| 18  | 64  | 12,264 |
| (10.87)                |      |    |     |      | (10.490) |      |     |     |      | (10.367) |      |     |     |      |
| Male (%)               | 0.523| 0   | 1   | 10,311 | 0.519| 0   | 1   | 11,740 | 0.530| 0   | 1   | 12,264 |
| (0.500)                |      |    |     |      | (0.500) |      |     |     |      | (0.499) |      |     |     |      |
| Married (%)            | 0.612| 0   | 1   | 10,311 | 0.640| 0   | 1   | 11,740 | 0.654| 0   | 1   | 12,264 |
| (0.487)                |      |    |     |      | (0.480) |      |     |     |      | (0.476) |      |     |     |      |
| # Children in HH      | 0.671| 0   | 4   | 10,311 | 0.682| 0   | 6   | 11,740 | 0.689| 0   | 5   | 12,264 |
| (0.948)                |      |    |     |      | (0.950) |      |     |     |      | (0.941) |      |     |     |      |
| HH Size                | 2.987| 1   | 7   | 10,311 | 2.977| 1   | 8   | 11,740 | 2.978| 1   | 10  | 12,264 |
| (1.213)                |      |    |     |      | (1.197) |      |     |     |      | (1.189) |      |     |     |      |
| A-Levels (%)           | 0.121| 0   | 1   | 10,311 | 0.122| 0   | 1   | 11,740 | 0.115| 0   | 1   | 12,264 |
| (0.327)                |      |    |     |      | (0.328) |      |     |     |      | (0.319) |      |     |     |      |
| O-Levels (%)           | 0.172| 0   | 1   | 10,311 | 0.158| 0   | 1   | 11,740 | 0.153| 0   | 1   | 12,264 |
| (0.377)                |      |    |     |      | (0.365) |      |     |     |      | (0.360) |      |     |     |      |
| Monthly Income         | £1,693.89 | 0 | £36,027.71 | 10,311 | £1,822.66 | 0 | £36,027.71 | 11,740 | £1,964.01 | 0 | £36,027.71 | 12,264 |
| (1,144.16)             |      |    |     |      | (1,277.03) |      |     |     |      | (1,390.41) |      |     |     |      |
| Monthly HH Income      | £3,193.65 | 0 | £37,549.31 | 10,311 | £3,366.21 | 0 | £37,549.31 | 11,740 | £3,566.70 | 0 | £37,549.31 | 12,264 |
| (1,750.46)             |      |    |     |      | (1,854.81) |      |     |     |      | (1,993.02) |      |     |     |      |
| Weekly Work Hours      | 34.923| 0   | 84  | 10,311 | 34.930| 0   | 84  | 11,740 | 35.118| 0   | 84  | 12,264 |
| (10.405)               |      |    |     |      | (10.067) |      |     |     |      | (9.764) |      |     |     |      |
| Part-Time (%)          | 0.163| 0   | 1   | 10,311 | 0.160| 0   | 1   | 11,740 | 0.154| 0   | 1   | 12,264 |
| (0.369)                |      |    |     |      | (0.366) |      |     |     |      | (0.361) |      |     |     |      |
| Save Any (%)           | 0.567| 0   | 1   | 10,311 | 0.586| 0   | 1   | 11,740 | 0.592| 0   | 1   | 12,264 |
| (0.496)                |      |    |     |      | (0.493) |      |     |     |      | (0.491) |      |     |     |      |

Notes: Standard deviations are shown in parentheses.
Table 3: Pre-Treatment Descriptive Statistics by Groups:

| Variables            | 3 Year Sample (2000) | 5 Year Sample (2001) | 7 Year Sample (2002) |
|----------------------|----------------------|----------------------|----------------------|
|                      | Treatment            | Control              | Treatment            | Control              | Treatment            | Control              |
| Age                  | 39.858 (11.072)      | 38.646 (10.807)      | 41.513 (10.009)      | 39.891 (10.406)      | 39.847 (10.361)      | 40.751 (10.179)      |
| % Male               | 0.523 (0.501)        | 0.523 (0.500)        | 0.470 (0.501)        | 0.521 (0.500)        | 0.542 (0.502)        | 0.531 (0.499)        |
| % Married            | 0.604 (0.490)        | 0.598 (0.490)        | 0.624 (0.486)        | 0.628 (0.483)        | 0.569 (0.499)        | 0.645 (0.479)        |
| # Children           | 0.680 (0.950)        | 0.689 (0.963)        | 0.632 (0.979)        | 0.702 (0.964)        | 0.528 (0.787)        | 0.716 (0.958)        |
| HH Size              | 3.000 (1.169)        | 3.015 (1.227)        | 2.940 (1.220)        | 3.010 (1.201)        | 2.819 (1.407)        | 3.025 (1.195)        |
| % A-levels           | 0.142 (0.350)        | 0.125 (0.330)        | 0.171 (0.378)        | 0.125 (0.331)        | 0.111 (0.316)        | 0.120 (0.325)        |
| % O-levels           | 0.162 (0.184)        | 0.184 (0.388)        | 0.137 (0.345)        | 0.168 (0.374)        | 0.083* (0.278)       | 0.163* (0.369)       |
| Monthly Income       | £1,489.88 (922.720)  | £1,609.72 (1,175.28) | £1,392.93*** (791.32) | £1,769.41*** (1,134.56) | £1,736.17 (854.05)  | £1,919.56 (1,332.26) |
| Monthly HH Income    | £2,810.41** (1,503.78) | £3,083.80** (1,660.26) | £2,797.78*** (1,528.33) | £3,320.60*** (1,662.17) | £3,031.36** (1,285.43) | £3,556.91** (1,989.69) |
| Weekly Work Hours    | 35.328 (10.485)      | 34.845 (10.460)      | 35.595 (8.840)       | 35.057 (9.994)       | 36.778 (8.396)       | 35.202 (9.797)       |
| % Part-Time          | 0.157 (0.365)        | 0.168 (0.374)        | 0.154 (0.362)        | 0.156 (0.363)        | 0.125 (0.333)        | 0.155 (0.362)        |
| % Saving             | 0.538 (0.500)        | 0.570 (0.495)        | 0.513 (0.502)        | 0.593 (0.399)        | 0.542 (0.502)        | 0.599 (0.490)        |
| Observations:        | 197                  | 3,240                | 117                  | 2,231                | 72                   | 1,680                |

Notes: Standard deviations are shown in parentheses, whereas tests of the null hypothesis whether the statistics for the two groups are the same are indicated by stars. * p < 0.10, ** p < 0.05, *** p < 0.01.
Table 4: DD Effects of Health Shock on Labor Market Outcomes

|                  | Annual Income  | Employed  | Weekly Work Hours | Second Job | N     |
|------------------|---------------|-----------|-------------------|------------|-------|
|                  | (1)           | (2)       | (3)               | (4)        |       |
| **Panel A: All** |               |           |                   |            |       |
| 3 Year Sample    | -1,663.45***  | -0.0678***| -2.54**           | -0.0045    | 6,874 |
|                  | (611.47)      | (0.0246)  | (1.06)            | (0.0235)   |       |
| Percent Change   | -12.26%       | -6.78%    | -7.47%            | -6.01%     |       |
| 5-Year Sample    | -1,264.63**   | -0.0432*  | -2.34***          | -0.0541*** | 9,315 |
|                  | (495.69)      | (0.0246)  | (0.88)            | (0.0200)   |       |
| Percent Change   | -7.65%        | -4.32%    | -6.55%            | -57.55%    |       |
| 7-Year Sample    | -2,772.69***  | -0.0708***| -2.99***          | 0.0286     | 10,402|
|                  | (587.30)      | (0.0225)  | (1.02)            | (0.0185)   |       |
| Percent Change   | -14.08%       | -7.08%    | -8.08%            | 36.34%     |       |
| **Panel B: Workers Only** |     |           |                   |            |       |
| 3 Year Sample    | -817.82*      | -        | -1.29             | 0.0021     | 6,534 |
|                  | (458.58)      |          | (0.91)            | (0.0274)   |       |
| Percent Change   | -6.03%        | -3.79%    | 2.80%             |           |       |
| 5-Year Sample    | -883.08**     | -        | -0.87             | -0.0572**  | 8,989 |
|                  | (418.01)      |          | (0.60)            | (0.0226)   |       |
| Percent Change   | -5.34%        | -2.43%    | -60.85%           |           |       |
| 7-Year Sample    | -2,005.00***  | -        | -0.94             | -0.0128    | 10,001|
|                  | (539.39)      |          | (0.71)            | (0.0205)   |       |
| Percent Change   | -10.18%       | -2.54%    | -16.26            |           |       |

*Notes: Robust standard errors, clustered by individuals, are shown in parentheses. All specifications include controls for marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview.  
* p < 0.10, ** p < 0.05, *** p < 0.01.
### Table 5: DD Effects of Health Shocks on Health Care Usage

#### Panel A: Annual Doctor Visits

| Frequency | None        | 1 to 2       | 3 to 5       | More than 5 | N       |
|-----------|-------------|--------------|--------------|-------------|---------|
| 3-Year Sample | -0.2470***  | 0.0670***    | 0.1250***    | 0.0550***   | 6,686   |
|            | (0.0396)    | (0.0119)     | (0.0205)     | (0.0090)    |         |
| Percent Change | -142.45%    | 17.79%       | 52.41%       | 26.02%      |         |
| 5-Year Sample | -0.3144***  | 0.1236***    | 0.1372***    | 0.0537***   | 9,315   |
|            | (0.0463)    | (0.0190)     | (0.0208)     | (0.0083)    |         |
| Percent Change | -118.64%    | 30.77%       | 60.57%       | 50.28%      |         |
| 7-Year Sample | -0.3132***  | 0.1375***    | 0.1286***    | 0.0471***   | 10,402  |
|            | (0.0589)    | (0.0267)     | (0.0244)     | (0.0092)    |         |
| Percent Change | -116.65%    | 39.60%       | 48.73%       | 39.12%      |         |

#### Panel B: Other Health Care Usage

| Activity                          | Spent a night at hospital | Used any other health services | Paid for any health services | N |
|-----------------------------------|---------------------------|-------------------------------|------------------------------|---|
| 3-Year Sample                     | 0.0940***                 | 0.2188***                    | 0.0724***                   | 6,686 |
| Percent Change                    | 87.85%                    | 47.58%                       | 90.27%                      |     |
| 5-Year Sample                     | 0.0944***                 | 0.1440***                    | 0.0631**                    | 9,315 |
| Percent Change                    | 157.86%                   | 38.29%                       | 61.50%                      |     |
| 7-Year Sample                     | 0.1196***                 | 0.1017***                    | 0.0248                      | 10,402|
| Percent Change                    | 258.32%                   | 24.68%                       | 24.34%                      |     |

**Notes:** Robust standard errors, clustered by individuals, are shown in parentheses. All specifications include controls for marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview. \( * \) \( p < 0.10 \), \( ** \) \( p < 0.05 \), \( *** \) \( p < 0.01 \).
Table 6: DD Effects of Health Shocks on Work Productivity

|                      | Work limited by health | Having difficulties to concentrate | Enjoying day-to-day activities | Feeling constantly under strain | N   |
|----------------------|------------------------|-----------------------------------|-------------------------------|---------------------------------|-----|
| **3-Year Sample**    | 0.1400***              | 0.1611***                         | -0.1337***                    | 0.1119***                       | 6,682 |
|                      | (0.0312)               | (0.0405)                          | (0.0435)                      | (0.0425)                        |     |
| Percent Change       | 79.32%                 | 81.00%                            | -59.85%                       | 32.50%                          |     |
| **5-Year Sample**    | 0.1227***              | 0.0107                            | -0.0498                       | -0.0129                         | 9,456 |
|                      | (0.0294)               | (0.0336)                          | (0.0337)                      | (0.0398)                        |     |
| Percent Change       | 239.18%                | 5.91%                             | -27.51%                       | -3.70%                          |     |
| **7-Year Sample**    | 0.0949***              | 0.0851**                          | -0.1046***                    | -0.0323                         | 11,436|
|                      | (0.0307)               | (0.0366)                          | (0.0385)                      | (0.0426)                        |     |
| Percent Change       | 102.15%                | 42.74%                            | -53.56%                       | -7.72%                          |     |

Notes: Robust standard errors, clustered by individuals, are shown in parentheses. All specifications include controls for marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview. 
* \( p < 0.10 \), ** \( p < 0.05 \), *** \( p < 0.01 \).
Table 7: DD Effects of Health Shocks on Economic Stress

|                        | Satisfied with income | Satisfied with work | Satisfied with # hours worked | Difficulty dealing w. financial situation | Feeling job security | Opportunity for Promotion | Saving any money | Spend >£50 on food eaten out per month | N  |
|------------------------|-----------------------|--------------------|-------------------------------|--------------------------------------------|----------------------|---------------------------|------------------|----------------------------------------|-----|
| 3-Year Sample          | -0.1499***            | -0.0445            | -0.0958**                    | -0.0277                                   | -0.1002**           | -0.0621                   | -0.0515          | -0.0790**                             | 6,688 |
|                        | (0.0429)              | (0.0453)           | (0.0379)                      | (0.0364)                                   | (0.0416)            | (0.0407)                   | (0.0381)         | (0.0400)                              |     |
| Percent Change         | -33.78%               | -7.55%             | -12.48%                       | -6.93%                                     | -16.43%             | -12.01%                    | -11.68%          | -25.13%                               |     |
| 5-Year Sample          | -0.0695               | -0.0844*           | -0.0484                       | 0.0317                                     | -0.0097             | -0.0394                   | -0.0688*         | -0.0068                               | 9,315 |
|                        | (0.0480)              | (0.0419)           | (0.0380)                      | (0.0329)                                   | (0.0393)            | (0.0359)                   | (0.0370)         | (0.0363)                              |     |
| Percent Change         | -14.02%               | -14.05%            | -6.44%                        | 10.45%                                     | -1.67%              | -7.29%                     | -13.70%          | -1.99%                                |     |
| 7-Year Sample          | -0.1198***            | -0.0274            | -0.0099                       | 0.1216***                                  | -0.0737**           | -0.0537                   | 0.0221           | 0.0152                                | 10,402 |
|                        | (0.0449)              | (0.0469)           | (0.0420)                      | (0.0330)                                   | (0.0319)            | (0.0395)                   | (0.0400)         | (0.0379)                              |     |
| Percent Change         | -19.17%               | -4.75%             | -1.54%                        | 65.66%                                     | -8.70%              | -10.64%                    | 4.40%            | 4.40%                                 |     |

Notes: Robust standard errors, clustered by individuals, are shown in parentheses. All specifications include controls for marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview. * p < 0.10, ** p < 0.05, *** p < 0.01.
## Table 8: DD Effects of Health Shocks on General Well-Being

|                        | Satisfied with life (1) | Feeling depressed (2) | Feeling less happy than usual (3) | Feel like a worthless person (4) | N   |
|------------------------|-------------------------|-----------------------|----------------------------------|----------------------------------|-----|
| **3-Year Sample**      | -0.2028*** (0.0375)     | 0.0926** (0.0410)     | 0.1376*** (0.0389)               | 0.0496* (0.0273)                 | 6,686|
| **Percent Change**     | -50.70%                 | 35.96%                | 85.57%                           | 60.34%                           |     |
| **5-Year Sample**      | -0.0425 (0.0444)        | 0.0328 (0.0372)       | 0.0346 (0.0213)                  | 0.0273 (0.0249)                  | 9,315|
| **Percent Change**     | -5.69%                  | 12.68%                | 23.60%                           | 30.17%                           |     |
| **7-Year Sample**      | -0.1078*** (0.0412)     | 0.0665* (0.0382)      | 0.0382 (0.0337)                  | 0.0757*** (0.0250)               | 10,402|
| **Percent Change**     | -13.52%                 | 27.49%                | 22.20%                           | 135.66%                          |     |

**Notes:** Robust standard errors, clustered by individuals, are shown in parentheses. All specifications include controls for marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview. 
* p < 0.10, ** p < 0.05, *** p < 0.01.
Table 9: DD Effects of Health Conditions

|                  | Annual Income | Employed          | Work limited by health | Feeling job security | Spent a night at hospital | Paid for any health services | N     |
|------------------|---------------|-------------------|------------------------|----------------------|---------------------------|-----------------------------|-------|
| **Panel A:**     |               |                   |                        |                      |                           |                             |       |
| 3-Year Sample    | -506.17       | 0.0046            | 0.0460***              | -0.0298              | 0.0206                    | 0.0042                      | 4,436 |
|                  | (499.84)      | (0.0128)          | (0.0103)               | (0.0293)             | (0.0160)                  | (0.0161)                    |       |
| **Percent Change** | -3.13%       | 0.46%             | 247.31%                | -4.60%               | 26.86%                    | 5.48%                       |       |
| 5-Year Sample    | -1004.52**    | 0.0079            | 0.0408***              | -0.0404*             | 0.0620***                 | 0.0566***                   | 5,313 |
|                  | (446.96)      | (0.0054)          | (0.0105)               | (0.0220)             | (0.0142)                  | (0.0142)                    |       |
| **Percent Change** | -5.24%       | 0.79%             | 396.12%                | -4.93%               | 164.46%                   | 107.81%                     |       |
| 7-Year Sample    | -919.12*      | -0.0084           | 0.0723***              | -0.0041              | 0.0411***                 | 0.0450***                   | 5,120 |
|                  | (549.82)      | (0.0127)          | (0.0148)               | (0.0235)             | (0.0158)                  | (0.0171)                    |       |
| **Percent Change** | -4.86%       | -0.84%            | 578.40%                | -0.49%               | 110.19%                   | 55.15%                      |       |
| **Panel B: Annual Doctor Visits** | |                   |                        |                      |                           |                             |       |
| 3-Year Sample    | -0.0951***    | 0.0447***         | 0.0356***              | 0.0148***            | 4,436                     |                             |       |
|                  | (0.0396)      | (0.0136)          | (0.0108)               | (0.0046)             |                           |                             |       |
| **Percent Change** | -30.65%      | 9.83%             | 22.10%                 | 20.00%               |                           |                             |       |
| 5-Year Sample    | -0.0977***    | 0.0582***         | 0.0284***              | 0.0110***            | 5,313                     |                             |       |
|                  | (0.0326)      | (0.0194)          | (0.0096)               | (0.0038)             |                           |                             |       |
| **Percent Change** | -26.14%      | 12.77%            | 23.73%                 | 21.65%               |                           |                             |       |
| 7-Year Sample    | -0.1143***    | 0.0732***         | 0.0297***              | 0.0113**             | 5,120                     |                             |       |
|                  | (0.0424)      | (0.0271)          | (0.0112)               | (0.0045)             |                           |                             |       |
| **Percent Change** | -28.84%      | 16.70%            | 24.05%                 | 26.90%               |                           |                             |       |

**Notes:** Robust standard errors, clustered by individuals, are shown in parentheses. All specifications include controls for marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview. * p < 0.10, ** p < 0.05, *** p < 0.01.
Table 10: Alternative DD Model (Mora and Reggio)

|                  | Annual Income | Employed | Weekly Work Hours | Used any health services | Paid for any health services | Work limited by health | Difficulty dealing w. financial situation | N     |
|------------------|---------------|----------|-------------------|--------------------------|-----------------------------|------------------------|------------------------------------------|-------|
| Panel A: All     |               |          |                   |                          |                             |                        |                                          |       |
| 3 Year Sample    | -1,314.51***  | -0.0469* | -2.23**           | 0.1362***                | 0.0717***                   | 0.0684***              | -0.0153                                  | 6,874 |
| Percent Change   | -9.69%        | -4.69%   | -6.56%            | 29.62%                   | 89.40%                      | 38.75%                 | -3.83%                                   |       |
| 5-Year Sample    | -1,030.49*    | -0.0432* | -2.14*            | 0.0863**                 | 0.0432                      | 0.0730***              | 0.0258                                   | 9,315 |
| Percent Change   | -6.23%        | -4.32%   | -5.99%            | 22.95%                   | 42.11%                      | 141.75%                | 8.51%                                    |       |
| 7-Year Sample    | -2,778.06***  | -0.0708**| -3.25**           | 0.1206***                | -0.0071                     | 0.0684                 | 0.1124***                                | 10,402|
| Percent Change   | -14.11%       | -7.08%   | -8.78%            | 29.26%                   | -6.97%                      | 73.63%                 | 60.69%                                   |       |

Notes: Robust standard errors, clustered by individuals, are shown in parentheses. All specifications include controls for marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview. * p < 0.10, ** p < 0.05, *** p < 0.01.
### Table 11: DD Effects on Income across Subgroups

| Panel | Subgroup | 3-Year | 5-Year | 7-Year |
|-------|----------|--------|--------|--------|
| **Panel A: Gender** | | | | |
| | Male | -1,907.62** | -1,616.09* | 4,267.13*** |
| | | (776.27) | (845.77) | (933.19) |
| | N | 3,592 | 4,831 | 5,527 |
| | Female | -1,451.80 | -884.93 | -1,042.25 |
| | | (966.26) | (571.07) | (638.91) |
| | N | 3,282 | 4,484 | 4,875 |
| **Panel B: Education** | | | | |
| | High Education | -1,861.14*** | -1,960.22*** | -3,231.90*** |
| | | (719.87) | (727.62) | (704.34) |
| | N | 4,469 | 6,356 | 7,389 |
| | Low Education | -600.78 | 68.09 | -1,800.59* |
| | | (1,291.23) | (739.74) | (1,064.16) |
| | N | 2,191 | 2,790 | 2,834 |
| **Panel C: Job Classification** | | | | |
| | Managerial/Professional Job | -1,806.78 | 501.02 | -1,978.78* |
| | | (1,319.10) | (1,156.78) | (1,013.00) |
| | N | 2,889 | 4,173 | 4,850 |
| | Skilled/Partly Skilled/Unskilled Job | -1,033.45* | -740.43 | -1,861.24*** |
| | | (591.01) | (489.85) | (707.19) |
| | N | 3,796 | 4,863 | 5,173 |
| **Panel D: Age** | | | | |
| | Below 40 Years | -1,094.92* | -1,248.13 | -2,549.78*** |
| | | (664.75) | (918.87) | (956.89) |
| | N | 3,444 | 4,218 | 5,465 |
| | At least 40 | -2,224.89** | -1,193.82* | -2,657.32*** |
| | | (1,104.74) | (664.89) | (887.86) |
| | N | 3,430 | 5,097 | 6,047 |

**Notes:** Robust standard errors, clustered by individuals, are shown in parentheses. All specifications include controls for marital status, household size, the number of children as well as a set of dummy variables for region, year and month of the interview. 
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. 

