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Essays on the Relationship between Income and Health

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Essays on the Relationship between Income and Health

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M.Sc., Emory University, 2015

B.A., Valdosta State University, 2011

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An abstract of

A dissertation submitted to the Faculty of the James T. Laney School of Graduate Studies of Emory University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics 2016

Abstract

Essays on the Relationship between Income and Health
By Otto Lenhart

This dissertation examines health effects of policy changes which alter individuals' income security. Besides investigating potential health effects of different types of policies, I am furthermore examining different policy settings since all three chapters cover look at a different country. The first two chapters examine the causal nature of the well-established positive association between income and health, also known as the income gradient in health. I approach this question by exploiting an expansion of the Earned Income Tax Credit (EITC) in the US as well as the implementation of a National Minimum Wage (NMW) in the UK as exogenous variations of income. Both chapters provide evidence for significant health benefits of additional income for low-earning individuals, suggesting that a causal link between income and health exists. Furthermore, both studies provide evidence for potential mechanisms by showing that factors such as health insurance, food and leisure expenditures, health-related behavior and financial stress can explain the positive link between income and health. The third chapter contributes to earlier literature on the relationship between economic conditions and health outcomes. The study investigates health effects of the German Reunification of 1990, which confronted individuals with a large economic shock. I find that these negative economic events led to significant health declines, with the effects being stronger for unemployed and low-income individuals as well as for people in East Germany. I find that exercise frequency, economic uncertainty and overall stress are potential channel through which economic shocks can affect the health of individuals.

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Table of Contents

List of Tables

List of Figures

Preface

This dissertation contains of three chapters, which examine health effects of policies that influence individuals' income security for low-income individuals. The studies add to two main questions in the fields of health economics and labor economics: 1) Does income cause better health outcomes? 2) How is health affected by variations in the economy?

Despite thorough investigation, previous literature has not conclusively whether the well-established positive association between income and health, also known as the income gradient in health, is the result of a causal link from income to health. In order to make policy recommendations, it is necessary to know whether increasing income of vulnerable parts of the populations provides direct health benefits or whether the previously observed gradient is simply driven by third factors, which are correlated to higher income and better health outcomes. Such factors include living environment, access to quality health care, health knowledge, health behaviors and genetics.

I test the causal nature of the relationship between by using an expansion in the Earned Income Tax Credit (EITC) in the US and the implementation of a National Minimum Wage (NMW) in the UK as exogenous variations of income to test for potential health effects. Both studies find that an increase in available income significantly improves health outcomes of low-income individuals providing suggestive evidence that income causes better health outcomes. Additionally, I examine potential mechanisms through which income can influence the health of affected individuals. The studies find that health insurance, food and leisure expenditures, health-related behavior

as well as financial stress are channels which can explain the positive link between income and health.

The third chapter of this dissertation examines how large economics shocks affect individual health outcomes. Previous work has not established a consensus on whether recessions are associated with improvements or declines in health. One reason for these mixed findings in the literature is that studies have looked at periods of relatively small economic variations. In my study, I examine health effects as a result of the dramatic economic changes that followed the German Reunification of 1990, which included a sudden change from a socialist to a capitalist system in East Germany as well as other changes. The study provides evidence that economic shocks lead to significant declines in several measures of health. Additionally, I show that effects are stronger for unemployed and low-income individuals as well as for East Germans, who were confronted with larger economic fluctuations. When examining potential mechanisms, I find that exercise frequency, economic uncertainty and overall stress can explain the observed declines in health.

Overall, the findings in this dissertation provide evidence that income assistance programs are a policy tool that is not only able to reduce existing inequalities in earnings but also affect inequalities in health. The findings about health improvements as a result of an expansion in the EITC as we as higher minimum wages emphasize that it is crucial for policymakers to also consider the effects of similar policies on non-monetary outcomes in order to obtain a better understanding for how certain regulations affect the overall welfare of society.

1 Chapter One

The Effect of EITC Expansion on Health:

A Different Approach to the Income Gradient in Health

Abstract:

This study investigates the validity of previous findings illustrating a positive relationship between income and health. This paper differs from previous studies in three ways. First, it directly accounts for potential income endogeneity by exploiting an expansion of the Earned Income Tax Credit (EITC) as exogenous income variations. Second, this study offers a more accurate identification of affected individuals by obtaining simulated EITC benefits. I examine a number of different model specifications, including fixed effects model which can remove potential concerns about the sample composition in cross-sectional models. Across all specifications, the study finds that the policy change positively impacts health status of affected individuals. Third, this study provides evidence that insurance coverage and food expenditures are potential mechanisms underlying the relationship between income and health.

Keywords: Income Gradient; Health; Earned Income Tax Credit; Mechanisms

JEL Classifications: I12, I14, I38, J38

1.1 Introduction:

The existence of a significant positive association between income and health, also known as the income gradient in health, has been well documented in the literature (Case et al., 2002; Deaton, 2002). Despite several contributions over the past decade in a number of fields — all of which have found robust correlations using data from different countries — it is still not entirely clear whether such a positive association is the result of a causal relationship between income and health. There are good reasons to believe that a causal effect between income and health exists. Higher income families may have better access to care as well as more opportunities to purchase care; whereas people with lower income may be confronted with more stressful situations, which are detrimental to health. This study tests whether the well-established health gradient exists once the endogeneity of income is accounted for by using expansions in the Earned Income Tax Credit (EITC) in the mid-1990s as an exogenous income variation.

By using data from the Panel Data of Income Dynamics (PSID) for the years 1990-2003, as well as double- and triple-difference models, this study exploits the expansion of the EITC, which was part of the Omnibus Reconciliation Act (OBRA) of 1993, to test for the relationship between the income and health outcomes of heads of households. This approach can eliminate or significantly reduce the omitted variable bias due to shocks correlated with income and give estimates for the average treatment effect of receiving a boost in income on health. Findings for the relationship between income and health in this setting advance previous work on the gradient and provide evidence for a causal effect of income on health. The later part of the study furthermore tests for the

role of health insurance and food expenditures as potential mechanisms underlying the link between income and health.

Three recent studies on the EITC have examine whether the program is able to improve health outcomes of infants (Hoynes et al., 2015), mothers (Evans and Garthwaite, 2014), and low-income adults (Larrimore, 2011). This study differs from these papers in four ways. First, I use a tax simulator program to obtain predicted EITC payments and to narrow the analysis down to individuals who are eligible to receive EITC benefits, whereas previous studies have examined samples of low-educated individuals. Thus, my sample selection approach allows me to provide an estimate for treatment effects on the treated rather than for intent-to-treat estimates. Second, by examining DD models, I furthermore estimate additional specifications such as DDD models to account for the fact that other events at the time could impact health outcomes of individuals in the sample as well as semiparamateric DD and IV models and a falsification test. Third, this study contributes to the work of Hoynes et al. (2015) by examining potential mechanisms through which the EITC can affect health outcomes. Fourth, by using the longitudinal nature of the data, this paper estimates several fixed effects specification, which are able to remove concerns about changes in the sample composition and distinguishes itself from previous work.

This study finds that higher EITC payments lead to improvements in self-reported health status. The positive health effects are robust to variations in both sample selection and methodology and become larger when the policy change is allowed to have an adjustment period after its implementation. Furthermore, this paper provides evidence

that higher take-up rates of insurance and increases in food expenditures are mechanisms underlying the relationship between income and health.

1.2 Previous Literature:

A number of previous studies have investigated the relationship between household income and self-reported health status. Case et al. (2002) set the groundwork for this area of research by finding a significant positive relationship between family income and health of children younger than seventeen years of age in the United States. Applying similar setups as Case et al. (2002), many studies have since then investigated the existence of an income/health gradient in Canada (Currie and Stabile, 2003), England (Adda et al., 2009; Currie et al., 2007; Propper et al., 2007), Australia (Khanam et al., 2009), and Germany (Reinhold and Jürges, 2012). As a result of the findings in these studies, the existence of the income gradient in health became widely acknowledged.

A small number of studies have so far addressed this issue by exploiting exogenous variations of income. Kuehnle (2014) uses changes in local unemployment rates as an instrument for income while examining the gradient in child health in the United Kingdom. Lindahl (2005) finds evidence for a causal link between income and health by analyzing health effects of winning the lottery, whereas no information on the timing of lottery winnings is available. Frijters et al. (2005) uses income transfers to individuals living in East Germany following the German Reunification in order to test for the causal impact of income on health. Overall, these papers find at most small evidence for the presence of a causal link between income and health.

The majority of previous work on the EITC has focused on the effects on economic outcomes. Researchers have investigated the role of the program on poverty (Scholz, 1994; Neumark and Wascher, 2001; Meyer, 2010), labor force participation (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001; Hotz and Scholz, 2003; Eissa et al. 2008) as well as other outcomes such as on educational attainments (Miller and Zhang, 2009), test scores (Dahl and Lochner, 2012), marriage (Ellwood, 2000; Dickert-Conlin and Houser, 2002) and fertility (Baughman and Dickert-Conlin, 2009). The existing literature has been established that changes in the EITC are a successful tool in lifting families above the poverty threshold. Not until very recently have researchers started examining the potential effects of the program on health outcomes. Expansions of the EITC have been shown to positively impact birth weight (Hoynes et al., 2015) and health (Evans and Garthwaite, 2014; Larrimore, 2011), while furthermore reducing smoking of affected mothers (Averett and Wang, 2013).

1.3 Background:

1.3.1. *The Earned Income Tax Credit*:

The Earned Income Tax Credit (EITC) provides a refundable transfer to lower-income working families through the tax system. First enacted in 1975 as a relatively small credit capped at $400 per family to offset the growth of payroll tax payments by families with children, the program was supposed to act as a work bonus as well as a response to the 1974 recession. The implementation of the program was the outcome of vital policy discussions regarding the Negative Income Tax (NIT) as a means of reducing poverty. As a result of intense debates, the EITC was introduced in an attempt to reward work rather than to provide guaranteed income, while aiming at moving families beyond

the poverty line. Since the original implementation, Congress has expanded the EITC several times both in terms of benefit size and eligibility requirements. The Omnibus Reconciliation Act (OBRA) of 1993, signed by President Clinton, delivered one of the most significant changes to the tax credit. The reform significantly increased differences in benefits given to eligible families with two or more children younger than nineteen years of age in the household and those with only one child. As soon as the changes of the 1993 reform were fully put in place in 1996, maximum benefits for families with two or more children more than doubled, whereas payments for families with one eligible child only slightly increased.

Today, the EITC has become the largest cash transfer program as well as the most important anti-poverty policy in the United States. In 2010, over 26 million families received the credit, totaling $58.6 billion in foregone revenue. In comparison, federal expenditures on Temporary Assistance to Needy Families (TANF), previously the largest cash transfer program in the United States, amounted to only $15.2 billion (U.S. Department of Health and Human Services, 2012). In addition to the federal EITC program, many states have introduced state credits that further enhance benefits given to lower-income working families.[1] The fact that the subsidy rate for families with more than two children increased as part of the American Recovery and Reinvestment Act, which was passed in February 2009, furthermore emphasizes the current relevance of the tax program as a tool of public policy.

[1] Before the policy changes of OBRA 1993 were implemented, seven states had introduced state-level EITC payments and ten additional states adopted it until the end of the period of interest of this study in 2003. Today, twenty-five states have EITC credits at the state level in place, which further highlights the increasing importance of the program.

In addition to the augmented importance of the program over the last decades, another reason for why the EITC has attracted much interest by researchers is its unique payment structure, which significantly differs from other welfare programs. The size of benefits received by eligible families depends on several factors, such as the presence and number of qualifying children in the household.[2] Depending on the amount of a family's earnings and adjusted gross income, EITC payments have: 1) A phase-in range in which higher earnings yield higher credits; 2) A plateau phase in which payments remain the same even as earnings rises; and 3) A phase-out range in which higher earnings yield lower credits. Permanently disabled individuals of any age as well as full-time students up to age 24 can furthermore qualify as a filer for the EITC. As a result of several expansions to the program, the plateau phase expanded from $5,000-6,000 in 1984 to around $10,000-13,000 in 2003. In 2003, families with household incomes of around $29,000 (one child) and $36,000 (two or more children) are eligible to receive the EITC benefits.

1.3.2. *Other Welfare Reforms during the 1990s*:

The late 1990s witnessed significant changes in welfare policies due to the implementation of the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA). The main goal of the reforms was to make low-income families independent of welfare benefits and to provide states with flexibility in determining eligibility criteria and benefit levels. Previous literature has established that the policy changes significantly affected the lives of lower-income families who were dependent on welfare assistance at the time (Schoeni and Blank, 2000). However, there is no evidence

[2] Please see Hotz and Scholz (2003) for a detailed overview of the eligibility restrictions to the EITC.

that the welfare reforms impacted the health outcomes of affected individuals (Bitler et al., 2005). Given the framework of the study, other welfare changes that occurred in the 1990s offer a threat to the identification of the impact of the EITC on health outcomes if the other welfare changes differentially affected low-income families with two or more children compared to families compared to families with only one child.

One advantage of the timing of the EITC expansion examined in this study is that it was implemented one year before the first welfare reforms were passed, which allows me to separate the effects of the policy changes. In order to account for other economic changes and policy alterations that occurred during the period of this study, specifications that additionally control for a set of state characteristics and welfare policy variables. These controls include average annual state unemployment rates, state-level AFDC eligibility requirements (for a family of three), the presence and timing of AFDC waivers and time limits on receiving welfare, and the type of sanctions as well as indicators of whether the state expanded Medicaid coverage and implemented state-level EITC benefits. Since state dummy variables can only deal with the state-level heterogeneity that is time-invariant, the inclusion of these additional characteristics can account for statewide variations in welfare reforms.

1.4 Data:

1.4.1: *Panel Study of Income Dynamics (PSID)*

The main part of this study uses data from the Panel Study of Income Dynamics (PSID), a nationally-representative longitudinal sample of households and families interviewed annually since 1968 and biannually since 1997. The PSID, the longest running U.S. panel, was specifically designed to track income dynamics over time. The

survey over-samples low-income families, which is advantageous for this analysis since these households are more likely to be affected by policy changes to the EITC. Due to its detailed information on earnings, the PSID is well-suited for calculating simulated EITC benefits through the tax simulator program NBER TAXSIM (version 9; for more information see Feenberg and Coutts, 1993). Furthermore, by using state identifiers provided in the PSID, I am able to simulate both state-level and federal EITC benefits.[3]

In order to obtain estimates for the effect of the policy expansion, I limit the sample to heads of households with at least one child who, based on the TAXSIM simulations, are eligible to receive EITC benefits in the year of the interview.[4] Consistent with findings in the literature showing that 80 to 87 percent of eligible households indeed receive the credit (IRS, 2002; Scholz, 1994), this study assumes full take-up rates (Dahl and Lochner, 2012). Individuals with missing income information (5.4 percent of the sample) are dropped from the analysis since the use of imputed values could cause a substantial measurement error and attenuate the estimates. Heads of households with missing information on their health status are removed from the analysis as well, whereas the sample is restricted to individuals less than sixty-five years of age. This provides the analysis with a sample of 15,189 heads of households for the years 1990-2003.[5]

The main dependent variable is self-reported health status of the heads of households, which is categorized on a scale from 1 (excellent) to 5 (poor). This health

[3] The EITC values are calculated based on a family's earnings in the previous year and federal and state EITC laws for the number of eligible children. Details are available upon request.
[4] The simulated EITC benefits obtained through the simulation program are based on up to 22 categories, including previous years' income and other types of earnings. For more information, please see Feenberg and Coutts (1993).
[5] Given that the PSID is conducted only biannually starting in 1997, the main analysis of the study includes 11 years of data.

measure has been widely used in previous studies regarding the relationship between income and health (e.g. Case et al., 2002; Currie and Stabile, 2003; Adda et al., 2009) and has furthermore been shown to be a good predictor of other health outcomes, including mortality (Idler and Benyamini, 1997). Additionally, I test for changes in the presence of health limitation following the EITC expansion. A potential disadvantage of using self-reported health data would occur due to the presence of reporting heterogeneity (Johnston et al., 2009). Given that self-reported health status is the left-hand variable in this study, this should however only lead to a classical measurement error in this study.

When testing for the role of food expenditures as a channel underlying the relationship between income and health, the dependent variables are the amounts of money that a household spends on food eaten at home as well as on meal eaten out per week.[6] Despite the fact that the spending more money on food does not guarantee that individuals buy groceries with higher quality, I believe that changes in the quantity of food can be viewed as a proxy for food quality. Consistent with this, a study by McGranahan and Schanzenbach (2013) provides evidence that EITC receipt increases spending on relatively healthy groceries while lowering expenditures on processed fruit and vegetables.

1.4.2 *Current Population Survey (CPS):*

Besides examining the role of food expenditures, this study also tests for the role of health insurance coverage as a potential mechanism underlying the relationship between income and health. For this analysis, I use data from the annual March Population Survey (March CPS), which includes a variable for the amount of EITC that

[6] The PSID provides data for these outcomes between 1994 and 1999, whereas survey questions do not include meals eaten at work or at school.

each household is eligible to receive in the year of the interview.[7] In comparison to the PSID, the March CPS provides a larger sample of individuals who are eligible for EITC benefits giving the analysis a sample of 58,196 observations.

Using March CPS data in order to test for the role of insurance is beneficial since it provides extensive information on the health insurance coverage. More specifically, I test for the effect of the expansion of the EITC on different types of insurance (private, public, Medicaid/SCHIP). This allows me to not only examine whether affected individuals are more likely to have any coverage but also whether individuals switch between different types of plans following the policy change. Since health insurance information is only available from 1992 and onwards in the CPS, the time period of interest is reduced to the years 1992 to 2000.

1.4.3 *Descriptive Statistics:*

Figure 1.1 presents graphical motivation for using the EITC expansion through OBRA 1993 to examine the causal link between income and health. The picture shows the amount of EITC which eligible families in the sample receive, with the sample being split into two groups: families with one child and those with two or more children. It is noticeable that the size of the benefits is very similar for both groups prior to the implementation of the expansion in 1996. However, after the policy change, families with two or more children are receiving substantially higher payment than those with one

[7] These values are obtained from the Census Bureau's tax model, which simulates individual tax returns in order to produce estimates of federal, state, and payroll tax amounts by incorporating information from non-CPS sources such as the Internal Revenue Service's Statistics of Income series, the American Housing Survey, and the State Tax Handbook. I compared these simulated EITC amounts with those obtained from the TAXSIM simulation program used for the PSID data and find that both programs provide very similar simulated results.

child. By 1999, the difference between the two groups is about $900 and it remains very similar for the remaining years.[8]

Summary statistics for the two groups are presented in Table 1.1. Consistent with Figure 1.1, it is noticeable that average EITC payments to one-child households increased significantly for eligible families with two or more children compared to those with only one child. The average difference in benefits rose from $40 during the years 1990-1995 to $722 for the years after the law changed. This effect of the policy on EITC benefits is significantly higher than the gap of $320 reported by Averett and Wang (2013). I believe that this discrepancy stems from the fact obtaining simulated EITC benefits provides a more accurate identification of affected individuals than solely relying on education as the criteria for EITC eligibility.

The descriptive statistics in Table 1.1 additionally indicate that a large share of credit-eligible households is composed of unmarried and black individuals, whereas relatively more heads of households with two eligible children are married. The bottom of Table 1.1 shows health statistics for the two groups. It is observable that the share of heads of households with at least two children who report to be in excellent or very good health increases by 4.7 percentage points after the policy change, whereas it only increases by 1.7 percentage points for those with one child. This change is furthermore displayed in Figure 1.2, which shows that individuals with one child seem to be more likely to be in excellent health in the early 1990s, whereas both groups experience identical trends in health status during the three years before the implementation of the

[8] The picture looks identical for the March CPS data, which is used to check for the role of health insurance. This picture is not shown in the paper but is available upon request.

law. After 1998, heads of households with two or more children are more likely to report either excellent or very good health. The fact that there are three years of expanded benefits before differences in health status become distinct suggests that the effects of income on health takes some time before having observable impacts.

1.5 Econometric Models:

1.5.1 *Main Models*:

The study exploits the expansions of the EITC through OBRA 1993 in order to test for a causal relationship between income and health outcomes. The structure of the policy changes offers the opportunity for a difference-in-differences (DD) framework to observe the average treatment effects for the treated. The baseline DD equation for the study is the following:

$$Y_{it} = \beta_0 + \beta_1 POST_{it} + \beta_2 2KIDS_{it} + \beta_3 X_{it} + \delta_{DD} POST_{it} * 2KIDS_{it} + \lambda_1 State + \lambda_2 Year_t + \varepsilon_{it}, \quad (1)$$

where Y_{it} is an indicator that equals one if the EITC-eligible respondent reports to be in either excellent or very good health; $POST_{it}$ is an indicator for the time period either before or after 1996; and $2KIDS_{it}$ equals to one if there is more than one eligible child in the household.[9] X_{it} represents a set of baseline covariates that include controls for age, gender, race, and marital status of the head of household. δ_{DD} is the main parameter of interest, which captures the effect of the EITC expansion on the health status. The set of state dummy variables (λ_1 State) accounts for differences in health patterns across states. I use linear probability methods to estimate the main specifications shown in this section.

[9] The EITC expansions through OBRA 1993 were slowly phased in over the tax years 1994 and 1995. As mentioned by Evans and Garthwaite (2014), a potential misclassification of individuals who are treated in the pre-treatment period should bias the observed estimates in this study against finding any health impacts. For additional robustness, I find that the results remain unchanged when allowing the post-treatment period to start in 1995.

Since it seems reasonable that it might take some time before health outcomes are affected through an increase in income, I furthermore examine specifications with multiple time periods that allow the policy change to have an adjustment period of one and three years.

Like any DD model, the estimation of equation (1) makes the key assumption that trends in health outcomes over time are similar across both the treatment and control groups, implying that trends in the control group provide a good estimate of the counterfactual outcome for the treatment group in the absence of the policy change. Despite the fact that there appears to be no obvious reason to expect that this assumption is not satisfied in the given framework, a violation would lead to a bias of δ_{DD}. One way to reduce this potential bias is to additionally explore a difference-in-difference-in-differences (DDD) framework. Similar to Averett and Wang (2013), who include highly-educated mothers as an additional comparison group, I include households with children who are not eligible to receive EITC benefits based on the tax simulations. The estimated equation in the DDD model is presented in equation (2):

$$Y_{it} = \beta_0 + \beta_1 POST_{it} + \beta_2 2KIDS_{it} + \beta_3 ELIG_{it} + \beta_4 POST_{it}*2KIDS_{it} + \beta_5 POST_{it}*ELIG_{it} + \beta_6 ELIG_{it}*2KIDS_{it} + \beta_7 X_{it} + \delta_{DDD} POST_{it}*ELIG_{it}*2KIDS_{it} + \lambda_1 State + \lambda_2 Year_t + \varepsilon_{it}, \quad (2)$$

where $ELIG_{it}$ is an indicator for whether a family is eligible to receive any EITC benefits during the year of the survey. δ_{DDD} is now the parameter of interest, whereas the other variables remain the same as in equation (1).

To provide further evidence that the estimated treatment effects are indeed capturing the impact of income on health, this study follows the approach by Averett and Wang (2013) by conducting a falsification test that compares the health outcomes of heads of households that are equally affected by the policy change. More specifically, individuals with three or more children form the treatment group, whereas those with exactly two children are used as the control group. Given that the EITC expansions do not affect families with two and three or more children differently, I expect to find no health differences for these groups. Besides comparing the health outcomes of two different groups (2 children vs. 3+ children), the remainder of the analysis stays the same as in equation (1):

$$Y_{it} = \beta_0 + \beta_1 POST_{it} + \beta_2\, 3KIDS_{it} + \beta_3 X_{it} + \delta_{DD} POST_{it} * 3KIDS_{it} + \lambda_1 State + \lambda_2 Year_t + \varepsilon_{it.} \quad (3)$$

1.5.2 *Potential Changes in Sample Composition*:

A potential concern with the analysis arises if heads of household in the treatment group are different before and after the policy expansion. For example, if higher income people are not eligible for EITC benefits in the pre-period and eligible in the post-period, this could affect the estimates since higher income individuals are likely to be in better health. The descriptive statistics presented in Table 1.1 provide suggestive evidence that people forming the treatment and control groups remain similar based on observable characteristics. Family income is almost identical in the pre-period, whereas eligible households with two or more children have $832.69 higher total income compared to those with one child. This difference corresponds to the gap in EITC benefits received by members from the two groups, which suggests that the observed income variations are a result of the policy change.

Figures 1.3(a) and 1.3(b) present the propensity scores for the pre- and post-policy period, which indicate the likelihood with which individuals fall into the treatment group based on observable characteristics. The pictures show evidence for the presence of a common support for the two groups in both periods, which suggests that the composition of the sample remains similar throughout the period of the study.[10] In case of selection into the treatment group being present in the form of healthier people eligible for EITC benefits entering the workforce after the reform, the estimates would be biased downward and should therefore be viewed as a lower boundary for the effects of the policy on health. In the later part of the paper, I furthermore present results obtained by using the longitudinal nature of the nature, which allows removing concerns about changes in the composition of the sample following the EITC expansion.

1.5.3 *Additional Specifications*:

This section introduces three additional models which I estimate to test whether the main results are robust to other model specifications. First, I estimate a semiparametric DD model, which was introduced by Abadie (2005) and which relaxes the assumption of a linear relationship between income and health. The method captures average treatment effects for the treated group (ATT) for the case that differences in observed characteristics create non-parallel outcome dynamics between the two observed groups, which violates the main assumption of standard DD models. The ATT is given by the following equation:

[10] Propensity scores are obtained using probit estimation. The distribution of propensity scores for the two groups remains unchanged when applying the two other commonly implemented estimation techniques for propensity scores, logit, and complimentary log-log estimation.

$$E\left[Y^1(1) - Y^0(1) \mid D = 1\right] = E\left[\frac{P(D = 1 \mid X)}{P(D = 1)} * \varphi_o * Y\right], \quad (4)$$

where Y(1) and Y(0) represent health outcomes before and after the treatment, D is an indicator for belonging to the treatment group, P(D=1) gives the probability of receiving treatment, and P(D=1 | X) is the propensity score that equals the probability of treatment, conditional on the observed covariates X. φ_0 is obtained from the following equation:

$$\varphi_0 = \frac{T-\gamma}{\gamma*(1-\gamma)} * \frac{D-P(D=1 \mid X)}{P(D=1 \mid X) * P(D=0 \mid X)},$$

where T is a time indicator that equals one if the observation belongs to the post-treatment period and γ reflects the proportion of observations sampled in the post-treatment period. The semiparametric estimator is obtained through two steps: 1) Estimation of the propensity score and computation of fitted values for the sample; and 2) Plugging in the obtained fitted values into the sample analogue of equation (4) obtains an average treatment effect for the treated.

Next, I estimate Instrumental Variable (IV) models to provide further evidence for a causal link from income to health by using the policy change as an instrument for family income. The expansion of the EITC is a valid instrument if it is not correlated with unobserved determinants of health status but correlated with income. As pointed out by Larrimore (2011), the primary motivations of the EITC changes can help verify one requirement of IV estimation which states that the instrument is correlated with the endogenous variable. As previously mentioned, the main goal of policymakers was to get rid of guaranteed income to move families beyond the poverty line, whereas the

health of low-income individuals has traditionally not been a motivation for changing EITC benefits (Larrimore, 2011).

Finally, I estimate an alternative DD model which was introduced by Mora and Reggio (2012). The specification identifies the effect of the policy using a fully-flexible dynamic specification as well as a number of "parallel growth" assumptions. Mora and Reggio (2012) point out that it is often overlooked that the identification of treatment effects does not depend solely on the parallel trends assumption, but also on the trend modeling strategy applied by researchers. To obtain this alternative estimator, standard least squares estimation of the fully flexible model is conducted in the first step, whereas the solution of the equation in differences identifies the estimates in the second step.

1.6 Results:

1.6.1 *DD Estimation*:

Table 1.2 reports the DD estimates of the impact of receiving additional income through the EITC expansion on the health outcomes of heads of households. The main dependent variable is a binary indicator that equals 1 if an individual reports to be in either excellent or very good health. Being eligible for the increased benefits raises the likelihood of being in the top two health categories by 3.75 percentage points in comparison to eligible households with one child, with the treatment effect being statistically significant at the 5 percent level. This effect corresponds to a 7.98% change from the pre-treatment period and is larger than the estimates obtained by Evans and Garthwaite (2014), who report a 2.04 percentage point effect when examining a sample of lower-level educated mothers.

Column (1) is the preferred estimator of the study. When additionally accounting for state-specific controls in specification (2), it is observable that the effect remains unchanged, which supports the claim that the health effects are not spuriously driven by the other safety net laws passed during the 1990s. As suggested by Figure 1.2, the effect of receiving a financial boost on health status becomes substantially larger once the DD model allows the EITC expansion to have an adjustment period shortly after its implementation. This seems reasonable since it might take some time for the extra income to actually have an impact on health outcomes. Columns (3) and (4) show large increases in the DD estimate to 4.74 and 6.16 percentage points when adjustment periods of one and three years are considered, respectively; whereas the estimate in the final specification is statistically significant at the 1 percent level. These results provide suggestive evidence for significant medium- to long-term health impacts when additional income is provided to vulnerable parts of the population.

When examining whether the EITC expansion impacts the likelihood with which individuals suffer from health-limiting conditions, Table 1.2 reports statistically insignificant evidence that the EITC expansion reduced the presence of health limitations, whereas the observed percentage changes in the effects of the policy are of similar magnitude than the effects for health status. Possible explanations for the relatively small findings are that only 13.7 percent of individuals in the sample report to have any health limitations and that it might take longer before changes are observable. Also, previous work on the gradient provides evidence that lack of awareness can underestimate true income-related health inequalities when looking at self-reported health conditions (Johnston et al., 2009).

1.6.2 *DDD Estimation*:

The previous estimates remain unbiased if similar health trends would have occurred for individuals in both the treatment and control groups in the absence of the policy change. Figure 1.2 provides suggestive evidence supporting this assumption by showing that trends in health status were almost identical for the two groups during the three years before the policy implementation (1993-1995). In order to further take into account potentially different health trends between households with two or more children and those with one child, this section examines the results obtained by Difference-in-Difference-in-Differences (DDD) models. When adding a comparison group of heads of households with children who are ineligible for the EITC, the sample size increases to 221,735 observations.

Estimates for the impact of the policy change on health when controlling for health trends between the two groups are presented in Table 1.3 The baseline result in specification (1) indicates that EITC expansion increased the likelihood of affected heads of households reporting either excellent or very good health by 3.32 percentage points, which corresponds to a 7.06 percent change from the pre-policy period. Again, the treatment effects increase when allowing the policy change to adjust for some time (columns 3 and 4).

1.6.3 *Alternative Models:*

Table 1.4 presents estimates from additional estimation models, as described in section 6. The first two columns present results obtained from a semiparametric DD model (Abadie, 2005). The semiparametric findings provide further evidence for the fact

that increases in income lead to significant health benefits. The results are larger in magnitude compared to the main findings and are statistically significant at the 1 percent level. The policy change is shown to increase the likelihood of reporting excellent or very good health by 11.54 percentage points for affected heads of household, suggesting that the result remains consistent when relaxing the assumption of a linear relationship between income and health.

Columns (3) and (4) show estimates obtained by IV specifications, whereas the results represent the effects of an increase in family income by $1,000. It is noticeable that the observed treatment effects are consistent with the DD findings indicating significant health improvements after as a result of increases in family income. The baseline estimate in column (3) suggests that an additional $1,000 increases the probability of being in the top two health categories by 3.04 percentage points. Again, the results become larger once the policy change has an adjustment period. The IV findings provide additional robustness to the main results and further confirm the presence of a causal link from income to health. The first-stage result indicates the reform increased incomes of treated households by $1,277.29, whereas the F-Statistic of 24.9 suggests that the EITC expansion offers a suitable instrument for income.

Finally, columns (5) and (6) provide additional DD results using the alternative specifications introduced by Mora and Reggio (2012), which allows testing for the validity of standard DD assumptions and thus provides a check for the robustness of the baseline estimates. The last two columns of Table 1.4 show that that the results obtained from applying this alternative DD strategy are consistent with those shown in Table 1.2.

Overall, Table 1.4 provides further evidence that the findings of a causal link between income and health are robust to a number of different model specifications.

1.7 Mechanisms:

After having previously established the presence of positive health impacts as a result of the expansion in the EITC, this section examines potential channels explaining the positive link from income to health. The two mechanisms that are investigated are changes in insurance coverage and weekly food expenditures. The mechanisms are chosen due to the availability in the data. However, it appears reasonable to assume that both these channels are likely to play a role underlying the link between income and health outcomes.

1.7.1 *Health Insurance*:

Previous work has established that health insurance coverage is capable of improving the health outcomes of lower-income families (Levy and Meltzer, 2008). Similar to Hoynes et al. (2015), this section examines whether the EITC expansion increased the health insurance coverage of financially-affected households. More specifically, the March CPS data allows me to examine whether a switch from public to private health insurance is observable. The dependent variables for the four separate specifications are indicators of whether a household is covered by: 1) Any insurance; 2) Private insurance; 3) Public insurance; or 4) Medicaid/SCHIP.[11]

[11] The category Medicaid/SCHIP includes all types of public insurance coverages from category 3) excluding Medicare and military insurance. Due to the magnitude of welfare reforms that were implemented during the late 1990s, all models include controls for state-specific characteristics, which include average annual state unemployment rates, state-level AFDC eligibility requirements (for a family of three), the presence and timing of AFDC waivers and time limits on receiving welfare, the type of sanctions as well as whether the state expanded Medicaid coverage and implemented state-level EITC benefits.

Table 1.5 presents the estimates for the impact of the EITC expansion on the health insurance coverage using a number of different estimation models. The baseline DD model shows that treated households are 1.75 percentage points more likely to have any type of insurance than those in the control group following the law change, with the estimate being statistically significant at the 5% level. Columns (2) and (3) provide evidence for switching behavior from public to private insurance coverage following the policy change. Given the assumption that private coverage provides better services than public insurance, this finding could be regarded as an explanation for the positive health impacts of the EITC expansion. These results are consistent with findings by Hoynes et al. (2015) who provide evidence for a switching for public to private coverage as a result of the EITC expansion for mothers with at most a high school degree for the year 1992 to 1998.

Furthermore, Table 1.5 presents estimates for the effect of EITC expansion on health insurance from two DDD models: one that includes all credit-ineligible households with children, while the other only considers ineligible households with a total annual income of less than $50,000. The reason for this additional distinction is the fact that families with an income of more than $50,000 are less financially constrained and are therefore more likely to purchase insurance. It is noticeable that the DDD estimates from both specifications are consistent with the baseline DD results providing additional evidence for the fact that health insurance is a channel underlying the link between income and health.

Finally, Table 1.5 provides results a falsification test, which compares changes in health insurance between two groups that were equally affected by the program

expansion: eligible households with two and three or more children. The results indicate that health insurance coverage of these two groups was not affected differentially as a result of the policy change. This finding backs up the previous estimates which indicate that health insurance changes are a direct result of the increases in EITC benefits to heads of households with two or more children.

One disadvantage of the analysis is that the CPS data only began providing information on whether respondents purchased their own insurance coverage or whether it is sponsored by their employers starting in 1996, which could strengthens the case that health insurance is a mechanism for the link between income and health. Nevertheless, previous work has shown that income affects the likelihood with which workers are covered by employer-sponsored insurance. Cutler (2003) shows that the costs for enrolling in employer-provided insurance plans are $350 for an individual and $1,500 for a family during the late 1990s, which is twice as much as the cost in the late 1980s. Furthermore, the paper shows that these costs were the main reason for why workers did not take up offered insurance plans.

1.7.2 *Food Expenditures:*

Another potential mechanism that could explain the existence of a positive relationship between income and health is the intake of better nutrition following increased earnings. Previous work on the EITC shows that receiving benefits positively affects spending on relatively healthy food items like fresh fruit, vegetables, meat, poultry, and dairy products, while lowering spending on processed fruit and vegetables (McGranahan and Schanzenbach, 2013). In order to test for the role of food expenditures, I test for whether the expansion altered the amount of money households spent on food

that is eaten at home as well as on food eaten outside the home per week. Due to the fact that the PSID introduced questions regarding food expenditures in 1994, I examine the years 1994-1999 in this analysis. Despite the fact that the data does not provide information on the quality of food being purchased, I believe that the total amount of money spent on food can show suggestive evidence for the role of nutrition.

Table 1.6 presents DD and DDD estimates as well as results from a falsification test on three different outcomes: 1) Whether the household spends at least $50 on food eaten at home; 2) whether the household spends at least $75 on food eaten at home; 3) whether the household spends at least $50 on food eaten out. It is noticeable that treated households significantly more increase their food expenditures on food eaten at home and away from home following the EITC expansion. Given the magnitude and the level of significance of the findings, the results suggest that food expenditures could also serve as a channel which can explain the relationship between income and health.

The results in this section provide evidence for the role of health insurance coverage and food expenditures in explaining the income gradient in health. However, it should be considered that these two factors are by no means the only two potential mechanisms. Other aspects, such as health behaviors and financial stress, are likely to also impact the link between income and health and should be examined in future work. The availability of data regarding the quality of food consumed could furthermore strengthen the evidence suggesting that nutrition explains parts of the improved health outcomes.

1.8 Robustness Checks:

In order to further test for the validity of the main results of the study, several robustness checks are presented in this section. In Table 1.7, I take advantage of the

longitudinal nature of the PSID and estimate model with individuals fixed effects. In the main part of the paper, I use the data as cross sections given that respondents typically do not remain eligible for the EITC for many consecutive years which leads to a drastic reduction of the sample size. Testing whether fixed effect models provide consistent results as the baseline models can further remove concerns about the fact that changes in the composition of the sample are potentially driving the findings of improved health. Panel A of Table 1.7 considers individuals who are eligible to receive EITC benefits throughout the sample, whereas Panel B includes all individuals who were eligible to receive EITC payments at least three in both the pre- and post-treatment period. It is observable that the results are consistent with the main findings of the paper indicating that the policy significantly improved health status, while also increasing food individuals for treated individuals.

Table 1.8 presents three additional robustness checks for the effects of the expansion on health status. First, I conduct a falsification test that compares changes in health status between the two groups that are equally affected by the expansion. Eligible heads of households with at least three children form the treatment group, whereas the control group consists of eligible heads of households with two children.[12] Figure 1.4 justifies the validity of this falsification test by confirming that EITC credits evolved identically for both groups throughout the period of study. Consistent with the claim that the previously observed health improvements are a result of increases in income, the falsification test finds no differential health effects for the two groups.

[12] Differences in EITC benefits between eligible households with two and more than three children were introduced in later years, not during the period of this study.

Second, I estimate additional models that account for the issue of reverse causality, which would exist when health status predicts the number of children living in a household and would bias the results. One example of this is if one-child families with health conditions in the pre-treatment period decide not to have a second child and are therefore unable to benefit from the program expansion. In order to test for the presence of this issue, I exclude individuals who report suffering from limiting health conditions from the analysis. The result from this model (columns 3 and 4) are shown to be almost unchanged from the baseline estimates of the paper suggesting that reverse causality is not influencing the estimates.

Third, I test for the validity of the claim that the identification of the sample used in this study is more accurate than the previously used strategy, which focuses on lower-level educated individuals only when examining the potential health-related impacts of the EITC expansions (Hoynes et al., 2015; Evans and Garthwaite, 2014; Averett and Wang, 2013). The main concern with this identification strategy is that it potentially includes many individuals who are not eligible to receive any EITC benefits and are therefore not affected by the policy change. This is confirmed by the summary statistics of the lower-level educated sample, which shows that only 10-14 percent of individuals are eligible to receive any EITC benefits based on the TAXSIM simulations. Thus, the sample size is increased from 15,189 to 140,535 individuals when solely using education as the treatment criterion. The final two columns show the results for the sample of low-educated heads of households. It is noticeable that the results are substantially smaller than those obtained by this study. While the baseline result of this study finds a policy effect of 7.98%, the analog model for the sample based on education reports a change of

only 3.08%. One potential explanation for these differences could be the fact that a selection based on education can lead to a downward bias in the result given that it provides estimates for an intent-to-treat effect. Despite the differences in the magnitudes of the estimates between the two approaches, both types of identification provide statistically significant estimates.

1.9 Discussion and Conclusion:

The findings of this study advance the literature on the relationship between income and health by providing evidence for the protective health effects of exogenous increases of income to vulnerable parts of the population. When examining potential explanations for the positive health impacts of additional income, the paper finds that higher take-up rates of private health insurance and increased spending on food could serve as mechanisms for the causal link between income and health. It would be interesting for future work to examine the short- and long-term effects of similar policies on health outcomes of children living in directly-affected households. Since it appears likely that income affects health in several ways, a further examination of other potential channels such as the role of health-related behaviors, health care usage, health expenditures, and stress should be conducted to better understand the link between income and health.

Given the fact that the EITC has become the most important cash transfer program in the United States, learning more about the program's impact on the health of individuals should be important to policymakers. The analysis in this study provides additional evidence for the presence of health benefits related to the EITC. The estimates for the positive health effects for adults are consistent with findings by Evans and

Garthwaite (2014) and Hoynes et al. (2015). Recent work on the tax credit suggests that further program expansions could help reduce existing health inequalities (Fletcher and Wolfe, 2014). Based on the success of earlier policy changes, other researchers have proposed that the program should be expanded for both families with one child as well as for childless families (Hoynes, 2014; Marr et al., 2013).

The findings of this paper furthermore suggest that governmental regulations aimed at assisting lower income families are capable of providing health benefits. As proposed by Berkman et al. (2014), formal analyses of the cost-benefit trade-offs of such policy interventions should incorporate both financial and population health benefits. A better understanding of the potentially unintended health benefits of welfare assistance programs could provide additional arguments in favor of certain policy adaptions. Findings in this area of research could help predict the effect of the current development towards mandated health insurance as well as with changes in federal- and state-level minimum wages, which have been discussed intensely by politicians in recent years.

1.10 References:

Abadie, A. (2005). Semiparametric Difference-in-Differences Estimators. *Review of Economic Studies* 72: 1-19.

Adda, J., J. Banks, J., and H.-M. von Gaudecker. (2009). The Impact of Income Shocks on Health: Evidence from Cohort Data. *Journal of the European Association* 7 (6): 1361-99.

Averett, S., and Y. Wang. (2013). The Effects of Earned Income Tax Credit Payment Expansion on Maternal Smoking. *Health Economics* 22: 1344-1359.

Baughman, R. and Dickert-Conlin, S. (2009). The Earned Income Tax Credit and Fertility. *Journal of Population Economics* 22 (3): 537-563.

Berkman, L. F., I. Kawachi, and M. M. Glymour. (2014). *Social Epidemiology*. New York, NY: Oxford University Press, Second Edition.

Bitler, M. P., J. B. Gelbach, and H. W. Hoynes. (2005). Welfare Reform and Health. *Journal of Human Resources* 40 (2): 309-334.

Card, D., C. Dobkin, and N. Maestas. (2009). Does Medicare Save Lives? *Quarterly Journal of Economics* 124 (2): 597-636.

Case, A., D. Lubotsky, and C. Paxson, (2002). Economic Status and Health in Childhood: The Origins of the Gradient. *American Economic Review* 92 (5):1308-1334.

Cebi, M., Woodbury, S. A. (2009). Health Insurance Tax Credits and Health Insurance Coverage of Low-Earning Single Mothers. Employment Research 16 (2): 1-3.

Cebi, M., and S. A. Woodbury. (2014). Health Insurance Tax Credits, the Earned Income Tax Credit, and Health Insurance Coverage of Single Mothers. *Health Economics* 23: 501-515.

Currie, J., and J. Gruber. (1996a). Health Insurance Eligibility, Utilization of Medical Care, and Child Health. *Quarterly Journal of Economics* 111 (2): 431-466.

_____. (1996b). Saving Babies: The Efficacy and Cost of Recent Changes in the Medicaid Eligibility of Pregnant Women. *Journal of Political Economy* 106 (6): 1263–1296.

Currie, A., M. A. Shield, and S. W. Price, (2007). The Child Health/Family Income Gradient: Evidence from England. *Journal of Health Economics* 26: 213-232.

Currie, J., and M. Stabile. (2003). Socioeconomic Status and Child Health: Why is the Relationship Stronger for Older Children? *American Economic Review* 93 (5): 1813-1823.

Cutler, D. M. (2003). Employee Costs and the Decline in Health Insurance Coverage. In *Frontiers in Health Policy Research* 6. Cambridge, MA: MIT Press.

Cutler, D. M., and A. Lleras-Muney. (2006). Education and Health: Evaluating Theories and Evidence. *NBER Working Papers* 12352, National Bureau of Economic Research, Inc.

Dahl, G. B., and L. Lochner. (2012). The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit. *American Economic Journal*, 102 (5): 1927-1956.

Deaton, A. S., and C. H. Paxson. (1998). Aging and Inequality in Income and Health. *American Economic Review* 88 (2): 248-253.

Deaton, A. S. (2002). Policy Implications of the Gradient of Health and Wealth. *Health Affairs* 21: 13-30.

Dickert-Conlin, S., and S. Houser. (2002) EITC and Marriage. *National Tax Journal* 55 (1): 25-40.

Eissa, N., and J. B. Liebman. (1996). Labor Supply Response to the Earned Income Tax Credit. *Quarterly Journal of Economics*111(2): 605-37.

Eissa, N., H. J. Kleven, and C. T. Kreiner. (2008). Evaluation of Four Tax Reforms in the United States: Labor Supply and Welfare Effects for Single Mothers. *Journal of Public Economics* 92 (3-4): 795-816.

Ellwood, D. T. (2000). The Impact of the Earned Income Tax Credit and Social Policy Reform on Work, Marriage, and Living Arrangements. *National Tax Journal* 53 (4): 1063-1105.

Evans, W. N., and C. Garthwaite. (2014). Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health. *American Economic Journal: Economic Policy* 6 (2): 258-290.

Feenberg, D, and E. Coutts. (1993). An Introduction to the TAXSIM Model. *Journal of Policy Analysis and Management* 12 (1): 189–94.

Fletcher, J., and B. Wolfe. (2014). Increasing Our Understanding of the Health-Income Gradient in Children. *Health Economics* 23: 473-486.

Frijters, P., J. P. Haisken-DeNew, and M. Shields. (2005). The Causal Effect of Income on Health: Evidence from German Reunification. *Journal of Health Economics* 24: 997-1017.

Gruber, J., and K. I. Simon. (2007). Crowd-Out Ten Years Later: Have Recent Public Insurance Expansions Crowded Out Private Health Insurance? *Journal of Health Economics* 27: 201-227.

Henry, J. P. (1982). The Relation of Social to Biological Processes in Disease. *Social Science and Medicine* 16: 369-380.

Hotz, J. V., and J. K. Scholz. (2003). The Earned Income Tax Credit. In *Means-Tested Transfer Programs in the United States*, R. Moffitt, ed.. Chicago, IL: University of Chicago Press and the NBER, 141-197.

Hoynes, H. W. (2014). Proposal 11: Building on the Success of the Earned Income Tax Credit. *The Hamilton Project: Policies to Address Poverty in America*: 1-12.

Hoynes, H. W., D. L. Miller, and D. Simon. (2015). Income, the Earned Income Tax Credit, and Infant Health. *American Economic Journal: Economic Policy* 7 (1): 172-211.

Idler, E. L., and Y. Benyamini. (1997). Self-rated Health and Mortality: A Review of Twenty-Seven Community Studies. *Journal of Health and Social Behavior* 38 (March): 21-37.

Internal Revenue Service (2002). Participation in the Earned Income Tax Credit Program for Tax Year 1996. Washington, DC: Internal Revenue Service.

Khanam, R., H. S. Nghiem, and L. B. Connelly. (2009). Child Health and the Income Gradient: Evidence from Australia. *Journal of Health Economics* 28(4): 805-817.

Kuehnle, D. (2014). The Causal Effect of Family Income on Child Health in the U.K. *Journal of Health Economics* 36: 137-150.

Larrimore, J. (2011). Does a Higher Income Have Positive Health Effects? Using the Earned Income Tax Credit to Explore the Income-Health Gradient. *Milbank Quarterly* 89 (4): 694-727.

Levy, H., and D. Meltzer. (2008). The Impact of Health Insurance on Health. *Annual Review of Public Health* 29: 399-409.

Lindahl, M. (2005). Estimating the Effect of Income on Health and Mortality Using Lottery Prizes as an Exogenous Source of Variation in Income. Journal of Human Resources, University of Wisconsin Press, 40(1): 144-168.

Marr, C., K. Ruffini, and C.-C. Huang. (2014). Strengthening the EITC for Childless Workers Would Promote Work and Reduce Poverty. Washington, D.C.: Center on Budget and Policy Priorities. *http://www.cbpp.org/cms/?fa=view&id=3991*.

McGranahan, L., and D. W. Schanzenbach. (2013). The Earned Income Tax Credit and Food Consumption Patterns. Federal Reserve Bank of Chicago Working Paper 2013-2014.

Meyer, B. D. (2010). The Effects of the Earned Income Tax Credit and Recent Reforms. *Tax Policy and the Economy* 24: 153-180.

Meyer, B. D. (2002). Labor Supply at the Extensive and Intensive Margins: The EITC, Welfare, and Hours Worked. *American Economic Review* 92: 373-379.

Meyer, B. D., and D. T. Rosenbaum. (2001). Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers. *Quarterly Journal of Economics* 116 (3): 1063-1114.

Miller, A. R., and L. Zhang. (2009). The Effects of Welfare Reform on the Academic Performance of Children in Low-Income Households. *Journal of Policy Analysis and Management* 28 (4): 577-599.

Neumark, D., and W. Wascher. (2001). Using the EITC to Help Poor Families: New Evidence and a Comparison with the Minimum Wage. *National Tax Journal* 54 (2): 281-317.

Panel Study of Income Dynamics, Public Use Dataset. (2013). Produced and distributed by the Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI.

Propper, C., J. Rigg, and S. Burgess. (2007). Child Health: Evidence on the Roles of Family Income and Maternal Mental Health from a U.K. Birth Cohort. *Health Economics* 16: 1245-1269.

Reinhold, S., and H. Jürges. (2012). Parental Income and Child Health in Germany. *Health Economics* 21 (5): 562-579.

Schoeni, R. F., and R. M. Blank. (2000). What Has Welfare Reform Accomplished? Impacts on Welfare Participation, Employment, Income, Poverty, and Family Structure. *RAND Labor and Population Program*. Working Paper Series 00-02.

Scholz, J. K. (1994). The Earned Income Tax Credit: Participation, Compliance, and Anti-Poverty Effectiveness. *National Tax Journal* 47 (1): 59-81.

Smith, J. P. (1999). Healthy Bodies and Thick Wallets: The Dual Relation between Health and Economic Status. *Journal of Economic Perspectives* 12 (2): 145-166.

Sterling, P., and J. Eyer. (1981). Biological Basis of Stress-related Mortality. *Social Science and Medicine* 15E (3): 42.

Tax Credit for Working Families. http://www.taxcreditsforworkingfamilies.org/earned-income-tax-credit/states-with-eitcs/.

Figure 1.1: The Size of EITC Credits for Eligible Households (PSID Data):

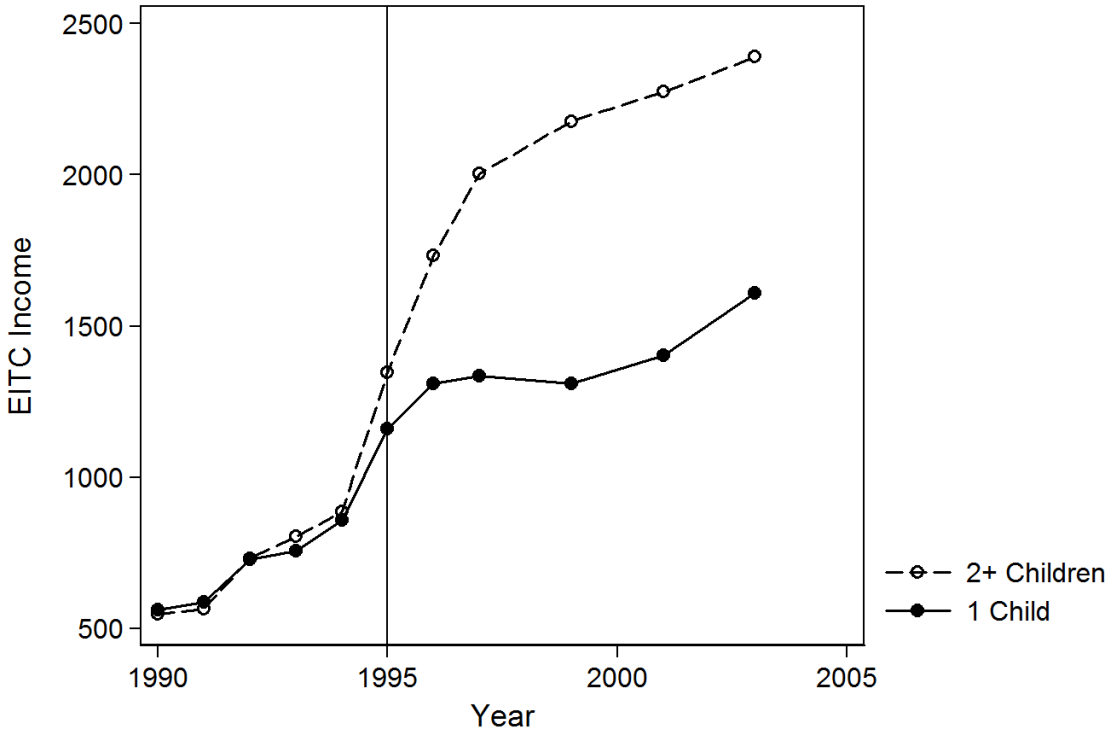


Figure 1.2: Share of Eligible Heads of Households in Excellent/Very Good Health:

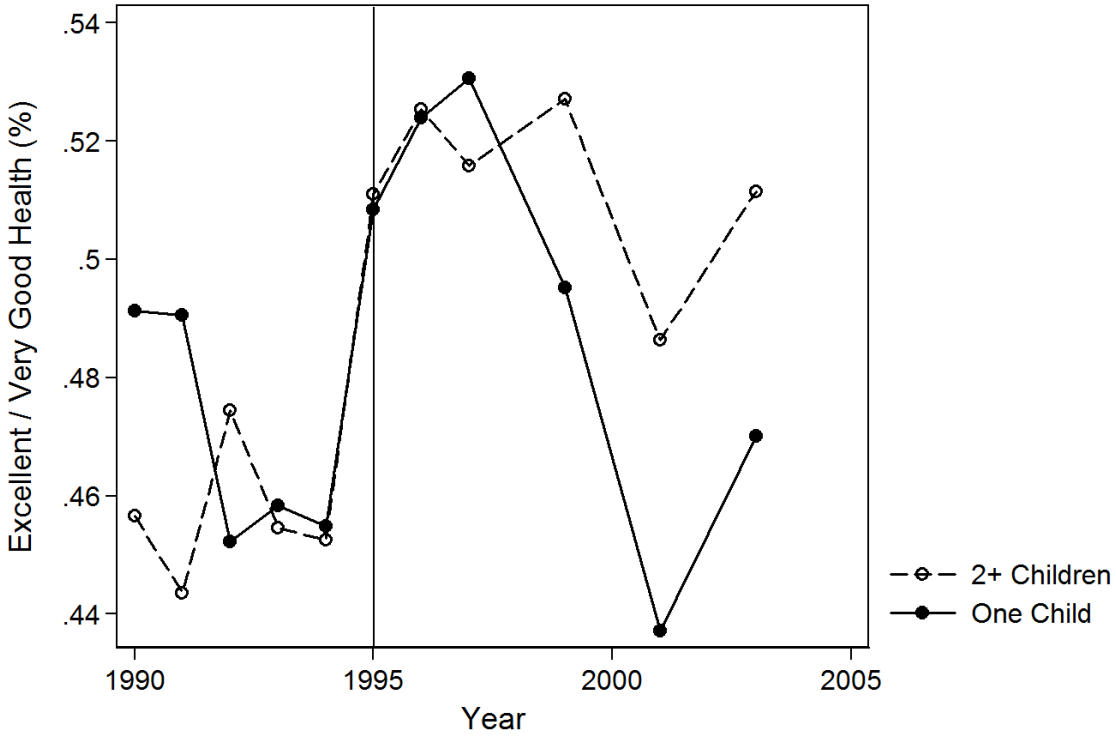


Figure 1.3(a): Histogram of Propensity Scores for Both Groups During the Pre-period:

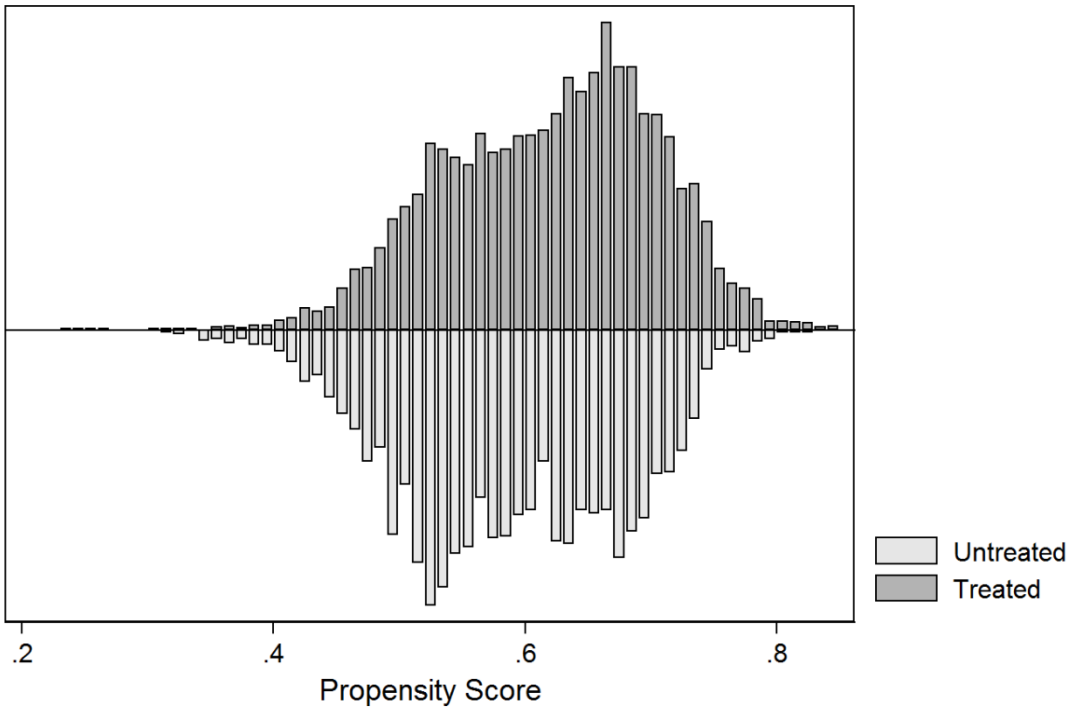


Figure 1.3(b): Histogram of Propensity Scores for Both Groups During the Post-period:

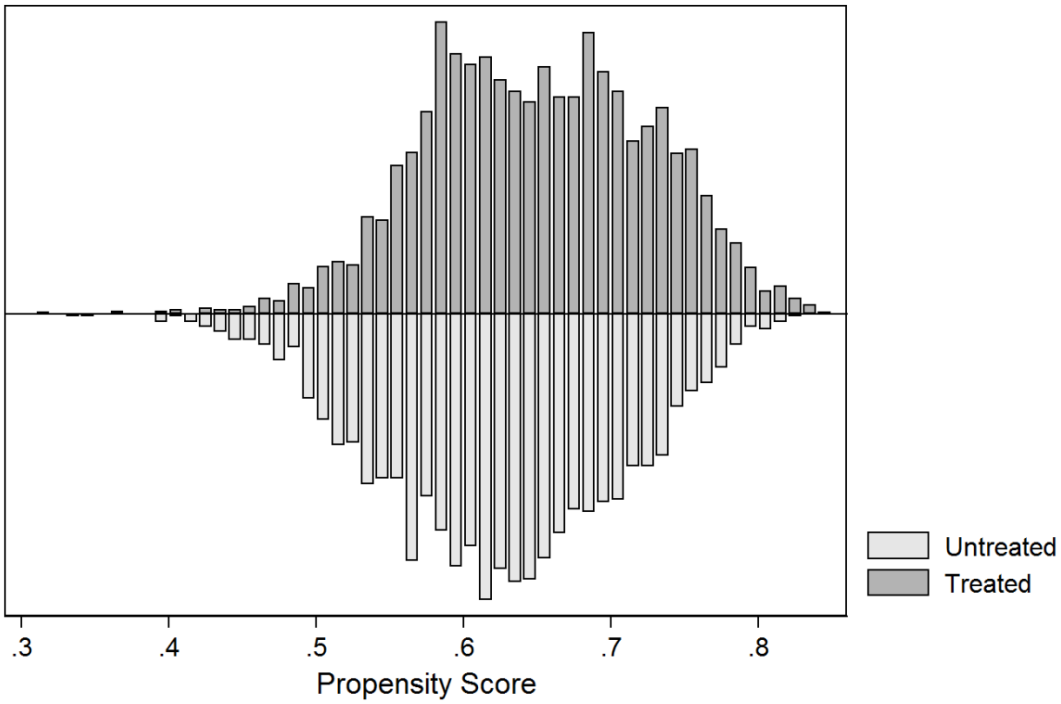


Figure 1.4: EITC Benefits to Eligible Households with 3+ Children versus 2 Children:

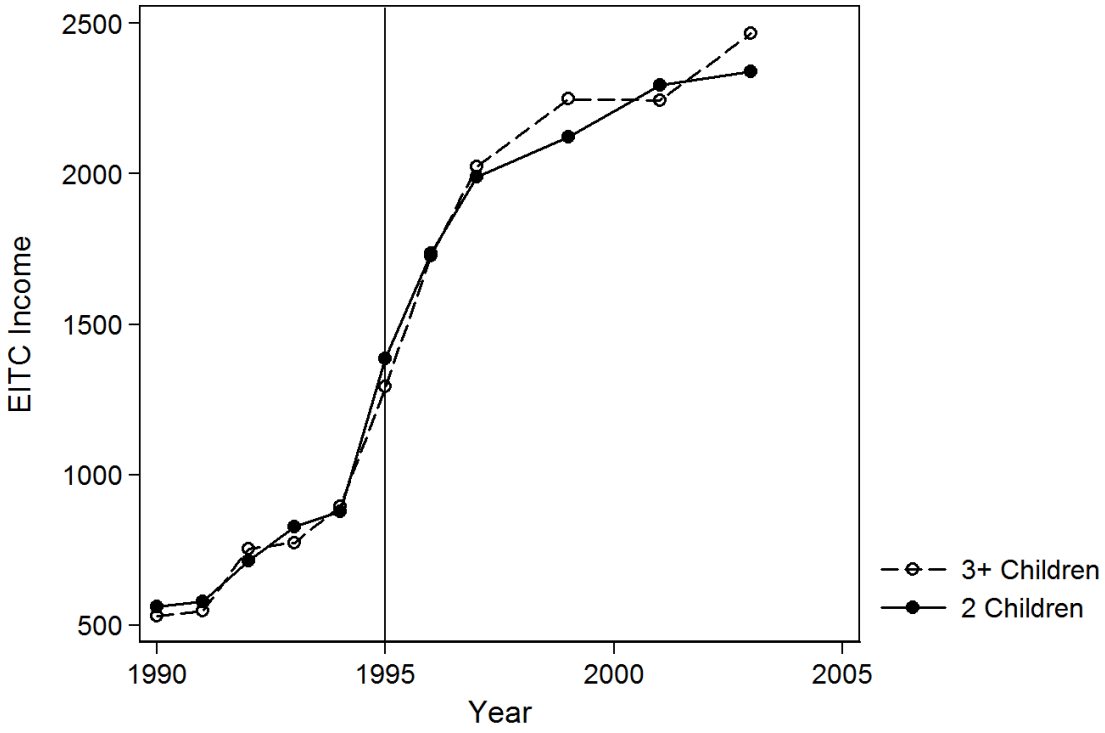


Table 1.1: Descriptive Statistics for Eligible Heads of Households (PSID):

Variable	1 child	2+ children	All
EITC Payments			
1990-1995	$784.71 (496.12)	$824.67 (584.92)	$809.04 (552.21)
1996-2003	$1,393.23 (779.02)	$2,115.36 (1,217.26)	$1,855.87 (1,134.58)
Average Age			
1990-1995	35.89 (11.49)	35.08 (8.53)	35.40 (9.80)
1996-2003	36.11 (10.78)	35.51 (8.30)	35.73 (9.28)
% Male			
1990-1995	0.525 (0.499)	0.595 (0.491)	0.567 (0.495)
1996-2003	0.461 (0.500)	0.497 (0.500)	0.484 (0.500)
% Black			
1990-1995	0.398 (0.490)	0.385 (0.487)	0.390 (0.495)
1996-2003	0.489 (0.500)	0.526 (0.499)	0.513 (0.500)
% Married			
1990-1995	0.391 (0.489)	0.502 (0.500)	0.459 (0.498)
1996-2003	0.322 (0.467)	0.395 (0.489)	0.369 (0.483)
Family Income			
1990-1995	$11,534.27 (6,211.93)	$11,263.12 (6,521.61)	$11,369.18 (6,403.30)
1996-2003	$14,527.29 (7,447.75)	$15,359.98 (8,549.74)	$15,020.30 (8,178.59)
% Excellent/Very Good Health			
1990-1995	0.476 (0.499)	0.466 (0.499)	0.470 (0.499)
1996-2003	0.493 (0.500)	0.513 (0.500)	0.506 (0.500)
% Health Limitation			
1990-1995	0.155 (0.362)	0.141 (0.349)	0.147 (0.354)
1996-2003	0.136 (0.343)	0.113 (0.316)	0.121 (0.326)
Observations	5,901	9,674	15,575

Table 1.2: DD Estimates for the Effect of EITC on Health Status and Health Limitations

	Excellent / Very Good Health			
	(1)	(2)	(3)	(4)
Policy Effect	0.0375**	0.0408**	0.0474**	0.0616***
	(0.0183)	(0.0185)	(0.0202)	(0.0224)
Change from Pre-Period	7.98%	8.68%	10.09%	13.11%
Additional State Characteristics		x		
1-Year Adjustment Period			x	
3-Year Adjustment Period				x
N	15,189	14,314	13,329	12,802

	Health Limitation			
	(1)	(2)	(3)	(4)
Policy Effect	-0.0110	-0.0132	-0.0124	-0.0098
	(0.0131)	(0.0134)	(0.0143)	(0.0158)
Change from Pre-Period	8.84%	8.98%	8.43%	6.67%
Additional State Characteristics		x		
1-Year Adjustment Period			x	
3-Year Adjustment Period				x
N	15,189	14,314	13,329	12,802

Robust standard errors, clustered by individuals, are shown in parentheses. All models control for age, gender, race, marital status as well as the number of people living in the household. Furthermore, state and year fixed effects are controlled for. The additional state characteristics include average annual state unemployment rates, state-level AFDC eligibility requirements (for a family of three), the presence and timing of AFDC waivers and time limits on receiving welfare, the type of sanctions as well as whether the state expanded Medicaid coverage and implemented state-level EITC benefits. * $p< 0.10$, ** $p< 0.05$, *** $p < 0.01$.

Table 1.3: DDD Estimates for the Effect of EITC Expansion on Health Status

	Excellent / Very Good Health			
	(1)	(2)	(3)	(4)
Policy Effect	0.0332*	0.0369*	0.0432**	0.0496**
	(0.0191)	(0.0193)	(0.0193)	(0.0233)
Change from Pre-Period	7.06%	7.85%	9.19%	10.55%
Additional State Characteristics		x		
1-Year Adjustment Period			x	
3-Year Adjustment Period				x
N	221,735	212,045	203,546	187,485

Robust standard errors, clustered by individuals, are shown in parentheses. All models control for age, gender, race, marital status as well as the number of people living in the household. Furthermore, state and year fixed effects are controlled for. * $p< 0.10$, ** $p< 0.05$, *** $p < 0.01$.

Table 1.4: Additional Specification Estimates

	Excellent / Very Good Health					
	Semi-Parametric DD		*IV*		*Alternative DD (Mora & Reggio)*	
	(1)	(2)	(3)	(4)	(5)	(6)
	0.1154***	0.1258***	0.0304**	0.0363**	0.0361**	0.0459**
	(0.0257)	(0.0248)	(0.0142)	(0.0145)	(0.0166)	(0.0180)
	24.75%	26.98%	6.52%	7.78%	7.68%	9.77%
1-Year Adjustment Period		x		x		x
1st Stage Estimate			$1,277.29	$1,380.44		
			(255.98)	(289.65)		
F-Statistic			24.90	22.71		
			0.0022	0.0024		
	15,189	13,329	15,189	13,329	15,189	13,929

Robust standard errors, clustered by individuals, are shown in parentheses. All models control for age, gender, race, marital status as well as the number of people living in the household. Furthermore, state and year fixed effects are controlled for. * $p< 0.10$, ** $p< 0.05$, *** $p < 0.01$.

Table 1.5: Effects of EITC Expansion on Insurance Coverage

	Any Insurance	**Private Insurance**	**Public Insurance**	**Medicaid/SCHIP**
	(1)	(2)	(3)	(4)
DD Estimate	0.0174**	0.0322***	-0.0148***	-0.0095
	(0.0080)	(0.0060)	(0.0052)	(0.0050)
Change from Pre-Period	2.60%	6.68%	6.14%	4.97%
N	58,196	58,196	58,196	58,196
DDD Estimate *(all)*	0.0171**	0.0203***	-0.0059	-0.0054
	(0.0079)	(0.0071)	(0.0056)	(0.0053)
Change from Pre-Period	2.53%	4.06%	2.55%	3.06%
N	397,415	397,415	397,415	397,415
DDD Estimate *(<$50,000)*	0.0182**	0.0208**	-0.0031	-0.0082
	(0.0081)	(0.0081)	(0.0065)	(0.0060)
Change from Pre-Period	2.70%	4.16%	1.34%	4.65%
N	225,963	225,963	225,963	225,963
DD Estimate *(2 vs. 3+ Kids)*	0.0024	0.0135	-0.0150	-0.0093
	(0.0129)	(0.0089)	(0.0143)	(0.0117)
Change from Pre-Period	0.36%	3.08%	5.59%	4.20%
N	34,706	34,706	34,706	34,706

Robust standard errors, clustered by individuals, are shown in parentheses. All models control for age, gender, race, marital status as well as the number of people living in the household. Furthermore, state and year fixed effects are controlled for. * $p< 0.10$, ** $p< 0.05$, *** $p < 0.01$.

Table 1.6: Effects of EITC Expansion on Food Expenditures

	Spend ≥$50 on Food at Home (1)	**Spend ≥$75on Food at Home** (2)	**Spend ≥$50 on Food Eaten Out** (3)
DD Estimate	0.0454*	0.0467**	0.0303*
	(0.0234)	(0.0231)	(0.0177)
Change from Pre-Period	7.22%	11.75%	22.28%
N	6,895	6,895	6,895
DDD Estimate	0.0492**	0.0477**	0.0414**
	(0.0239)	(0.0243)	(0.0193)
Change from Pre-Period	7.82%	12.00%	30.44%
N	97,159	97,159	97,159
DD Estimate	-0.0507*	-0.0281	-0.0051
(2 vs. 3+ Kids)	(0.0277)	(0.0302)	(0.0219)
Change from Pre-Period	8.50%	6.31%	3.78%
N	4,262	4,262	4,262

Robust standard errors, clustered by individuals, are shown in parentheses. All models control for age, gender, race, marital status as well as the number of people living in the household. Furthermore, state and year fixed effects are controlled for. * $p< 0.10$, ** $p< 0.05$, *** $p < 0.01$.

Table 1.7: Fixed Effect Estimates on Health Status and Food Expenditures

Panel A: All Years	**Excellent / Very Good Health**		**Food Expenditures**	
	DD	*DDD*	*Spend ≥$75on Food at Home*	*Spend ≥$50 on Food Eaten Out*
	(1)	(2)	(3)	(4)
Policy Effect	0.0892**	0.0994**	0.0869***	0.0371
	(0.0423)	(0.0404)	(0.0309)	(0.0249)
Change from Pre-Period	20.35%	22.68%	24.64%	36.62%
N	1,956	97,277	4,428	4,428

Panel B: At least three observations pre and post	**Excellent / Very Good Health**		**Food Expenditures**	
	DD	*DDD*	*Spend ≥$75on Food at Home*	*Spend ≥$50 on Food Eaten Out*
	(1)	(2)	(3)	(4)
Policy Effect	0.0691**	0.0729**	0.0602**	0.0117
	(0.0381)	(0.0354)	(0.0237)	(0.0198)
Change from Pre-Period	15.20%	14.90%	15.26%	9.95%
N	2,538	97,856	6,286	6,286

Robust standard errors, clustered by individuals, are shown in parentheses. All models control for, marital status, the number of people living in the household as well as for state, year and individuals fixed effects. * $p< 0.10$, ** $p< 0.05$, *** $p < 0.01$.

Table 1.8: Additional Robustness Checks

	Excellent / Very Good Health					
	Falsification Test		*Reverse Causality Test*		*Low-Educated Sample*	
	(1)	(2)	(3)	(4)	(5)	(6)
Policy Effect	-0.0012	-0.0013	0.0374*	0.0625***	0.0145**	0.0322***
	(0.0242)	(0.0274)	(0.0192)	(0.0238)	(0.0069)	(0.0087)
Change from Pre	0.26%	0.28%	7.13%	11.91%	3.08%	6.84%
3-Year Adjustment Period		x		x		x
N	9,429	7,942	13,116	11,013	140,535	120,234

Robust standard errors, clustered by individuals, are shown in parentheses. All models control for age, gender, race, marital status as well as the number of people living in the household. Furthermore, state and year fixed effects are controlled for. * $p< 0.10$, ** $p< 0.05$, *** $p < 0.01$.

2 Chapter Two

Do Higher Minimum Wages Benefit Health?

Evidence from the UK

Abstract:

This study examines the association between minimum wages and health outcomes. In order to provide evidence for a causal link, I exploit the introduction of the National Minimum Wage (NMW) in the United Kingdom on April 1st, 1999, as an exogenous variation of wages. I exploit the policy change by estimating Difference-in-Differences models to examine the impact of wage increases on health. I find that the NMW significantly improved a number of health measures such as self-reported health status and whether individuals suffer from a number of health conditions. Furthermore, the study shows that the reform did not impact working hours, which is consistent with previous findings and suggests that the observed health improvements are the results of higher earnings. When testing for potential mechanisms, I find that leisure expenditures and leisure activities as well as financial well-being could explain the changes in health.

Keywords: National Minimum Wage; Health; Mechanisms; United Kingdom.

JEL Classifications: I12, I14, J38.

2.1 Introduction:

It has been established in previous work that low-income families suffer from worse health outcomes than wealthier ones (e.g. Case et al., 2002; Deaton, 2002). The World Health Organization summarizes the literature on the subject by pointing out that "people further down the social ladder usually run at least twice the risk of serious illness and premature death as those near the top" (WHO, 2003). Over the last few years, researchers have started examining whether changes to governmental assistance programs aimed at improving living conditions of low-income families provide health benefits for this vulnerable group of the population (e.g. Hoynes et al., 2011 and 2013; Milligan and Stabile, 2011). A policy tool that is receiving much attention by policymakers at the moment is the minimum wage – several developed countries (e.g. USA, Germany and the UK) have been discussing changes to existing wage floors in recent years. To my knowledge, no previous study has so far tested for direct health effects of minimum wage policies. By exploiting the introduction of the National Minimum Wage (NMW) in the UK, this paper investigates whether health outcomes of low-wage workers who benefited from the new wage floor were affected by the policy change.

The British NMW was implemented on April 1st 1999 following both a change in government and a period of six years during which no statutory wage-floor existed in any sector but agriculture. This introduction of the first economy-wide minimum wage in the United Kingdom offers a setting close to a natural experiment to test for the relationship between variations in wages and health. While previous work has examined the effects of the NMW on outcomes such as employment (Stewart, 2004), wage inequality (Dickens and Manning, 2004) and work-related training (Arulampalam et al., 2004), this is the first

study that focuses on health-related impacts of the reform. Unlike the majority of minimum wage increases in the US over the past decades, the NMW introduction led to substantial raises to low-wage workers which allows testing for the presence of health benefits as a result of these wage increases. Neumark and Wascher (2001) show that average real minimum wages between the years 1985-1994 increased by only $0.20 per year in the US, whereas this study shows that annual earnings of affected workers increased by $927 compared to workers who did not benefit financially from the NMW.

Using longitudinal data from the British Household Panel Survey (BHPS) for the years 1997-2001 as well as difference-in-differences (DD) estimation, this paper investigates whether the introduction of a minimum wage in the UK provided health benefits to low-income workers. The analysis compares changes in health outcomes t between hourly paid workers who received an immediate raise to similar workers who were financially unaffected by the policy. The paper examines subjective health measures like self-assessed health status as well as potentially more objective outcomes such as the frequency of doctor visits and the presence of a number of health conditions. Furthermore, the later part of the study tests for potential mechanisms explaining the relationship between higher wages and health by examining the role of the reform on health behaviors, leisure activities as well as on psychological well-being.

Besides adding to earlier research on minimum wages, this paper expands the literature regarding the association between income and health. As a result of researchers having found significant positive associations between income and health in the past, an income gradient in health became well-established in the literature. However, previous work has not yet been able to clarify whether the observed positive associations are the

result of a causal effect from income on health or whether they are spuriously driven by unobserved factors. Examples of this occur if poor individuals are more likely to live in adverse environments which could then lead to worse health outcomes through channels like inadequate quality of available care, unhealthy lifestyles or limited health information rather than through the channel of income. Furthermore, income endogeneity could exist because of factors like reverse causality and measurement error. By exploiting a policy change that increases earnings for a group of individuals, this study contributes to previous work on the income gradient in health.

This study finds that the health status of low-earning individuals who experience substantial wage increases immediately after the implementation of the NMW improves significantly compared to workers with unchanged wages. Furthermore, affected employees are found to be less likely to suffer from chronic health conditions, to frequently see a doctor and to use other health services in the years following the policy change which re-emphasizes the presence of health benefits as a result of wage increases. These findings provide suggestive evidence for a causal link between higher minimum wages and health outcomes. The fact that no other major policies affecting population health outcomes were implemented at the time of the study support the claim that the observed health changes are a result of the NMW introduction. When examining possible channels for the link between higher wages and health, I find suggestive evidence for the role of health-related behavior, leisure activities and financial well-being.

(1) <u>Previous Literature</u>:

Despite the fact that several studies have previously examined the impact of minimum wages on employment and monetary outcomes, no consensus has been reached

on how employment and earnings of low-wage workers are impacted by changes to wage floors. While the majority of work has looked at the US, previous work on the implementation of the NMW in the UK has no significant employment effects (Stewart, 2004; Dickens and Manning, 2004; Connolly and Gregory, 2003) and no effects on hours worked (Connolly and Gregory, 2003). Previous research has provided evidence that the NMW affected the overall wage distribution in the UK substantially and that it successfully decreased wage inequality in the decade after its introduction (Dickens and Manning, 2004; Dolton et al., 2012), which was one of the proclaimed policy goals of the government. Researchers have furthermore provided evidence for spillover effects of the policy change, meaning that workers who previously earned slightly above the new wage floor also received wage increases immediately following the reform, whereas wages of high earners remained unaffected (Butcher et al., 2012; Arulampalam et al., 2004). Similar evidence for the presence of spillover effects of minimum wage policies has been shown for the US (Card and Krueger, 1995).

Only a few studies so far have examined the relationship between minimum wages and non-monetary job attributes. Previous work testing for the association of wage floors and employment-based health insurance has delivered mixed results (Simon and Kaestner, 2004; Marks, 2011; Bucila, 2013). To my knowledge, the only other non-monetary job aspect that has that has previously been examined is work-related training of low-wage workers. Arulampalam et al. (2004) finds that the NMW introduction significantly increased the amount of training obtained by low-wage workers. A literature regarding the relationship between minimum wage laws and health had been non-existent until recently. Two studies provide mixed evidence when examining the association

between state variations of minimum wages and individual BMI in the US (Meltzer and Chen, 2011; Cotti and Tefft, 2013). Furthermore, Adams et al. (2012) indicate that increased minimum wages are associated with higher rates of fatal traffic accidents among drivers under the legal drinking age. Others have mentioned the possibility of a positive relationship between minimum wage and public health outcomes without providing empirical evidence (Leigh, 2013; Bhatia, 2014). In the only other study that examines health-related effect of the UK minimum wage, Kronenberg et al. (2015) find limited short-run effect on the mental health of affected workers. To my knowledge, this is the first study that examines the relationship between minimum wages and direct measures of health in more detail.

The past years have seen a growth in the literature regarding potential health effects of governmental assistance programs that aim at improving living conditions of lower-income families. Early work in this area found health improvements from eligibility expansions of Medicaid and Medicare (Currie and Gruber, 1996a and 1996b; Card et al., 2009). More recently, researchers have started examining a variety of polices to test for potential health effects. Hoynes et al. (2011) show that the implementation of the Women, Infants and Children (WIC) program in the US, which targeted nutritional well-being and health of low-income families, increases average birth weight and decrease the fraction of birth weights classified as low. Similarly, evidence for health benefits of expansions in assistance programs such as the Earned Income Tax Credit (EITC) and the Canada Child Tax Benefit has been documented (Hoynes et al., 2013; Evans and Garthwaite, 2014; Milligan and Stabile, 2011). Fletcher and Wolfe (2014) suggest that further expansions in cash transfer programs can help reduce existing health inequalities.

Following the work by Case et al. (2002) who find a highly significant positive association between family income and child health in the US, researchers have found similar results when expanding the analysis to Canada (Currie and Stabile, 2003), England (Currie et al., 2007; Propper et al., 2007, Adda et al., 2009), Australia (Khanam et al., 2009) and Germany (Reinhold and Jürges, 2012). Despite a consensus in the findings for the presence of a strong association between income and health, these early studies have yet been able to establish a causal link between income and health due to the potential endogeneity of income. Only a small number of studies have so far provided evidence for causal effects of income on health by directly accounting for the endogeneity of income (Kuehnle, 2014; Lindahl, 2005; Frijters et al., 2005).

(2) Background On Minimum Wages in the UK:

In 1909, Winston Churchill, then President of the Board of Trade, established a Wages Council system in the UK with the goal of protecting the pay of workers in a number of different industries. Despite leading to statutory wage floors in many low-wage sectors of the economy, an economy-wide minimum wage was never implemented by the Wage Councils. In 1993, John Major's government decided to abolish the Wage Councils arguing that the system reduces employment by raising wages.[13] Following a period of six years during which no statutory wage floors existed in any sector of the economy besides agriculture and soon after Tony Blair was elected as Prime Minister in May 1997, the Low Pay Commission (LPC) was established.[14] Based on advice of the LPC (LPC, 1998), a NMW was introduced by Blair's Government on April 1st 1999. The

[13] Dickens et al. (1999) provide evidence showing that wage councils had no negative impacts on employment.

[14] The Low Pay Commission is an assembly that consists of nine commissioners which was supposed to serve as an independent body that gives the UK government recommendations about a potential minimum wage.

wage floor was set at £3.60 per hour for adults, £3.20 per hour for adults in the first six months of a job with accredited training and £3.00 per hour for those aged 18-21. [15] Besides attempting to improve minimum standards in the workplace, Blair wanted to reverse the previous development toward a larger wage inequality in the United Kingdom which also coincided with a significant decline in union coverage (Metcalf, 1999).

Research has shown that the Minimum Wage Act of 1999 substantially impacted the British labor market. The pay of 1.2 million adult jobs increased in order to comply with the NMW which corresponds to 5.4% of workers in the UK (Metcalf, 2008), while providing low-wage workers with an average pay increase of 10-15% (Metcalf, 2006). Butcher (2005) points out that these immediate raises were greater than the wage growth for workers in the bottom half of the hourly earnings distribution for the years 1992 to 1997. Despite early opposition by the Conservative Party based on the fear of increases in unemployment, the NMW has been widely perceived as extremely successful over the years and has been increased continuously since 1999 (Manning, 2013)[16]. Michael Portillo, who was appointed as the new Conservative Leader in 2000, reversed the party's opposition to the NMW stating that it should not create concerns since "at the modest level at which it has been set by the government… The minimum wage has caused less damage to employment than we feared" (Metcalf, 1999). A number of studies have confirmed that the national wage floor did not negatively affect a number of labor market outcomes (Stewart, 2004; Metcalf, 2006; Bryan et al., 2013), while reducing lower tail wage inequality (Dolton et al., 2012).

[15] Hicks and Allen (1999) provide a better understanding of the value of the NMW by showing average prices of certain goods: a dozen of new laid eggs (£1.57); 16 ounce of beer in a public bar (£1.73); a gallon of petrol (£2.81).

[16] In a poll of political experts by the Institute of Government, the NMW was voted the most successful UK government policy of the past 30 years (Manning, 2013).

Besides addressing the issue of wage inequality, a secondary goal of the government was to reduce health inequalities and improve overall population health. On the eve of the 1997 UK election, Tony Blair famously told voters they had "24 hours to save the NHS" by voting his Labour party and declared that increasing public spending on health was one of their main goals. However, due to the fact that Blair's cabinet was committed to retain the outgoing Conservative government's expenditure plan, increases in NHS inputs and outputs such as staffing services and healthcare activities were delayed until after 2000. Consequently, as shown by Vizard and Obolenskaya (2013), total health expenditures increased from remained similar to previous years during Blair's first term (£82.3 billion), which overlaps with the time period of this study, before increasing significantly during the second term (£105.5 billion). This suggests that any observed health improvements as a result of additional income are not driven by changes in health services at the time.

(3) <u>Data</u>:

This study uses data from waves 7 to 11 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.[17] In addition to its longitudinal nature, the data set is convenient for the purpose of this study because it questions all individuals above 15 years of age who live in the household at the time of the interview. Thus, by being able to provide coverage of pay and hours worked across the entire pay distribution, the BHPS gives a complete representation of earnings for workers receiving around the minimum wage. In comparison to the Labor Force Survey

[17] 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.

(LFS) and the New Earnings Survey (NES), the two other commonly used British data sets with detailed information on earnings of survey participants, the BHPS also provides information on health outcomes.

The main dependent variable of this study is self-reported health status, which is categorized from 1 (=excellent) to 5 (=very poor). This measure of health has been widely used in previous studies regarding the relationship between income and health (e.g. Case et al., 2002; Currie and Stabile, 2003; Adda et al., 2009) and has been shown to be a good predictor of other health outcomes, including mortality (Idler and Benyamini, 1997). In order to test for the potential issue of reporting heterogeneity of health status, previous work has additionally looked at other health outcomes which are viewed as more objective (Johnston et al., 2009). This study follows this approach by testing whether the introduction of the NMW impacted the share of low-wage workers suffering from 13 types of health conditions for which information is available in the BHPS. Other outcomes examined in this study are frequency of doctor visits, use of any other health services as well as whether respondents stayed at a hospital overnight within the last 12 months. In order to control for the fact that individuals in the UK are eligible to receive state pensions at the age of 65, the sample is restricted to individuals aged 65 and younger.

In order to assist researchers in evaluating the introduction of the NMW, additional questions were introduced in wave 9 of the BHPS, the first interview after the policy adaption. Employees who are paid hourly were now directly asked about their wage rates. Furthermore, the survey introduced the following question for hourly paid workers: “Has your pay or hourly rate in your current job been increased to bring you up to the National

Minimum Wage or has it remained the same?" This question allows identifying a group of workers who are directly affected by the policy change. Additionally, the longitudinal nature of the BHPS provides another advantage of using it examine the relationship between higher wages and health since it assures that individual time-invariant heterogeneity is removed from the estimates. A disadvantage of the BHPS is the relatively small sample size of the survey which makes it less attractive to researchers compared to both the LFS and NES. Nevertheless, I believe that the advantages of the data set outweigh this potential issue for the purpose of this study.

(4) Econometric Methods:

5.1. Main Model:

This study estimates difference-in-differences (DD) models to find average treatment effects of the reform on low-wage workers. For the treatment group, the analysis considers individuals whose hourly wage was below the new NMW before 1999 before being raised to comply with the new wage floor immediately after the policy change. Following previous evidence for spillover effects of the NMW (Butcher et al., 2012; Arulampalam et al., 2004) and given the fact that the sample size for this group of directly affected workers is quite small (144 individuals), workers who earned slightly above the new wage floor in 1998 before receiving a raise immediately after the reform are also considered as treated. Consistent with previous findings on the magnitude of spillover effects, only workers who earn less than £5.00 in 2000 are included.[18] The control group is comprised of workers who are also paid hourly but who did not

[18] Butcher et al. (2012) and Arulampalam et al. (2004) provide evidence for the presence of spillover effects of up to 40% above the NMW. I have repeated the analysis with different thresholds and the results remain unchanged.

experience an increase in wages immediately after the policy change. As a result of focusing on hourly paid workers, the entire sample consists of low-earning individuals. The treatment group consists of 327 workers (1,635 observations), while the control group consists of 564 individuals (2,820 observations). The main DD equation estimated in this study is the following:

$$Y_{it} = \beta_0 + + \delta_{DD} \text{Post*Treat} + \beta_1 X_{it} + \lambda_1 \text{Area}_{it} + \lambda_2 \text{Year}_i + \lambda_3 \text{Month}_{it} + \alpha_i + \varepsilon_{it}, \quad (1)$$

where Y_{it} represents self-reported health status in the main specification, Treat_{it} equals to one if an individual belongs to the treatment group and Post is an indicator for the post-treatment period 1999-2001[19]. Since the dependent variable is categorized from 1 (=excellent) to 5 (=very poor), ordered logit estimation is conducted in order to observe impacts of the reform across the distribution of health status. In other specifications, Y_{it} equals an indicator that equals one if respondents suffer from any chronic medical condition, if they have seen a doctor more than five times annually, if they have stayed at a hospital overnight as well as if they have used any other health services during the past 12 months. δ_{DD} is the main parameter of interest which represents the effect of the policy change on health outcomes. Prior to estimating the effect of the policy change on health, I furthermore test for how the reform affected income and hours worked of treated workers. X_{it} represents a set of time-varying individual and household characteristics. Equation (1) also includes dummy variables for region, year and month of the interview. The inclusion of α_i captures unobserved individual heterogeneity and accounts for potential omitted variable bias.

[19] All interviews of Wave 9 in 1999 were conducted in the later parts of the year and therefore after the policy change in April 1999.

5.2. Descriptive Statistics:

Table 2.1 presents descriptive statistics for the sample of low-wage workers who benefitted from the implementation of the NMW (treatment group) as well as for employees who did not experience a pay raise (control group) for 1997. It is observable that individuals from both groups are similar regarding most characteristics and demographics before the policy change. Since a portion of the treatment group includes 144 workers who were paid below the new NMW in the pre-treatment period, it is not surprising that average personal income of treated people is lower than that of individuals belonging to the control group (£553.86 vs. £966.34). Only small differences between the groups exist regarding the share of people reporting to be in excellent or very good health (73.1% vs. 75.7%). The statistics furthermore show that the share of women is substantially larger in the treatment group which is consistent with findings by Stewart and Swaffield (2002).

Table 2.2 shows sample statistics for health conditions in the first year of the study. Panel A provides the share of individuals reporting suffering from the 13 health conditions for each group. It is observable that treated individuals are 6.7 percentage points more likely to suffer from any health condition, whereas the shares for the two groups are comparable across all conditions besides migraine. In order to further examine the role of wage increases on health, I create two groups of health conditions in Panel B, based on the hypothesis that individuals are more likely to purchase over-the-counter medication following a raise: (1) conditions that could be treated immediately by additional earnings; (2) long-term/chronic conditions that should not be affected by having more money in the short-run. Despite the fact that the NHS provides universal

health insurance coverage, issues like quality of care as well as long waiting times were prevalent at the time of the study (Vizard and Obolenskaya, 2013). In order to avoid long waiting times, individuals in the UK can purchase a relatively small number of medications, which are placed on the General Sales List, at pharmacies without any prescription.[20] Finding declines in the presence of immediately "treatable" conditions after the reform could provide additional evidence for improvements in self-reported health status, whereas examining short-run changes in the presence of long-term conditions serves as a falsification test.

Figure 2.1 provides an overview of changes in the ratio of hourly wages throughout the period of interest, whereas the ratios are calculated using generated wage information (Stewart and Swaffield, 2002). The picture shows that the share of wages earned by members in the treatment group increases from 78% of wages earned by control group workers to 85% within one year of the reform, suggesting that the policy has a significant effect on earnings. Figure 2.2 shows the share of treated and non-treated individuals who report either excellent or very good health status during the period of the study. During the two years before the reform, an identical trend in health status is observable for the two groups, which fulfills a key identifying assumption of DD models.[21] After the implementation of the NMW, changes become apparent. Treated workers, who report worse health prior to the reform, are more likely to assess their health as excellent or very good after the policy change. Figure 2.3 furthermore shows

[20] Examples of medications on the General Sales List are painkillers, skin creams, anti-allergy tablets, hearing aids, eye drops as well as non-prescription glasses. Thus, I group the following conditions as potentially treatable by additional earnings: body pain, skin condition/allergy as well as problems with either hearing or eye sight.

[21] The presence of similar pre-treatment trends is confirmed when extending the sample period from five to nine years (1995-2003). The graph is available upon request.

that individuals in the treatment group experience a significant decline in the likelihood of reporting to suffer from conditions that are classified as potentially "treatable". The fact that the decline for treated workers occurs immediately after the increase in wages suggests that individuals use parts of this additional money to take care of existing conditions, while avoiding long waiting times at the doctor.

5.3. Alternative Specification:

A potential issue with the main specification could arise if some of those individuals who are classified treated as a result of having benefitted from spillover effects of the reform received their raise because they are more productive or even in better health. In an additional specification, I follow the approach used by Stewart and Swaffield (2002) and construct an hourly wage measure for the pre-treatment period by using reported monthly income and hours worked per week. Again, the sample is restricted to low-wage workers: Individuals earning below the NMW in the year before the reform are considered as treated, whereas those earning above the NMW and below £6.00 form the control group.

5.4. Potential Mechanisms:

In a summary of the literature on the income gradient in health, Evans et al. (2012) point out that previous work has not been able to conclusively explain the positive association between income and health. Consistent with standard economic models of the demand of health, which introduced the concept that individuals invest in their stock of health, a higher minimum wage could affect health by changing health-related behavior of low-wage workers. Using available data in the BHPS, I examine whether the NMW

affected a number of activities that are related to overall well-being of individuals, such as leisure expenditures, family vacations, membership in sport clubs, as well as smoking and drinking. The first two outcomes could affect health following the assumption that leisure activities and family vacations increase overall utility, whereas the other outcome could directly impact workers' health (Humphreys et al. 2014).

Other channels through which minimum wages could influence health are financial and job-related stress. This idea is consistent with early work in the medical literature which established the presence of physiological reactions to stress for diseases of the heart and the circulatory system (Sterling and Eyer, 1981; Henry, 1982). Similarly, the World Health Organization (WHO, 2013) points out that circumstances related to social and psychological well-being are capable of causing long-term stress through lack of self-esteem, social isolation, anxiety and stress at work. In an analysis of the recent economic downturn in the US, Macy et al. (2013) show that financial stain negatively affects health behavior. This study examines the role of financial and job-related stress by estimating the effects of the NMW on five outcomes, which equal to one if respondents report to: (1) be in a better financial position than one year ago; (2) expect his or her financial situation to worsen over the next year; (3) be in a very difficult financial situation currently; (4) be satisfied with his or her job; (5) be satisfied with the payment received at his or her job.

(5) Results:

6.1. Effect of the Policy on Labor Market Outcomes:

Before reporting results for the impact of the minimum wage implementation on health outcomes, Table 2.3 provides evidence for the effects of the policy change on

labor market outcomes. Panel A shows both descriptive statistics as well as an DD estimate regarding the impacts on monthly income. It is noticeable that earnings increase for both treatment and control group within one year of the reform, whereas the change is larger for treated workers. The DD results indicate that the policy significantly increased monthly income of treated workers by £51 ($77 using the year 2000 conversion rate), which corresponds to annual pay raises of £612 ($927). This finding is consistent with results from the literature (Metcalf, 2006 and 2008; Butcher, 2005). Panel B provides evidence for whether the NMW introduction impacted hours worked of low-wage workers. Consistent with previous work (Connolly and Gregory, 2003), I find no effects of the policy change on time spent at work.

6.2. Effects of the Policy on Health:

Table 2.4 shows results for average treatment effects of the NMW introduction on health status of affected workers. Since the share of individuals reporting to be in very poor health is quite small (< 1%), the bottom two health responses (poor and very poor) are combined to one outcome leaving the analysis with four health categories. The regression coefficient in column (1) shows that experiencing a wage increase as a result of the NMW introduction is significantly correlated with self-reported health status. The DD estimate is statistically significant at the 5% level. When looking at marginal effects in columns (2)-(5), it is noticeable that treated workers are 3.68 and 1.27 percentage points more likely to be in excellent health and very good health, respectively. Furthermore, receiving wage increases reduces the probability of reporting to be in fair and poor/very poor health. The observed impacts for various categories of health status correspond to percentage changes of up to 20% from the pre-treatment period and

provide evidence for the presence of a causal link between higher minimum wages and health.[22]

In order to further investigate the impact of the reform on health, I re-estimate equation (1) while examining outcomes that are potentially more objective (Johnston et al., 2009).[23] Based on the classification of health conditions shown in Table 2.2, DD estimates for several categories are presented in Table 2.5. The first column indicates that treated workers are 3.68 percentage points less likely to suffer from at least one of the thirteen health conditions mentioned in the survey, while the estimate is slightly significant. Column (2) shows that this finding is mainly driven by "treatable" conditions. Compared to workers in the control group, individuals who financially benefited from the reform are 3.48 percentage points less likely to suffer from a "treatable" health condition which corresponds to a 10% change from the pre-policy period. As expected, the policy change is not found to impact long-term conditions such as asthma and epilepsy (column 3). Overall, the estimates in Table 2.5 confirm that the NMW provides health benefits. The lack of highly significant results, which could be explained by the short time period of study and by reporting heterogeneity, suggests that these results should be treated with caution.

[22] The estimates for age and education dummies indicate that results do not differ by age and level of education. Reason for this could be the use of fixed effect models as well as a relatively short panel period. I have run additional models which separate the sample into age and education groups. I find that health benefits following the reform are stronger for higher educated as well as for younger workers. To account for differences in labor force exits between the two groups, I additionally estimate models that restrict the sample to individuals who remain employed throughout all five years of the sample. The findings remain identical to the main estimates.

[23] When examining the association between health status and other health measures, I find that individuals who are in excellent or very good health are significantly less likely to suffer from health conditions and to use health services frequently.

Next, this section examines various indicators of health care usage which, based on the assumption that health declines lead to increased use of health services, could be viewed as proxies for changes in health. Column (1) of Table 2.6 shows that treated individuals are 5.56 percentage points less likely to have used any health service in the previous year compared to workers in the control group. Consistent with this, column (2) reports that the NMW lowers the probability of having seen a doctor more than five times during the last 12 month by 3.26 percentage points. Both estimators are statistically significant at the 5% level and correspond to percentage changes of 14 and 17%, respectively. Due to the fact that the provision of health care through the NHS is mainly financed by taxes with relative low copays for prescription medications, these findings can be regarded as additional evidence for health improvements following the reform. Column (3) indicates that the NMW leads to a reduction in the likelihood of staying in a hospital overnight, whereas the lack of significance could be due to a combination of the following factors: an inelastic demand for hospital stays, insurance coverage provided by the NHS as well as only a small share of respondents who report to have stayed in a hospital overnight during the period of interest.

6.3 Alternative Specification:

Table 2.7 presents estimates obtained from an alternative DD specification, which uses a constructed measure of hourly wages in order to assign workers into treatment and control group. It is noticeable that the ordered logit results remain almost unchanged from the baseline estimates shown in Table 2.4. Receiving an increase in wages following the reform increases the likelihood of reporting excellent health by 3.88 percentage points. The estimate is statistically significant at the 1% level. The consistency in the finding

across both specifications removes concerns regarding the fact that some workers who are classified as treated in the baseline model are receiving a raise due to higher productivity.

(6) **Mechanisms**:

Consistent with Grossman (1972) who introduced the concept of individuals investing in their health, Table 2.8 examines whether the NMW led to changes in expenditures on leisure activities as well as on health-related behavior. Column (1) shows that treated households are 3.46 percentage points more likely to spend more than £80 per week on leisure as a result of the NMW (significant at 5% level), while column (2) indicates that treated workers are 3.39 percentage points more likely to go on a family vacation of at least one week. Following the assumption that both leisure expenditures and vacations increase utility, these changes could potentially explain parts of the observed changes in well-being. Column (3) shows that the reform increased active participation in sports clubs by 3.92 percentage points (significant at 10%). An increased participation in physical activity with no changes in hours worked could also potentially explain parts of the observed health improvements (Humphreys et al., 2014). Furthermore, column (4) shows that treated workers are 4.50 percentage points less likely to consume alcohol at least once per week after the reform, whereas no effects on smoking are shown.

In addition to physical health, it seems reasonable that the NMW also impacted psychological well-being of low-wage workers. Table 2.9 shows estimates for financial and job-related stress using five different indicators as dependent variables. The first three columns provide suggestive evidence for relative decreases of financial stress as a result of the policy change. Despite the lack of significance, the estimates can be

interpreted as indications that financial well-being was affected by the reform, especially when considering that treated workers earn on average £1.63 less than those in control group after the reform despite their pay increases (Table 2.3). Furthermore, specifications (4) and (5) show that the NMW introduction is significantly correlated with job satisfaction. Treated workers are 6.26 and 5.53 percentage points more likely to be satisfied with their current job and the payment received their job after the policy change compared to financially unaffected workers, respectively. The findings in Tables 2.8 and 2.9 suggest that there is not a single channel through which minimum wages influence health outcomes. Potentially, a combination of factors such as health-related behavior, psychological well-being and financial stress, are important mechanisms between minimum wages and health.

(7) **Robustness Checks**:

The previous analysis showed that the implementation of the NMW led to relative health improvements for low-paid workers. This section provides several robustness checks for the main findings. First, I estimate IV models by using an indicator for the policy change as an instrument for reported monthly income. Table 2.10 presents the treatment effects obtained from this specification, whereas the estimates correspond to changes following an increase of income by $1000. It is noticeable that the results are fairly consistent with the previous DD results. The findings provide additional evidence supporting the claim that income improves health and financial well-being of treated workers.

In order to test for additional robustness of the main findings, I construct a second control (control group 2) which consists of workers earning a fixed salary who were

financially unaffected by the policy change.[24] This allows testing for whether the observed health declines were solely experienced by workers who are paid hourly wages. The estimates in Table 2.11 confirm the presence of significant health improvements when comparing outcomes of treated individuals with the new control group. The fact that the magnitude of the ordered logit coefficient and the marginal effects remain analogous to the baseline results indicates that the estimates are robust to the selection of the control group and provide additional evidence for the presence of a downward trend in health in the UK shortly after the reform. Similar finding are found when looking at changes in health conditions between the two groups.

Next, I conduct a falsification test by comparing changes in health between the two control groups. Since neither group was financially affected by the reform, no health differences are expected to be found. The results in Table 2.12 confirm this expectation. Financially unaffected workers who are paid hourly are 0.04 and 0.01 percentage points more likely to report excellent health and very good health, respectively. Furthermore, I find no differential impacts on the likelihood of reporting several health conditions as a result of the policy. These findings strengthen the claim that the observed health improvements shown in section (6) are a result of increases in wages that followed the introduction of the NMW.

(8) Discussion and Conclusion:

Although the main goal of the implementation of the NMW by the British Government was to protect the pay of workers and to counter previous trends towards

[24] For the purpose of this analysis, salary workers are defined as financially unaffected if their personal monthly incomes immediately before and after the reform are within £25 of each other.

larger income inequality, this paper points out that the reform also provided non-monetary benefits. A complete evaluation minimum wage policy changes should consider evaluating all potential outcomes. Due to the popularity of the NMW, the UK wage floor has been increased several times since its initial introduction in 1999. Only recently, First Secretary of State George Osborne announced the introduction of the National Living Wage (NLW) which would significantly increase wages of low-income workers in the UK (Watt and Stewart, 2015). According to Osborne, the governments' goal is to increase the NLW to 60 % of median earnings by 2020, while decreasing working-age benefits. Given the findings of this study, potential health benefits of higher wage floors should be considered by policymakers when discussing changes to existing wage floor policies.

Changes to both federal and state minimum wages have been debated intensely in recent decades in the US as well as in other developed countries which underscores the relevance on studying the effects of such law changes. Only recently, President Obama proposed an increase of the federal minimum wage from $7.25 to $10.10. After the latest national elections in Germany in September 2013, the potential introduction of a federal wage floor was one of the first policies to be discussed and to be passed by the new administration. To my knowledge, this is the first study that investigates direct health effects of minimum wage policies. The findings suggest that minimum wage laws are capable of reducing existing health inequalities in society, a result that is desirable by both individuals and governments. Furthermore, the study provides some evidence for the role of health-related behavior, psychological well-being and financial stress as potential

channels underlying the link between minimum wages and health. Future research should continue to examine how minimum wages affect well-being of low-income individuals.

(9) References:

Abadie, A. (2005). Semiparametric Difference-in-Differences Estimators. Review of Economic Studies 72: 1-19.

Adams, S., McKinley, L. B., Cotti, C. (2012). Minimum Wages and Alcohol-Related Traffic Fatalities among Teens. The Review of Economics and Statistics, Vol. 94 (3): 828-840.

Adda, J., Banks, J., von Gaudecker, H.-M. (2009). The Impact of Income Shocks on Health: Evidence from Cohort Data. Journal of the European Association, Vol. 7 (6): 1361-99.

Arulampalam, W., Booth, A. L., Bryan, M. L. (2004). Training and the New Minimum Wage. The Economic Journal, 114 (March): C87-C94.

Bhatia, R. (2014). Health Impacts of Raising California's Minimum Wage. Human Impact Partners. Oakland, CA. May 2014.

Blundell, R., Duncan, A., McCrae, J., Meghir, C. (2000). The Labour Market Impact of the Working Families' Tax Credit. Fiscal Studies, Vol. 21 (1): 75-104.

Bryan, M., Salvatori, A., Taylor, M. (2013). The Impact of the National Minimum Wage on Employment Retention, Hours and Job Entry. Research Report for the Low Pay Commission. February. (Institute for Social and Economic Research, University of Essex).

Bucila, L. (2013). Employment-Based Health Insurance and the Minimum Wage. Working Papers Series, available at: SSRN: http://ssrn.com/abstract=2275342.

Butcher, T. (2005). The Hourly Earnings Distribution Before and After the National Minimum Wage. Labour Market Trends, October: 427-435.

Butcher, T., Dickens, R., Manning, A. (2012). Minimum Wages and Wage Inequality: Some Theory and an Application to the UK. LSE CEP Discussion Paper No. 1177.

Case, A., Lubotsky, D., Paxson, C. (2002). Economic Status and Health in Childhood: The Origins of the Gradient. The American Economic Review, Vol. 92, No. 5 (2002): 1308-1334.

Card, D., Krueger, A. B. (1995). Myth and measurement: The new economics of the minimum wage. New Jersey: Princeton University Press.

Card, D., Dobkin, C., Maestas, N. (2009). Does Medicare Save Lives ? Quarterly Journal of Economics, Vol. 124 (2): 597-636.

Clark, A. E., Oswald, A. J. (1996). Satisfaction and Comparison Income. Journal of Public Economics, Vol. 61: 359-381.

Connolly, S., Gregory, M. (2003). The National Minimum Wage and Hours of Work: Implications of Low Paid Women. Oxford Bulletin of Economics and Statistics, Vol. 64, Supplement (2002).

Cotti C., Tefft, N. (2013). Fast food prices, obesity, and the minimum wage. Economics and Human Biology, Vol. 11: 134-147.

Currie, A., Shield, M. A., Price, S. W., (2007). The child health/family income gradient: Evidence from England. Journal of Health Economics, Vol. 26 (2007): 212-232.

Currie, J., Gruber, J. (1996a). Health Insurance Eligibility, Utilization of Medical Care, and Child Health. Quarterly Journal of Economics, Vol. 111 (2): 431-466.

Currie, J., Gruber, J. (1996b). Saving Babies: The Efficacy and Cost of Recent Changes in the Medicaid Eligibility of Pregnant Women. Journal of Political Economy, Vol. 106 (6): 1263-96.

Currie, J., Stabile, M. (2003). Socioeconomic Status and Child Health: Why is the Relationship Stronger for Older Children? The American Economic Review, Vol. 93, No. 5 (2003): 1813-1823.

Deaton, A. S. (2002). Policy Implications of the Gradient of Health and Wealth. Health Affairs, Vol. 21: 13-30.

Dickens, R., Machin, S., Manning, A. (1999). The Effects of Minimum Wages on Employment: Theory and Evidence from Britain. Journal of Labor Economics, Vol. 17 (1): 1-22.

Dickens, R., Manning, A. (2004). Has the national minimum wage reduced UK wage inequality? Journal of the Royal Statistical Society Series A, Royal Statistical Society, Vol. 167 (4): 613-626.

Dolton, P., Bondibene, C. R., Wadsworth, J. (2012). Employment, Inequality and the UK National Minimum Wage over the Medium-Term. Oxford Bulletin of Economics and Statistics, Vol. 74 (1): 78-106.

Easterlin, R. A. (1974). Does Economic Growth Improve the Human Lot? Some Empirical Evidence. In Nations and Households in Economic Growth: Essays in Honor of Moses Abramowitz, by Paul A. David and Melvin W. Reder. New York: Academic Press, Inc.

Easterlin, R. A. (1995). Will Raising the Incomes of All Increase the Happiness of All? Journal of Behavioral and Organization, Vol. 27 (1): 35-48.

Evans, W., Wolfe, B., Adler, N. (2012). The SES and Health Gradient: A Brief Review of the Literature. The Biological Consequences of Socioeconomics Inequalities, Russell Sage Foundation: 2012.

Evans, W. N., Garthwaite, C. (2014). Giving Mom a Break: The Impact of Higher EITC Payments on Maternal Health. American Economic Journal Policy, Vol. 6 (2): 258-290.

Fletcher, J., Wolfe, B. (2014). Increasing our Understanding of the Health-Income Gradient in Children. Health Economics, Vol. 23: 473-486.

Frijters, P., Haisken-DeNew, J. P., Shields, M. (2005). The Causal Effect of Income on Health: Evidence from German Reunification. Journal of Health Economics 24: 997-1017.

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. Journal of Political Economy, Vol. 80 (2): 223-255.

Henry, J. P. (1982). The Relation of Social to Biological Processes in Disease. Social Science and Medicine, Vol. 16: 369-380.

Hicks, J., Allen, G. (1999). A Century of Change: Trends in UK statistics since 1900. House of Commons Library. Research Paper 99/111, Social and General Statistics Section.

Hoynes, H., Page, M., Stevens, A. H. (2011). Can targeted transfers improve birth outcomes? Evidence from the introduction of the WIC program. Journal of Public Economics, Vol. 95 (2011): 813-827.

Hoynes, H. W., Miller, D. L., Simon, D. (2013). Income, the Earned Income Tax Credit, and Infant Health. NBER Working Paper #18206. http://www.nber.org/papers/w18206.

Humphreys, B. R., McLeod, L., Ruseski, J. E. (2014). Physical activity and health outcomes: Evidence from Canada. Health Economics, Vol. 23: 33-54.

Idler, E. L., Benyamini, Y. (1997). Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. Journal of Health and Social Behavior 1997, Vol. 38 (March): 21-37.

Johnston, D. W., Propper, C., Shields, M. A. (2009) Comparing subjective and objective measures of health: Evidence for the income/health gradient. Journal of Health Economics, Vol. 28: 540-552.

Khanam, R., Nghiem, H. S., Connelly, L. B. (2009). Child health and the income gradient: Evidence from Australia. Journal of Health Economics, Vol. 28(4): 805-817.

Kronenberg, C., Jacobs, R., Zucchelli, E. (2015). The Impact of a Wage Increase on Mental Health: Evidence from the UK Minimum Wage. Health, Econometrics and Data Group, The University of York. WP 15/08.

Kuehnle, D. (2014). The Causal Effect of Family Income on Child Health in the UK. Journal of Health Economics 36: 137-150.

Leigh, J. P. (2013). Raising the minimum wage could improve public health. Economic Policy Institute, http://www.epi.org/blog/raising-minimum -wage-improve-public-health/

Lindahl, M. (2005). Estimating the Effect of Income on Health and Mortality using Lottery Prizes as an Exogenous Source of Variation in Income. Journal of Human Resources, University of Wisconsin Press, Vol. 40 (1).

Low Pay Commission (1998). The National Minimum Wage, First Report, Cm. 3976. The Stationary Office, London.

Lupton, R., Hills, J., Stewart, K., Vizard, P. (2013). Labour's Social Policy Record: Policy, Spending and Outcomes 1997-2010. Social Policy in Cold Climate Research Report 1. London: CASE.

Macy, J. T., Chassin, L., Presson, C. C. (2013) Predictors of Health Behaviors after the Economic Downturn: A Longitudinal Study. Social Science & Medicine, Vol. 89: 8-15.

Manning, A. (2013). Minimum Wages: A View from the UK. Perspektiven der Wirtschaftspolitik, Vol. 14 (1-2): 57-66.

Marks, M. S. (2011). Minimum Wages, Employer-Provided Health Insurance, and the Non-discrimination Law. Industrial relation, Vol. 50 (2).

Meltzer, D. O., Chen, Z. (2011). The Impact of Minimum Wage Rates on Body Weight in the United States. National Bureau of Economic Research, Volume Title: Economic Aspects of Obesity. Chapter URL: http://www.nber.org/chapters/c11815.

Metcalf, D (1999). The British National Minimum Wage (1999). CEPDP, 419. Centre for Economic Performance, London School of Economics and Political Science, London, UK. ISBN 0753012693.

Metcalf, D. (2006). On the Impact of the British National Minimum Wage on pay and Employment. Centre Piece Working Paper, London School of Economics. http://cep.lse.ac.uk/research/labour/minimum wage/WP1481c.pdf

Metcalf, D. (2008). Why has the British National Minimum Wage had Little or No Impact on Employment? Journal of Industrial Relations, Vol. 50 (3): 489-512.

Milligan, K., Stabile, M. (2011). Do Child tax Benefits Affect the Wellbeing of Children? Evidence from Canadian Benefits Expansion. American Economic Journal of Economic Policy, Vol. 3 (3): 175-2005.

Neumark, D., Wascher, W. (2001). Using the EITC to Help Poor Families: New Evidence and a Comparison with the Minimum Wage. National Tax Journal, National Tax Association, Vol. 54 (2): 281-318.

Propper, C., Rigg, J., Burgess, S. (2007). Child Health: Evidence on the Roles of Family Income and Maternal Mental Health from a UK Birth Cohort. Health Economics, Vol. 16 (2007): 1245-1269.

Reinhold, S., Jürges, H. (2012). Parental income and child health in Germany. Health Economics, Vol. 21 (5): 562-579.

Royal College of Nursing (2012). Health inequalities and the social determinants of health. Policy and International Department, RCN. Policy Briefing #01/12.

Simon, K. I., Kaestner, R. (2004). Do Minimum Wages affect non-wage job attributes? Evidence on fringe benefits. Industrial and Labor Relations Review, Vol. 58 (1).

Sterling, P., Eyer, J. (1981). Biological Basis of Stress-Related Mortality. Social Science and Medicine 15 E: 3-42.

Stewart, M. B., Swaffield, J. K. (2002). Using the BHPS Wave 9 Additional Questions to Evaluate the Impact of the National Minimum Wage. Oxford Bulletin of Economics and Statistics, 64, Supplement: 633-652.

Stewart, M. B. (2004). The Impact of the Introduction of the U.K. Minimum Wage on the Employment Probabilities of low-wage Workers. Journal of the European Economic Association, Vol. 2 (2004): 67-97.

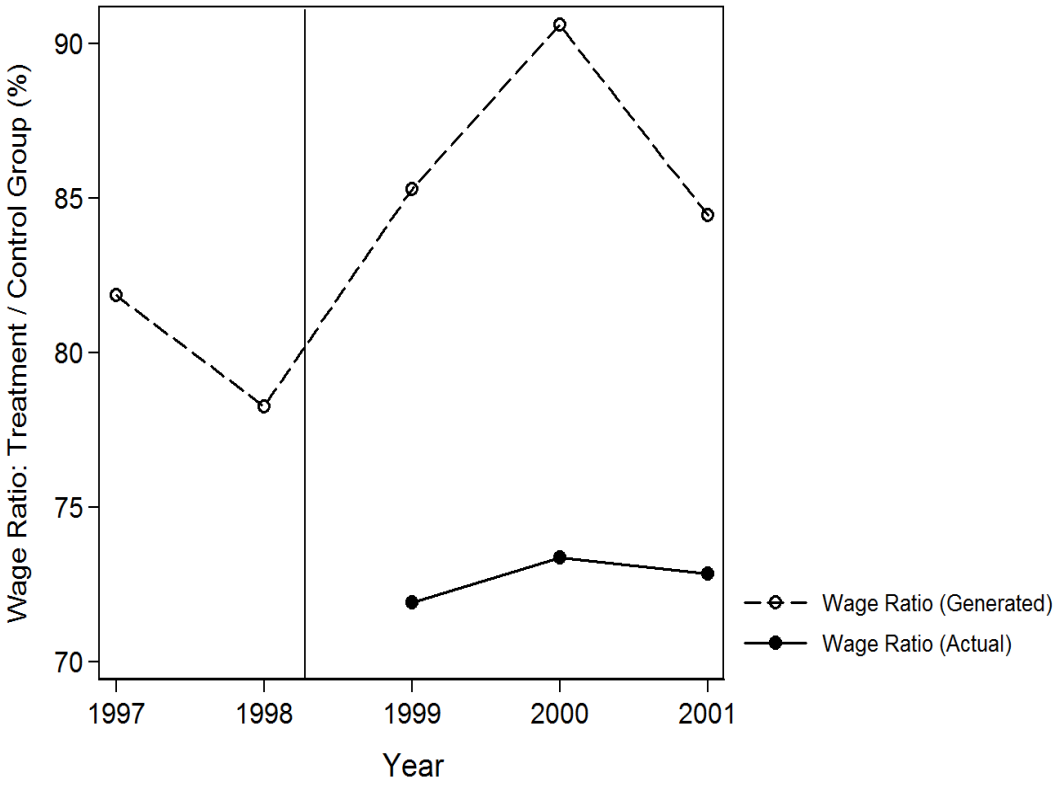
Taylor, M. (1998). British household panel study user manual: Introduction, technical reports and appendices. ESRC Research Center on Micro-social Change, University of Essex, Colchester.

Vizard, P., Obolenskaya, P. (2013). Labour's Record on Health: Policy Spending and Outcomes. Social Policy in a Cold Climate Working Paper WP02. London: CASE.

Watt, N., Stewart, H. (2015). George Osborne introduces new 'living wage' but cuts working-age benefits. http://www.theguardian.com/uk-news/2015/jul/08/budget-2015-uk-gdp-other-rich-nations-george-osborne.

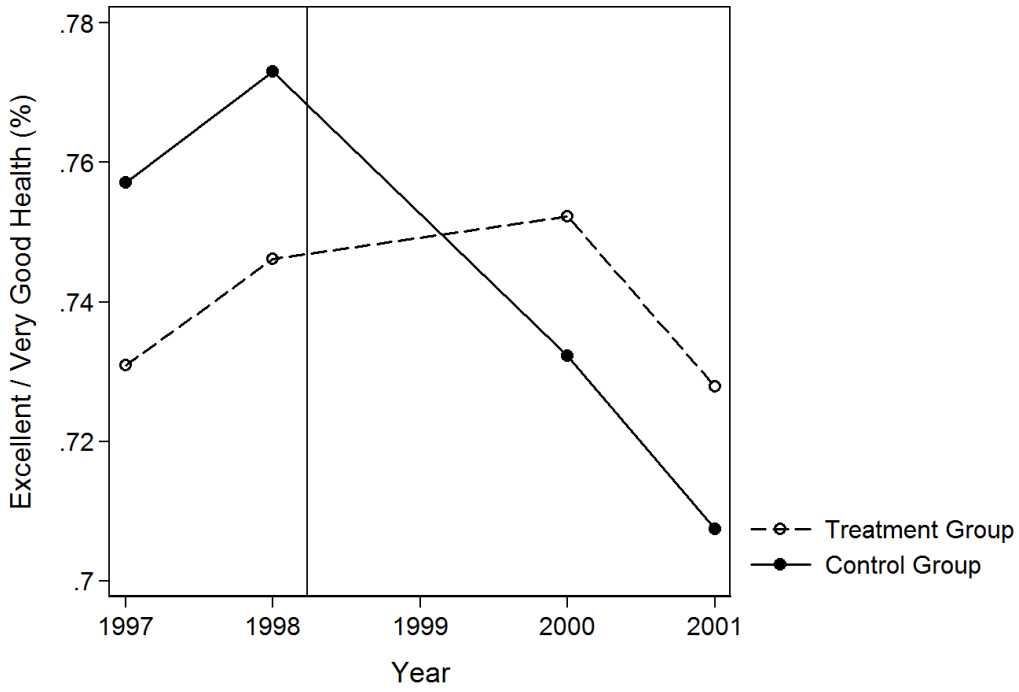
World Health Organization (2003). Social determinants of health: the solid facts. WHO Library Cataloguing in Publication Data, 2nd Edition. ISBN: 92 890 1371 0.

Figure 2.1: Hourly Wage Ratios: Treatment Group / Control Group



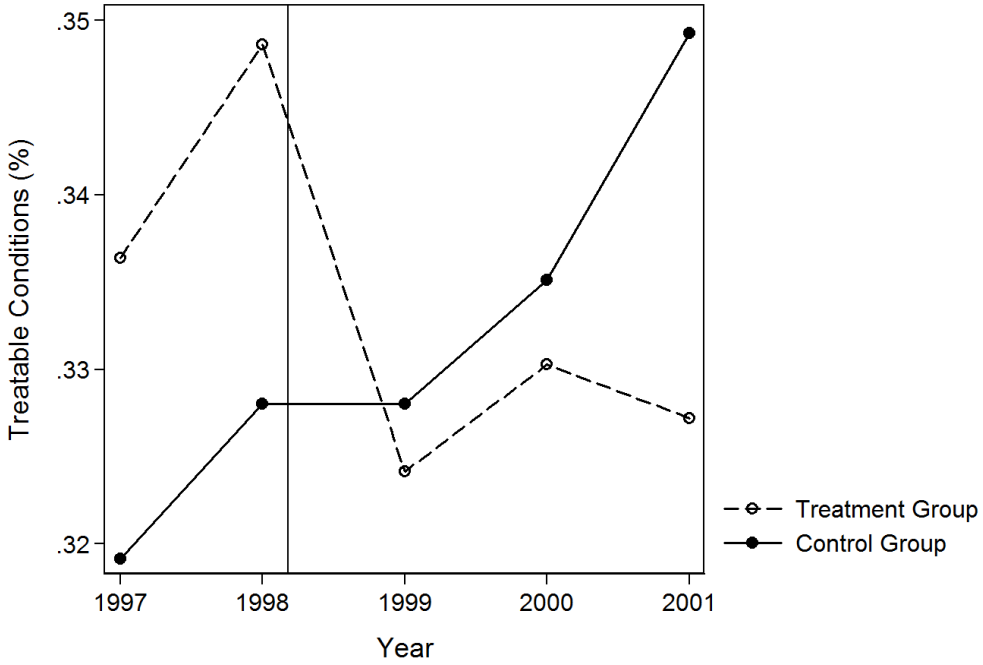
The wages used for the ratios are deflated to 2000 Pounds using the UK Average Earnings Index. Generated hourly wages are calculated based on the reported number of hours worked per week and the self-reported personal monthly income for the last payment period. Actual wages are based on responses to questions about hourly wages which were introduced to the survey in the post-treatment period.

Figure 2.2: The Share of Individuals in Excellent or Very Good Health:



The picture shows the share of individuals in both groups who report to be in excellent or very good health.

Figure 2.3: The Share of Individuals with "Treatable" Health Conditions:



The picture shows the share of individuals in both groups who suffer from a health condition that is classified as "treatable".

Table 2.1: Descriptive Statistics Pre-Treatment (1997):

Variables	Treatment Group	Control Group
Income		
Personal Income/Month	£553.86*** (354.74)	£966.34*** (581.46)
Household Income/Month	£1,899.63*** (1,157.40)	£2,301.93*** (1,311.37)
Health:		
% Excellent/Very Good	0.731 (0.444)	0.757 (0.429)
% Poor/Very Poor	0.080 (0.271)	0.039 (0.194)
% Health Condition	0.578* (0.495)	0.511* (0.500)
% Doctor > 5 times last year	0.200 (0.400)	0.140 (0.347)
% Hospital In-Patient last year	0.067 (0.251)	0.060 (0.238)
Education		
% A-Levels	0.107 (0.310)	0.145 (0.353)
% O-Levels	0.284 (0.452)	0.275 (0.447)
% Higher Education	0.159*** (0.366)	0.248*** (0.432)
Marital Status		
% Married	0.541 (0.499)	0.606 (0.489)
% Divorced	0.064* (0.014)	0.057* (0.008)
% Separated	0.028** (0.009)	0.007** (0.004)
% Never Married	0.266** (0.025)	0.174** (0.016)
Age	36.63 (12.72)	37.88 (11.64)
% Male	0.266*** (0.443)	0.482*** (0.500)
# of Children in HH	0.709 (1.00)	0.768 (1.06)
Household Size	3.31 (1.22)	3.24 (1.20)
% Private Insurance	0.092* (0.289)	0.133* (0.282)
% Saving any	0.419 (0.494)	0.439 (0.500)
% Living Comfortably financially	0.229 (0.421)	0.236 (0.425)
% Completely satisfied with job	0.205 (0.404)	0.195 (0.400)
Observations:	327	564

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 2.2: Descriptive Statistics on Health Conditions Pre-Treatment (1997):

Conditions	Treatment Group	Control Group
Panel A: All Conditions		
Any	0.578* (0.495)	0.511* (0.500)
Body Pain / Problems	0.180 (0.385)	0.193 (0.395)
Migraine	0.174** (0.380)	0.119** (0.324)
Skin / Allergy	0.116 (0.321)	0.103 (0.304)
Asthma / Chest / Breathing	0.101 (0.302)	0.094 (0.292)
Anxiety / Depression	0.070 (0.256)	0.060 (0.238)
Heart / Blood Pressure	0.064 (0.246)	0.066 (0.248)
Hearing	0.064 (0.246)	0.050 (0.217)
Stomach / Liver / Kidney	0.052 (0.222)	0.057 (0.232)
Seeing	0.027 (0.164)	0.020 (0.138)
Epilepsy	0.012** (0.110)	0.002** (0.042)
Diabetes	0.003 (0.055)	0.004 (0.059)
Alcohol / Drugs	0	0.002 (0.042)
Other	0.043* (0.203)	0.021* (0.144)
Observations	327	564
Panel B: Groups of Conditions	*"Treatable" Conditions*	*Long-Term Conditions*
	Body Pain / Problems Skin / Allergy Hearing Seeing	Asthma / Chest / Breathing Epilepsy
Treatment Group	0.336 (0.473)	0.113 (0.317)
Control Group	0.319 (0.467)	0.096 (0.295)

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 2.3: The Effects of the Policy on Income and Hours Worked:

	Panel A: Monthly Income		**Panel B: Hours Worked per Week**	
Descriptive Statistics	*Treatment Group*	*Control Group*	*Treatment Group*	*Control Group*
1998	605.68	1,030.86	26.63	32.21
	(338.13)	(590.22)	(12.48)	(11.47)
1999	681.57	1,055.48	26.02	31.97
	(334.06)	(573.68)	(12.30)	(11.78)
DD Estimates				
Policy Effect	50.9703***		0.4124	
	(16.1394)		(0.6903)	
Observations	4,455		4,150	

Robust standard errors are reported in parentheses. Panel B only considers workers who report their number of hours worked. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.4: The Effects of the Policy on Health Status (Ordered Logit):

	Coefficient	**Marginal Effects**			
		Excellent	Very Good	Fair	Poor/Very Poor
Post*Treat	-0.2346**	0.0368**	0.0127**	-0.0347**	-0.0148**
	(0.0975)	(0.0153)	(0.0057)	(0.0144)	(0.0063)
Age	0.0023	-0.0004	-0.0001	0.0003	0.0001
	(0.0055)	(0.0009)	(0.0003)	(0.0008)	(0.0003)
HH Size	-0.0418	0.0065	0.0023	-0.0062	-0.0026
	(0.0504)	(0.0079)	(0.0028)	(0.0074)	(0.0032)
# of Children	-0.0962	0.0151	0.0052	-0.0142	-0.0061
	(0.0618)	(0.0097)	(0.0034)	(0.0092)	(0.0039)
Observations	4,455	4,455	4,455	4,455	4,455

Robust standard errors, clustered by individuals, are shown in parentheses. Region, year and month dummy variables are included in all models. The statistical significance of the marginal effects corresponds to the statistical significance of the coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.5: The Effects of the Policy on Health Conditions:

	Types of Health Conditions		
	(1) Any	(2) "Treatable"	(3) Long-Term / Chronic
Post*Treat	-0.0368*	-0.0348*	-0.0006
	(0.0217)	(0.0205)	(0.0115)
Age	0.0082	-0.0013	0.0131
	(0.0203)	(0.0173)	(0.0125)
HH Size	0.0059	0.0150	-0.0094*
	(0.0131)	(0.0127)	(0.0049)
# of Children	-0.0183	-0.0376**	-0.0042
	(0.0588)	(0.0184)	(0.0094)
Observations	4,455	4,455	4,455

The division of health conditions is based on the categorization in Table 2 and is based on the author's opinion. Robust standard errors, clustered by individuals, are shown in parentheses. Furthermore, region, year and month dummy variables are included in all models. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.6: The Effects of the Policy on Health Care Usage:

	Used any Health Service last year	**Doctor >5 times last year**	**Hospital In-Patient last year**
	(1)	(2)	(3)
Post*Treat	-0.0556**	-0.0326**	-0.0192
	(0.0255)	(0.0136)	(0.0164)
Age	0.0432	0.0183	0.0249
	(0.0304)	(0.0175)	(0.0203)
HH Size	-0.0171	0.0280	0.0061
	(0.0134)	(0.0122)	(0.0068)
# of Children	0.0098	0.0357*	-0.0158
	(0.0211)	(0.0190)	(0.0136)
Observations	4,455	4,455	4,455

Robust standard errors are shown in parentheses. Furthermore, region, year and month dummy variables are included in all models. Examples of health services asked for in the BHPS are usage of a physiotherapist, psychotherapist, health visitor at home and a hospital consultant. Pregnancies are excluded when examining changes in the likelihood of being a hospital in-patient. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2.7: The Effects of the Policy on Health Status (Alternative Specification):

	Coefficient	**Marginal Effects**			
		Excellent	Very Good	Fair	Poor/Very Poor
Post*Treat	-0.2430***	0.0388***	0.0105**	-0.0358***	-0.0137***
	(0.0889)	(0.0142)	(0.0043)	(0.0131)	(0.0051)
Age	0.0082*	-0.0013*	-0.0004*	0.0012*	0.0004*
	(0.0044)	(0.0007)	(0.0002)	(0.0007)	(0.0003)
HH Size	0.0305	-0.0049	-0.0013	0.0045	0.0017
	(0.0359)	(0.0057)	(0.0016)	(0.0053)	(0.0020)
# of Children	-0.0488	0.0079	0.0021	-0.0072	-0.0027
	(0.0642)	(0.0103)	(0.0028)	(0.0095)	(0.0036)
Observations	5,995	5,995	5,995	5,995	5,995

Robust standard errors, clustered by individuals, are shown in parentheses. Region, year and month dummy variables are included in all models. The statistical significance of the marginal effects corresponds to the statistical significance of the coefficients. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2.8: Potential Mechanisms underlying the Income/Health Relationship:

	Spend > £80 per Week on Leisure	**Family Vacation of at least one Week per Year**	**Member of a Sports Club**	**Drink at least once per Week**	**Smoker**
	(1)	(2)	(3)	(4)	(5)
Post*Treat	0.0346**	0.0339	0.0392*	-0.0450	0.0061
	(0.0158)	(0.0210)	(0.0230)	(0.0304)	(0.0133)
Age	0.0053	-0.0075	-0.0102	0.0040	-0.0189
	(0.0163)	(0.0214)	(0.0255)	(0.0527)	(0.0219)
HH Size	0.0208**	0.0247	-0.0095	-0.0222	-0.0050
	(0.0094)	(0.0130)	(0.0111)	(0.0229)	(0.0073)
# of Children	-0.0301**	0.0260	-0.0332	-0.0284	0.0040
	(0.0127)	(0.0199)	(0.0202)	(0.0313)	(0.0105)
Observations	4,455	4,455	2,647	1,772	3,531

Robust standard errors are shown in parentheses. Furthermore, region, year and month dummy variables are included in all models. Questions regarding participation in sport clubs are only available in the years 1997, 1999 and 2001, whereas questions about alcohol consumption are only asked in 1998 and 2000. * $p< 0.10$, ** $p< 0.05$, *** $p < 0.01$.

Table 2.9: The Effects of the Policy on Financial Stress:

	Better financial position than 1 year ago	**Expect financial situation to worsen next year**	**Current financial situation very difficult**	**Satisfied with current job (overall)**	**Satisfied with current job (pay)**
	(1)	(2)	(3)	(4)	(5)
Post*Treat	0.0344	-0.0222	-0.0147	0.0626***	0.0495*
	(0.0281)	(0.0185)	(0.0097)	(0.0277)	(0.0244)
Age	0.0208	0.0093	0.0049	0.0099	0.0154
	(0.0187)	(0.0126)	(0.0074)	(0.0254)	(0.0225)
HH Size	0.0427***	0.0063	0.0101**	-0.0022	0.0035
	(0.0159)	(0.0135)	(0.0049)	(0.0192)	(0.0137)
# of Children	-0.0367	-0.0419*	-0.0124	-0.0256	0.0092
	(0.0230)	(0.0218)	(0.0068)	(0.0193)	(0.0215)
Observations	4,455	4,455	4,455	4,455	4,455

Robust standard errors are shown in parentheses. Furthermore, region, year and month dummy variables are included in all models. * $p < 0.10$, ** $p < 0.05$, *** $p<0.01$.

Table 2.10: IV Estimates for the Effects of the Policy:

	Excellent/Very Good Health	*Poor/Very Poor Health*	*Used any Health Service*	*Financial Situation very difficult*	*Satisfied with Job*	*Spend >£80 on Leisure*
	(1)	(2)	(3)	(4)	(5)	(6)
Total Income	0.0514	-0.0474	-0.0940	-0.0263	0.1186	0.0579
	(0.0390)	(0.0247)	(0.0462)	(0.0150)	(0.0418)	(0.0262)
Observations	4,455	4,455	4,455	4,455	4,455	4,455

Robust standard errors are shown in parentheses. Furthermore, region, year and month dummy variables are included in all models. The first-stage F-Statistic for the instrument equals 10.96, while the partial R-squared equals 0.0007.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.11: The Effects of the Policy on Health Status with Control Group 2:

	Coefficient	**Marginal Effects**			
		Excellent	Very Good	Fair	Poor/Very Poor
Post*Treat	-0.2196**	0.0371**	0.0068	-0.0318**	-0.0122**
	(0.1073)	(0.0181)	(0.0042)	(0.0156)	(0.0061)
Age	-0.0029	0.0005	0.0001	-0.0004	-0.0002
	(0.0062)	(0.0011)	(0.0002)	(0.0009)	(0.0003)
HH Size	-0.0668	0.0113	0.0021	-0.0097	-0.0037
	(0.0572)	(0.0097)	(0.0019)	(0.0083)	(0.0032)
# of Children	-0.0352	0.0060	0.0011	-0.0051	-0.0020
	(0.0740)	(0.0125)	(0.0023)	(0.0107)	(0.0041)
Observations	3,360	3,360	3,360	3,360	3,360

Robust standard errors, clustered by individuals, are shown in parentheses. Region, year and month dummy variables are included in all models. The statistical significance of the marginal effects corresponds to the statistical significance of the coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.12: Falsification Test: The Effects of the Policy on Health Status:

	Coefficient	**Marginal Effects**			
		Excellent	Very Good	Fair	Poor/Very Poor
Treat*After	-0.0022	0.0004	0.0001	-0.0003	-0.0001
	(0.1053)	(0.0174)	(0.0040)	(0.0158)	(0.0055)
Age	0.0036	-0.0006	-0.0001	0.0005	0.0002
	(0.0056)	(0.0009)	(0.0002)	(0.0008)	(0.0003)
HH Size	-0.0052	0.0009	0.0002	-0.0008	-0.0003
	(0.0564)	(0.0093)	(0.0021)	(0.0085)	(0.0030)
# of Children	-0.0361	0.0060	0.0014	-0.0054	-0.0019
	(0.0707)	(0.0117)	(0.0027)	(0.0106)	(0.0037)
Observations	4,110	4,110	4,110	4,110	4,110

In this falsification test, financially unaffected workers paid hourly form an "artificial" treatment group, whereas financially unaffected salary workers form the control group. Robust standard errors, clustered by individuals, are shown in parentheses. Region, year and month dummy variables are included in all models. The statistical significance of the marginal effects corresponds to the statistical significance of the coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Chapter Three

The Role of Economic Shocks on Health: Evidence from German Reunification

Abstract:

Sudden economic shocks impact the living conditions of affected populations from one day to the next. A number of studies have previously examined the association between economic fluctuations and health outcomes, whereas no consensus has yet been established about the nature of the relationship. By exploiting the dramatic changes in Germany which followed German Reunification of 1990 and included a sudden change from a socialist to a capitalist system in East Germany as well as other dramatic changes, this study tests whether large economic shocks affect health. I find a large and statistically significant association between economic shocks and worsened health outcomes. The analysis shows that the effects are stronger for people who are unemployed shortly after reunification, for low-income individuals as well as for East Germans, who were confronted with larger economic fluctuations. Furthermore, I provide evidence that exercise frequency, economics uncertainty and overall stress are mechanisms underlying the link between economic shocks and health.

Keywords: Health; Economic Shock; Health Behavior; Well-Being; Unemployment

JEL Codes: I0, I12, J64.

3.1 Introduction:

Negative economic shocks like the recent worldwide recession induce, among many other things, a rise in unemployment, tightened credit markets and an increase in the number of bankruptcies. Due to the fact that the majority of economic downturns occur without foresight, it is likely that not only labor market outcomes are affected by the fluctuations of the economy. Despite being examined by several researchers, no consensus about the effects of economic declines on individual health outcomes has been established. One suggested reason for the mixed findings is the lack of substantial macroeconomic variations that are exploited by the majority of early studies (Currie et al., 2014). This study contributes to the literature by examining health effect of a dramatic shock to the economy: the German reunification of 1990. Given that unemployment rates rose from 4.1% in 1990 to 11.8% in 1994, this time period offers a unique setting to test the association between economic shocks and health. By following the same individuals over time, this study examines how variations in unemployment rates in all 16 German states affected several outcomes related to health.

Beginning with Ruhm (2000), numerous studies have examined the relationship between economic downturns and a number of health outcomes such as mortality (Neumayer, 2004; Miller et al., 2009), self-reported health status (Currie et al., 2014), health behaviors (Ruhm and Black, 2002; Currie et al., 2014) as well as mental health (McInerney et al., 2013). However, previous work has not been able to reach a consensus on how economic decline affect health. On the one hand, several studies provide evidence for declines in mortality and improvements in health behaviors like smoking, drinking, exercising and weight loss as a response to being confronted by economic

downturns (Ruhm, 2000; Ruhm and Black, 2002; Dehejia and Lleras-Muney, 2004). On the other hand, more recent studies show that increases in unemployment rates lead to declines in physical and mental health as well as to deteriorations of health behaviors (McInerney et al., 2013; Currie et al., 2014). The disparity of findings in the literature suggests that additional research is needed to better understand how macroeconomic events impact health-related outcomes.

This study advances previous work on the relationship between economic shocks and health in five ways. First, while the majority of early work in the literature examined relatively small recessions, the early 1990s in Germany offer not only substantial fluctuations of unemployment rates but also several other dramatic structural changes. Second, this paper is one of very few studies to use longitudinal data to analyze the effects of economic fluctuations on health, which allows controlling for individual time-invariant characteristics that are potentially correlated with changes in health. Third, the study tests for the presence of heterogeneous health effects by testing for differences across regions, employment status and income distribution in order to examine which groups of the population are affected the most from economic shocks. Fourth, by exploiting the richness of the dataset, the analysis also investigates the role of a number of potential mechanisms such as physical activity, economic uncertainty and stress. Finally, the study examines whether changes in income inequality in Germany following reunification, measured by variations in statewide Gini coefficients, are associated with health outcomes.

The findings of this study show that sudden economic shocks significantly worsen the health of individuals. Following the reunification, Germans report significant declines in

health, while increasing the number of doctor and hospital visits. The analysis shows that the effects are stronger for people who are unemployed shortly after reunification, for low-earning individuals as well as for people in East Germany, who were confronted with larger economic fluctuations. When examining potential mechanisms underlying the link between economic shocks and health, I find that reductions in exercise frequency, increases in economic uncertainty and stress can explain the observed declines in health. Overall, the findings suggest that government officials should not only focus on policies that are able to stabilize the economy, but also consider ways to help individuals better deal with economic downturns and prevent negative effects on health.

3.2 Background on the German Reunification:

After World War II, the German population was faced with significant territorial and economic changes. The East German region became occupied by Soviet forces which formed the German Democratic Republic (GDR) in 1949. The GDR became a socialist state that placed emphasis on having its own identity by establishing its own government and currency. At the same time, American, British and French representatives combined forces and created a capitalist state in West Germany: the Federal Republic of Germany. The division of two German countries lasted for four decades and ended only in the aftermath of the Cold War. Following the collapse of the one-party rule in East Germany 1989 and drastic changes in the Soviet system, the signing of a unification treaty by the governments of East and West Germany on August 31, 1990 initiated the end of a divided Germany.

Political unification was finalized on October 3, 1990 when the six eastern states East Berlin, Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt and

Thuringia were included in the German Federal Republic. Besides the political annex and the immediate adaption of the capitalist system in East Germany, reunification additionally included both a monetary and a social union. The events of 1990 led to substantial changes in the German labor market. Unemployment rates in East Germany increased by 13.8 percentage points by 1992 due to the terrible state of the East German economy in the late 1980s.[25] During the time period examined in this study, West German unemployment rates also increased from 5.9% in 1990 to 9.2% in 1995. As part of the monetary union, the West German currency was adapted from one day to the next in the former GDR. Furthermore, significant income support transfers from West to East were conducted shortly after reunification (Frijters et al., 2004). People from East Germany were also allowed to travel to West Germany, unlike during the years before. Overall, the events following the union of the two German regions provide researchers with a large and unforeseen economic shock.

The timing and magnitude of economic fluctuations immediately after reunification provides the opportunity to test for the effects of economic shocks on health. Despite the number and the extent of the fluctuations with which individuals in Germany were confronted with after reunification, Frijters et al. (2005) point out that no changes in several health-producing circumstances occurred at the time – hospital kept working similar to before, vaccination programs remained alike (Frijters et al., 2005). Nonetheless, the East German health care system was reformed after reunification (Nolte, 2004; Vogt and Vaupel, 2015). With the exception of a 5-year period of grace for the

[25] Productivity levels in East Germany were one-third compared to its West German counterpart.

maintenance of polyclinics and related facilities, West Germany's health care structure was transferred over to the former GDR region during the 1990s.

3.3 Previous Literature:

Several researchers have previously investigated the role of economic fluctuations on health. The first study to examine this topic was conducted by Ruhm (2000) by linking US data on state unemployment rates to state-level Vital Statistics Death Records from 1972 to 1991. Ruhm finds that a 1 percentage point increase in the state unemployment is associated with a 0.5% reduction in state mortality rates suggesting that economic downturns potentially have positive effects on population health. In a similar study, Neumayer (2004) provides additional evidence supporting Ruhm's finding by using data from Germany. In the US, these mortality declines during bad economic times have been shown to be driven by elderly parts of the population (Miller et al., 2009), whereas researchers have suggested that improvements in health-related behaviors such as smoking, drinking, exercising and weight loss could explain the findings (Ruhm, 2000; Ruhm and Black, 2002; Dehejia and Lleras-Muney, 2004).

More recent work, however, contradicts earlier evidence in the literature (McInerney and Mellor, 2012; McInerney et al., 2013; Currie et al., 2014). Wealth losses following the negative economic events during the latest recession are shown to increase depression among older adults (McInerney et al., 2013), while being negatively associated with physical and mental health as well as with health behaviors (McInerney and Mellor, 2012; Currie et al., 2014). These results are consistent with another stream of papers that find substantial health declines as a result of negative employment events such as mass layoffs, plant closings and job loss (Sullivan and von Wachter, 2009; Eliason and Storrie,

2009a and 2009b; Schmitz, 2011; Marcus, 2013; Schaller and Stevens, 2015). When examining potential mechanisms for the health deteriorations, Charles and DeCicca (2008) find evidence for weight gains and increased smoking rates for African-American men as well as for men who have the highest probability of being unemployed.

Currie et al. (2014) show that controlling for time-invariant individual fixed effects is important when examining the role economics fluctuations on health. To my knowledge, only a few studies so far use longitudinal data for the question on hand (Neumayer, 2004; Davalos and French, 2011; Davalos et al., 2012; Currie et al., 2014; Schaller and Stevens, 2015). The disparity of findings in the literature suggests that additional research is needed to better understand how macroeconomic events are associated with health-related outcomes. This study contributes to the previous work by exploiting the substantial changes to the German economy after 1990 to investigate potential effects on health.

Despite the magnitude of changes that occurred in Germany during the early 1990s, only a limited number of studies have so far examined effects on health. Riphahn and Zimmermann (2000) as well as data from the World Health Organization (WHO, 1993) provide evidence that the reunion led to a "mortality crisis" in the former GDR, while Eberstadt (1994) finds that the increased death rates are driven by men aged 15-44. East Germans have been found to be less likely to be satisfied with their health while being more likely to suffer from stress- and alcohol-related diseases after reunification (Riphahn and Zimmerman, 1998). Consistent with early evidence in the medical literature, stress could potentially explain the mortality changes (Sterling and Eyer, 1981; Henry, 1982). By exploiting wage increases for workers who remained employed after

1990, Frijters et al. (2005) find small positive effects of additional income on health. To my knowledge, no previous study has used the macroeconomic fluctuations during the early 1990s in Germany to test for the association economic shocks and health.

3.4 Data:

3.4.1 *German Socioeconomic Panel (GSOEP)*:

In order to investigate the effects of economic shocks on health during the 1990s, this analysis uses data from the German Socio-Economic Panel (GSOEP)[26], a nationally representative large sample of individuals that started in 1984 in West Germany. In 1990, the panel was extended to include residents of the former GDR, with the first East German sample being taken several months before reunification. All individuals above the age of 15 living in the household at the time of the interview are surveyed each year. Individuals who migrate between East and West Germany (n=67) are excluded from the study due to the large economic differences between the two regions.[27] Respondents who are missing health data in at least one period are dropped from the analysis (n=143). This leaves the analysis with a sample size of 8,009 individuals. The study exploits variations in average annual state unemployment rates for all 16 states in Germany, whereas the data comes from the "Bundesagentur für Arbeit" (Federal Employment Agency).

Health Outcomes:

The main outcome variable of the study is self-assessed health satisfaction, which respondents are asked to rate each year on a scale from 0 (=very dissatisfied) to 10 (=very

[26] This study uses the international version of the GSOEP which includes 95% of the original sample. Please see Haisken-DeNew and Frick's Desktop Companion (2005) for an overview.
[27] Given that state unemployment rates are similar within states in both regions, individuals migrating within the same region are kept in the analysis. The results remain consistent when excluding these "movers" from the sample.

satisfied). This outcome has been used by several previous studies examining GSOEP data to test for health changes (e.g. Riphahn and Zimmermann, 1998; Frijters et al., 2005). A more commonly used subjective health outcome is health status, which is usually reported on a scale from 1 (=very good) to 5 (=poor). Given that health status is not available in 1990, 1991 and 1993 in the GSOEP, health satisfaction is the main outcome variable for the analysis. Using data for the years in which both variables are available, I find a strong and statistically significant association between reported health status and health satisfaction. As shown by Idler and Benyamini (1997), self-assessed health information is a powerful predictor of other health indicators, including mortality.

Given the concern about the validity of self-assessed health due to reporting heterogeneity, an approach of prior work to remove any doubts is to additionally examine other potentially more objective health indicators (Johnston et al., 2009). I follow this approach by examining changes in the likelihood of individuals going to the doctor more than 10 times per year which and staying at a hospital overnight in the past year. Based on the assumption that improvements in health reduce the need for medical care, these outcomes can be viewed as additional indicators of poor health. As documented in previous work, West Germany's health care structure was transferred over to East Germany during the 1990s (Nolte, 2004; Vogt and Vaupel, 2015). The validity of the results for health care usage as a proxy for health could potentially be limited if better access to health care led to the diagnosis of previously unknown conditions. By using the longitudinal nature of the data, I find that the frequency of doctor visits and hospital stays are strongly correlated with lower health satisfaction in both East and West Germany. Since the provision of health care did not change in the latter region, this backs up the

idea of using medical care as a proxy for health. When examining potential channels through which economic shocks can affect health, I investigate whether changes in the frequency with which individuals exercise influenced health outcomes of Germans.

3.4.2 *Descriptive Statistics*:

Table 3.1 presents summary statistics for the sample of 61,573 individuals for the period of my study (1990-1998). It is noticeable that 32.3% of the sample resides in East Germany, whereas the sample consists evenly of both male and females. When looking at health-related statistics, it can be seen that average health satisfaction is 6.60, whereas 10.90% of individuals report to have stayed in a hospital overnight. Finally, Table 3.1 also provides an overview of changes in economic conditions following reunification. State-level unemployment rates increased significantly immediately after 1990 and continued to increase steadily until 1994. This study uses these fluctuations in state-level economic conditions as the main independent variable capturing the large economic shock which occurred in Germany at the time.

3.4.3 *Graphical Evidence*:

Based on the statistics shown in the previous section, Figure 3.1 graphically illustrates changes in state unemployment rates and health satisfaction in Germany between 1990 and 1998. The picture provides suggestive evidence for an inverse relationship between the economic shocks experienced by Germans following and health satisfaction. Figure 3.2 indicates that unemployment rates are positively associated with the share of individuals seeing a doctor more than ten times per year.[28] Given the assumption that

[28] Due to the lack of data regarding the frequency of doctor visits for the years 1990 and 1993, the analysis only uses data for four years when examining this outcome.

individuals visit the doctor more often as their health deteriorates, this provides additional evidence for declines in health. Figures 3.1 and 3.2 furthermore indicate that respondents are substantially less likely to exercise at least once per week and to report high levels of life-satisfaction following reunification, respectively.

3.5 Methods:

This study applies linear probability models with individual fixed effects in order to estimate impacts of substantial economic fluctuations during the 1990s in Germany on individual health outcomes. Currie et al. (2014) point out the importance of controlling for individual fixed effects when testing for a causal link between variations of regional unemployment rates and health. The main equation being estimated in this study is the following:

$$Y_{ist} = \beta_0 + \beta_1 UR_{st} + \beta_2 X_{ist} + \lambda_1 State_{it} + \lambda_2 Year_t + \alpha_i + \varepsilon_{ist}, \quad (1),$$

where the dependent variable of the main specification is self-reported health satisfaction. Other health-related outcomes that I examine are indicators for whether respondents have seen a doctor more than ten times per year, whether they spent a night in a hospital in the previous year and whether they exercise at least once per week. UR_{st} represents average state-level unemployment rates for all 16 German states in each year, whereas X_{ist} includes controls for marital status as well as the number of people living in the household. Furthermore, equation (1) controls for state and year dummies as well as for individual fixed effects (α_i). Following Ruhm's framework (2000), I include potentially endogenous variables such as employment status and monthly personal income in an additional specification.

Given the large variations in the extent of the economic shock experienced following reunification between the two German regions, it appears reasonable that health of East Germans was more affected at the time. To test for regional differences the sample is split by region, whereas individuals who move from one region to another during the period of the study are excluded. By exploiting the longitudinal nature of the GSOEP, the analysis is furthermore able to separately test for health effects for individuals who became unemployed shortly after reunification and for those who remained employed throughout the sample period. This allows disentangling the impact of job loss on health due to the large economic shock from other economic and social changes that occurred in Germany at the time. Finally, the study tests for differences in health impacts between individuals from different parts of the income distribution.

3.6 Results:

Table 3.2 presents estimates for the role of changes in state unemployment rates following reunification on self-reported health satisfaction. The table provides estimates obtained by several specifications. The first column of the baseline model indicates that a 1 percentage point increase in state unemployment rates is associated with a 1.9 percentage point decrease in health satisfaction, whereas the estimate is statistically significant at the 1% level. The result remains consistent when including potentially endogenous control variables such as education, income, employment status in column (b). Following the framework of Ruhm's work (2000), Table 3.2 next includes controls for state-specific time trends in the analysis. It is observable that the main findings remain almost unchanged.

The remainder of Table 3.2 examines the effects of reunification on health satisfaction of various subgroups of the German population. The estimates shown in Table 3.2 provide evidence for the fact that increases in regional unemployment rates significantly worsened health satisfaction of East Germans, while having no effect for their West German counterparts. Furthermore, the results indicate the presence of large differences across the income distribution. Declines in health satisfaction following reunification are strongest for lower-income individuals, whereas only negligent health effects are observable for relatively high earners.

Due to the fact that Germany experienced major structural changes immediately after reunification, some doubts remain regarding which changes are actually driving the previously observed health declines. By taking advantage of the longitudinal nature of the data, I furthermore test for the role of employment loss on health by looking at individuals whose labor market positions were differently affected by the events during the early 1990s. More specifically, I use information on individuals' employment status between 1990 and 1993 in order to stratify the sample.[29] The results provide evidence for large and statistically significant health effects for individuals who are unemployed for at least two years following reunification, while no effects are found for those who remained employed throughout the early 1990s. These findings are consistent with previous evidence examining the effects of job loss on health-related outcomes (Sullivan and von Wachter, 2009; Eliason and Storrie, 2009a and 2009b; Marcus, 2013; Schaller and Stevens, 2015).

[29] Using labor market information for three years after reunification allows testing for health impacts as a result of the large economic changes that shortly followed 1990. The results remain unchanged when looking at employment outcomes for the whole period of the study (1990-1998).

Table 3.3 provides evidence for the role of economic shocks on health care usage, a proxy for health. Panel A examines changes in the likelihood of seeing a doctor more than ten times per year, while Panel B looks at the likelihood of staying in a hospital overnight in the last year. As mentioned above, both outcomes are shown to be strongly associated with lower health satisfaction and health status. The estimates in Table 3.3 are consistent with the previous results for health satisfaction. Increases in state unemployment rates following the reunification led to significant increases in the likelihood with which individuals see a doctor more than ten times per year and stay in a hospital overnight. Furthermore, the results are stronger for lower-income individuals and East Germany (doctor visits).

3.7 Mechanisms:

While the previous section provides evidence of significant health declines following German Reunification, this section examines potential mechanisms underlying the relationships between economic shocks and health. Consistent with previous work that examines health effects of recessions (Ruhm, 2000), I test for the role of physical activity as a channel through which health is affected during economic fluctuations. Additionally, I look at changes in indicators of psychological well-being such as the respondents' satisfaction with their living situation and leisure time as well as with outcomes related to work-related stress. Early evidence from the medical literature suggests that stress can lead to significant health declines (Sterling and Eyer, 1981; Henry, 1982). Furthermore, evidence from the Great Recession in the US shows that economic downturns are associated with mental health outcomes (McInerney et al., 2013; Currie et al., 2014).

Table 3.4 shows that respondents are significantly less likely to exercise at least once per week as a result of being confronted with increases in state unemployment rates following reunification. The baseline estimate suggest that a 1 percentage point increase in state unemployment rates decreases the likelihood of weekly physical activity by 4.1 percentage points. When examining outcomes related to individuals' stress levels, the results show that individuals are significantly less likely to be satisfied with their living situation as well as with their leisure time following economic shocks. When examining stress related to employment, I find that Germans are significantly less likely to believe that they could find a new job, while also being significantly less likely to work in an occupation for which they received training for. Both results provide suggestive evidence for increases in work-related stress and economic uncertainty. Based on the assumption that reduction in physical activity as well as increased level of stress and economic uncertainty negatively affects peoples' health, the results in Table 3.4 provide evidence for potential channels underlying the link between economic events and health.

3.8 Robustness Tests:

3.8.1 *Fixed Effect Ordered Logit Models:*

A recent study by Baetschmann et al. (2015) introduces a new consistent ordered fixed effect logit estimator when examining dependent variables with with ordered nature by combining the information associated with different cut-off points in a single likelihood function in order to obtain a one-step estimator of β. The authors refer to it as BUC estimator ("blow up and cluster") since it is obtained by replacing every observation with K-1 copies of itself ('blowing up' the sample size) before dichotomizing each of the K-1 copies of the individual at a different cut-off point. The authors claim that

one advantage over other estimators is that BUC results are obtained through Conditional Maximum Likelihood estimation using the entire sample, allowing them to account for the incidental parameters problem which is an issue of previous fixed effect approaches which can lead to inconsistent and biased estimates (Neyman and Scott, 1948; Lancaster, 2000; Greene, 2004). Table 3.5 reports the BUC estimates for the role of state-level variations in unemployment rates on health satisfaction following reunification. It is noticeable that the estimates are consistent with the main result of section 6 providing additional evidence for negative health effects of economic shocks.

3.8.2 *The Role of Income Inequality:*

Besides examining the relationship between fluctuations of economic conditions and health, previous work has also investigated health effects of changes in relative income (e.g. Kaplan et al., 1996; Subramanian and Kawachi, 2003, Ram, 2005). The majority of these studies provide evidence that higher income inequality is negatively associated with health. Given the large economic changes in Germany during the early 1990s, which also included a monetary union, income inequality increased significantly. Table 3.6 reports the effects of income inequality, captured by state-level variation of Gini coefficients, on health satisfaction and health care usage. The estimates correspond to increases in Gini coefficients of 0.1. The estimates provide evidence that higher income inequality is associated with declines in health outcomes, which is consistent with earlier findings in the literature.

3.8.3 *Lagged and Lead Unemployment Effects:*

Given that it might be reasonable to expect that it takes some time before health consequences are observable following economic shocks, Table 3.7 reports additional

models using one-year lagged state unemployment rates as the main independent variable (Panel A). It is noticeable that the lagged estimates for health satisfaction are consistent with the immediate effects shown in Table 3.2 and are also statistically significant at the 1% level. The results for lagged impacts on medical care use provide additional evidence suggesting that economic shocks have lasting negative effects on health. Panel B of Table 3.7 furthermore presents estimates for health effects of one-year lead unemployment rates. These models can serve as falsification tests by providing evidence for the fact that the economic variations were not the result of health declines by the working population. In contrast to immediate and lagged economic fluctuations, the results show that lead unemployment rates have no significant negative health effects.

3.9 Conclusions:

The findings of this paper provide evidence for the fact that large economic shocks like the German Reunification lead to significant health declines. The results contribute to earlier work examining potential health effects following economic downturns during recessions. Two advantages of this study are the availability of both significant economic fluctuations as well as of longitudinal data. The observed health effects are shown for three different measures of health and are found to be largest in East Germany, a region that experienced substantially larger increases in unemployment rates after reunification. Furthermore, health declines are shown to be larger for individuals who were unemployed during the early 1990s as well as for lower-income people. When examining potential channels explaining the inverse relationship between unemployment rates and health, the analysis finds that individuals are less likely to exercise frequently as well as experience significantly higher levels of stress and economic uncertainty suggesting that

no single channel is responsible for the association between economic conditions and health.

A better understanding of potential declines in health as well as of the mechanisms should be considered by governments in order to curb the negative effects of economic downturns. While this study looks at changes in health-related outcomes over a period of nine years, future work could attempt to examine longer term health effects of economic shocks such as health effects on adults who grew up during economic downturns. This would complement previous studies showing that health and labor market outcomes in later life are shaped at early stages of life (Smith, 2009; Case et al., 2002 and 2005). Finally, knowing more about potential channels through which loss of employment and economic instabilities affect health other than through the reduction of financial resources should be viewed as important by policymakers attempting to improve health outcomes of society.

3.10 References:

Arzheimer, K.: Politikverdrossenheit. Bedeutung, Verwendung und empirisch Relevanz eines politikwissenschaftlichen Begriffs. Westdeutscher Verlag (2002).

Baetschmann, G., Staub, K. E., Winkelmann, R.: Consistent estimation of the fixed effects ordered logit model (2015).

Case, A., Lubotsky, D., Paxson, C.: Economic status and health in childhood: The origins of the gradient. American Economic Review, 92 (5): 1308-1334 (2002).

Case, A., Fertig, A., Paxson, C.: The lasting impact of childhood health and circumstance. Journal of Health Economics, 24 (2): 365-389 (2005).

Charles, K. K., DeCicca, P.: Local labor market fluctuations and health: Is there a connection and for whom? Journal of Health Economics (27): 1532-1550 (2008).

Currie, J., Duque, V., Garfinkel, I.: The Great Recession and Mother's Health. (2014). http://cupop.columbia.edu/publications/2014.

Davalos, M.E. and French, M.T.: This Recession Is Wearing Me Out! Health-Related Quality of Life and Economic Downturns. Journal of Mental Health and Economic Policy, 14(2): 61 (2011)

Davalos, M.E., Fang, H., and French, M.T.: Easing the Pain of an Economic Downturn: Macroeconomic Conditions and Excessive Alcohol Consumption. Health Economics, 21: 1318-1335 (2012).

Dehejia, R., Lleras-Muney, A.: Booms, Busts, and Babies' Health. The Quarterly Journal of Economics, 119 (3): 1091-1130 (2004).

Eberstadt, N.: Demographic shocks after Communism: Eastern Germany, 1989-1993. Population and Development Review, 20: 137-152 (1994).

Eliason, M. and Storrie, D.: Does Job Loss Shorten Life? Journal of Human Resources, 44(2): 277-302 (2009a).

Eliason. M. and Storrie, D.: Job Loss is Bad for Your Health: Swedish Evidence on Cause-Specific Hospitalization Following Involuntary Job Loss, Social Science and Medicine, 68(8): 1396-1406 (2009b).

Frijters, P., Haisken-DeNew, J.P., Shields, M.A.: Money Does Matter! Evidence from Increasing Real Income and Life Satisfaction in East Germany Following Reunification. American Economic Review, 94 (3): 730-740 (2004).

Frijters, P., Haisken-DeNew, J. P., Shields, M. A.: The Causal Effect of Income on Health: Evidence from German Reunification. Journal of Health Economics 24: 997-1017 (2005).

Haisken-DeNew, J.P., Frick, J.R: Desktop Companion to the German Socio-Economic Panel (SOEP). Version 8.0 (December 2005).

Henry, J. P.: The Relation of Social to Biological Processes in Disease. Social Science and Medicine, Vol. 16: 369-380 (1982).

Idler, E. L., Benyamini, Y.: Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. Journal of Health and Social Behavior 1997, Vol. 38 (March): 21-37 (1997).

Johnston, D. W., Propper, C., Shields, M. A.: Comparing subjective and objective measures of health: Evidence for the income/health gradient. Journal of Health Economics, Vol. 28: 540-552 (2009).

Marcus, J.: The effect of unemployment on the mental health of spouses – Evidence from plant closures in Germany. Journal of Health Economics, Vol. 32: 546–558 (2013).

McInerney, M., Mellor, J.M.: Recessions and Seniors' Health, Health Behaviors, and Healthcare Use: Analysis of the Medicare Current Beneficiary Survey. Journal of Health Economics 31: 744-751 (2012).

McInerney, M., Mellor, J.M., Nicholas, L.H.: Recession Depression: Mental Health Effects of the 2008 Stock Market Crash. Journal of Health Economics 32: 1090-1104 (2013).

Mellor, J.M., Milyo, J.: Reexamining the evidence of an ecological association between income inequality and health. Journal of Politics, Policy and Law, 26 (3): 487-522 (2001).

Miller, D.L., Page, M.E., Stevens, A.H., and Filipski, M.: Why are recessions good for your health? The American Economic Review 99 (2): 122-127 (2009).

Neumayer, E.: Recessions Lower (some) Mortality Rates: Evidence from Germany. Social Science & Medicine, 58 (6): 1037-1047 (2004).

Nolte, E.: Integration of East Germany into the EU: Investment and health outcomes. In: Health Policy and European Union Enlargement. McKee et al. (Eds.) (2004).

Ram, R.: Income inequality, poverty, and population health: Evidence from recent data for the United States. Social Science & Medicine 61: 2568-2576 (2005).

Riphahn, R. T., Zimmermann, K. F.: The Mortality Crisis in East Germany. IZA Discussion Papers 6, Institute for the Study of Labor (1998.)

Ruhm, C.: Are Recessions Good for Your Health? Quarterly Journal of Economics, 115 (2): 617-650 (2000).

Ruhm, C., Black, W. E.: Does Drinking Really Decrease in Bad Times? Journal of Health Economics, 21 (4): 659-678 (2002).

Schmitz, H.: Why are the unemployed in worse health? The causal effect of unemployment on health. Labour Economics, Vol. 18: 71-78 (2011).

Smith, J.P.: The impact of childhood health on adult labor market outcomes. The Review of Economics and Statistics, 91 (3): 478-489 (2009).

Sterling, P., Eyer, J.: Biological Basis of Stress-Related Mortality. Social Science and Medicine 15 E: 3-42 (1981).

Stevens, A.H., and Schaller, J.: Short-run effects of job loss on health conditions, health insurance, and health care utilization. Journal of Health Economics, Vol.43: 190-203 (2015).

Subramanian, S.V., Kawachi, I.: Income Inequality and Health: What have we learned so far? Epidemiologic Reviews 26: 78-91 (2003).

Sullivan, D., von Wachter, T.: Job Displacement and Mortality: An Analysis using Administrative Data. Quarterly Journal of Economics: 1265-1306 (2009).

Vogt, T., Vaupel, J.: The importance of regional availability of health for old age survival – Findings from German reunification. Population Health Metrics, Vol. 13 (2015).

World Health Organization (WHO). http://www.who.int/research/en//

Figure 3.1: Unemployment Rates and Health Satisfaction

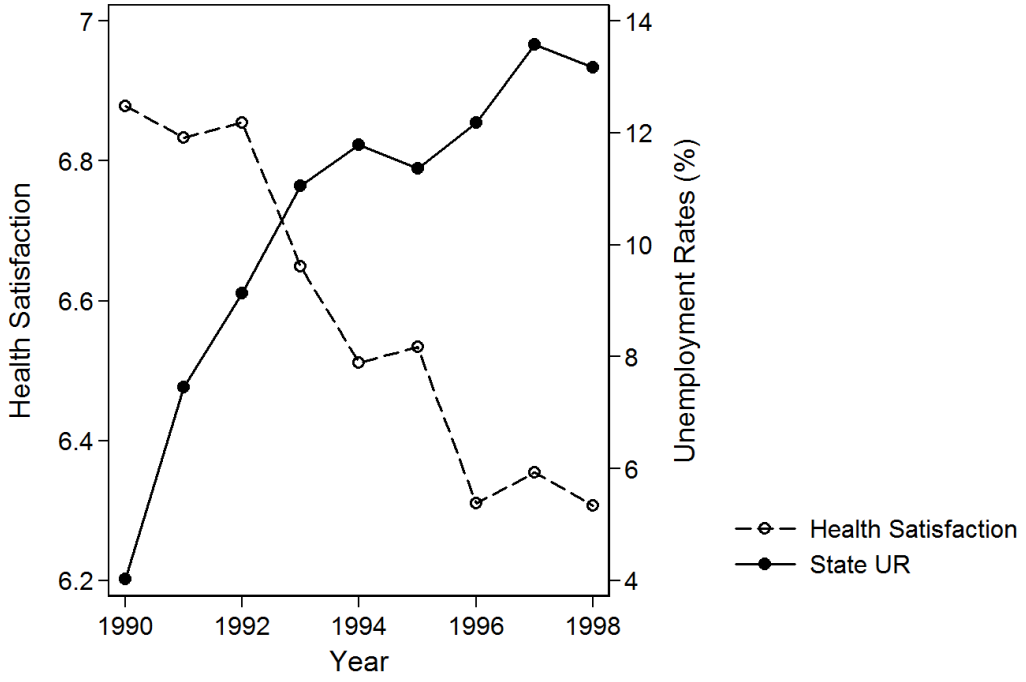


Figure 3.2: Unemployment Rates and Hospital Stays

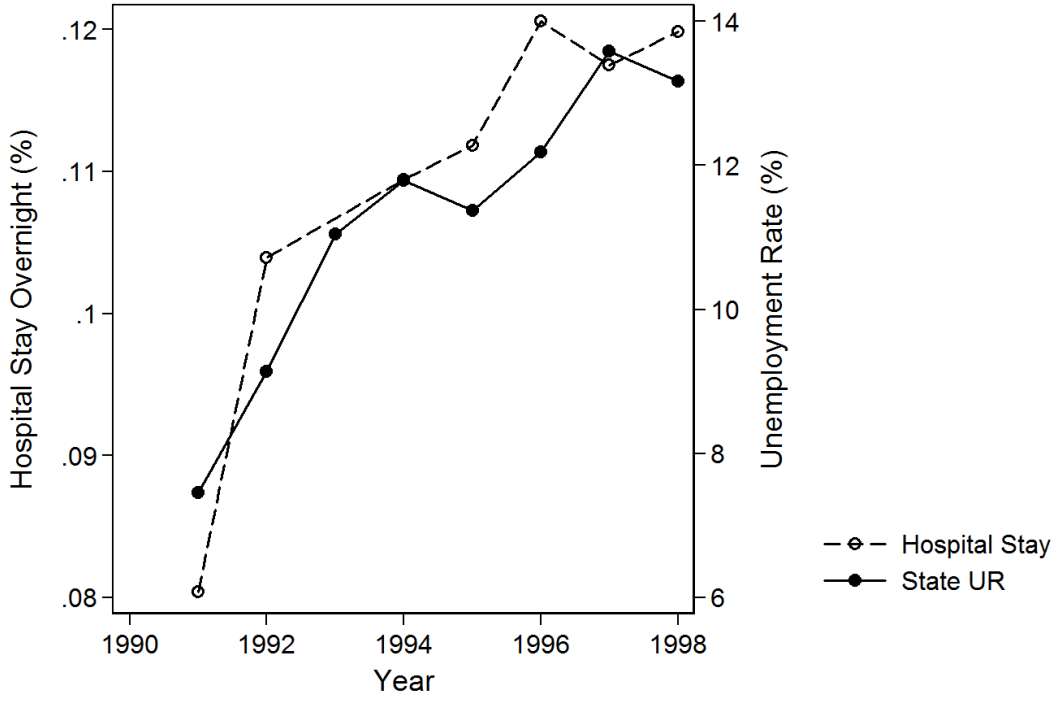


Table 3.1: Descriptive Statistics

Variable	Mean	Min	Max
Age	45.70	16	85
Male (%)	47.75	0	100
Married (%)	70.95	0	100
# Children in HH	0.67	0	7
High School or less (%)	86.51	0	100
Unemployed (%)	31.31	0	100
Monthly Net Income (DM)	1,353.07	0	6,000
Living in East Germany (%)	32.27	0	100
Health Satisfaction (0-10)	6.60	0	10
More than 10 Doctor Visits per Year (%)	37.88	0	100
Hospital Stay Overnight last Year (%)	10.90	0	100
Hopeful of finding a new Job (%)	19.23	0	100
State Unemployment Rates (%)			
1990	4.03	1.0	13.5
1991	7.45	3.5	12.5
1992	9.14	4.4	16.8
1993	11.05	6.3	17.5
1994	11.79	7.1	17.6
1995	11.37	7.0	16.5
1996	12.19	7.9	18.8
1997	13.58	8.7	21.7
1997	13.17	8.0	21.7

Table 3.2: Fixed effects estimates for the role of economic shocks on health satisfaction

	Basic specification		**State-specific time trends**		**East**	**West**
	(a)	(b)	(c)	(d)	(e)	(f)
State UR	-0.0190***	-0.0181***	-0.0191***	-0.0182***	-0.0312*	0.0203
	(0.0058)	(0.0055)	(0.0058)	(0.0055)	(0.0180)	(0.0211)
More Controls		Yes		Yes		
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	61,573	61,573	61,573	61,573	22,648	38,492

	Income			*Employment Status (90-93)*			
	<25th	***25-75th***	***>75th***	***Employed***		***Unemployed >2 yrs***	
	(a)	(b)	(c)	East	West	East	West
State UR	-0.0368***	-0.0231**	-0.0141	-0.0254	-0.0396	-0.1437***	-0.0254
	(0.0099)	(0.0105)	(0.0101)	(0.0287)	(0.0339)	(0.0571)	(0.0592)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,152	18,922	9,599	8,081	14,448	2,989	5,947

Robust standard errors, clustered by states, are shown in parentheses. Baseline models include marital status as well the number of children. Further controls in some specifications include employment status, education, and monthly net income. Furthermore, state dummies are included in all models. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.3: Fixed effects estimates for the role of economic shocks on health care usage

Panel A: More than 10 Doctor Visits per Year

	Full Sample		**Region**		**Income**		
	(a)	(b)	*East*	*West*	*<25th*	*25th-75th*	*>75th*
State UR	0.0156***	0.0157***	0.0131**	0.0163	0.0181***	0.0057	0.0072
	(0.0032)	(0.0032)	(0.0053)	(0.0170)	(0.0051)	(0.0036)	(0.0073)
State time trends		Yes					
N	47,578	47,578	17,652	29,926	7,051	14,813	7,356

Panel B: Hospital Stays Overnight

	Full Sample		**Region**		**Income**		
	(a)	(c)	*East*	*West*	*<25th*	*25th-75th*	*>75th*
State UR	0.0148***	0.0148***	0.0030	-0.0068	0.0118***	0.0101***	0.0074**
	(0.0016)	(0.0016)	(0.0051)	(0.0062)	(0.0033)	(0.0023)	(0.0035)
State time trends		Yes					
N	48,002	48,002	17,783	30,219	7,102	14,937	7,420

Robust standard errors, clustered by states, are shown in parentheses. Baseline models include marital status as well the number of children. Further controls in some specifications include employment status, education, and monthly net income. Furthermore, year and state dummies are included in all models. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.4: The role of potential mechanisms

	Exercise weekly		**Satisfaction with :**		**Work-Related Stress**	
	(a)	(b)	*Living Situation*	*Leisure Time*	*Hopeful find new job*	*Work in occupation trained for*
State UR	-0.0410***	-0.0413***	-0.1403**	-0.0441***	-0.0173***	-0.0139***
	(0.0093)	(0.0093)	(0.0633)	(0.0129)	(0.0037)	(0.0018)
State time trends		Yes				
N	7,338	7,338	41,541	41,541	17,197	17,197

Robust standard errors, clustered by states, are shown in parentheses. Baseline models include marital status as well the number of children. Further controls in some specifications include employment status, education, and monthly net income. Furthermore, year and state dummies are included in all models. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.5: Fixed effects ordered logit estimates for health satisfaction

	Baseline		**State Time trends**	
	(a)	(b)	(a)	(b)
State UR	-0.0190***	-0.0181***	-0.0191***	-0.0182***
	(0.0058)	(0.0055)	(0.0058)	(0.0055)
More Controls		Yes		Yes
Year effects	Yes	Yes	Yes	Yes
N	234,449	234,449	234,449	234,449

Robust standard errors, clustered by states, are shown in parentheses. Baseline models include marital status as well the number of children. Further controls in some specifications include employment status, education, and monthly net income. Furthermore, state dummies are included in all models. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.6: Fixed effects estimates for the role of income inequality on health

	Health Satisfaction	**> 10 Doctor Visits**	**Hospital Stay**
	(a)	(b)	(c)
State Gini	-0.1125**	0.1057***	0.0947***
	(0.0563)	(0.0221)	(0.0121)
Year effects	Yes	Yes	Yes
N	61,573	47,578	48,002

Robust standard errors, clustered by states, are shown in parentheses. Baseline models include marital status as well the number of children. Further controls in some specifications include employment status, education, and monthly net income. Furthermore, state dummies are included in all models. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.7: The role of lagged and lead economic fluctuations on health

Panel A: Lagged Unemployment Rates			
	Health Satisfaction	**>10 Doctor Visits**	**Hospital Stay**
	(a)	(c)	(b)
Lagged State UR	-0.0163***	0.0088***	0.0084***
	(0.0045)	(0.0011)	(0.0007)
Year effects	Yes	Yes	Yes
N	54,447	47,180	47,603
Panel B: Lead Unemployment Rates			
	Health Satisfaction	**>10 Doctor Visits**	**Hospital Stay**
	(a)	(c)	(b)
Lead State UR	-0.0188	-0.0112	-0.0073
	(0.0119)	(0.0077)	(0.0071)
Year effects	Yes	Yes	Yes
N	54,447	47,180	47,603

Robust standard errors, clustered by states, are shown in parentheses. Baseline models include marital status as well the number of children. Further controls in some specifications include employment status, education, and monthly net income. Furthermore, state dummies are included in all models. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.