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Health Insurance and Subjective Well-being: Evidence from Two Healthcare Reforms in the United States

Seonghoon Kim[a] and Kanghyock Koh[b]

Abstract

We study the role of access to health insurance coverage as a determinant of individuals' subjective well-being by analyzing large-scale healthcare reforms in the United States. Using data from the Behavioral Risk Factor Surveillance System and Panel Study of Income Dynamics, we find that the 2006 Massachusetts reform and 2014 Affordable Care Act Medicaid expansion improved the overall life satisfaction of Massachusetts residents and low-income adults in Medicaid expansion states, respectively. The results are robust to various sensitivity and falsification tests. Our findings imply that access to health insurance plays an important role in improving subjective well-being. Without considering psychological benefits, the actual benefits of health insurance may be underemphasized.

Keywords: health insurance, life satisfaction, subjective well-being, Massachusetts healthcare reform, Affordable Care Act Medicaid Expansion, Tennessee Medicaid disenrollment

JEL Codes: I13, I18, I31

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1. Introduction

Health insurance plays a major role in mitigating the financial losses of households due to unexpected sickness. However, health insurance coverage is generally suboptimal due to market failures such as information asymmetry. To alleviate this under-insurance problem, many governments have attempted to expand health insurance coverage. Due to the financial burden of expanding health insurance coverage, it is of great interest to both researchers and policymakers to understand the welfare impacts of gaining access to health insurance coverage.

Although a direct approach to conducting such welfare analysis is through counterfactual policy simulations using structurally estimated parameters, this approach imposes strong modeling assumptions and is computationally challenging.[1] To overcome these limitations, researchers have used a reduced-form approach combined with subjective well-being (SWB) data to evaluate the welfare impacts of several public policies (Gruber and Mullainathan, 2005; Ludwig et al., 2012; Oishi and Diener, 2014; Deaton, 2018) by presuming that SWB data can proxy for an individual's (experienced) utility (Kahneman and Sugden, 2005).

In this study, we attempt to provide causal evidence on the effect of health insurance coverage on SWB by analyzing large-scale healthcare reforms in the United States. Federal and state governments in the United States have implemented several reforms to expand health insurance coverage among the uninsured over the past two decades. Many studies have evaluated the effects of these healthcare reforms on outcomes such as health, healthcare utilization, household finances, and labor market outcomes (Chay et al., 2012; Finkelstein et al., 2012; Kolstad and Kowalski, 2012, 2016; Baicker et al., 2013; Mazumder and Miller, 2016; Courtemanche et al., 2018; Leung and Mas, 2018; Borgschulte and Vogler, 2020; Brevoort et al., 2020; Kim and Koh, 2021). While these outcome measures can proxy different aspects of well-being, healthcare reforms can have a broader impact on overall well-being, which are not fully captured by these objective measures.

We focus on two large-scale state- and national-level healthcare reforms on individuals' SWB. First, the Massachusetts healthcare reform was legislated in April 2006 to provide nearly universal health insurance coverage within the state. The reform was fully implemented in July 2007. Except for a few cases, all residents were mandated to have health insurance coverage or

[1] Researchers have used the so-called *sufficient statistics* approach to conduct welfare analysis in a relatively simplified manner, combining the advantages of a structural estimation approach and a reduced-form approach (Kolstad and Kowalski, 2016; Finkelstein et al., 2019).

otherwise pay a tax penalty. Consequently, the reform decreased the uninsured rate by 6.6 percentage points (pp) for all adults (Long et al., 2009). Second, the Patient Protection and Affordable Care Act (ACA) expanded Medicaid eligibility to individuals with family income up to 138% of the federal poverty level (FPL), making it the largest expansion of Medicaid coverage (17 pp) to non-elderly low-income adults since the 1960s (Miller and Wherry, 2019). However, the US Supreme Court decision in June 2012 made the Medicaid expansion optional for individual states, creating a quasi-experimental setting to identify the impact of the ACA Medicaid expansion. In 2014, the federal government began to fully fund Medicaid expansion (Leung and Mas, 2018).

Access to health insurance coverage can improve the SWB through two major channels. First, health insurance coverage can provide "peace of mind." The core function of health insurance is to protect individuals from negative health shocks and catastrophic medical expenditures (Arrow, 1963; Nyman, 1999). As such, this ex-ante risk reduction can induce individuals to be more satisfied with their lives by decreasing anxiety or stress. This mechanism may have improved SWB as soon as health insurance reform that aimed to expand access to health insurance coverage was expected to be legislated. Second, health insurance coverage can increase SWB by improving financial and health conditions (Courtemanche and Zapata, 2014; Mazumder and Miller, 2016; Allen et al., 2017; Hu et al., 2018; Goldin et al., 2019; Argys et al., 2020; Brevoort et al., 2020). This mechanism can have immediate effects on SWB for those with existing chronic conditions as they will receive the financial benefits of reduced out-of-pocket healthcare spending as soon as healthcare coverage is expanded. It can also take time to affect SWB if chronic health conditions and household finances adjust gradually (Brown et al., 2020).

To identify the effects of the two healthcare reforms on SWB, we compare changes in SWB levels between eligible individuals in treated states and those in untreated states before and after reform implementation.[2] Since no dataset with life satisfaction information is available to cover the periods of both the Massachusetts healthcare reform and the ACA Medicaid expansion, we use separate datasets. We use data from the Behavioral Risk Factor Surveillance System (BRFSS) to

[2] In our empirical analysis of the ACA Medicaid expansion, there are 32 expansion states that expanded Medicaid by 2017, while the non-expansion states include those that did not expand Medicaid or expanded later than 2017 (Kaiser Family Foundation, 2020). We acknowledge that our treatment effect estimate could be biased due to the staggered expansion of Medicaid coverage across states over time. However, this bias, if present, is likely to attenuate our estimates and thus we can provide the lower bound on the true effects of the ACA Medicaid expansion.

analyze Massachusetts' reform and the Panel Study of Income Dynamics (PSID) to analyze the ACA Medicaid expansion.

Our difference-in-differences (DID) estimates indicate that both healthcare reforms significantly improved the overall life satisfaction of Massachusetts residents and low-income individuals in Medicaid expansion states. Our back-of-the-envelope calculation suggests that Massachusetts' reform improved non-elderly residents' overall life satisfaction by 0.83 of a standard deviation (SD) per health insurance coverage, and the ACA Medicaid expansion improved non-elderly low-income adults in expansion states by 1.36 SD per Medicaid coverage. Our results are robust to a variety of sensitivity and falsification checks. To further check the external validity of our baseline findings, we consider the 2005 Tennessee Medicaid disenrollment as a "reverse experiment." We do not incorporate the Tennessee reform into the main analysis because there is only one pre-reform period in our data. Nevertheless, we find consistent evidence that Medicaid disenrollment was negatively associated with Tennessee residents' overall life satisfaction.

This study contributes to the literature on the determinants of SWB by providing causal evidence on health insurance as an important determinant of SWB. Several studies have examined the determinants of SWB, but the role of health insurance has received little attention compared to commonly discussed determinants such as income, employment, children, and marriage (Dolan et al., 2008; Oswald and Powdthavee, 2008; Clark et al., 2018). This study shows that health insurance coverage plays an important role in determining individuals' SWB. The studies most closely related to our research are those by Finkelstein et al. (2012), Baicker et al. (2013), and Kobayashi et al. (2019). Finkelstein et al. (2012) and Baicker et al. (2013) show that gaining Medicaid coverage in Oregon via a lottery draw, known as the Oregon Health Insurance Experiment (HIE), increased the self-reported happiness of low-income individuals by 0.39 SD after the first year, but a significant difference was not detected after the second year. It may be difficult to directly apply the Oregon HIE's results to those of the ACA Medicaid expansion if the underlying population characteristics are different (Kowalski, 2020). For example, in the Oregon HIE, only about 30% of the selected individuals were enrolled in Oregon's Medicaid program. Kobayashi et al. (2019) estimated the SWB impact of the ACA Medicaid expansion using Gallup-Sharecare Well-being data between 2010 and 2016 but found no evidence of a positive SWB impact. The authors cannot identify policy-eligible individuals precisely because the Gallup data

provide only a few household income brackets. Thus, their findings are likely to be subject to measurement errors.[3]

In addition, we contribute to the growing literature on the effects of public policies on SWB. Existing studies have examined the SWB consequences of economic policies such as the 2008 stimulus tax rebate program, changes in the minimum wage, early access to pension wealth, and the Moving to Opportunity housing voucher program (Ludwig et al., 2012; Lachowska, 2017; Kuroki, 2018; Kim and Koh, 2020). Our study offers novel evidence of how healthcare policy reforms can affect SWB.

Last, much research has estimated the consequences of the Massachusetts and ACA healthcare reforms.[4] This study contributes to the healthcare reform literature by providing novel evidence that these two large-scale healthcare reforms significantly improved SWB. Our findings imply that we could have underemphasized the beneficial impacts of health insurance without considering its impact on SWB.

The remainder of this paper is organized as follows. Sections 2 and 3 present the data and empirical strategies, respectively. Section 4 presents the main results and examines the internal and external validity of our findings. Section 5 presents the conclusions.

2. Data

2.1. BRFSS, 2005–2010

We use data from the BRFSS to analyze the Massachusetts healthcare reform. The BRFSS comprises state-based, cross-sectional data surveyed annually in the United States. This survey is conducted on a random sample of nationally representative adults aged 18 years or older by

[3] To identify policy-eligible individuals, Kobayashi et al. (2019) use the midpoints of income brackets, resulting in the potential classification errors of policy-eligible sample respondents. This could attenuate the estimates. For example, their DID estimates of the effects of the ACA Medicaid expansion on health insurance coverage is smaller than those of other studies such as Miller and Wherry (2019). Their DID estimates on SWB can also be attenuated in the same manner, and thus the true SWB effects are likely to be larger. We overcome their limitation by using the more precise information on household income available in the PSID.

[4] Many studies have estimated the effects of Massachusetts' healthcare reform on medical care utilization, health, household finance, and labor market outcomes (Kolstad and Kowalski, 2012, 2016; Miller, 2012, 2013; Courtemanche and Zapata, 2014; Sommers et al., 2014; Mazumder and Miller, 2016; Dillender et al., 2016). A large number of studies have investigated the effects of the ACA Medicaid expansion on medical care utilization, labor supply, household finances, physical and mental health, and mortality (Wherry and Miller, 2016; Allen et al., 2017; Ghosh et al., 2017; Kaestner et al., 2017; Simon et al., 2017; Sommers et al., 2017; Hu et al., 2018; Leung and Mas, 2018; Borgschulte and Vogler, 2020; Miller et al., 2021).

telephone interview. The data provide detailed information on SWB, health, health insurance coverage, and other characteristics of individuals.

Our key dependent variable is an individual's overall life satisfaction. The BRFSS asks respondents, "In general, how satisfied are you with your life?" A respondent can answer "very satisfied," "satisfied," "dissatisfied," or "very dissatisfied." We treat this as a cardinal variable by assigning a value of 1 to "very dissatisfied" and 4 to "very satisfied" following the SWB literature (Dehejia et al., 2007; Oswald and Powdthavee, 2008).[5] We consider 2005 to 2010 as the sample period because the life satisfaction question was surveyed in all states only during this timeframe and was not asked before 2005.[6] The life satisfaction question was not included in the 2011 and 2012 surveys because of a major change in the survey method in 2011, and only five states have intermittently included the life satisfaction question again in their surveys since 2013.

2.2. PSID, 2009–2017

We cannot use the BRFSS data to analyze the ACA Medicaid expansion because of the absence of life satisfaction data after 2010. We overcome this limitation by using data from the PSID, which is a nationally representative biannual panel survey of American households (since 1999). PSID has been collecting information on overall life satisfaction since 2009. Thus, their data from 2009 through 2017 allow us to estimate the impact of the ACA Medicaid expansion on overall life satisfaction.

In the PSID, overall life satisfaction is measured by the response to the following question: "Please think about your life as a whole. How satisfied are you with it? Are you completely satisfied, very satisfied, somewhat satisfied, not very satisfied, or not at all satisfied?" We assign the value of 1 to "not at all satisfied," 2 to "not very satisfied," 3 to "somewhat satisfied," 4 to "very satisfied," and 5 to "completely satisfied." It is noteworthy that the overall life satisfaction question was a part of the family module, and thus it was only asked to household heads.

Unlike the case of Massachusetts healthcare reform, there are multiple treated states in the case of ACA Medicaid expansion. In our baseline analysis, there are 32 expansion states that expanded Medicaid by 2017 and non-expansion states include those that did not expand Medicaid

[5] Ferrer-i-Carbonell and Frijters (2004) find that assuming either the cardinality or ordinality of a happiness measure in the German socioeconomic panel survey makes little difference when estimating determinants of happiness.
[6] We exclude individuals who reside in Guam, Puerto Rico, and the Virgin Islands from the sample; however, the results are robust when including these sample individuals.

or expanded later than 2017 (Kaiser Family Foundation, 2020). The 32 expansion states are AK, AZ, AR, CA, CO, CT, DE, DC, HI, IL, IN, KY, LA, MD, MA, MI, MN, MT, NV, NH, NJ, NM, NY, ND, OH, OR, PA, RI, VT, WA, WV, and WI. Of these, 27 states expanded in 2014. However, we acknowledge that this definition of expansion state is not necessarily correct, because i) there are states that expanded Medicaid coverage after 2014, and ii) there are some non-expansion states who had already operated relatively generous Medicaid programs even before 2014. To address this issue, we conduct the following robustness checks following Simon et al. (2017): 1) we re-estimate the effects of the ACA Medicaid expansion by re-classifying the exact timing of Medicaid expansion[7] and 2) we exclude states that expanded Medicaid eligibility before 2014.

2.3. Sample Restrictions and Characteristics

To analyze the Massachusetts reform, we restrict our sample to those aged 18–64 years. To analyze the ACA Medicaid expansion, we restrict the sample to those aged 18–64 years whose family income is equal to or less than 138% of the FPL. We use the excluded samples such as i) those aged 65 years and older and ii) those aged 18–64 years whose family income is greater than 138% of the FPL (only for the ACA Medicaid expansion analysis) to conduct falsification checks.

Table 1 reports sample respondents' pre-reform baseline characteristics such as overall life satisfaction and other characteristics in Massachusetts and other US states (panel A) and in ACA Medicaid expansion states and non-expansion states (in panel B). We control for individuals' characteristics related to overall life satisfaction such as age, age squared, number of children, college education, marital status, gender, race, and ethnicity (Hispanic origin). We do not control for employment status or household income in the baseline analysis, as healthcare reforms can affect employment, wages, and working hours, and, consequently, household income (Dillender et al., 2016; Kolstad and Kowalski, 2016; Kim and Koh, 2021). We find that the treatment and control states in both panels have similar levels of overall life satisfaction. However, both panels indicate some differences in demographics. Panel A shows that Massachusetts residents are more likely to be white and college-educated, and thus they have incomes higher than residents of other states do. Panel B shows that low-income individuals in expansion states are more likely to be married, white, Hispanic, and male.

[7] Simon et al. (2017) changed the definition of the *Post* dummy variable to be relative to the year of actual implementation for each state.

3. Empirical Strategy

To identify the effects of healthcare reforms on SWB, we consider the following DID specification:

$$LS_{ist} = \beta_0 + \beta_1 Treat_s * Post_t + \delta_s + \theta_t + \beta_2 X_{ist} + \varepsilon_{ist} \quad (1)$$

where LS_{ist} is the overall life satisfaction of individual *i* living in state *s* in year *t*. For the Massachusetts reform, $Treat_s$ is a binary indicator of whether a respondent lives in Massachusetts and $Post_t$ is a binary indicator of whether the calendar year is 2007 or after.[8] For the ACA Medicaid expansion, $Treat_s$ is a binary indicator of whether a respondent lives in one of the ACA Medicaid expansion states (see Section 2.2), and $Post_t$ is a binary indicator of whether the calendar year is 2014 or after. X_{ist} is a vector of the aforementioned individual characteristics related to overall life satisfaction. δ_s captures time-invariant, state-specific unobserved heterogeneity, and θ_t, the year-fixed effect, controls for any common trend affecting individuals' life satisfaction over time. It is noteworthy that the PSID is individual-level panel data. To control for individual-specific heterogeneity in life satisfaction, we add individual fixed effects to conduct a robustness check of the effects of the ACA Medicaid expansion on overall life satisfaction. ε_{ist} is an error term. The coefficient of interest, β_1, represents the causal effect of healthcare reform of interest on overall life satisfaction. For statistical inference, we calculate standard errors corrected for heteroskedasticity and clustered at the state level by allowing for serial correlation within a state.

The key identification assumption in the DID approach is that life satisfaction trends between the treatment and control states are common in the absence of healthcare reform (Wing et al., 2018). To test the validity of this assumption, we estimate an event study design-type regression and examine whether the coefficient estimates during the pre-reform periods are statistically different from zero.

[8] We choose the baseline control group following the previous Massachusetts healthcare reform studies that use remaining states as the baseline control group (Hackmann et al., 2015; Kolstad and Kowalski, 2012, 2016).

4. Empirical Results

4.1. Main Results

Panel A of Figure 1 shows the trends of overall life satisfaction among non-elderly adults between Massachusetts and other states from 2005 to 2010. We find little difference between the residents of Massachusetts and those of other states until 2006, when the Massachusetts healthcare reform was legislated. However, Massachusetts residents experienced an increase in overall life satisfaction relative to those of other states after 2007.

Panel B of Figure 1 reveals the trends of overall life satisfaction among non-elderly adults whose household income is below 138% of the FPL between ACA Medicaid expansion and non-expansion states from 2009 to 2017. This indicates that low-income individuals in expansion states have a slightly lower level of overall life satisfaction than low-income individuals in non-expansion states. However, after the Medicaid expansion, low-income individuals in expansion states have higher overall life satisfaction than low-income individuals in non-expansion states.

Table 2 reports the regression results quantifying the effects of the healthcare reforms on overall life satisfaction. Panel A presents the DID estimates of the effects of Massachusetts' healthcare reform. Column (1) indicates that the reform improved overall life satisfaction by 0.031 points, which is statistically significant at the 1% level. The magnitude of this estimate is equivalent to 0.05 SD of the dependent variable. In column (2), we re-estimate equation (1) without the control variables because, under our identification assumption, the estimation results should be robust to the absence of the exogenously given control variables. We find that the result remains robust. In column (3), we check whether our result is robust to the inclusion of state-specific linear trends. The result remains robust, although the magnitude becomes slightly smaller. To account for the ordinal nature of the life satisfaction variable, we use a binary indicator of being very satisfied with overall life as an alternative dependent variable in column (4). We find that the Massachusetts reform increased the proportion of individuals who are very satisfied with their overall life by 2.1 pp.

Panel B of Table 2 shows the DID estimates of the effects of the ACA Medicaid expansion. In column (1), we find that the ACA Medicaid expansion increased overall life satisfaction by 0.23 points, statistically significant at the 1% level. The magnitude is equivalent to 0.27 SD of the

dependent variable. The results are similar when we drop the control variables in column (2).[9] The magnitudes become smaller in column (3) when we additionally control for the state-specific linear time trends, but the estimates are still statistically significant at the 5% level. In column (4), we consider a binary indicator of being completely satisfied with overall life as an alternative dependent variable. We find that the ACA Medicaid expansion increased the proportion of individuals who are completely satisfied with their overall life by 9.3 pp.[10]

The baseline analysis uses the overall life satisfaction variable by assuming its values as cardinal values. One issue is that researchers cannot observe the true cardinal values of respondents' life satisfaction. Schroeder and Yitzhaki (2017) and Bond and Lang (2019) argue that researchers cannot identify life satisfaction impacts because the ordering of self-reported life satisfaction values (e.g., from very satisfied to very dissatisfied) might not be comparable across individuals. As a result, the statistical analysis of ordinal measures like life satisfaction or happiness can be problematic as the order is unstable for some monotonically increasing transformations. However, Kaiser and Vendrik (2020) provide evidence that identification failure occurs only in extreme cases. To account for the ordinal nature of the life satisfaction variable, we estimate the heteroskedastic ordered probit model following Chen et al. (2019) as a robustness check. Table A2 shows that the estimation results are qualitatively similar to the baseline results. The estimates of the effects of the Massachusetts reform and ACA Medicaid expansion, reported in Panels A and B, respectively, are positive and statistically significant at the 1% level. The estimated marginal effects indicate that the Massachusetts healthcare reform reduced the probability that individuals report being very dissatisfied, dissatisfied, or satisfied with their overall life, while increasing the probability that they report being very (or completely) satisfied with their life. The estimated marginal effects of the ACA Medicaid expansion show that the reform reduced the probability that low-income non-

[9] Consistent with this finding, we find little evidence that the ACA Medicaid expansion changed the composition of eligible individuals. We use individual characteristics, which are used for control variables, as dependent variables, and estimate the equation (1) without the inclusion of other individual characteristics. The estimates are small in magnitude and statistically insignificant.

[10] We conduct additional specification checks for the effects of the ACA Medicaid expansion. First, since the PSID is individual-level panel data, we include individual-fixed effects to control for individual-specific heterogeneity in life satisfaction in addition to state-fixed effects. Second, we consider an alternative definition of the Medicaid-eligible group (100% of the FPL instead of 138%) following Simon et al. (2017). Columns (1) and (2) of Table A1 show that our baseline findings are not sensitive to these robustness checks. Since the eligible group can be endogenously formulated due to the ACA Medicaid expansion, we use the education attainment level to define an alternative eligible group. We find that the results remain robust when restricting the sample to those whose completed education level is equal to or less than high school.

elderly adults in expansion states are not at all satisfied, not very satisfied, or somewhat satisfied with their overall life, but increased the probability that they were very satisfied or completely satisfied.

Next, we examine the lagged and lead effects of healthcare reforms. We estimate the slightly modified baseline regression model that replaces $Treat_s * Post_t$ with $Treat_s * 1[Year_t = k]$ where k covers the sample period of the BRFSS and PSID. We use the initial year of the datasets (2005 for the BRFSS and 2009 for the PSID) as the reference year to examine how the effects of the healthcare reforms evolve over time. The estimates of the interaction terms between the treatment status and year dummy variables represent the year-specific effects of healthcare reforms. Figure A1 plots the estimated year-specific effects of Massachusetts' healthcare reform and the ACA Medicaid expansion on SWB along with 95% confidence intervals in Panels A and B, respectively.[11] First, both panels indicate that the estimates during pre-reform periods are small in magnitude and statistically insignificant, which provides supportive evidence of the parallel pre-reform trend assumption. This implies that healthcare reforms are less likely to improve individuals' SWB through anticipation. In contrast, consistent with the patterns shown in Figure 1, there were immediate improvements in overall life satisfaction once healthcare reforms were implemented. We also find that the reforms' estimated effects on SWB persist over time. This lack of adaptation is different from the findings of previous studies such as Clark et al. (2008). We conjecture that the lack of adaptation can be achieved through ex-post improvements in financial and health conditions, which can take time to build financial and health capital. In addition, this result is consistent with the recent work by Lindqvist et al. (2020), who examined the SWB impact of a windfall wealth gain among Swedish lottery players.[12]

[11] Table A3 summarizes estimation results of the effects of Massachusetts' healthcare reform and the ACA Medicaid expansion in Panels A and B, respectively.

[12] In the baseline analysis, we could not distinguish the specific mechanisms discussed in the introduction: i) peace of mind and ii) improved health and economic conditions. Since several studies have studied the effects of these two healthcare reforms on financial and health status, our main finding could be simply "repackaging" those results in a vaguer measure. To evaluate whether the estimated improvement in SWB can shed new light on the benefits of the healthcare reforms that have been under-explored, we examine the relative role of financial and/or health improvements compared to other channels. Specifically, we conduct an additional analysis by sequentially controlling for proxies for health and economic improvements induced by healthcare reforms. Table A4 shows that much of the baseline estimate remains even after controlling for overall health status and variables related to household economic conditions. Columns (1) and (2) show that the SWB impacts of the Massachusetts healthcare reform decrease to some extent but are statistically significant at the 1% level after controlling for health and economic status. Columns (3) and (4) show that the SWB impacts are similar in the case of the ACA Medicaid expansion. The results provide suggestive evidence that the SWB impact of these healthcare reforms could capture the effects beyond improved health and

4.2. Robustness and Falsification Checks

Robustness Checks

We use the synthetic control method and Fisher's (1935) permutation test to strengthen the identification of the baseline analysis. First, to minimize the arbitrary choice of a control group, we use a data-driven procedure to construct suitable comparison groups following Abadie et al. (2010). The main goal of this approach is to construct a synthetic treatment state (i.e., Massachusetts or expansion states), which is the weighted average of the control states, as an alternative control group. Under this framework, any difference in life satisfaction level between treatment states and their synthetic control during post-treatment periods is due to healthcare reform. To save space, we discuss the details of how we construct the synthetic control group and weights in Appendix A.[13] Figure 2 shows the trends in the overall life satisfaction of Massachusetts and Medicaid expansion states and their synthetic control groups in Panels A and B, respectively. This indicates that the baseline results are robust.[14]

In addition to the synthetic control approach, we consider alternative control groups for each reform. For the Massachusetts healthcare reform, the Great Recession of 2008, soon after the implementation of the reform, might have biased the DID estimates. To further examine this issue, we restrict the sample to residents of northeastern states and those that experienced comparable recession shocks in terms of an unemployment rate change and re-estimate equation (1). The regression results reported in Table A5 show that the baseline results of the Massachusetts reform remain robust to these alternative control groups. To save space, details are presented in Appendix B. In the case of the ACA Medicaid expansion, i) most states started expanding Medicaid coverage

economic conditions. Since it is difficult to completely partial out health and financial improvements due to data limitations, the results should be accepted with caution.

[13] In Table A9, we report the state-specific weights computed by the synthetic control method. It is noteworthy that the calculated weights for synthetic Massachusetts are all positive. The synthetic control method is a data-driven approach and thus it is not straightforward to provide systematic explanations on possible mechanisms through which we obtain such results. However, we would like to point out that there appears to be a significant variation in the magnitude of weights. For example, the weight of a seemingly different state such as Alaska is only 0.014, and the weights of many other states vary from 0.008 to 0.052. However, the weight of a seemingly much similar state such as New York is 0.191. This implies that New York will consist of the largest part of the synthetic Massachusetts, while other seemingly different states will consist of a smaller part of the synthetic Massachusetts.

[14] We also use the matrix completion method proposed by Athey et al. (2021) and find that the result is almost identical to the result using the synthetic control method.

in 2014 and ii) some states had already operated relatively generous Medicaid programs even before 2014. Following Simon et al. (2017), we check whether our baseline results of the ACA Medicaid expansion are robust to i) changing the definition of the *Post* dummy variable to be relative to the year of actual implementation for each state and ii) excluding states that expanded Medicaid eligibility before 2014. The results reported in Table A6 show that the baseline results are not sensitive to either check.

Second, we consider an alternative inference method. In the baseline regression analysis, we calculate clustered standard errors to correct for serial correlation within each state. However, clustering standard errors at the state level may not be the most conservative approach for statistical inference (Buchmueller et al., 2011). This is particularly relevant in the analysis of the Massachusetts reform because we have only one treatment state. We address this concern by conducting Fisher's (1935) permutation test. We randomly assign a fake treatment status to randomly chosen sample individuals in non-Massachusetts and non-expansion states after excluding the sample from Massachusetts and expansion states, respectively. Subsequently, we estimate the fake treatment effect using regression specification (1) and repeat this exercise 1,000 times.

Figure 3 plots the DID estimates of the fake treatment effects. Panels A and B show the distributions of possible estimates under the null hypothesis that the Massachusetts healthcare reform and ACA Medicaid expansion do not affect individuals' overall life satisfaction, respectively. We indicate our baseline estimate with a solid vertical line and the 5th and 95th percentile values of the estimated fake treatment effects with dashed lines. The baseline estimate remains outside the distributions, which implies that the baseline estimates of the Massachusetts healthcare reform effect and ACA Medicaid expansion effect are still statistically significant under an alternative metric for statistical inference.[15]

Falsification Checks

We conduct falsification tests using a sample of individuals not eligible for or affected by healthcare reforms. First, individuals aged 65 years and over are covered by Medicare, a federal

[15] Alternatively, we estimate the fake treatment effect of the Massachusetts reform by assigning a fake treatment status to one of the other states after excluding Massachusetts from the sample and repeating this exercise for the other 49 states. The result, which is available upon request, shows that the baseline estimate remains statistically significant.

health insurance program for the elderly and disabled. If the baseline results of the Massachusetts healthcare reform are indeed due to the expanded access to health insurance, they would have little impact on the elderly's life satisfaction. Columns (1) and (2) of Table 3 indicate that elderly Massachusetts residents' overall life satisfaction even decreased after the reform, which may be due to the crowding out of healthcare resources in the state by the newly insured.[16]

Second, individuals whose household income is greater than 138% of the FPL are not eligible for the ACA Medicaid expansion. If the baseline results of the ACA Medicaid expansion are indeed due to the expanded access to Medicaid, the reform would have little impact on the life satisfaction of non-elderly individuals whose incomes are above 138% of the FPL. Columns (3) and (4) of Table 3 indicate that this is indeed the case. None of the estimates are statistically significant, and the magnitudes are also small.[17]

To further strengthen our identification, we employ a difference-in-difference-in-differences (DDD) specification using the non-eligible groups as additional control groups. Table A8 indicates that the DDD estimates are similar to the baseline DID estimates. The details are presented in Appendix C.

4.3. Effects of Losing Health Insurance Coverage

In the baseline analysis, we examine the effects of gaining health insurance coverage on individuals' SWB. In this subsection, we investigate whether individuals experience a decrease in SWB when losing health insurance coverage by exploiting Tennessee's Medicaid disenrollment in 2005 as a "reverse experiment." Tennessee disenrolled approximately 170,000 adults from the Medicaid program (TennCare) by changing the eligibility rules from July to September 2005. Consequently, the adult uninsured rate increased by almost 5 pp compared with other southern states. Existing studies show that TennCare disenrollment leads to worsened self-reported health, reduced healthcare access, and lower credit risk scores (Tello-Trillo, 2016; DeLeire, 2018; Argys et al., 2020) with mixed evidence on the employment effect (Garthwaite et al., 2014; DeLeire, 2018). Hence, we posit that Tennessee's Medicaid disenrollment might have led to a reduction in

[16] Table A7 provides consistent evidence that the ACA Medicaid expansion did not improve the elderly's overall life satisfaction in expansion states regardless of their income level. The results are similar when restricting the sample to older individuals. For example, we still do not find evidence that both reforms improved SWB among individuals aged 70 or older.

[17] The results are similar when restricting the sample to those with a higher income (e.g., 200% of the FPL).

the SWB level. Following the literature, we use other southern states as control states to determine the relationship between the TennCare disenrollment and Tennessee residents' SWB.[18] As there is only one pre-reform period in the BRFSS (due to the lack of life satisfaction data before 2005), we do not incorporate the Tennessee reform in the main analysis and acknowledge that we can only demonstrate the associations between the reform and SWB.

Panel A of Figure 4 shows the life satisfaction trends of individuals aged 18–64 years in Tennessee and other southern states. This demonstrates that life satisfaction sharply decreased one year after the disenrollment, while there were minimal changes in life satisfaction among residents in the other southern states. Next, we estimate the associations between the TennCare disenrollment and overall life satisfaction using equation (1). In this analysis, *Treat* in equation (1) is defined as a binary indicator of Tennessee and *Post* is coded 1 if the survey period is 2006 and after, and 0 if otherwise. In addition to these changes, we follow the same notations and use the same control variables as in equation (1). Table 4 presents the results of the estimation. Column (1) indicates that TennCare disenrollment was associated with a reduction in life satisfaction by 0.029 points, and column (2) demonstrates that TennCare disenrollment decreased the probability of being very satisfied with overall life satisfaction by 2.3 pp. All estimates are statistically significant at the 1% level.

Next, we construct a synthetic Tennessee by calculating the weighted average of the other southern states. To save space, we discuss the details of how we construct the synthetic control group and weights in Appendix A. Panel B of Figure 4 shows that the life satisfaction of Tennessee's residents sharply decreased one year after the disenrollment, while there were minimal changes in life satisfaction among residents in other southern states. As in the main analysis (Figure 3), we conduct Fisher's permutation test as a robustness check to address the limitation that there is a single treatment state. Figure A2 demonstrates that the statistical inference of the findings in Table 4 remains robust.

The results imply that losing health insurance coverage is associated with a decline in overall life satisfaction. This implication is consistent with the prediction based on our baseline results, indicating a positive association between health insurance coverage and increases in SWB. Our findings of TennCare disenrollment are robust to using the synthetic control method and

[18] Other southern states include AL, AK, DE, DC, FL, GA, KY, LA, MD, MS, NC, OK, TX, VA, SC, and WV.

Fisher's permutation test. Nevertheless, we acknowledge that the results should be interpreted with caution because we use only a single year as the pre-reform period because of data limitations.[19]

4.4. Comparison with Other Studies

To benchmark the magnitudes of this study with those of existing studies, we first calculate the average SWB improvement per health insurance coverage of each reform. The Massachusetts reform's average improvement in life satisfaction per health insurance coverage is 1.29 SD for a non-elderly adult.[20] The ACA Medicaid expansion's average life satisfaction improvement per Medicaid coverage for a low-income non-elderly adult is 1.36 SD.[21] These results indicate that the SWB impacts are slightly larger when the increase in health insurance coverage is achieved through the ACA Medicaid expansion than through the Massachusetts healthcare reform. This is probably because the ACA Medicaid expansion targets low-income individuals relatively more than the Massachusetts reform does. Although the Massachusetts reform also disproportionately targets low-income populations, it affects a broader range of the population than the ACA Medicaid expansion which exclusively targets low-income populations.[22]

We then compare these magnitudes with those of several studies that examine the SWB impacts of other policy reforms and public policies. We consider the TennCare disenrollment, the Oregon HIE, the Moving to Opportunity program, minimum wage, and tax rebates during the Great Recession in the United States. We compute that the Tennessee Medicaid disenrollment reduced overall life satisfaction by 0.69 SD. Finkelstein et al. (2012) estimate that the average

[19] Although Tello-Trillo (2016) does not examine life satisfaction, he finds consistent evidence that the number of days with poor mental health increased after the TennCare disenrollment.

[20] We use the fact that Kolstad and Kowalski (2012) estimate that the Massachusetts healthcare reform increased health insurance coverage by 5.7 pp using the CPS March data and that the coefficient estimate in column (1) of Panel A in Table 2 is 0.031. Thus, the average SWB improvement per health insurance coverage is 0.83 SD (=0.54/0.65). We borrow the health insurance coverage estimate from Kolstad and Kowalski (2012) because Kenny et al. (2006) showed that the March CPS data is the most reliable source to measure health insurance coverage, while health insurance coverage estimate with the BRFSS can be inaccurate.

[21] We use the fact that Miller and Wherry (2019) estimate that the ACA Medicaid expansion increased the Medicaid coverage of low-income adults by 17 pp and that the coefficient estimate in column (1) of Panel B in Table 2 is 0.23. Thus, the average SWB improvement per health insurance coverage is 1.36 SD (=1.35/0.99). We rely on the external estimate of the health insurance coverage impact due to the change in the health insurance coverage question in the PSID in 2013.

[22] We acknowledge that the calculated SWB impact per health insurance coverage might not incorporate the effects of healthcare reforms on SWB among ineligible individuals. The beneficial impact can accrue even to people who are not currently eligible for expanded health insurance coverage because they expect that health insurance coverage could be available for them in the future. This can improve their SWB without actual health insurance coverage via the "peace of mind" mechanism.

improvement in self-reported happiness per Medicaid coverage is 0.39 SD among Oregon residents. Ludwig et al. (2012) find that a 10-pp reduction in tract-level poverty due to the Moving to Opportunity program increased life satisfaction by 0.11 SD. Kuroki (2018) demonstrates that a 100% increase in minimum wage raises life satisfaction by about 0.4 SD among high school dropouts. Lachowska (2017) indicates that the $950 stimulus tax rebate during a recession increased life satisfaction by 0.32 SD. This suggests that expanded access to health insurance via large-scale healthcare reforms has a large positive impact on an individual's overall life satisfaction compared with the SWB impacts of other public policies.

5. Concluding Remarks

We provide novel evidence of the relationship between health insurance and SWB. We document that Massachusetts' healthcare reform and the ACA Medicaid expansion significantly improved the self-reported overall life satisfaction of Massachusetts residents and low-income adults in Medicaid expansion states, respectively. A set of robustness checks and falsification tests, as well as the analysis of the Tennessee Medicaid disenrollment as a reverse experiment support the beneficial impact of the two healthcare reforms. Compared with previous studies estimating the SWB impact of public policies, we find that access to health insurance coverage has a large positive impact on SWB. Although a number of studies have investigated the effects of healthcare reforms, our results imply that the beneficial impacts may have been underemphasized by overlooking the impact of SWB.

References

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program. *Journal of the American Statistical Association*, *105*(490), 493–505.

Allen, H., Swanson, A., Wang, J., & Gross, T. (2017). Early Medicaid Expansion Associated With Reduced Payday Borrowing In California. *Health Affairs*, *36*(10), 1769–1776.

Argys, L. M., Friedson. A. I., Pitts, M. M., & Tello-Trillo, D. S. (2020). Losing Public Health Insurance: TennCare Disenrollment and Personal Financial Distress. *Journal of Public Economics*, 187: 104202

Arrow, K. J. (1963). Uncertainty and The Welfare Economics of Medical Care. *The American Economic Review*, *53*(5), 941–973.

Baicker, K., Taubman, S. L., Allen, H. L., Bernstein, M., Gruber, J. H., Newhouse, J. P. … Finkelstein, A. N. (2013). The Oregon Experiment: Effects of Medicaid on Clinical Outcomes. *New England Journal of Medicine*, *368*(18), 1713–1722.

Bond, T. N., & Lang, K. (2019). The Sad Truth about Happiness Scales. *Journal of Political Economy*, *127*(4), 1629–1640.

Borgschulte, M., & Vogler, J. (2020). Did the ACA Medicaid Expansion Save Lives? *Journal of Health Economics*, *72*, 102333.

Brevoort, K., Grodzicki, D., & Hackmann, M. B. (2020). The Credit Consequences of Unpaid Medical Bills. *Journal of Public Economics*, *187*, 104203.

Brown, D. W., Kowalski, A. E., & Lurie, I. Z. (2020). Long-Term Impacts of Childhood Medicaid Expansions on Outcomes in Adulthood. *Review of Economic Studies*, *87*(2), 792–821.

Buchmueller, T. C., DiNardo, J., & Valletta, R. G. (2011). The Effect of an Employer Health Insurance Mandate on Health Insurance Coverage and the Demand for Labor: Evidence from Hawaii. *American Economic Journal: Economic Policy*, *3*(4), 25–51.

Chay, K. Y., Kim, D., & Swaminathan, S. (2012). Medicare's Impact on Hospital Insurance, Hospital Utilization, and Life Expectancy: The First 25 Years. Brown University Working Paper.

Chen, L.-Y., Oparina, E., Powdthavee, N., & Srisuma, S. (2019). Have Econometric Analyses of Happiness Data Been Futile? A Simple Truth About Happiness Scales. IZA Discussion Paper No. 12152.

Clark, A. E., Diener, E., Georgellis, Y., & Lucas, R. E. (2008). Lags and Leads in Life Satisfaction: A Test of the Baseline Hypothesis. *The Economic Journal*, *118*(529), F222–243.

Clark, A. E., Flèche, S., Layard, R., Powdthavee, N., & Ward, G. (2018). *The Origins of Happiness: The Science of Well-Being over the Life Course*. Princeton University Press.

Courtemanche, C. J., & Zapata, D. (2014). Does Universal Coverage Improve Health? The Massachusetts Experience. *Journal of Policy Analysis and Management*, *33*(1), 36–69.

Courtemanche, C., Marton, J., Ukert, B., Yelowitz, A., & Zapata, D. (2018). Early Effects of the Affordable Care Act on Health Care Access, Risky Health Behaviors, and Self-Assessed Health: Early Effects of the Affordable Care Act. *Southern Economic Journal*, *84*(3), 660–691.

Deaton, A. (2018). What do Self-reports of Wellbeing Say about Life-cycle Theory and Policy? *Journal of Public Economics*, *162*, 18–25.

Dehejia, R., DeLeire, T., & Luttmer, E. F. P. (2007). Insuring Consumption and Happiness through Religious Organizations. *Journal of Public Economics*, *91*(1–2), 259–279.

DeLeire, T. (2018). The Effect of Disenrollment from Medicaid on Employment, Insurance Coverage, Health and Health Care Utilization. NBER Working Paper No. 24899.

Dillender, M. O., Heinrich, C.J. and Houseman, S. N. (2016). Health Insurance Reform and Part-time Work: Evidence from Massachusetts. *Labour Economics*, *43*, 151–158.

Dolan, P., Peasgood, T., & White, M. (2008). Do we Really Know What Makes us Happy? A Review of the Economic Literature on the Factors Associated with Subjective Well-being. *Journal of Economic Psychology*, *29*(1), 94–122.

Ferrer-i-Carbonell, A., & Frijters, P. (2004). How Important is Methodology for the Estimates of the Determinants of Happiness? *The Economic Journal*, *114*(497), 641–659.

Finkelstein, A., Taubman, S., Wright, B., Bernstein, M., Gruber, J., Newhouse, J. P. … Oregon Health Study Group. (2012). The Oregon Health Insurance Experiment: Evidence from the First Year. *The Quarterly Journal of Economics*, *127*(3), 1057–1106.

Finkelstein, A., Nathaniel, H, & Luttmer, E. F. P. (2019). The Value of Medicaid: Interpreting Results from the Oregon Health Insurance Experiment. *Journal of Political Economy*, *127*(6), 2836–2874.

Fisher, R. A. (1935). *The design of experiments*. Oliver & Boyd Ltd.

Garthwaite, C., Gross, T., & Notowidigdo, M. J. (2014). Public Health Insurance, Labor Supply, and Employment Lock. *The Quarterly Journal of Economics*, *129*(2), 653–696.

Ghosh, A., Simon, K., & Sommers, B D. (2017). The Effect of State Medicaid Expansions on Prescription Drug Use: Evidence from the Affordable Care Act. NBER Working Paper No. 23044.

Goldin, J., Lurie, I. Z., & McCubbin, J. (2019). Health Insurance and Mortality: Experimental Evidence from Taxpayer Outreach. NBER Working Paper No. 26533.

Gruber, J. H., & Mullainathan, S. (2005). Do Cigarette Taxes Make Smokers Happier. *The B.E. Journal of Economic Analysis & Policy*, *5*(1), 4.

Gruber, J. H., & Sommers, B. (2019). The Affordable Care Act's Effect on Patients, Providers and the Economy: What We've Learned so Far. *Journal of Policy Analysis and Management*, *38*(4), 1028–1052.

Hackmann, M. B., Kolstad, J. T., & Kowalski, A. E. (2015). Adverse Selection and an Individual Mandate: When Theory Meets Practice. *American Economic Review*, *105*(3), 1030–1066.

Hu, L., Kaestner, R., Mazumder, B., Miller, S., & Wong, A. (2018). The Effect of the Affordable Care Act Medicaid Expansions on Financial Wellbeing. *Journal of Public Economics*, *163*, 99–112.

Kahneman, D., & Krueger, A. B. (2006). Developments in the Measurement of Subjective Well-Being. *Journal of Economic Perspectives*, *20*(1), 3-24.

Kaestner, R., Garrett, B., Chen, J., Gangopadhyaya, A., & Fleming, C. (2017). Effects of ACA Medicaid Expansions on Health Insurance Coverage and Labor Supply. *Journal of Policy Analysis and Management*, *36*(3), 608–642.

Kahneman, D., & Sugden, R. (2005). Experienced Utility as a Standard of Policy Evaluation. *Environmental and Resource Economics*, *32*(1), 161–181.

Kaiser, C., & Vendrik, M. C. M. (2020). How Threatening are Transformations of Reported Happiness to Subjective Wellbeing Research? IZA Discussion Paper No. 13905.

Kaiser Family Foundation. (2020, August, 17). Status of State Medicaid Expansion Decisions: Interactive Map. *Medicaid*. Retrieved from https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/

Kenney, G., Holahan, J. and Nichols, L., 2006. Toward a more reliable federal survey for tracking health insurance coverage and access. *Health Services Research*, *41*(3p1), pp.918-945.

Kim, S., & Koh, K. (2020). Does Early Access to Pension Wealth Improve Health? *Economic Inquiry, 58*(4): 1783– 1794.

Kim, S. and Koh, K. (2021). Labor Market Impacts of Mandated Dependent Health Insurance Coverage: Evidence from the Affordable Care Act Dependent Mandate. Working Paper.

Kowalski, A. (2020). Reconciling Seemingly Contradictory Results from the Oregon Health Insurance Experiment and the Massachusetts Health Reform. NBER Working Paper 24647.

Kobayashi, L. C., Altindag, O., Truskinovsky, Y., & Berkman, L. F. (2019). Effects of the Affordable Care Act Medicaid Expansion on Subjective Well-Being in the US Adult Population, 2010–2016. *American Journal of Public Health*, *109*(9), 1236–1242.

Kolstad, J. T., & Kowalski, A. E. (2012). The Impact of Healthcare Reform on Hospital and Preventive Care: Evidence from Massachusetts. *Journal of Public Economics*, *96*(11–12), 909–929.

Kolstad, J. T., & Kowalski, A. E. (2016). Mandate-based Health Reform and the Labor Market: Evidence from the Massachusetts Reform. *Journal of Health Economics*, *47*, 81–106.

Kuroki, M. (2018). Subjective Well-being and Minimum Wages: Evidence from U.S. States. *Health Economics, 27*(2), 171-180.

Lachowska, M. (2017). The Effect of Income on Subjective Well-Being: Evidence from the 2008 Economic Stimulus Tax Rebates. *Journal of Human Resources, 52*(2), 374-417.

Leung, P., & Mas, A. (2018). Employment Effects of the Affordable Care Act Medicaid Expansions. *Industrial Relations: A Journal of Economy and Society, 57*(2), 206-234.

Lindqvist, E., Östling, R., & Cesarini, D. (2020). Long-Run Effects of Lottery Wealth on Psychological Well-Being. *The Review of Economic Studies,* 87(6), 2703-2726.

Ludwig, J., Duncan, G. J., Gennetian, L. A., Katz, L. F., Kessler, R. C., Kling, J. R., & Sanbonmatsu, L. (2012). Neighborhood Effects on the Long-Term Well-Being of Low-Income Adults. *Science, 337*(6101), 1505-1510.

Long S., Stockely K. and Yemane A. (2009). Another Look at the Impacts of Health Reform in Massachusetts: Evidence Using New Data and a Stronger Model. *American Economic Review Papers and Proceedings*, 99(2), 508-511

Mazumder, B., & Miller, S. (2016). The Effects of the Massachusetts Health Reform on Household Financial Distress. *American Economic Journal: Economic Policy*, *8*(3), 284–313.

Miller, S. (2012). The Impact of the Massachusetts Health Care Reform on Health Care Use Among Children. *American Economic Review Papers and Proceedings*, *102*(3), 502–507.

Miller, S. (2013). The Effect of the Massachusetts Reform on Health Care Utilization. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, *49*(4), 317–326.

Miller, S., & Wherry, L. R. (2017). Health and Access to Care during the First 2 Years of the ACA Medicaid Expansions. *The New England Journal of Medicine*, *376*(10), 947–956.

Miller, S., & Wherry, L. R. (2019). Four Years Later: Insurance Coverage and Access to Care Continue to Diverge between ACA Medicaid Expansion and Non-Expansion States. *AEA Papers and Proceedings*, *109*, 327–333.

Miller, S., Johnson, N. and Wherry, L.R., 2021. Medicaid and mortality: new evidence from linked survey and administrative data. *The Quarterly Journal of Economics*.

Nyman, J. A. (1999). The Value of Health Insurance: The Access Motive. *Journal of Health Economics*, *18*(2), 141–152.

Oishi, S., & Diener, E. (2014). Can and Should Happiness be a Policy Goal? *Policy Insights from the Behavioral and Brain Sciences*, *1*(1), 195–203.

Oswald, A. J., & Powdthavee, N. (2008). Does Happiness Adapt? A Longitudinal Study of Disability with Implications for Economists and Judges. *Journal of Public Economics*, *92*(5–6), 1061–1077.

Schroeder, C., & Yitzhaki, S. (2017). Revisiting the Evidence for Cardinal Treatment of Ordinal Variables. *European Economic Review*, *92*, 337–358.

Simon, K., Soni, A., & Cawley, J. (2017). The Impact of Health Insurance on Preventive Care and Health Behaviors: Evidence from the First Two Years of the ACA Medicaid Expansions. *Journal of Policy Analysis and Management*, *36*(2), 390–417.

Sommers, B. D., Long, S. K., & Baicker, K. (2014). Changes in Mortality After Massachusetts Health Care Reform: A Quasi-experimental Study. *Annals of Internal Medicine*, *160*, 585–593.

Sommers, B. D., Gunja, M. Z., Finegold, K., & Musco, T. (2015). Changes in Self-reported Insurance Coverage, Access to Care, and Health Under the Affordable Care Act. *JAMA*, *314*(4), 366–374.

Sommers, B. D., Maylone, B., Blendon, R. J., Orav, E. J., & Epstein, A. M. (2017). Three-year Impacts of the Affordable Care Act: Improved Medical Care and Health among Low-income Adults. *Health Affairs*, *36*(6), 1119–1128.

Tello-Trillo, D. S. (2016). Effects of Losing Public Health Insurance on Healthcare Access, Utilization and Health Outcomes: Evidence from the TennCare Disenrollment. University of Virginia Working Paper.

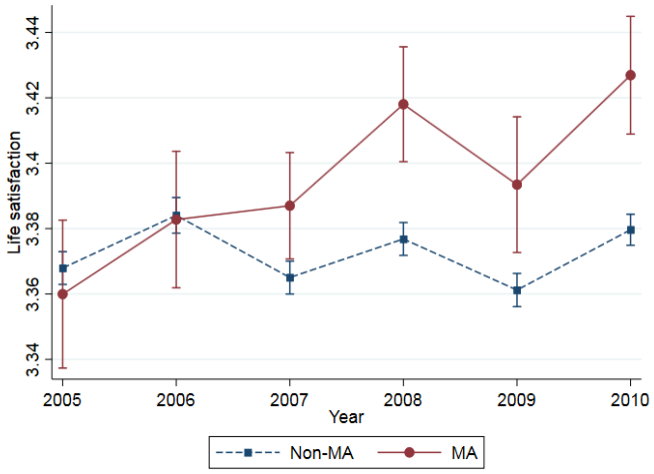
Wherry, L. R., & S. Miller. (2016). Early Coverage, Access, Utilization, and Health Effects of the Affordable Care Act Medicaid Expansions: A Quasi-experimental Study. *Annals of Internal Medicine*, *164*(12), 795.

Wing, C., Simon, K., & Bello-Gomez, R. A. (2018). Designing Difference in Difference Studies: Best Practices for Public Health Policy Research. *Annual Review of Public Health*, *39*(1), 453–469.

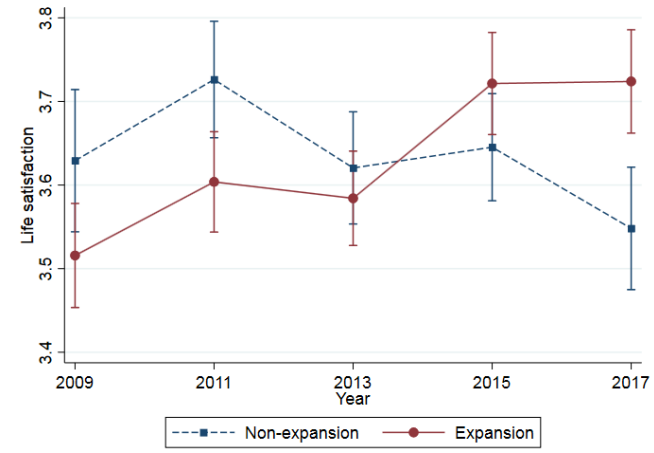
Figures and Tables

Figure 1. Trends of Overall Life Satisfaction

A. Massachusetts and other US states



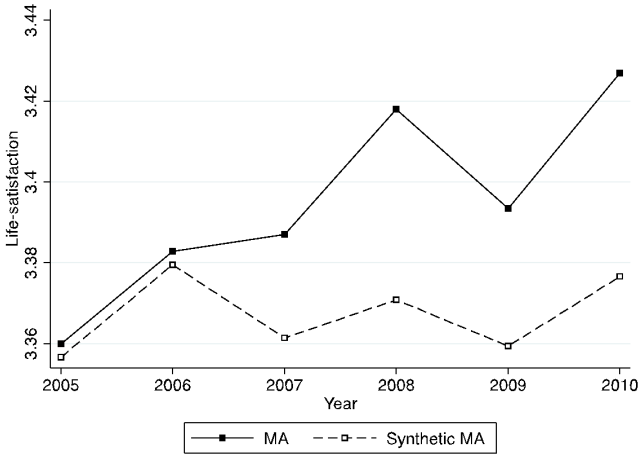
B. ACA Medicaid expansion states and non-expansion states



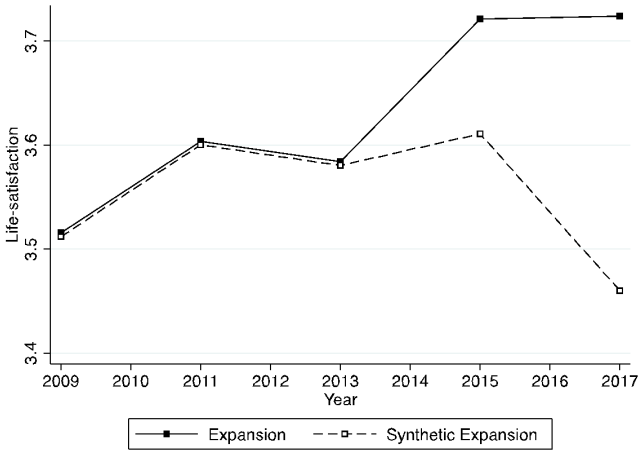
Data Sources: BRFSS, 2005–2010 (Panel A) and PSID, 2009–2017 (Panel B).
Notes: We restrict the sample to non-elderly adults aged 18–64 in Panel A and to non-elderly adults aged 18–64 whose household income is ≤138% of the FPL in Panel B. Caps indicate 95% confidence intervals.

Figure 2. Trends of Overall Life Satisfaction
Treatment States vs their Synthetic Controls

A. The Massachusetts healthcare reform



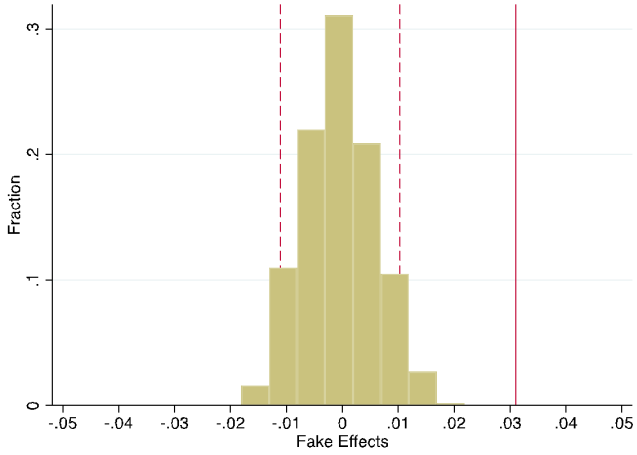
B. The ACA Medicaid expansion



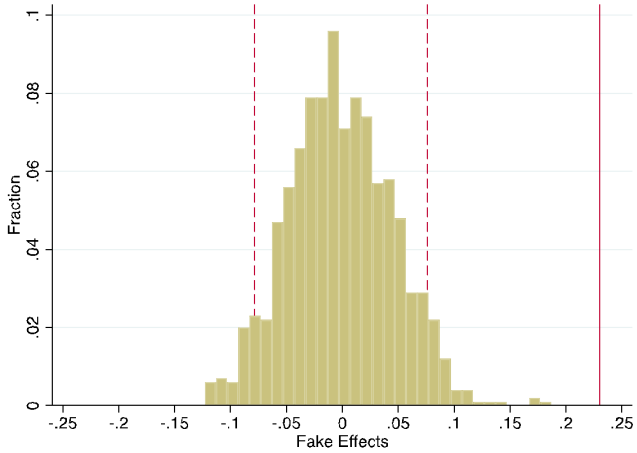
Data Sources: BRFSS, 2005–2010 (Panel A) and PSID, 2009–2017 (Panel B).
Notes: We restrict the sample to non-elderly adults aged 18–64 in Panel A and to non-elderly adults aged 18–64 whose household income is ≤138% of the FPL in Panel B. We use overall life satisfaction as the dependent variable. We match the averages of the dependent variable in each pre-reform period as well as the averages of the control variables used in the baseline regression analysis.

Figure 3. Distribution of the Effects of "Fake Reforms" on Life Satisfaction

A. The Massachusetts healthcare reform



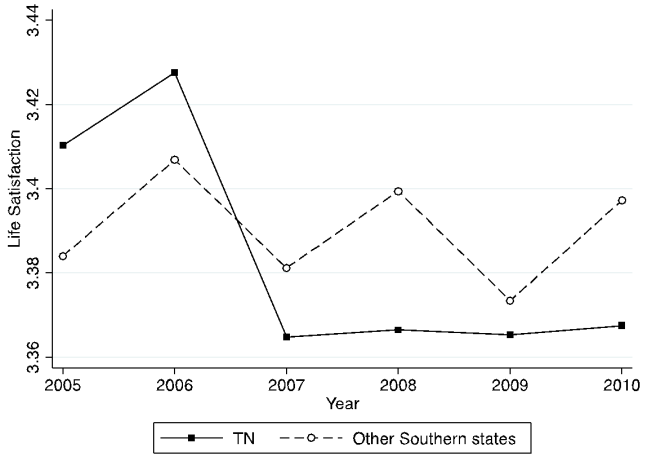
B. The ACA Medicaid expansion



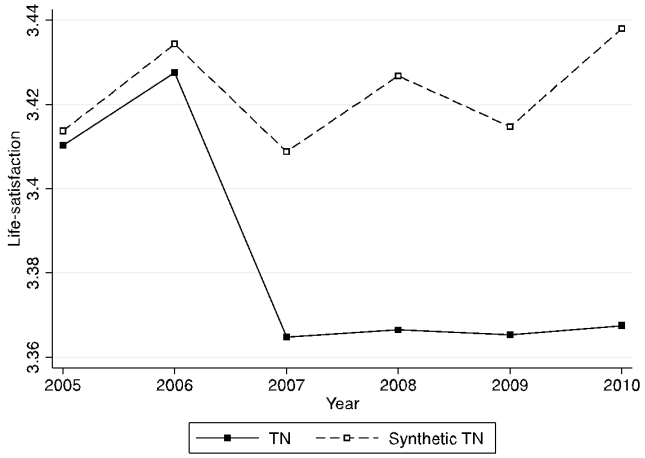
Data Sources: BRFSS, 2005–2010 (Panel A) and PSID, 2009–2017 (Panel B).
Notes: We include state-fixed effects, year-fixed effects, age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as control variables. We use the individual sampling weight as the probabilistic weight. The solid vertical line indicates the baseline estimates. The dashed vertical lines indicate the 5th and 95th percentile values of the fake treatment effects.

Figure 4. Trends of Overall Life Satisfaction between Tennessee and Control States

A. Control group: Other southern states



B. Control group: Synthetic Tennessee using other southern states



Data Sources: BRFSS, 2005–2010.
Notes: We restrict the sample to non-elderly adults aged 18–64 years. We construct a synthetic Tennessee by minimizing the difference in life satisfaction levels in 2005 between Tennessee and synthetic Tennessee.

Table 1. Summary Statistics

A. BRFSS

	Massachusetts (1)	Other States (2)
A. Overall Life Satisfaction		
Overall Life Satisfaction (scale of 1 to 4)	3.39 (0.65)	3.39 (0.63)
Pr(Very Dissatisfied)	0.01 (0.11)	0.01 (0.11)
Pr(Dissatisfied)	0.05 (0.22)	0.04 (0.21)
Pr(Satisfied)	0.49 (0.50)	0.50 (0.50)
Pr(Very Satisfied)	0.45 (0.49)	0.45 (0.50)
B. Individual Characteristics		
Age	46.3 (17.0)	45.7 (17.2)
Pr(Hispanic)	0.08 (0.29)	0.14 (0.26)
Pr(Male)	0.47 (0.49)	0.49 (0.49)
Pr(White)	0.21 (0.45)	0.18 (0.41)
Number of Children	0.72 (1.05)	0.82 (1.09)
Pr(Married)	0.56 (0.50)	0.59 (0.50)
Pr(College)	0.67 (0.48)	0.58 (0.49)
Annual Household Income Distribution		
Pr(< $20K)	0.13 (0.39)	0.19 (0.40)
Pr($20K–$35K)	0.17 (0.39)	0.22 (0.43)
Pr($35K–$50K)	0.14 (0.35)	0.16 (0.38)
Pr($50K–$75K)	0.18 (0.38)	0.17 (0.38)
Pr(>$75K)	0.37 (0.46)	0.25 (0.41)

B. PSID

	Medicaid Expansion States (1)	Non-expansion States (2)
A. Overall Life satisfaction		
Overall life satisfaction (scale of 1 to 5)	3.57 (0.99)	3.66 (0.99)
Pr(Not at all satisfied)	0.03 (0.17)	0.03 (0.16)
Pr(Not very satisfied)	0.08 (0.27)	0.07 (0.24)
Pr(Somewhat satisfied)	0.40 (0.49)	0.34 (0.49)
Pr(Very satisfied)	0.29 (0.45)	0.34 (0.45)
Pr(Completely satisfied)	0.21 (0.41)	0.22 (0.42)
B. Individual characteristics		
Age	39.2 (11.4)	39.6 (11.6)
Pr(Married)	0.41 (0.48)	0.34 (0.45)
Pr(White)	0.61 (0.49)	0.53 (0.43)
Pr(Hispanic)	0.26 (0.37)	0.14 (0.22)
Years of education	11.3 (2.5)	11.8 (2.1)
Pr(Male)	0.57 (0.50)	0.51 (0.50)
Household Income	18,990 (11,816)	17,003 (11,173)

Note: SDs are in parentheses.

Table 2. DID Estimates of the Effects of the Healthcare Reforms on Life Satisfaction

A. Massachusetts Healthcare Reform

Dep. Var.:	Overall life satisfaction (scale of 1 to 4)			Pr(Very Satisfied)
	(1)	(2)	(3)	(4)
Treat×Post	0.031***	0.041***	0.020***	0.021***
	(0.004)	(0.003)	(0.004)	(0.002)
Sample size	1,590,821	1,599,569	1,590,821	1,590,821
R-Squared	0.064	0.003	0.065	0.053
Controls	Y		Y	Y
State-specific linear trend			Y	
Mean Dep. Var.	3.37	3.37	3.37	0.45

B. ACA Medicaid Expansion

Dep. Var.:	Overall life satisfaction (scale of 1 to 5)			Pr(Completely Satisfied)
	(1)	(2)	(3)	(4)
Treat×Post	0.23***	0.20***	0.13**	0.093***
	(0.05)	(0.05)	(0.06)	(0.03)
Sample size	19,296	19,692	19,296	19,296
R-Squared	0.10	0.04	0.11	0.06
Controls	Y		Y	Y
State-specific linear trend			Y	
Mean Dep. Var.	3.64	3.64	3.64	0.23

Data Sources: BRFSS, 2005–2010 (Panel A) and PSID, 2009–2017 (Panel B).

Notes: We include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. DID Estimates of the Effects of the Healthcare Reforms on Life Satisfaction
Among Ineligible Individuals

Reform:	Massachusetts healthcare reform		ACA Medicaid Expansion	
Ineligible group:	Individuals aged 65 and above		Household income > 138% of the FPL	
Dep. Var.:	Overall life satisfaction (scale of 1 to 4)	Pr(Very Satisfied)	Overall life satisfaction (scale of 1 to 5)	Pr(Completely Satisfied)
	(1)	(2)	(3)	(4)
Treat×Post	-0.010***	-0.007**	0.018	0.002
	(0.003)	(0.003)	(0.024)	(0.013)
Sample size	662,567	662,567	57,077	57,077
R-Squared	0.039	0.039	0.081	0.033

Data Sources: BRFSS, 2005–2010 (columns (1) and (2)) and PSID, 2009–2017 (columns (3) and (4)).
Notes: We include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table 4. DID Estimates of the Association between Tennessee's Medicaid Disenrollment and Life Satisfaction

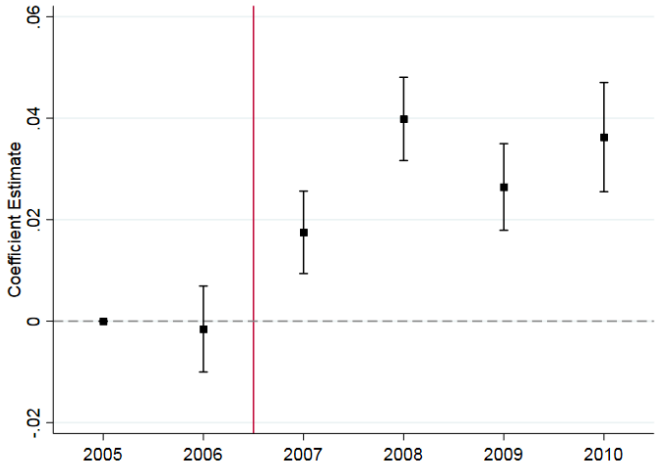
Dep. Var.:	Overall life satisfaction (scale of 1 to 4)	Pr(Very Satisfied)
	(1)	(2)
Treat×Post	-0.035***	-0.024***
	(0.005)	(0.004)
Sample size	530,100	530,100
R-Squared	0.063	0.052

Data Source: BRFSS, 2005–2010.
Notes: We restrict the sample to individuals aged 18–64 years. We use other southern states as the control group. We include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

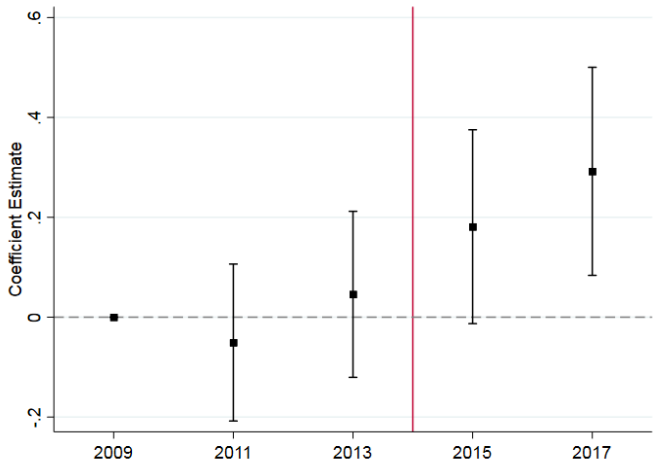
Appendix Figures and Tables

Figure A1. Dynamic Treatment Effects of the Healthcare Reforms

Panel A. Massachusetts Healthcare Reforms

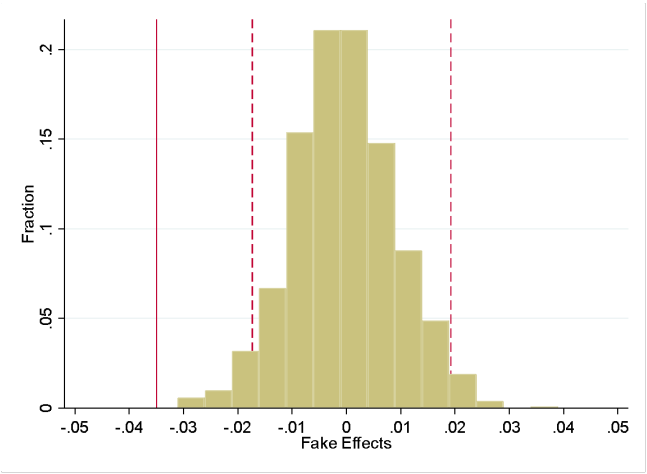


Panel B. ACA Medicaid Expansion



Data Sources: BRFSS, 2005–2010 (Panel A) and PSID, 2009–2017 (Panel B).
Notes: We restrict the sample to non-elderly adults aged 18–64 in Panel A and to non-elderly adults aged 18–64 whose household income is ≤138% of the FPL in Panel B. We use overall life satisfaction as the dependent variable. We use the individual sampling weight as a probabilistic weight. The solid vertical line indicates the baseline estimate. The dashed vertical lines indicate the 5th and 95th percentile values of the year-specific treatment effects.

Figure A2. Distribution of the Effects of the "Fake Tennessee Medicaid Disenrollment" on Life Satisfaction



Data Source: BRFSS, 2005–2010.
Notes: We include state-fixed effects, year-fixed effects, age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We use the individual sampling weight as a probabilistic weight. The solid vertical line indicates the baseline estimate. The dashed vertical lines indicate the 5th and 95th percentile values of the fake treatment effects.

Table A1. Additional Sensitivity Checks for the Effects of the ACA Medicaid Expansion on Overall Life Satisfaction

	Adding Individual Fixed Effects (1)	Restricting to Non-elderly Adults with Household Income ≤ 100% of the FPL (2)
Expansion×Post	0.21***	0.23**
	(0.06)	(0.09)
Sample size	19,296	13,345
R-Squared	0.66	0.10

Data Source: PSID, 2009–2017.
Notes: We restrict the sample to individuals aged 18 to 64 years with a household income up to 138% of the FPL in column (1). In column (2), we further restrict the sample to those with household income up to 100% of the FPL. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the individual level in column (1) and at the state level in column (2). *** p<0.01, ** p<0.05, * p<0.1.

Table A2. The Effects of the ACA Medicaid Expansion on Overall Life Satisfaction
Using the Heteroskedastic Ordered Probit Model

A. Massachusetts Healthcare Reforms

Dep. Var:	Overall life satisfaction
Massachusetts×Post	0.060***
	(0.006)
Average Marginal Effects	
Pr(Very dissatisfied)	-0.002***
	(0.0002)
Pr(Dissatisfied)	-0.005***
	(0.0005)
Pr(Satisfied)	-0.016***
	(0.002)
Pr(Very satisfied)	0.023***
	(0.002)
Sample size	1,590,821
Pseudo R-squared	0.04

B. ACA Medicaid Expansion

Dep. Var:	Overall life satisfaction
Expansion×Post	0.278***
	(0.063)
Average Marginal Effects	
Pr(Not at all satisfied)	-0.015***
	(0.003)
Pr(Not very satisfied)	-0.027***
	(0.006)
Pr(Somewhat satisfied)	-0.063***
	(0.014)
Pr(Very satisfied)	0.029***
	(0.007)
Pr(Completely satisfied)	0.077***
	(0.016)
Sample size	19,296
Pseudo R-squared	0.04

Data Sources: BRFSS, 2005–2010 (Panel A) and PSID, 2009–2017 (Panel B).
Notes: We include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We allow heteroskedasticity by expansion status and post-expansion periods. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A3. DID Estimates of the Lagged and Lead Effects of the Healthcare Reforms on Overall Life Satisfaction

A. Massachusetts' Healthcare Reform

Dep. var.	Overall life satisfaction
Treat×1[Year=2006]	-0.002
	(0.004)
Treat×1[Year=2007]	0.018***
	(0.004)
Treat×1[Year=2008]	0.040***
	(0.004)
Treat×1[Year=2009]	0.026***
	(0.004)
Treat×1[Year=2010]	0.036***
	(0.005)
Observations	1,590,821
R-squared	0.06

B. ACA Medicaid Expansion

Dep. var.	Overall life satisfaction
Treat×1[Year=2011]	-0.051
	(0.078)
Treat×1[Year=2013]	0.046
	(0.083)
Treat×1[Year=2015]	0.181*
	(0.097)
Treat×1[Year=2017]	0.292***
	(0.104)
Observations	19,296
R-squared	0.10

Data Sources: BRFSS, 2005–2010 (Panel A) and PSID, 2009–2017 (Panel B).
Notes: We include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A4. DID Estimates of the Effects of the Healthcare Reforms on Life Satisfaction
Controlling for Health and Economic Conditions

Reform:	Massachusetts healthcare reform		ACA Medicaid Expansion	
	(1)	(2)	(3)	(4)
Treat×Post	0.023***	0.018***	0.220***	0.220**
	(0.003)	(0.003)	(0.050)	(0.049)
Sample size	1,586,234	1,432,484	19,259	19,259
R-Squared	0.150	0.174	0.16	0.16
Health Control	Y	Y	Y	Y
Economic Control		Y		Y

Data Sources: BRFSS, 2005–2010 (columns (1) and (2)) and PSID, 2009–2017 (columns (3) and (4)).
Notes: We use overall health status as a measure for health following the previous studies (e.g., Finkelstein et al., 2012; Sommers et al., 2015; Courtemanche et al., 2018). Unfortunately, we cannot access proxies used for a measure of financial distress used by the previous studies (Mazumder and Miller, 2016; Hu et al., 2018). To indirectly measure the financial status, we include the following variables into regression analysis. For the BRFSS data, we use whether a respondent could not see a doctor due to costs, employment status and household income category as additional economic controls. For the PSID data, we use employment status, household income, and household net worth as additional economic controls. Baseline controls include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. Health control includes self-reported overall health status. Economic controls include whether a respondent could not see a doctor due to costs, employment status, and household income category in Panel A and employment status, household income, and household net worth in Panel B. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A5. The Effects of the Massachusetts Healthcare Reform on Overall Life Satisfaction
Using Alternative Control Groups

Control Groups:	Other Northeastern States	States with Similar Recession Shocks	States used for Synthetic Massachusetts among those with Similar Recession Shocks
	(1)	(2)	(3)
Massachusetts ×Post	0.029***	0.032***	0.037***
	(0.007)	(0.006)	(0.003)
Observations	311,548	266,524	211,077
R-squared	0.07	0.07	0.07

Data Source: BRFSS, 2005–2010.

Notes: We restrict the sample to individuals aged 18–64 years. As alternative control groups, we use northeastern states in column (1); Kentucky, Louisiana, Maryland, Nebraska, Oklahoma, and Vermont in column (2); and Kentucky, Maryland, Nebraska, and Oklahoma in column (3). For the control variables, we use age, age squared, and the number of children, as well as dummy variables for Hispanic ethnicity, gender, white, marital status, and college education. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A6. DID Estimates of the Effects of the ACA Medicaid Expansion on Overall Life Satisfaction
Using Actual Implementation Date for the Definition of the Post Dummy and Excluding States Expanded Medicaid before 2014

Dep. Var.:	Overall life satisfaction (scale of 1 to 5)			
Specifications:	Using Alternative Definition of the Post dummy (relative to the actual implementation)	Excluding states that expanded Medicaid substantially before 2014 (CA, CT, HI, MN, WI)	Excluding states that expanded Medicaid mildly before 2014 (DE, DC, MA, NY, VT)	Excluding 10 states in columns (2) and (3)
	(1)	(2)	(3)	(4)
Treat ×Post	0.226***	0.225***	0.229***	0.217***
	(0.054)	(0.056)	(0.053)	(0.056)
Observations	19,296	16,998	18,546	16,248
R-squared	0.101	0.105	0.102	0.107

Data Source: PSID, 2009–2017.

Notes: We include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. We adopt the state-specific implementation date of the ACA Medicaid expansion and definition of substantial and mild expansion states before 2014, following Simon et al. (2017, p. 394 and Table A1). *** p<0.01, ** p<0.05, * p<0.1.

Table A7. DID Estimates of the Effects of the ACA Medicaid Expansion on Life Satisfaction
Among Elderly Individuals Aged 65 and Above

Income group:	Household income ≤ 138% of the FPL		Household income > 138% of the FPL	
Dep. Var.:	Overall life satisfaction (scale of 1 to 4)	Pr(Very Satisfied)	Overall life satisfaction (scale of 1 to 5)	Pr(Very Satisfied)
	(1)	(2)	(3)	(4)
Treat×Post	-0.150	-0.084	-0.049	0.010
	(0.124)	(0.074)	(0.052)	(0.032)
Sample size	1,537	1,537	6,673	6,673
R-Squared	0.178	0.149	0.093	0.054

Data Source: PSID, 2009–2017.
Notes: We include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A8. DDD Estimates of the Effects of the Healthcare Reforms on Life Satisfaction

Reform:	Massachusetts Healthcare Reform		ACA Medicaid Expansion	
Ineligible group:	Individuals aged 65 and above		Household income > 138% of the FPL	
Dep. Var.:	Overall life satisfaction (scale of 1 to 4)	Pr(Very Satisfied)	Overall life satisfaction (scale of 1 to 5)	Pr(Completely Satisfied)
	(1)	(2)	(3)	(4)
Treat × Post × Eligible	0.040***	0.027***	0.21***	0.08*
	(0.004)	(0.003)	(0.06)	(0.04)
Sample size	2,253,388	2,253,388	76,373	76,373
R-Squared	0.059	0.050	0.09	0.48

Data Sources: BRFSS, 2005–2010 (columns (1) and (2)) and PSID, 2009–2017 (columns (3) and (4)).
Notes: We include age, age squared, marital status, race, ethnicity, years of education, gender, and the number of children as the control variables. We use the individual sampling weight as a probabilistic weight. Standard errors in parentheses are corrected for heteroscedasticity and clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table A9. State Weights in the Synthetic Control Approach

State	Synthetic Massachusetts	Synthetic Expansion States	Synthetic Tennessee	State	Synthetic Massachusetts	Synthetic Expansion States	Synthetic Tennessee
Alabama	0.02	0.033	0.013	Montana	0.015	-	-
Alaska	0.014	-	-	Nebraska	0.015	0.161	-
Arizona	0.015	-	-	Nevada	0.019	-	-
Arkansas	0.013	-	0.028	New Hampshire	0.008	-	-
California	0.021	-	-	New Jersey	0.019	-	-
Colorado	0.014	-	-	New Mexico	0.021	-	-
Connecticut	0.014	-	-	New York	0.191	-	-
Delaware	0.011	-	0.313	North Carolina	0.015	0.031	0.026
District of Columbia	0.016	-	0.019	North Dakota	0.011	-	-
Florida	0.014	0.038	0.029	Ohio	0.014	-	-
Georgia	0.019	0.251	0.017	Oklahoma	0.014	0.074	0.025
Hawaii	0.009	-	-	Oregon	0.022	-	-
Idaho	0.012	0.02	-	Pennsylvania	0.018	-	-
Illinois	0.013	-	-	Rhode Island	0.014	-	-
Indiana	0.027	-	-	South Carolina	0.015	0.031	0.025
Iowa	0.017	0.031	-	South Dakota	0.012	0.025	-
Kansas	0.013	0.014	-	Tennessee	0.012	0.056	-
Kentucky	0.018	-	0.011	Texas	0.015	0.037	0.028
Louisiana	0.014	-	0.033	Utah	0.012	0.023	-
Maine	0.013	0.041	-	Vermont	0.012	-	-
Maryland	0.014	-	0.033	Virginia	0.011	0.033	0.386
Massachusetts	-	-	-	Washington	0.017	-	-
Michigan	0.028	-	-	West Virginia	0.052	-	0.004
Minnesota	0.02	-	-	Wisconsin	0.016	-	-
Mississippi	0.022	0.06	0.011	Wyoming	0.011	-	-
Missouri	0.027	0.04	-				

Note: "-" indicates states not used for constructing the synthetic controls.

Appendix

A. Construction of the Synthetic Control Groups

We construct synthetic controls for Massachusetts, ACA Medicaid expansion states, and Tennessee, which are weighted averages of overall life satisfaction among the states used as the control groups in the baseline analysis (i.e., the 50 other US states used to analyze Massachusetts' healthcare reform, all the non-expansion states used to analyze the ACA Medicaid expansion, and the other southern states used to analyze the TennCare disenrollment) following Abadie et al. (2010). First, we aggregate the datasets at the state-year level, containing the annual averages of the dependent variables and covariates across states. The synthetic control method can be applied when there is only one treatment unit. However, we consider 32 expansion states when analyzing the effects of the ACA Medicaid expansion. To alleviate this technical issue, we aggregate the expansion states into a single treatment unit, following Abadie et al. (2010).[23] We acknowledge that recent developments in the literature may offer a better solution when dealing with multiple treated units (Powell, 2021).[24]

We then calculate the weights over states that minimize the differences between the averages of overall life satisfaction for each year of the pre-reform periods and covariates used in the baseline DID analysis over the entire pre-reform period between the treatment and control groups.[25] Table A9 shows the calculated weights used to construct the synthetic controls of Massachusetts, the representative expansion state, and Tennessee. All the states in donor pools are assigned positive weights, which may imply that it is a reasonable approach to construct control groups using the remaining US states, non-expansion states, and other southern states, respectively, in the baseline DID analyses.

[23] Consequently, we have balanced panel data of 18 states (one representative expansion state and 17 control states) from 2009 to 2017. We could not include Wyoming because it has missing overall life satisfaction data in one year, preventing us from creating balanced panel data.

[24] Unfortunately, we could not find a readily available Stata or R module to implement the generalized synthetic control method of Powell (2021). Hence, we follow Abadie et al. (2010)'s approach in our study.

[25] To construct synthetic Tennessee, we calculate the weights by minimizing the difference in overall life satisfaction between Tennessee and other southern states in 2005. We could not calculate the weights by minimizing the differences in the average values of the covariates because we could not find numerical solutions.

B. Alternative Control States to Analyze the Massachusetts Healthcare Reform

We acknowledge that we have only two years (2005 and 2006) of pre-reform life satisfaction data in the case of the Massachusetts reform. To overcome the empirical issues arising from this limitation, we use the following alternative control groups in addition to the synthetic control method to study the sensitivity of our baseline results. First, the DID estimates could be biased because of heterogeneity across states (Issue 1). The short pre-reform period data may not guarantee that state-fixed effects sufficiently control for heterogeneity across states. To address this issue, we use other northeastern states (Connecticut, Maine, New Hampshire, Rhode Island, Vermont, New Jersey, New York, and Pennsylvania) as alternative control states by assuming that, because of their close proximity, the characteristics of these states are more similar than those of the baseline control states (Courtemanche and Zapata, 2014).

Second, our estimates could be biased because of the time-varying unobserved confounding factors (Issue 2). The Great Recession of 2008–2009 could have affected overall life satisfaction differently across states over time. For example, if individuals in Massachusetts experienced less severe recession shocks than did individuals in the control states during the post-reform period, then Massachusetts residents might have higher overall life satisfaction than residents in the control states. We indirectly address this issue by comparing Massachusetts and states with similar reductions in the proportion of employed individuals during the recession period (±1 pp of Massachusetts' change in the share of employed individuals of the non-elderly population aged 18 to 64 years). We presume that the Great Recession is the leading time-varying confounding factor. However, we acknowledge that other unknown time-varying factors, if they exist, could bias our estimates. To further address bias due to other time-varying factors, we presume that residents in the same state are likely to share similar time-varying factors compared with those in other states. Based on this presumption, we use elderly individuals aged 65 and above in the same state as an additional control group and re-estimate the effects of Massachusetts' healthcare reform using a DDD specification in Appendix C.

Third, our baseline estimates could be biased because of both Issues 1 and 2 (Issue 3). To further investigate the sensitivity of our baseline estimates, we construct another "synthetic Massachusetts" among states that experienced similar recession shocks.

The regression results reported in Table A5 are robust for the alternative control groups. The estimated effects of the Massachusetts reform on overall life satisfaction when using other

northeastern states, states with similar recession shocks, and states used for synthetic Massachusetts among those with similar recession shocks are 0.029, 0.032, and 0.037, respectively. The estimates were all statistically significant at the 1% level.

C. DDD Regression Analysis

As a complementary identification strategy, we additionally compare changes in overall life satisfaction based on the eligibility status of healthcare reform. Specifically, we use the following DDD specifications:

$$LS_{ist} = \gamma_0 + \gamma_1 Treated_s * Post_t * Eligible_i + \gamma_2 Treated_s * Post_t + \gamma_3 Treated_s * Eligible_i + \gamma_4 Post_t * Eligible_i + \delta_s + \theta_t + \gamma_5 Eligible_i + \gamma_3 X_{ist} + \omega_{ist} \quad (2)$$

where $Eligible$ indicates i) non-elderly individuals aged 18 to 64 years in the Massachusetts reform analysis and ii) non-elderly individuals whose household income is above 138% of the FPL in the ACA Medicaid expansion analysis. Otherwise, we follow the same notations and use the same control variables as in regression specification (1). The coefficient of the triple interaction term, γ_1, is the coefficient of interest, which captures the different effects of the Massachusetts healthcare reform and ACA Medicaid expansion on overall life satisfaction between eligible and ineligible individuals.

Table A8 presents the DDD estimates of the effects of the healthcare reforms. These results were similar to those of the baseline DID estimates. Columns (1) and (2) indicate that Massachusetts' healthcare reform improved individuals' life satisfaction by 0.04 points and the probability that individuals are very satisfied with their lives by 2.7 pp. The estimates were statistically significant at the 1% level. Columns (3) and (4) show that the ACA Medicaid expansion improved low-income individuals' overall life satisfaction by 0.21 points and the probability that they are completely satisfied with their lives by 8 pp. The estimates are statistically significant at the 1% and 10% levels, respectively.

References for the Appendix

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program. *Journal of the American Statistical Association*, *105*, 493–505.

Courtemanche, C., & Zapata, D. (2014). Does Universal Coverage Improve Health? The Massachusetts Experience. *Journal of Policy Analysis and Management*, *33*(1), 36–69.

Powell, D. (2021). Synthetic Control Estimation Beyond Comparative Case Studies: Does the Minimum Wage Reduce Employment?. *Journal of Business & Economic Statistics*, Forthcoming, pp.1-39.