PUBLIC HEALTH INSURANCE, LABOR SUPPLY, AND EMPLOYMENT LOCK*

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We study the effect of public health insurance on labor supply by exploiting a large public health insurance disenrollment. In 2005, approximately 170,000 Tennessee residents abruptly lost Medicaid coverage. Using both across- and within-state variation in exposure to the disenrollment, we estimate large increases in labor supply, primarily along the extensive margin. The increased employment is concentrated among individuals working at least 20 hours a week and receiving private, employer-provided health insurance. We explore the dynamic effects of the disenrollment and find an immediate increase in job search behavior and a steady rise in both employment and health insurance coverage following the disenrollment. Our results are consistent with a significant degree of "employment lock"—workers who are employed primarily to secure private health insurance coverage. *JEL Codes:* I1, J22, H75.

I. Introduction

In the United States, health insurance is tightly linked to employment. Public health insurance programs cover the disabled, low-income parents, and those older than 65, but few other adults qualify for public coverage. Americans without access to public or employer-provided insurance can purchase

health insurance through the individual, non-group market, but that market is believed to face adverse selection pressures that limit its availability (Hackman, Kolstad, and Kowalski 2013; Hendren 2013). As a result, many Americans can only access affordable health insurance through their employer, and thus expansions of public health insurance can have large effects on the labor market.

The 2010 Affordable Care Act (ACA) is the largest public health insurance expansion since the creation of the Great Society programs in the 1960s. The ACA will weaken the link between employment and health insurance through the creation of health insurance exchanges. An individual mandate will require that nearly all individuals purchase health insurance, which may relieve adverse selection pressures. Additionally, low-income individuals participating in the exchanges will receive large tax subsidies, and those earning less than 138% of the poverty line regardless of their family or disability status are expected to receive health insurance through a Medicaid expansion.

The ACA may have a large effect on labor supply if some individuals work solely to access affordable health insurance, a phenomenon we call "employment lock."[1] Few empirical estimates of employment lock exist, particularly among the population that will likely be affected by the ACA.[2] Previous studies focus primarily on the disincentives for work created by Medicaid's strict earnings limits, restrictions that are effectively removed under the ACA (Yelowitz 1995; Meyer and Rosenbaum 2000). Other studies focus on the relationship between health insurance and job mobility or retirement but are unable to examine how the availability of heavily subsidized health insurance might affect these outcomes (Madrian 1994; Gruber and Madrian 1997). Additionally, previous analyses of the labor supply effects of public health insurance focus (by necessity) on traditional Medicaid beneficiaries, such as pregnant women, women receiving cash welfare, and children in low-income families (Dave et al. 2013). Even studies examining the labor supply effects of public

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1. We use the phrase "employment lock" rather than "job lock", because a large body literature uses the latter to indicate the role of employer-provided health insurance in reducing job mobility. By contrast, we focus on the role of employer-provided health insurance on the decision to work at all.

2. Currie and Madrian (1999) and Gruber and Madrian (2004) summarize the existing research on employment and health insurance.

health insurance for those not categorically eligible for Medicaid have focused on very low-income populations (Baicker et al. 2013). By contrast, the ACA will primarily affect non-disabled, childless adults and relatively higher-income families (Kenney et al. 2012). Very little is known about how this population reacts to public health insurance eligibility.

In this article, we exploit a reform of Tennessee's Medicaid system to estimate the effect of public health insurance eligibility on the labor supply of childless adults.[3] In 2005, Tennessee discontinued its expansion of TennCare, the state's Medicaid system. As a result, approximately 170,000 adults (roughly 4% of the state's non-elderly, adult population) abruptly lost public health insurance coverage over a three-month period.

We exploit both across- and within-state variation in exposure to the disenrollment. First, we use the sharp change in eligibility in Tennessee to estimate difference-in-difference models, which compare outcomes in Tennessee after the disenrollment to outcomes in Tennessee before the disenrollment and to other states in the American South. Second, we note that the disenrollment disproportionately affected a particular subpopulation—childless adults—which was unaffected by policy changes in other states. We exploit this fact to estimate triple-difference models, which compare outcomes among childless adults in Tennessee to other adults in Tennessee before and after the disenrollment. The disproportionate effect of the disenrollment on childless adults allows us to focus on a policy-relevant subpopulation that has received little attention in the existing literature on public health insurance eligibility. Relative to previous work, we believe that the sudden policy change and large scale of the policy reform leads to especially transparent results. In particular, most of our results are plainly evident in aggregate time-series data.

We find that the TennCare disenrollment caused a large increase in labor supply. The increased employment was concentrated among individuals working more than 20 hours a week and who reported having private, employer-provided health insurance. Indeed, we find a similarly large increase in private health insurance following the disenrollment, suggesting that public health insurance had been "crowding out" private health insurance. Our crowdout estimates are similar in magnitude to

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3. Throughout the article we use the phrase "childless adults" to refer to adults without children under the age of 18 in the household.

other estimates in the literature (Cutler and Gruber 1996; Gruber and Simon 2008; LoSasso and Buchmueller 2004). We also explore the dynamic effects of the disenrollment and find that job search behavior, employment, and health insurance coverage all increased almost immediately after the disenrollment. The pattern of labor supply changes and the crowdout behavior suggest that disenrollees entered the labor market and gained employment to procure health insurance. This finding is consistent with large valuations of health insurance as well as strong work disincentives from public health insurance that are unrelated to income-based eligibility limits.

Our results demonstrate that public health insurance eligibility can have large effects on the labor market. Additionally, our estimates provide insight regarding the potential for aggregate labor supply effects from the implementation of two features of the ACA: the Medicaid expansion and large insurance subsidies for individuals under 200% of the poverty level. As already discussed, both TennCare and these portions of the ACA target demographic groups not traditionally eligible for public health insurance, such as adults without dependents and with incomes above the federal poverty line. Additionally, unlike traditional Medicaid programs, as beneficiaries in the TennCare expansion program earned additional income, their insurance premiums and copayments increased, but they did not lose coverage.[4] Similarly, under the ACA, individuals in health insurance exchanges will experience decreased subsidies as their income increases.

Despite these similarities, there are important differences between the ACA and TennCare. Individuals enrolled in the TennCare expansion actively sought health insurance and therefore may not be representative of the average individual affected by the ACA. In addition, the ACA includes numerous provisions that may affect the labor supply decisions of individuals at all income levels. Nevertheless, we believe that our estimates can shed light on the potential labor market effects of the ACA and other policies that create non-employer health insurance options.

4. To remain eligible for TennCare, individuals in the expansion population had to be ineligible for group health coverage from another source. This is similar to the ACA, which stipulates that to qualify for tax subsidies in the non-group insurance exchanges, individuals have to be ineligible for affordable coverage (less than 9.5% of income) from their employer.

Our results suggest that if individuals can purchase affordable health insurance apart from their employer, many of them may leave employment and exit the labor force entirely.

The remainder of the article proceeds as follows. Section II describes Tennessee's Medicaid program and the particular policy change that we study. Section III describes the data sources we use in our analysis. Section IV describes the effects of the disenrollment on labor supply and health insurance coverage, and Section V concludes.

II. TENNESSEE'S HEALTH CARE REFORM

In 1994, facing a primarily Medicaid-driven budget deficit of approximately $250 million, Tennessee enacted health care reform designed to simultaneously control costs and expand coverage (Wright 2001). Tennessee enrolled all existing Medicaid recipients in managed care insurance plans and used the planned savings to fund a novel public health insurance expansion aimed at individuals, regardless of income or demographics, who were either "uninsured" or "uninsurable."[5]

Those in the TennCare expansion population were unlike traditional Medicaid beneficiaries. Individuals in the expansion program were far more likely to be white and between the ages of 21 and 64. Reflecting back on the program, the executive director of the Kaiser Commission on Medicaid and the Uninsured said, "TennCare was bold, it was comprehensive, it looked at the whole low-income population and was seen by many as a model for how we might provide coverage to the low-income population, especially by bringing in childless adults who historically have never been eligible for Medicaid" (Rowland 2005). Similarly, Wooldridge et al. (1996) said that the TennCare expansion opened Medicaid up to "able-bodied" adults regardless of family status.

Enrollees in the expansion program had higher incomes than traditional public insurance beneficiaries. In 1995, approximately 40% of enrollees in the TennCare expansion program

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5. To avoid gaming, the state required that individuals applying for coverage as "uninsured" on January 1, 1994, had to be uninsured as of March 1, 1993. To qualify as "uninsurable," individuals had to submit documentation demonstrating that they were previously denied private health insurance coverage (Moreno and Hoag 2001).

had incomes above 100% of the poverty line, with 6.3% having incomes between 200% and 400% and 1.3% have incomes above 400% of the poverty line (Wooldridge et al. 1996). Enrollees had higher incomes because eligibility for the TennCare expansion programs did not depend on income. By contrast, most previous public health insurance expansions placed limits on the income of beneficiaries and thereby created large notches in the budget sets of enrollees.

In 2002, in response to budget shortfalls, TennCare changed the eligibility of the uninsurable category to require a medical review of "insurability" rather than simply a letter stating a previous denial of private coverage. Tennessee also began a process of "reverification" in which all TennCare enrollees were required to schedule appointments to determine if they remained eligible for benefits (Kaiser Health News 2002).[6]

Figure I presents quarterly enrollment for both the entire TennCare system and the uninsured and uninsurable category from 2003 through 2010. Two effects of the 2002 reverification process can be seen during the earliest quarters in the graph. First, in early 2003, approximately 100,000 people were removed from the Medicaid rolls. Most of these individuals had not responded to repeated requests for reverification despite the threat of lost coverage. Thus it is unlikely that these individuals were frequent users of TennCare-covered medical services.[7] Second, the distribution of enrollees by category shifted. Approximately 20% of TennCare enrollees moved from the expansion population to traditional Medicaid. Following reverification, overall TennCare enrollments remained fairly stable at approximately 1.3 million, with everyone in the expansion category unable to qualify for traditional

6. The vast majority of individuals who responded to the request retained coverage. However, nearly 200,000 individuals did not respond and were immediately removed from the Medicaid rolls (TennCare 2003). As part of a court settlement, these individuals received an extended grace period to demonstrate eligibility that resulted in many requalifying for benefits (Ruble 2003).

7. Suggestive evidence of this lack of medical expenditures can be found in TennCare enrollment and expenditure data. In the last quarter of 2002 TennCare Spending was approximately $890 million for 1.4 million enrollees. In the last quarter of 2003, there were 1.3 million remaining enrollees, but spending increased to $1.1 billion. By contrast, on July 15, 2005, there were 1.35 million enrollees and quarterly expenditures were $1.3 billion. By July 15, 2006, enrollments fell to 1.2 million and quarterly expenditures fell to $950 million, a 30% decrease. Provider payments excluding pharmaceutical expenditures fell by 14% over that time period.
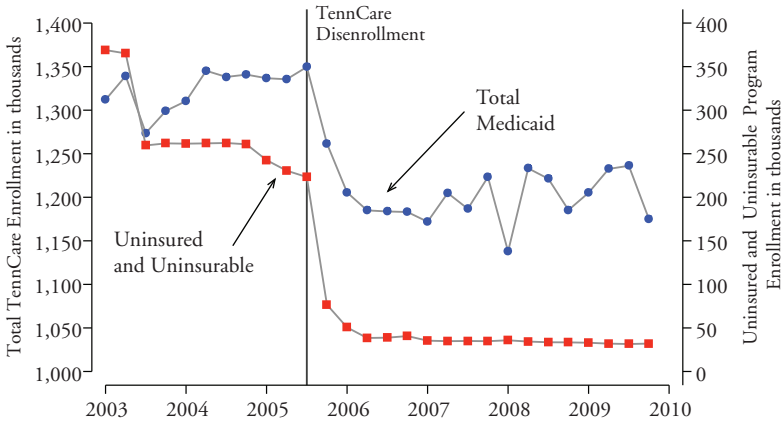
FIGURE I

Quarterly Medicaid Enrollment in Tennessee

This figure presents enrollment numbers reported in TennCare quarterly reports. Tennessee disenrolled most of those in the Uninsured and Uninsurable program in the last quarter of 2005.

Medicaid coverage either as a result of their income level or categorical restrictions such as being a childless adult.

As a result of the reverification process, it is likely that many of the remaining TennCare enrollees had a greater preference for health insurance than did the average Tennessee resident. This preference may result from greater expected health expenditures. In the years prior to the disenrollment, the average enrollee in the traditional TennCare population consumed \$113 in health care a month. Although those in the uninsured portion of the expansion population (who composed two-thirds of the disenrollees) had similar expenditures to traditional beneficiaries, individuals in the uninsurable category consumed approximately \$278 of health care a month. Thus one-third of the disenrolled population might have had a greater preference for health insurance than the average beneficiary (McKinsey and Company 2003).

In November 2004, Governor Phil Bredesen first announced that TennCare planned to cease covering adults over the age of 19 who didn't qualify for traditional Medicaid (Chang and Steinberg 2009).[8] Beginning in late July 2005, Tennessee disenrolled

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8. At the same time, there was also a reduction in certain services for the remaining enrollees. Perhaps the most significant reduction in benefits for those

individuals over the age of 19 who only qualified for coverage in an expansion category. Given the earlier reverification process, few of these individuals were able to requalify for traditional Medicaid and permanently lost public health insurance coverage. As a result of the disenrollment, approximately 4% of the non-elderly, adult population of Tennessee lost public insurance coverage over a period of several months. The disenrollment changed the ability of certain categories of enrollees to receive coverage at any income level.[9] According to the Tennessee Justice Center, which organized many of the legal challenges to the disenrollment, "most working adults cannot qualify [for TennCare]. Non-disabled childless adults under 65 cannot get TennCare, no matter how poor they are. Many parents whose children have turned 18 are also unable to get TennCare" (Tennessee Justice Center 2012).

Two other recent changes to public health insurance programs have received considerable attention: (i) the 2006 health reform in Massachusetts, intended to achieve universal health insurance coverage, and (ii) the Oregon Health Insurance Experiment, which involved categorically eligible individuals aged 19–64 with incomes below 100% of the poverty line and assets under $2,000. In Online Appendix Table A1, we present descriptive statistics for the populations affected by the reforms in Tennessee, Massachusetts, and Oregon, as well as predictions for the likely beneficiaries of the ACA Medicaid expansions. As expected, childless adults were disproportionately affected by the disenrollment. Similarly, approximately 82% of those newly eligible for Medicaid under the ACA are expected to be adults

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retaining coverage affected the generosity of prescription drug coverage. In 2004, these drugs accounted for 33 percent of overall TennCare spending. Effective August 1, 2005, TennCare beneficiaries retaining coverage were limited to 5 prescription drug refills per month of which no more than 2 could be brand name medications (Blue Cross Blue Shield, 2005). From 2005 to 2006, total TennCare spending fell by approximately $1.7 billion, with nearly $1.23 billion of this reduction coming from reduced pharmacy payments. After the reform, prescription drugs accounted for only 21 percent of overall TennCare expenditures (TennCare Annual Report, 2005).

9. In 2004, Tennessee's non-group insurance market was relatively unregulated. Although individual insurers were required to offer coverage to Health Insurance Portability and Accountability Act (HIPAA)-eligible individuals (those who have left group coverage within the past 63 days), there were no limits on the rates that they could charge. For non-HIPAA-eligible individuals, there was no form of guaranteed issue.

without children. By contrast, those newly on public insurance in Massachusetts were roughly evenly split by childless status, and approximately 56% of those affected by the Oregon lottery had no children in the house. Those affected by the TennCare disenrollment were generally older than the beneficiaries of the ACA and the Massachusetts health reform but similar to those affected by the Oregon lottery.[10] Baicker et al. (2013) examine the employment effects of the Oregon lottery and find small and statistically insignificant changes in employment for individuals who received public health insurance as a result of the lottery. We discuss several potential explanations for the differences between our results and the results in that paper in the conclusion, focusing on differences in demographics, the amount of crowdout, and labor market conditions.

III. DATA

Our primary data on health insurance coverage and labor market outcomes come from the Current Population Survey (CPS). The CPS is a monthly survey of approximately 50,000 households, and it is the primary data set for labor force characteristics of the U.S. civilian, non-institutionalized population. We use data from the March Annual Social and Economic Supplement of the CPS (March CPS), which contains additional questions on income, poverty, and health insurance status. We restrict the March CPS sample to individuals between ages 21 and 64 with a bachelor's degree or less who are not in the armed forces.

To determine a respondent's health insurance status for 2000–2007, we use questions from the 2001–2008 March CPS that refer to the respondent's health insurance coverage in the previous year. For health insurance variables, we use health insurance sample weights created by the State Health Access Data Assistance Center at the University of Minnesota.[11]

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10. The differences in ages likely result from the individual mandate to purchase insurance that was part of the Massachusetts reform and the ACA. We explore the role of age in more detail later in our analysis of heterogeneous treatment effects.

11. A full description of these weights can be found online at https://cps.ipums.org/cps-action/variables/HINSWT#description_section.

Individuals are classified as having any public insurance if they report having Medicare, Medicaid, or military health insurance coverage of any type during the previous year. A number of studies have documented that the CPS undercounts Medicaid enrollees (Lewis, Elwood, and Czajka 1998; Dubay and Kenny 1996). Davern et al. (2009) compare CPS estimates of Medicaid to actual enrollment and find an undercount that can be as high as 42%. A large portion of this undercount comes from survey response errors, with older individuals and those with higher income being more likely to inaccurately report their Medicaid status (Davern et al. 2009).

The estimated CPS Medicaid undercount grew in the 1990s, and some authors have posited that the spread of Medicaid managed care caused confusion among enrollees about whether they should report private, non-group coverage or public insurance (Call et al. 2008). For example, Chattopadhyay and Bindman (2006) examine a set of counties in California and find a relationship between the penetration of Medicaid managed care in a county and the magnitude of the Medicaid undercount.[12] Given these concerns, we only classify individuals as privately insured if they report private group insurance coverage.[13] Online Appendix Table A12 provides additional estimates when those with non-group insurance are reclassified as either privately or publicly insured.

For the labor market variables, we use the 2000–2007 March CPS and classify people as working if their employment status is "at work" during the survey reference week. The number of hours

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12. The accuracy of Medicaid reporting is particularly important in our setting. The TennCare population we study had higher income and was serviced by managed care organizations, and many members were covered by less generous cost sharing and paid premiums. This lack of similarity between the TennCare expansion program and traditional public health insurance may increase the survey error rate. It would be particularly problematic if individuals reported having private non-group insurance rather than TennCare, because we are focused on the potential private-to-public transition. This type of measurement error creates an upward bias in our estimates of the magnitude of the disenrollment and a downward bias in both the change in private insurance (particularly non-group insurance) and the estimated crowdout.

13. Additionally, because of the 2002 reverification, we do not categorize individuals as privately insured if they report having public insurance in 2002. We apply this rule across all states for consistency, but the vast majority of affected observations are in Tennessee.

worked is based on the number of reported hours worked in the previous week. When examining the heterogeneity of our estimates by health status, we use the CPS question on self-reported health status during the survey reference week on the standard 5-point scale of excellent, very good, good, fair, or poor. We compare individuals who report excellent health to all other individuals. For all non-health insurance outcomes we use the person-level weights from the CPS supplement.

Table I presents summary statistics for 2000–2007 for Tennessee and all other Southern states. In general, Tennessee is similar to the rest of the South. A notable and unsurprising exception is the much larger share of the Tennessee population covered by public health insurance. This is likely a result of the generosity of past TennCare expansions. Overall employment rates are also similar, with Tennessee having a slightly lower employment rate, more people working less than 35 hours a week, and fewer people working more than 35 hours a week. Childless adults compose a similar share of the population in Tennessee versus the rest of the South. Racial composition and education is also similar between Tennessee and the rest of the South, with Tennessee's population being slightly less educated and more likely to be white.

IV. THE EFFECT OF THE TENNCARE CUTS ON HEALTH INSURANCE COVERAGE AND LABOR SUPPLY

This section presents our main empirical results. We first study how the TennCare disenrollment affected public health insurance coverage. We then examine changes in labor supply and how these changes varied by demographic group. In Section IV.C we estimate crowdout, and in Section IV.D we investigate the dynamics of the labor supply and health insurance coverage responses.

IV.A. The Effect of the TennCare Disenrollment on Public Health Insurance Coverage

To identify the causal effect of the disenrollment on public health insurance coverage, we first estimate state-by-year difference-in-difference regressions of the following form:

$$(1) \qquad y_{st} = \alpha_s + \delta_t + \beta \cdot I\{s = TN\} \cdot I\{t \geq 2006\} + \varepsilon_{st}.$$

TABLE I

Summary Statistics for Tennessee and All Other Southern States, 2000–2007

	Tennessee (%)	Other Southern States (%)
Any public coverage	18.9	12.0
Any private coverage	61.8	62.1
At work	68.9	71.1
Working < 20 hours per week	4.1	3.6
Working 20–35 hours per week	9.7	9.5
Working ≥ 35 hours per week	55.1	58.1
Child in household (age < 18)	44.3	45.3
Age between 40 and 64	54.9	53.5
Female	52.1	51.7
High school dropout	16.1	15.8
High school graduate	37.5	34.9
Some college or college graduate	46.4	49.3
White	81.2	76.6
Black	16.8	19.6
Other	2.1	3.8

Notes. This table reports summary statistics for the CPS data used in the main analysis. Other Southern states include the 16 states in the census South region other than Tennessee. The sample is restricted to adults between ages 21 and 64 who are not in the armed forces and who do not have advanced college degrees. Numbers are computed using the health insurance sample weights for the health insurance coverage variables and the person-level CPS weights for other outcomes. See main text for details on sample selection and variable definitions.

The variable y_{st} represents an outcome for state s and year t, such as the share of the population with public health insurance coverage. The model includes state fixed effects (α), year fixed effects (δ), and an error term (ε) that is assumed to be uncorrelated with other unobserved determinants of the outcome variable.

The key coefficient of interest is β, which is the difference-in-difference estimate of the effect of the TennCare disenroll-ment. This coefficient is identified by comparing outcomes in Tennessee after the disenrollment to outcomes in Tennessee before the disenrollment and to other Southern states.[14] The

14. We use the U.S. Census Bureau definition of Southern states, which includes Alabama, Arkansas, Delaware, the District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, Tennessee, Texas, Virginia, South Carolina, and West Virginia. Panel B of Online Appendix Table A2 presents regression estimates when the sample includes all states. These results are very similar to our baseline estimates.

key identifying assumption is that outcomes in Tennessee would not have evolved differently to other Southern states in the absence of the disenrollment. We probe the validity of this assumption by studying preexisting time trends in the outcomes of interest.

One concern with all cross-state analyses is that the results may be driven by large shocks, such as recessions or contemporaneous national policy changes that affect states differentially. To address such concerns, we restrict our analysis to the years between 2000 and 2007. This time period provides two years of data after the disenrollment, but avoids potential confounding effects from the 2008 recession, which began in December 2007 (National Bureau of Economic Research 2008).

Another challenge in estimating the regression concerns statistical inference. Our baseline sample includes 17 Southern states observed over an eight-year period, and our main regressions are run on state-year means computed from individual-level data. We therefore need to compute standard errors that account for (i) serial correlation within states over time and (ii) sampling error in cell means, which is non-negligible given the sample sizes in the CPS. A common approach to inference in our setting would be to use cluster-robust standard errors or block-bootstrap standard errors (Bertrand, Duflo and Mullainathan 2004). However, when these procedures are carried out on aggregate data, they do not explicitly account for sampling error in cell means and may therefore not be accurate in small samples. For this reason, we estimate standard errors using a modified block-bootstrap procedure that is commonly used in the statistics literature in the analysis of survey data (Rao and Wu 1988). We implement the following two-stage resampling procedure. First, we resample states with replacement, just as in a standard block-bootstrap procedure. Second, when the set of resampled states includes Tennessee, we resample the individual-level data within each state (with independent resampling for each state cluster chosen more than once). We then calculate the cell means for each state-year cell for this bootstrap sample and estimate the regression. We repeat this procedure 1,000 times and then compute the standard deviation of the point estimates across the replications and use this as a bootstrap-based standard error estimate.

In the Online Appendix, we describe Monte Carlo simulations which show that these modified block-bootstrap standard

errors perform well in simulated data designed to resemble our primary data set. By contrast, these simulations show that cluster-robust and block-bootstrap standard errors tend to over-reject (Online Appendix Table A3). The differences across these procedures appear to come from the two-stage resampling procedure explicitly accounting for the sampling error within clusters. In our setting, the standard errors using this procedure are more conservative than cluster-robust and block-bootstrap standard errors, usually by a factor of approximately 2.

To further explore these issues, we also investigate a number of alternative procedures for computing standard errors and *p*-values, and we report these alternative results in Online Appendix Tables A3 and A4. These results include *p*-values from permutation tests, which do not rely on asymptotic approximations (Rosenbaum 1996), and *p*-values from a wild-cluster-bootstrap procedure, which may perform well when the number of clusters is small (Cameron, Gelbach, and Miller 2008). Overall, we find similar results across these alternatives, which gives us confidence that our preferred standard errors are reliable.

Turning to our empirical results, we begin by examining unadjusted sample means. Panel A of Figure II presents the share of residents who report having public health insurance in Tennessee and other Southern states. Given the small cell sizes, we group CPS respondents into two-year bins.[15] From 2000 to 2005, the percent of the population with public health insurance in Tennessee and other Southern states evolved similarly. In 2006 and 2007, however, we observe a sudden break in trend for Tennessee, with the share of Tennessee residents who report being publicly insured dropping by roughly 4 percentage points. By contrast, there was little change for other Southern states.

Panel A of Table II presents regression estimates of equation (1). The first column presents regression estimates with state-by-year mean public insurance coverage rates as the outcome of interest. Following the TennCare disenrollment, public coverage rates in Tennessee decreased by a statistically significant 4.6 percentage points.

Such a pattern could be driven by Tennessee-specific shocks other than the 2005 TennCare disenrollment. To examine the

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15. The figures presenting means by two-year bins are for illustrative purposes only. In the regression results that follow, the sample always consists of annual observations.

A Difference in Difference

B Triple Difference
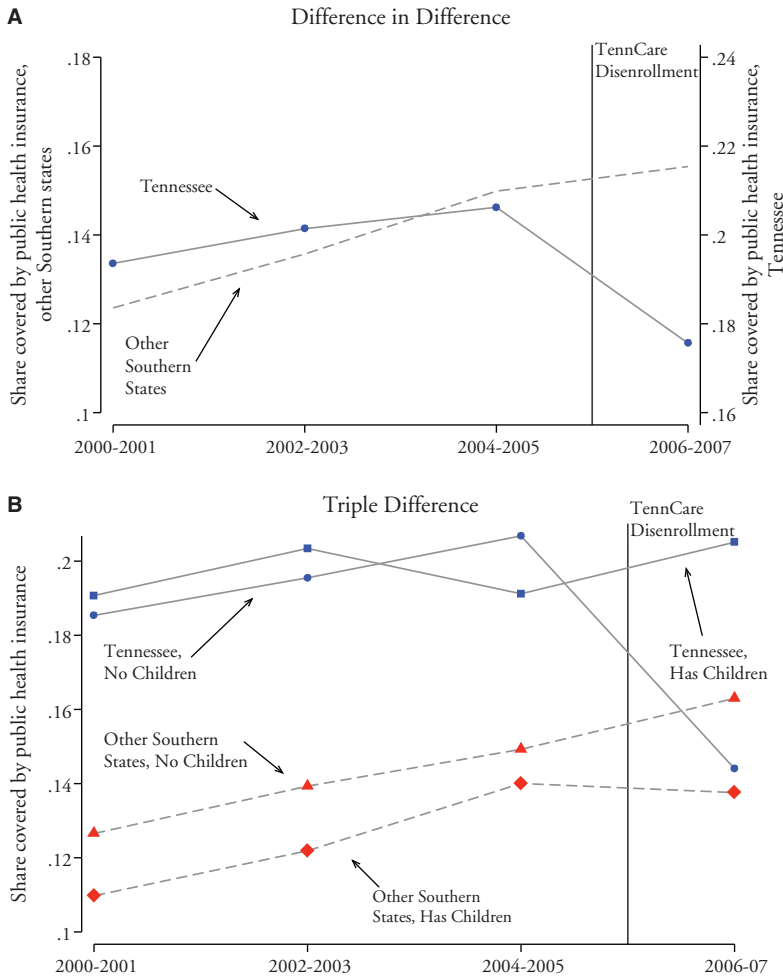
FIGURE II

Share Publicly Insured

Panel A reports the share of CPS March respondents ages 21–64 without an advanced degree and not in the armed forces who report being covered by public health insurance in Tennessee versus other Southern states. The Panel B sample is split based on whether the respondent lives in a household with a child under the age of 18. The figure presents means by two-year cells, and the shares are computed using the health insurance sample weights created by the State Health Access Data Assistance Center at the University of Minnesota.

TABLE II

THE EFFECT OF TENNCARE DISENROLLMENT ON EMPLOYMENT

	(1) Has public health insurance	(2) Employed	(3) Employed and working < 20 hours per week	(4) Employed and working ≥ 20 hours per week	(5) Employed and working 20–35 hours per week	(6) Employed and working ≥ 35 hours per week	(7) Employed with private insurance through employer
Panel A: Difference-in-difference estimates							
Tennessee × post 2005	−0.046	0.025	−0.001	0.026	0.001	0.025	0.009
	(0.010)	(0.011)	(0.004)	(0.010)	(0.007)	(0.011)	(0.013)
	[0.000]	[0.038]	[0.758]	[0.023]	[0.906]	[0.041]	[0.507]
R^2	0.871	0.867	0.392	0.847	0.418	0.819	0.911
Panel B: Triple-difference estimates							
Tennessee × post 2005 × no children	−0.073	0.046	0.002	0.044	0.018	0.026	0.042
	(0.017)	(0.020)	(0.009)	(0.020)	(0.013)	(0.021)	(0.023)
	[0.001]	[0.032]	[0.843]	[0.042]	[0.195]	[0.236]	[0.084]
R^2	0.952	0.941	0.665	0.931	0.824	0.918	0.942
Mean of dependent variable	0.139	0.705	0.037	0.668	0.097	0.572	0.515

Notes. Dependent variable: the share of CPS respondents reporting the given outcome. The sample includes the 17 Southern states between 2000 through 2007. For Panel A, $N = 136$; the sample consists of state-by-year means; state and year fixed effects are included but not shown. For Panel B, $N = 272$; the sample consists of means for each state, year, and childless status; state fixed effects, year fixed effects, childless fixed effects, and fixed effects for all possible pairwise interactions are included but not shown. The standard errors in parentheses are modified block bootstrap standard errors that are computed using the following two-stage resampling procedure: (i) states are drawn with replacement, and (ii) individuals are drawn with replacement within states (resampling independently for state clusters chosen more than once). These standard errors are robust to autocorrelation between observations from the same state and explicitly account for sampling error in the state-by-year means (or state-by-year-by-childless-status means in Panel B). The associated p-values in brackets are based on two-tailed t-test with 16 degrees of freedom.

robustness of our results to such possible confounding factors, we exploit the fact that the disenrollment primarily targeted childless adults, which we define as adults between the ages of 21 and 64 who do not have children under the age of 18 in their household. We would expect the changes in coverage to be concentrated among this population, which suggests a "triple-difference" analysis, comparing childless adults in Tennessee to other adults in Tennessee before and after the disenrollment. This triple-difference regression model takes the following form:

$$y_{ist} = \gamma_i \cdot \alpha_s + \gamma_i \cdot \delta_t + \alpha_s \cdot \delta_t +$$
$$(2) \qquad \beta \cdot I\{i = childless\} \cdot I\{s = TN\} \cdot I\{t \geq 2006\} + \varepsilon_{ist}.$$

The variable y_{ist} represents the outcome of interest for state s, in year t, and for demographic group i (either childless adults or other adults). Additionally, the triple-difference model includes a full set of state (α), year (δ), and demographic group (γ) fixed effects, and all of the two-way interactions between these three sets of fixed effects. This specification controls for any unobservable common shocks that affected all childless adults across the country in a given year as well as unobservable shocks that affected all adults in Tennessee in a given year. For example, shocks to labor demand that differ across states (but not differentially by childless status) would not lead to bias in this specification.

As before, the key coefficient of interest is β, which is the triple-difference estimate of the effect of the TennCare disenrollment on childless adults relative to other adults. This model relies on different assumptions than the difference-in-difference model. In particular, by controlling for state-by-year fixed effects, the triple-difference model is identified by comparing childless adults to other adults in Tennessee before and after the disenrollment. These results therefore address the concern that Tennessee would have evolved differently than other Southern states even in the absence of the TennCare disenrollment. Instead, the model is based on the identifying assumption that within Tennessee, the two demographic groups would have evolved similarly in the absence of the disenrollment.[16]

16. Our triple-difference estimates are based on state-by-year-by-childless-status cell means. We compute standard errors using the same two-stage resampling procedure to compute standard errors in the difference-in-difference model above: first, resampling states with replacement and, second, resampling

We begin with a comparison of unadjusted sample means. Figure II, Panel B presents the share of CPS respondents who report public coverage for four groups: respondents with children in Tennessee, respondents without children in Tennessee, and those same subgroups in other Southern states.[17] The figure depicts a striking pattern. Childless Tennessee adult residents experienced a sudden drop in public coverage in 2006 and 2007. That drop was roughly 6 percentage points in magnitude and was a clear break in the group's preexisting trend. By contrast, Tennessee residents with children experienced no such trend break. Moreover, we do not observe such a pattern in other Southern states for either group of adults. In this way, Figure II, Panel B summarizes our triple-difference strategy. The results strongly suggest that the drop in public coverage occurred precisely for the subgroup disproportionately affected by the TennCare disenrollment, with no evidence of a similar change among adults with children.

Table II, Panel B presents estimates of equation (2). The sample consists of coverage rates by state, year, and childless status. Column (1) presents estimates with mean public health insurance as the dependent variable. The results suggest a 7.3 percentage point drop in public coverage for childless Tennessee

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individuals within states. The only difference is that we compute cell means by state-by-year-by-childless-status rather than state-by-year before running the regression during each bootstrap iteration. Beyond this issue of statistical inference, one may also be concerned that demographic shifts caused by other factors could confound these aggregate results. Online Appendix Table A6 presents regressions using individual-level CPS data. Panel A presents estimates without any demographic controls, and Panel B includes covariates for gender, age, education, and interactions between the three. These estimates are extremely similar, which demonstrates that changes in observable demographic characteristics cannot account for our results.

17. Although our main estimates use other Southern states as a control group during the time period 2000–2007, our results do not depend on this choice. Online Appendix Figures A2 through A7 and Online Appendix Table A2 present estimates from samples of both different length (extending to 2011) and composition (extending to the entire United States). All of these estimates are fairly similar in magnitude and precision to our main estimates. Additionally, our results are similar when we rely on alternative sample definitions: an alternative definition of public health insurance coverage focusing on Medicaid coverage instead of any public health insurance coverage (Online Appendix Table A15), an alternative definition of employment using all employed individuals whether they report being at work (Online Appendix Table A16), and an alternative definition of "childlessness" using own children instead of any child in the household (Online Appendix Table A17).

residents after the TennCare disenrollment. In 2004, childless adults represented approximately 48% of all adults aged 21 to 64. The triple-difference estimates thus imply an aggregate decline in public health insurance coverage of 3.6 percentage points, which is broadly similar to the baseline difference-in-difference estimate of 4.6 percentage points.

IV.B. *The Effect of the TennCare Disenrollment on Labor Supply*

The foregoing estimates demonstrate that the TennCare disenrollment caused a sudden decrease in public health insurance. That decrease was concentrated among childless adults. We next examine whether this loss of insurance affected labor supply. Panel A of Figure III presents employment rates by state and year from 2000 to 2007. Between 2000 and 2005, employment fell in both Tennessee and the rest of the South. After 2005, employment rose slightly in both groups. However, beginning in 2005, Tennessee experienced a sudden employment increase not seen in the rest of the South.

Panel B of Figure III presents trends in employment across Tennessee and other Southern states, with the CPS sample split based on whether the respondent is a childless adult. The figure demonstrates that the employment increase seen in Panel A is driven by a sudden break in trend for childless residents of Tennessee after the TennCare disenrollment. By contrast, Tennessee residents with children did not experience such a change. Moreover, we do not see a similar pattern in other Southern states for either group of adults.[18]

The magnitude of changes in public health insurance coverage and employment among childless adults in Tennessee following the disenrollment are extremely unusual and highly unlikely to be simply an artifact of the relatively small cell sizes in the CPS.[19] To highlight this, we compute two-year changes in public health insurance coverage and employment over time for childless adults within each state during the 2000–2011 time period.

18. Online Appendix Figure A3 presents similar estimates to Figure III for the longer time period of 2000–2011. The figure shows a large and persistent increase in employment for childless adults in Tennessee compared to other adults in Tennessee and childless adults in other Southern states. Online Appendix Figures A13 and A14 show similar results from analogous event-study specifications.

19. The cell sizes themselves are not particularly small; approximately 800–1,200 childless adults in Tennessee meet our sample selection criteria each year.
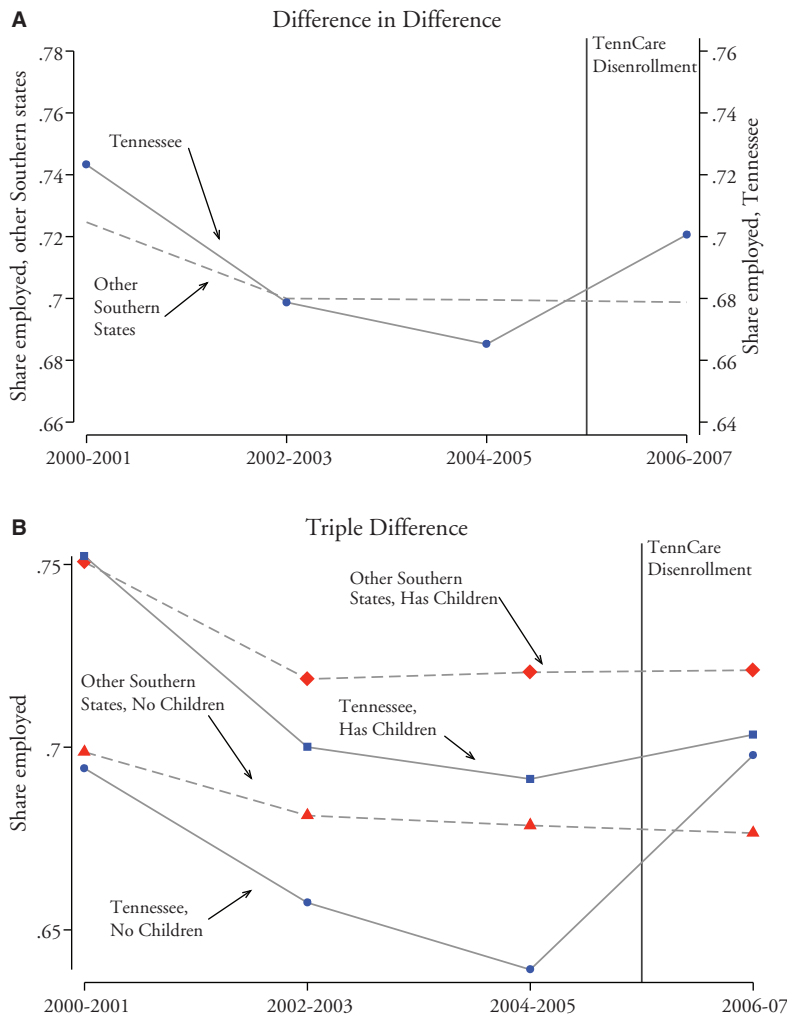
FIGURE III

Share Employed

Panel A reports the share of CPS March respondents ages 21–64 without an advanced degree and not in the armed forces who report being employed and at work in Tennessee versus other Southern states. The Panel B sample is split based on whether the respondent lives in a household with a child under the age of 18. The figure presents means by two-year cells, and the shares are computed using the person-level sample weights from the CPS supplement.

Figure IV plots the histogram of changes for the full sample of Southern states. The vertical line in the figure indicates the decline in public health insurance coverage for childless adults in Tennessee between 2004 and 2006, which was approximately 6.3 percentage points. This decline is larger than *any* other two-year decline for any other state during the 2000–2011 time period. We repeat this exercise for employment in Figure V and similarly find that the increase in employment among childless adults in Tennessee after the disenrollment was extremely unusual. The increase in employment of 5.9 percentage points for childless adults in Tennessee is larger than *any* other two-year increase for any of the other observations (including changes for childless adults in Tennessee in other years).[20]

We next quantify the changes in employment demonstrated by Figure III with a regression analysis. Column (2) of Table II presents regressions estimating the impact of the TennCare disenrollment on employment. Panel A presents difference-in-difference estimates of equation (1), in which state-year employment rates are the outcome of interest. We find a statistically significant 2.5 percentage point increase in employment rates following the disenrollment. Panel B presents triple-difference estimates for employment. The estimates suggest a 4.6 percentage point increase in employment for childless adults in Tennessee. The employment rate in our sample is 71%, suggesting that the TennCare disenrollment resulted in an approximately 6% increase in employment for childless adults over the following two years.[21] Taken together the estimates in columns (1) and (2) suggest that approximately 63% of TennCare disenrollees increased their labor supply along the extensive margin after losing public health insurance.

Columns (3) through (6) of Table II present estimates of the employment changes based on the reported number of hours worked in the CPS. Column (3) presents the estimated change in employment for individuals working less than 20 hours a week.

20. Online Appendix Figures A8 and A9 present histograms for a sample containing all states. For both public insurance and employment, the change in Tennessee is larger than any other two-year change in any state in the United States.

21. Online Appendix Table A7 presents the full set of two-way interactions for a similar triple-difference specification. These results demonstrate that the employment changes for TennCare exist almost entirely among childless adults, with no confounding trends for other groups.

FIGURE IV

The Distribution of Changes in the Public Insurance Rate

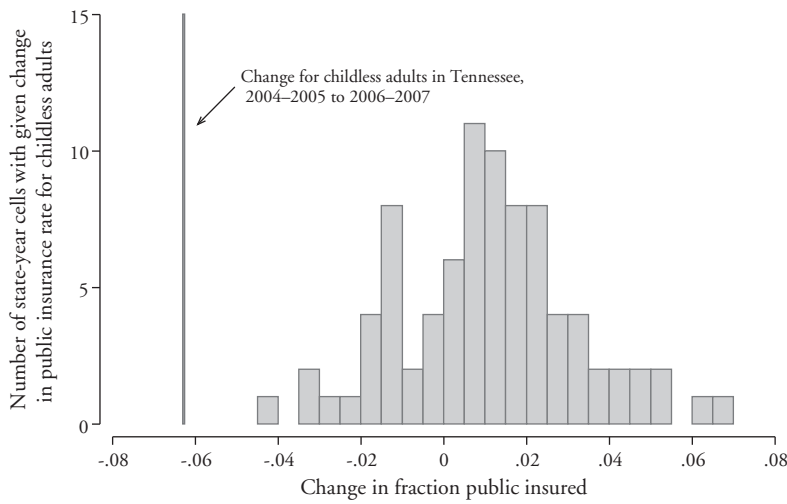This figure presents a histogram of two-year changes in the share of CPS March respondents ages 21–64 without an advanced degree, not in the armed forces, and without any children under the age of 18 living in their household having public health insurance for each state in the south. The shares are computed using the health insurance sample weights created by the State Health Access Data Assistance Center at the University of Minnesota.

This estimate is both small in magnitude and statistically insignificant at conventional levels. By contrast, column (4) presents estimates for individuals working more than 20 hours a week. These estimates suggest that nearly all of the labor supply increase comes from those working more than 20 hours a week. Columns (5) and (6) present estimates for respondents working between 20 and 34 hours a week and more than 35 hours a week, respectively. The estimates for these smaller bins of hours are imprecise, but the lack of large negative estimates suggests that the change in labor supply is primarily occurring along the extensive margin.

The TennCare expansion program did not involve strict income eligibility thresholds. Instead, as TennCare enrollees earned more income, they simply paid higher premiums (Online Appendix Table A8 reports the estimated premiums for TennCare enrollees in 2004). As a result, the employment estimates here are not a consequence of discontinuities in enrollees' budget sets.
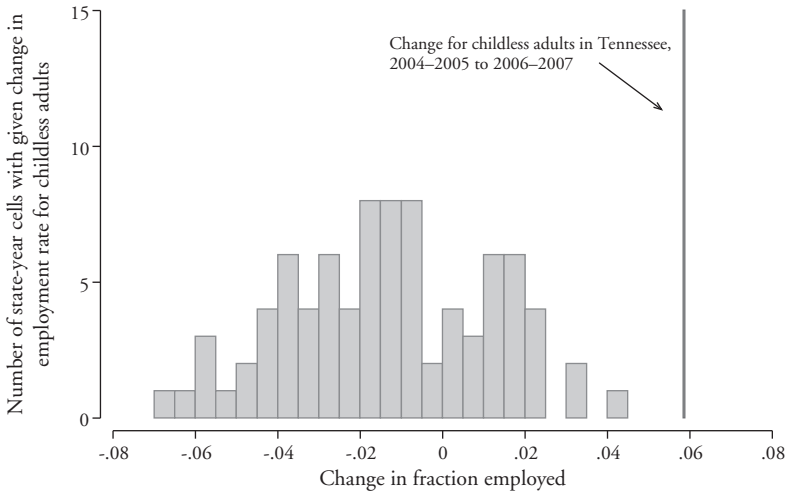
F<small>IGURE</small> V

The Distribution of Changes in the Employment Rate

This figure presents a histogram of two-year changes in the share of CPS March respondents ages 21–64 without an advanced degree, not in the armed forces, and without any children under the age of 18 living in their household being employed and at work for each state in the south. The shares are computed using the the person-level sample weights from the CPS supplement.

Instead, the change in employment suggests that disenrollees entered into the labor market to remain insured.

Several other patterns in Table II also point to this underlying mechanism. Nearly all of the increase in labor supply comes from individuals working more than 20 hours a week. Although health benefits are more common among full-time employees, a large number of employers also offer health insurance benefits to employees working at least 20 hours.[22] Online Appendix Table A9 presents statistics from the National Health Interview Survey on the offering of employer-provided insurance by hours worked. Approximately 40% of all individuals in the South working

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22. For example, Starbucks offers its "partners" health benefits after they work 160 hours over a two-month period, and employees retain benefits if they work 240 hours a quarter. See http://assets.starbucks.com/assets/7343fbbdc87845ff9a000 ee009707893.pdf. Similarly, Costco offers a "Choice Plus" plan for hourly part-time employees working an average of 20 hours a week. See http://custom.aetna. com/costco/WhoIsEligible.shtml. Kim (2011) details five additional large national employers offering health insurance benefits for part-time employees.

between 20 and 35 hours a week were offered health insurance from their employer in 2004.

To more directly examine this point, column (7) of Table II presents the estimated change in individuals who are employed with insurance from an employer. Following the disenrollment, there was a 4.2 percentage point increase in employed individuals with health insurance from an employer. This estimate accounts for approximately 90% of the overall employment increase. These estimates provide additional evidence that the labor supply response resulted from a desire for insurance.

The magnitude of the increase in labor supply should be a function of preferences for health insurance coverage, access to the private health insurance market, and the extent to which access to public health insurance provides a strong work disincentive. As a result, the observed labor supply response likely varied by socioeconomic group. Therefore, we next investigate how the labor supply effects vary across the population.

First, we examine differences by age in Panel A of Table III.[23] We divide CPS respondents into two age groups of approximately equal size: 21 to 39 and 40 to 64. Both age groups experienced a large and similarly sized decline in public health insurance coverage. Interestingly, we find a small and statistically insignificant increase in labor supply for younger disenrollees. There is also little change in the percentage of people in this age group who are employed with private insurance through an employer. By contrast, we observe a large increase in labor supply for 40- to 64-year-olds, suggesting that approximately three quarters of these disenrollees increased their labor supply. Approximately three quarters of this employment increase was for individuals working more than 20 hours a week and 97% was for people employed with private insurance through an employer. This pattern is consistent with older adults valuing health insurance more than the younger adults, and thus being more likely to enter the labor force to maintain access to health insurance following the disenrollment. Such a contrast might be driven by expected medical costs. Average medical expenditures are strongly positively

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23. Panel A of Online Appendix Table A10 presents the triple-difference estimates by gender. Both men and women exhibit a large and similarly sized decrease in public insurance after the policy change. Women experience a slightly larger increase in private coverage after the disenrollment. However, that difference is not statistically significant.

TABLE III

HETEROGENEITY IN THE DEGREE OF CROWDOUT

	(1) Has public health insurance	(2) Employed	(3) Employed and working < 20 hours per week	(4) Employed and working ≥ 20 hours per week	(5) Employed with private insurance through employer
Panel A: Heterogeneity by age					
Triple-difference estimate for ages 21–39	−0.070	0.010	−0.019	0.029	−0.003
	(0.023)	(0.031)	(0.014)	(0.034)	(0.039)
	[0.002]	[0.746]	[0.181]	[0.393]	[0.945]
Mean for ages 21–39	0.107	0.739	0.039	0.700	0.495
Triple-difference estimate for ages 40–64	−0.083	0.060	0.015	0.045	0.058
	(0.024)	(0.028)	(0.012)	(0.029)	(0.032)
	[0.001]	[0.033]	[0.201]	[0.125]	[0.065]
Mean for ages 40–64	0.155	0.691	0.035	0.656	0.543
p-value of test for equality across rows	[0.708]	[0.234]	[0.064]	[0.714]	[0.235]
R^2	0.947	0.930	0.628	0.914	0.914
Panel B: Heterogeneity by Education					
Triple-difference estimate for high school dropouts	−0.289	0.125	0.029	0.096	0.087
	(0.057)	(0.054)	(0.024)	(0.056)	(0.049)
	[0.000]	[0.021]	[0.228]	[0.087]	[0.076]
Mean for high school dropouts	0.257	0.533	0.031	0.502	0.246
Triple-difference estimate for those with a high school diploma or more	−0.034	0.034	−0.004	0.038	0.036
	(0.017)	(0.023)	(0.009)	(0.023)	(0.025)
	[0.051]	[0.134]	[0.639]	[0.095]	[0.155]
Mean for high school graduates	0.118	0.736	0.038	0.698	0.563
p-value of test for equality across rows	[0.000]	[0.128]	[0.190]	[0.335]	[0.352]
R^2	0.948	0.956	0.584	0.951	0.979

TABLE III
(CONTINUED)

	(1) Has public health insurance	(2) Employed	(3) Employed and working < 20 hours per week	(4) Employed and working ≥ 20 hours per week	(5) Employed with private insurance through employer
Panel C: Heterogeneity by health status					
Triple-difference estimate for those who report excellent health	−0.018	0.020	−0.003	0.024	−0.014
	(0.023)	(0.037)	(0.021)	(0.041)	(0.050)
	[0.439]	[0.583]	[0.876]	[0.570]	[0.776]
Mean for excellent health	0.065	0.791	0.040	0.750	0.608
Triple-difference estimate for those who report good or poor health	−0.091	0.053	0.004	0.049	0.061
	(0.021)	(0.024)	(0.009)	(0.025)	(0.027)
	[0.000]	[0.028]	[0.668]	[0.051]	[0.025]
Mean for good or poor health	0.165	0.675	0.036	0.640	0.483
p-value of test for equality across rows	[0.020]	[0.445]	[0.746]	[0.588]	[0.194]
R^2	0.955	0.951	0.603	0.928	0.943

Notes. Dependent variable: the share of CPS respondents reporting the given outcome. The sample includes the 17 southern states between 2000 through 2007. In all panels, $N=544$; the sample consists of means for each state, year, childless status, and demographic group. State fixed effects, year fixed effects, childless status fixed effects, group fixed effects, and fixed effects for all possible pairwise interactions are included but not shown. The standard errors in parentheses are modified block bootstrap standard errors that are computed using the following two-stage resampling procedure: (i) states are drawn with replacement and (ii) individuals are drawn with replacement within states (resampling independently for state clusters chosen more than once). These standard errors are robust to autocorrelation between observations from the same state and explicitly account for sampling error in the state-by-year-by-childless-status means. The associated p-values in brackets are based on two-tailed t-tests with 16 degrees of freedom.

associated with age (Hartman et al. 2008). In 2002, individuals aged 19–44 accounted for 43% of the bottom half of medical spenders and only 19% of the top 5% of medical spenders. By contrast, individuals aged 44–64 make up 16% of the bottom half of medical spenders and 33% of the top 5% (Conwell and Cohen 2005). Older adults are also more likely to be insured. While 65% of the young childless adults in our sample had health coverage, this number was nearly 74% for the older individuals.

Panel B of Table III presents the impact of the TennCare disenrollment by education. We divide the sample by whether respondents were high school dropouts as opposed to high school graduates. Even though TennCare did not have traditional earnings eligibility limits, its beneficiaries had low incomes. As would be expected, less-educated adults in Tennessee experienced a large decline in public health insurance coverage after the disenrollment. The estimates suggest that approximately 44% of the less-educated adults who lost public coverage increased their employment, and nearly three quarters of those individuals were employed with insurance from an employer. This demonstrates that some of the least-educated adults on public health insurance had access to private health insurance. By contrast, nearly all of the individuals with a high school degree moved into employment with employer-provided insurance. Although this subpopulation experienced a far smaller effect from the disenrollment, the greater share of disenrolled individuals securing employer-provided insurance is consistent with higher skilled workers being better able to find employment offering these benefits. This can also be seen in the mean rates of employment with employer-provided insurance: 56% for the more-educated group and 25% of the less-educated group.

Finally, Panel C of Table III examines the effect of the disenrollment by self-reported health status. Individuals in relatively poor health had a much larger decline in public health insurance than did individuals in excellent health. This is unsurprising; those in good or poor health had much higher rates of public health insurance, and the uninsurable category of the TennCare expansion was aimed at individuals who had been denied coverage in the non-group insurance market. Those in good or poor health also had a larger increase in labor supply with nearly all of the increase coming among individuals who were employed with employer-provided insurance. Disenrollees in excellent health did not exhibit a similar labor supply increase,

which could be a result of the lower disenrollment rate for this group or a lower desire for health insurance coverage.

Overall, we find similar labor supply estimates across demographic groups, and because of the limited sample sizes, few of the differences across demographic groups are statistically significant at conventional levels, with a few exceptions. Those who lost coverage were not concentrated in one age group or gender, but were more likely to be high school dropouts. In addition, older adults were more likely to exhibit an employment increase. More broadly, our results suggest that groups that exhibit large labor supply responses also exhibit increases in employment with employer-provided health insurance. This pattern is further evidence that procuring health insurance coverage is a primary channel driving these increases in labor supply.

These results suggest that TennCare disenrollees placed a large value on health insurance. We gauge the magnitude of this valuation by calculating the wage increase that would be necessary to generate a similar change in labor supply. In Table II, we observe a 6.5% (95% confidence interval: 5.1–8.0%) increase in labor supply for childless adults following the TennCare disenrollment. Chetty et al. (2011) survey the labor supply literature and find a mean Hicksian extensive margin labor supply elasticity of 0.25. Based on this elasticity, it would take a 26.2% increase in wages (95% confidence interval: 20.5–31.8%) to generate a similar change in extensive margin labor supply.

To understand whether this implied wage increase is reasonable, we consider both the average incomes of the disenrollees and the average premium for employer-provided insurance. The vast majority of enrollees in the TennCare expansion group had incomes below 200% of the poverty line, which in 2004 was $9,310 for a single adult. At 75%, 100%, and 200% of the poverty line, a 26.2% wage increase amounts to approximately $1,830, $2,400, and $4,900, respectively.

In 2006, the average price of employer-provided insurance in Tennessee was approximately $3,700 per year (Agency for Healthcare Research and Quality 2006). Given the high rate of insurance denials in the non-group market, some of these disenrollees may not have been able to obtain non-group coverage at any price (Hendren 2013). These individuals might place an even larger value on access to coverage than would be implied by the premium for group coverage. Thus this calculation suggests that

the TennCare disenrollees placed a large value on health insurance and that the labor supply increase is of a reasonable magnitude, given the actual price of health insurance.

The preference for health insurance can also be seen through the effect of the disenrollment on other public programs. Many Americans find health insurance not through Medicaid or an employer, but through other federal programs such as the Social Security Disability Insurance program (SSDI). Many of those targeted by the TennCare expansion program—low-income adults in poor health—are especially likely to apply for SSDI, which may in turn affect their labor market behavior (Autor and Duggan 2003). Because SSDI beneficiaries are eligible for Medicare benefits, the disenrollment may have caused an increase in SSDI applications among disenrollees seeking health insurance coverage. However, Medicare eligibility is only awarded to SSDI beneficiaries after a 24-month waiting period, and during the waiting period (and throughout their time in the program) SSDI enrollees cannot engage in substantial gainful activity—defined in 2005 for a nonblind individual to be earning more than $830 a month. This requirement likely precludes many job opportunities offering private insurance. Therefore, following the disenrollment, many applicants to SSDI would have no longer been able to use TennCare for health insurance during their Medicare waiting period. This would create a large gap in coverage for some, and this could make SSDI less attractive as a source of insurance compared to employment. When we compare the relative number of SSDI applicants from Tennessee versus the rest of the South (Online Appendix Figure A10), we find that the number of applicants from Tennessee sharply decreased after 2005 relative to the rest of the South, although the rates subsequently converged during the Great Recession.[24] These patterns suggest that reductions in the generosity of Medicaid may in turn have decreased the attractiveness of SSDI for some individuals.

Given the details of the reform, we interpret the employment increase to be a change in labor supply rather than labor demand. We evaluate this indirectly by studying changes in average wages, because an increase in labor supply should result in a decrease in wages. Table IV, Panel A presents difference-in-difference estimates of the effect of the disenrollment on average

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24. We are restricted to state-year analysis because data on SSDI applications below the state-level aggregates are not publicly available.

TABLE IV

THE EFFECT OF TENNCARE DISENROLLMENT ON WAGES, UNEMPLOYMENT, AND LABOR FORCE PARTICIPATION

	(1)	(2)
Panel A: Difference-in-difference estimates		
Outcome	Log wage	Residualized log wage
Tennessee × post 2005	−0.012	−0.021
	(0.019)	(0.017)
	[0.539]	[0.221]
R^2	0.956	0.966
Panel B: Triple-difference estimates		
Outcome	Unemployed	In labor force
Tennessee × post 2005 × no children	−0.012	0.044
	(0.009)	(0.019)
	[0.193]	[0.030]
R^2	0.772	0.949

Notes. Dependent Variable: Mean of the given variable among CPS respondents. For Panel A, $N = 136$; the sample consists of state-by-year means; state and year fixed effects not shown. For Panel B, $N = 272$; the sample consists of means for each state, year, and childless status; state fixed effects, year fixed effects, childless fixed effects, and fixed effects for all possible pairwise interaction terms included but not shown. We restrict the sample to Southern states from 2000 through 2007. To calculate the residual wage, we regress the logarithm of wages on a fifth-degree polynomial of age, an indicator function for gender, an indicator function for high school dropout, high school graduate, some college, and a college degree; and all two-way interactions between age, gender, and the education variables. The standard errors in parentheses are modified block bootstrap standard errors (see Table II for more details); associated *p*-values are in brackets.

wages. The first column suggests a statistically insignificant 1.2% decrease in wages. The second column presents estimates when the outcome of interest is a "residualized" wage measure that accounts for age, sex, education, and their interactions. We find a statistically insignificant 2.1% decrease in wages with this measure. Although we lack the power to detect a statistically significant change in wages, the lack of a large wage *increase* is consistent with a change in aggregate labor supply and not the result of an unobserved labor demand shock.[25]

Table IV, Panel B tests whether the increase in employment comes from people who were out of the labor force or those who were unemployed. The triple-difference estimates suggest that the increase in employment came primarily from people entering the labor force. We observe a 4.4 percentage point increase in CPS

25. It is also important to note that any unobserved labor demand shock biasing our triple-difference results would have to differentially affect childless adults relative to other adults in Tennessee.

respondents reporting that they are in the labor force, and only a 1.2 percentage point decrease in respondents reporting that they are unemployed. These estimates provide further evidence that the employment increase in Table II is primarily the result of not a change in labor demand but an increase in labor supply.

As an additional robustness check, we examine the effect of the disenrollment on CPS respondents who are older than 65. Such respondents are nearly all enrolled in Medicare, and thus they should be relatively unaffected by the disenrollment. The first two columns of Online Appendix Table A11 present the public health insurance and employment difference-in-differences estimates for individuals under age 65, and the last two columns present those estimates for those older than age 65. Reassuringly, these estimates are small in magnitude and statistically insignificant.

The increase in labor supply documented here suggests that some disenrollees entered the labor market once they lost coverage. If this were the case, we should also observe a change in job search behavior. To investigate this directly, we use a proxy for aggregate job search behavior based on data from Google Trends that represents the relative prevalence of particular search terms on Google over time. In Online Appendix Figure A11, we examine the prevalence of the term "TennCare" among Internet users in Tennessee and demonstrate that search frequency peaked during two particular months. Searches peak first in November 2004, when Governor Bredesen announced the TennCare disenrollment and then again during the month the disenrollment actually began.

We next turn our attention to job search behavior. Figure VI presents Google Trends data for the search term "job openings" in Tennessee and in other Southern states. In Tennessee, Google searches for "job openings" rose sharply in July 2005 and peaked in August 2005, when the TennCare disenrollment began. The figure suggests no similar change in search behavior among residents of other Southern states. This suggests an immediate increase in job search behavior, which is consistent with a labor supply increase in response to the disenrollment.

IV.C. The TennCare Disenrollment and Crowdout

The results suggest that much of the increase in employment came from those with employer-provided health insurance. This suggests substantial crowdout. We examine crowdout directly
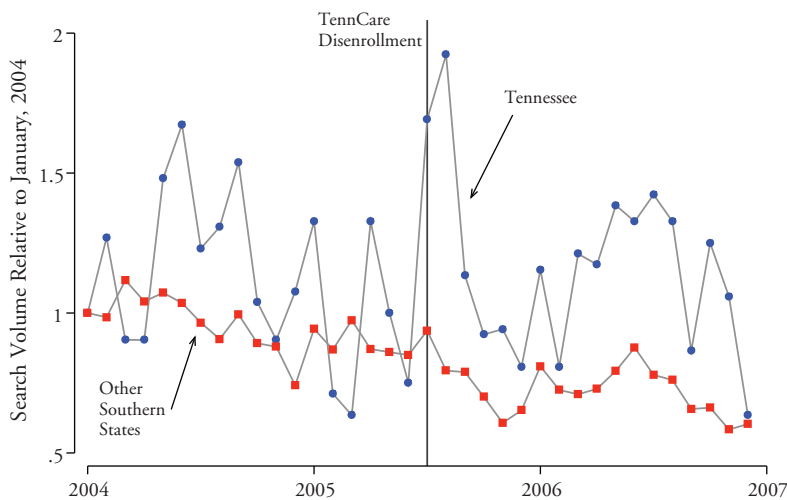
FIGURE VI

Searches on Google for Phrase "Job Openings"

This figure presents Google search volume for the phrase "job openings." The numbers are normalized by Google to represent relative changes in search volume over time, but not the absolute magnitude. We then divide each month's number by the value in January of 2004.

by estimating changes in private health insurance coverage. Figure VII presents the share of residents with private health insurance coverage in the CPS based on childless status and finds the opposite pattern relative to the trend in public coverage, as already described. In 2006, the share of Tennessee residents without children reporting private coverage sharply increased. By contrast, there was no similar change for residents in Tennessee with children or for any residents of other Southern states.[26]

Figure II, Panel B and Figure VII thus show that childless adults—the subpopulation disproportionately affected by the TennCare disenrollment—were especially likely to report a loss of public coverage and a gain of private coverage in the years

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26. As noted already, in our main sample, individuals are classified as privately insured if they report private group coverage. Online Appendix Table A12 presents estimates from a sample including those in non-group coverage that are somewhat smaller and slightly less precise than our main estimates.
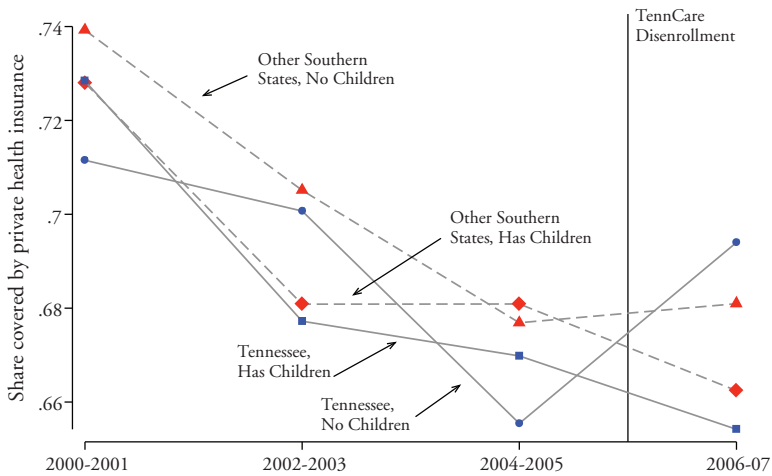
FIGURE VII

Share Privately Insured, Triple Difference

This figure reports the share of CPS March respondents ages 21–64 without an advanced degree and not in the armed forces who report being covered by private health insurance in Tennessee versus other Southern states. The sample is split based on whether the respondent lives in a household with a child under the age of 18. The figure presents means by two-year cells, and the shares are computed using the health insurance sample weights created by the State Health Access Data Assistance Center at the University of Minnesota.

following the disenrollment.[27] These changes were a sharp, sudden break from preexisting trends, and the changes in coverage after the disenrollment were large relative to previous year-over-year changes.

We now turn to a regression analysis to estimate the magnitude of the crowdout. Column (3) of Table V presents regression estimates with any private health insurance coverage as the outcome of interest. Panel A presents the difference-in-difference estimates from equation (1) and suggests that private coverage rates in Tennessee increased by 1.7 percentage points after the disenrollment. Based on these regressions, we estimate crowdout

27. One might be concerned that the pattern in such figures is an artifact of the relatively short time period after the disenrollment. Online Appendix Figures A2 and A4 are similar to Figures III and VII, but present data for 2000 through 2011. These appendix figures suggest that while the post-2007 trend is volatile, the overall pattern is qualitatively similar to the results from 2000–2007. Similarly, Panel C of Online Appendix Table A2 presents triple-difference regression estimates for this longer time period. These results are similar to the main estimates.

TABLE V

The Effect of the TennCare Disenrollment on Private Insurance

	(1) Has public health insurance	(2) Employed	(3) Has private health insurance	(4) Crowdout: Δ private / Δ public
Panel A: Difference-in-difference estimates				
Tennessee × post 2005	−0.046	0.025	0.017	−0.362
	(0.010)	(0.011)	(0.012)	(0.268)
	[0.000]	[0.038]	[0.187]	[0.196]
R^2	0.871	0.867	0.871	
Panel B: Triple-difference estimates				
Tennessee × post 2005 × no children	−0.073	0.046	0.043	−0.595
	(0.017)	(0.020)	(0.024)	(0.384)
	[0.001]	[0.032]	[0.091]	[0.141]
R^2	0.952	0.941	0.952	
Mean of dep. variable	0.139	0.705	0.631	

Notes. Dependent Variable: The share of CPS respondents reporting the given outcome. For Panel A, $N = 136$; the sample consists of state-by-year means; state and year fixed effects not shown. For Panel B, $N = 272$; the sample consists of means for each state, year, and childless status; state fixed effects, year fixed effects, childless fixed effects, and fixed effects for all possible pairwise interaction terms not shown. We restrict the sample to Southern states from 2000 through 2007. The standard errors in parentheses are modified block bootstrap standard errors (see Table II for more details); associated *p*-values are in brackets. The bootstrapped standard errors in column (4) are based on the ratio of the estimated private health insurance coefficient to the estimated public health insurance coefficient, computed for each bootstrap replication sample.

as the ratio of the decrease in public coverage to the increase in private coverage. The results in Panel A lead to a crowdout estimate of 36.2% (standard error: 27.5). Panel B presents triple-difference estimates. Childless adults in Tennessee exhibited a 4.3 percentage point increase in private coverage.[28]

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28. Appendix Table A13 provides estimates for other categories of employment responses and insurance coverage. Column (1) presents the change in adults without children reporting insurance from an employer. The estimate in Column (2) demonstrates that the disenrollment caused a decrease in individuals working without employer-provided insurance. This could occur either from individuals moving to a job offering insurance or taking up a previously declined offer for health benefits. Column (3) suggests that there was little change in the share of people employed but without insurance from any source, suggesting that the individuals leaving employment without employer-provided insurance in Column (3) likely had insurance from another source. Finally, column (4) shows a small but statistically insignificant decline in the number of individuals who were covered by the individual market. While imprecisely estimated, this decline in private non-group coverage provides further evidence that TennCare enrollees may have mistakenly reported they were privately insured.

The associated crowdout estimate for childless adults is thus 59.5% (standard error: 34.2).[29]

Despite the fact that the disenrollment was a *contraction* of public health insurance generosity, our crowdout estimates are remarkably similar to earlier estimates based on *expansions* in public insurance programs (Cutler and Gruber 1996; LoSasso and Buchmueller 2007; Gruber and Simon 2008). This symmetry is interesting and provides some suggestive evidence that our labor supply estimates may also imply a similar symmetry in response to similar expansions.[30] This seems particularly likely in our setting, because our observed labor supply increase appears to be a primary mechanism for securing private health coverage.

IV.D.   The Dynamics of Labor Supply and Health Insurance Coverage Responses

The foregoing estimates demonstrate that a large fraction of TennCare disenrollees secured both employment and private health insurance coverage following the disenrollment. In this section, we investigate the speed with which the disenrollees secured employment and insurance coverage. Because we interpret our main labor supply results as reflecting a demand for access to health insurance, the speed with which individuals are able to enter the labor force and secure employment likely plays an important role in these individuals' ability to secure private health insurance coverage quickly.

29. These estimates come from our main sample where the definition of privately insured does not include individuals with private, non-group coverage. Panel A of Appendix Table A12 contains estimates for a sample where private non-group coverage is counted as private insurance. To address concerns that individuals with TennCare actually reported themselves as have private non-group coverage, Panel B of Appendix Table A12 counts the non-group market as publicly insured. Across these two definitions the crowdout rate ranges from 50.3 − 55.4 percent. Appendix Table A14 contains the changes in private health insurance and crowdout behavior by the same socioeconomic groups in Table III.

30. We cannot estimate the effect of the initial expansion of TennCare on labor supply for several reasons. In 1994, the expansion did not have as large of a differential effect on health insurance for individuals with and without children. Medicaid expansions occurring after 1994 created more categorical eligibility and take-up for adults with children. Given this fact, our triple-difference strategy is not applicable to this earlier setting. Additionally, the enrollment following the 1994 expansion was less abrupt than the 2005 disenrollment, making it less ideal for a purely cross-state (difference-in-difference) analysis.

To investigate monthly changes in employment, we use data from the Bureau of Labor Statistics Local Area Unemployment Statistics (LAUS). By combining multiple sources, LAUS data provide a monthly, state-level employment estimate with less variation than any of the individual component data sources.[31] Figure VIII presents the monthly LAUS data from 2004 to 2007 for Tennessee and all other Southern states. To ease the comparison to our earlier estimates, these data are converted to employment rates using population estimates from the CPS. Prior to the middle of 2005, the estimated employment rates in the two groups of states follow very similar trends.[32] However, at approximately the same time as the TennCare disenrollment, the estimated Tennessee employment rate surged and, over the course of the next year, increased by approximately 2 percentage points. This increase in employment is very similar to the difference-in-differences estimate in Table II.

Given the sudden changes in labor supply in the LAUS, we would expect a similarly quick change in health insurance coverage. Unfortunately, the CPS data only measure health insurance coverage at an annual frequency. Therefore, to explore the dynamics of health insurance coverage, we supplement our CPS results with data from the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is an annual, state-based telephone survey designed to measure the health-related habits of the U.S. population. The survey is administered by individual states, and data are then aggregated into a single annual file by the Centers for Disease Control and Prevention. We construct a sample of individuals aged 21–64 who do not have a college degree.[33] Unfortunately, the BRFSS contains only a single question

31. State-level LAUS data are employment estimates produced through a joint federal and state cooperative and incorporate information from the CPS, Current Employment Statistics, and state unemployment insurance records. More specifically, the LAUS is developed using a signal-plus-noise methodology that accounts for changes in the labor force beyond time trends and seasonality. More information is available at http://www.bls.gov/lau/laumthd.htm#states.

32. There appears to be a very slight increase in employment in Tennessee in the months just before the disenrollment. Given that the disenrollment was announced in advance, it is not surprising that there may have been some anticipatory behavior among disenrollees.

33. Given the demographic questions in the BRFSS, we cannot exactly replicate our preferred CPS sample, which includes no respondents with an advanced degree but does include those with a college degree. In the BRFSS, we can only identify if individuals are college graduates but not if they have a postgraduate degree.
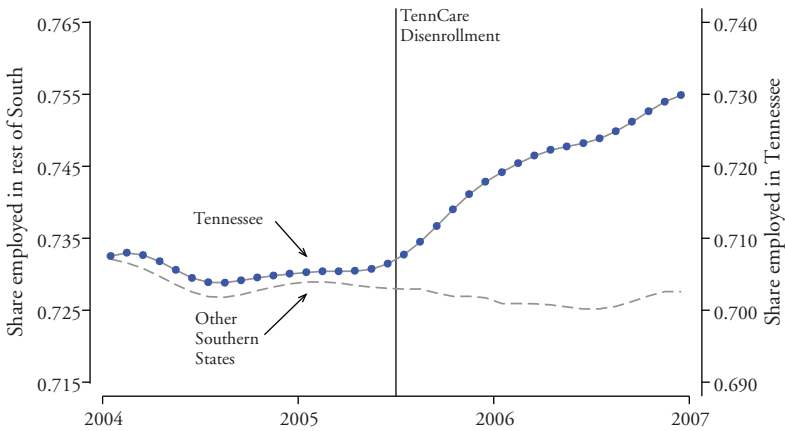
FIGURE VIII

Share Employed by Month, LAUS

This figure presents the estimated monthly employment rate using data from the Local Area Unemployment Statistics (LAUS) for Tennessee versus other Southern states. The employment rate is computed by dividing the total employment in LAUS data by estimated population aged 16–64 as estimated from monthly CPS data using a linear interpolation between the January 2004 CPS population estimate and the December 2006 CPS population estimate. See text for details.

about health insurance: whether respondents are covered by insurance from any source. As a result, we cannot separately identify the changes in private and public coverage using these data. However, an advantage of the BRFSS over the March CPS is that the survey is fielded in each month and can therefore be used to explore the dynamics of health insurance coverage within the year.

Figure IX presents the average insurance coverage rates by month for Tennessee and all other Southern states from 2004 to 2007. From 2000 until the middle of 2005, the two sets of states followed similar trends. In the last quarter of 2005, immediately following the TennCare disenrollment, the percentage of individuals reporting any insurance coverage was 8.0 percentage points below the pretreatment mean. Over the next two quarters, the percentage insured recovered and the post-treatment mean was 4.9 percentage points higher than the nadir, implying a crowdout rate of approximately 61%. Beyond verifying the CPS crowdout
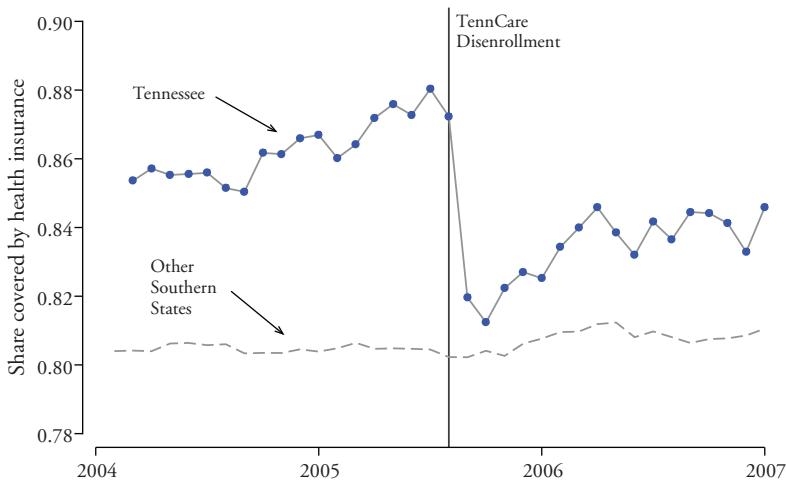
FIGURE IX

Share Insured by Month, BRFSS

This figure presents the share of respondents to the Behavioral Risk Factor Surveillance System ages 21–64 who have less education than a college degree and report being insured each month for Tennessee versus other Southern states. Both lines are trailing eight-month moving averages, and for Tennessee the trailing moving average is computed separately for the time periods before and after August 2005. See text for details.

estimates, these results also demonstrate that TennCare disenrollees secured private insurance fairly quickly.

V. Conclusion

We study a large reduction in Medicaid eligibility and find that public health insurance eligibility affects labor supply. The labor supply changes appear to be a means of securing access to private health insurance, and they demonstrate a large amount of employment lock. This is likely the result of a work disincentive from public health insurance eligibility and a high valuation of health insurance among the individuals exposed to the disenrollment.

In a 2010 Budgetary Outlook, the Congressional Budget Office (CBO) estimated that all of the combined features of the ACA will result in an approximately 0.5 percentage point decline in the aggregate employment rate (CBO 2010). This amounts to

approximately 800,000 individuals leaving employment. The CBO based this estimate on a number of different factors, but the empirical evidence available could not fully account for how lower-income Americans without children would respond to the availability of free or heavily subsidized health insurance. Because those who lost TennCare coverage were similar to many of the childless adults affected by the ACA, our results are potentially informative about the consequences of some features of this soon-to-be-implemented reform.[34]

It is also important to consider that although the enrollees in the TennCare expansion population were demographically similar to many ACA beneficiaries, they sought access to health insurance and therefore may not be representative of the average individual affected by the ACA. However, we believe that our results are still suggestive of the possibility that the non-employer insurance options created by the ACA will decrease aggregate labor supply. In particular, our estimates demonstrate substantial employment lock—that is, individuals working primarily to obtain insurance.

To try to assess the magnitude of this possibility, we apply our estimates to the segment of the national population that is affected by the ACA and similar to the TennCare disenrollees. Using CPS data, we estimate that between 840,000 and 1.5 million childless adults in the United States currently earn less than 200% of the poverty line, have employer-provided insurance, and are not eligible for public health insurance.[35] Given their income,

34. It is important to recognize that this article studies a large *contraction* in eligibility for public health insurance, but that the ACA is an *expansion* of eligibility. We cannot be certain that the effects of expansions are symmetric to the effects of contractions. At the same time, as we discuss, our estimates of crowdout are very similar to previous estimates in the literature based on expansions of eligibility. This suggests that our labor supply estimates may also be relevant for future expansions, as well.

35. This population is estimated as follows. First, we impose the same sample restrictions on the national CPS sample that we impose in our empirical analysis, focusing on childless adults aged 21–64 without an advanced degree. Second, within this sample, we focus on adults who are currently working at least 20 hours a week and have employer-provided health insurance. For 2012, we estimate the size of this population to be 3.6 million adults. To compute the share of this population eligible for public health insurance, we compute the share of this population enrolled in public health insurance, and then we scale this estimate using a range of take-up estimates (52% and 68%) from a recent meta-analysis by Sommers et al. (2012). We subtract these estimates from 3.6 million to arrive at the estimates in the main text.

childless adult status, and revealed preference for health insurance, this population is most similar to individuals affected by the TennCare expansion. Applying our labor supply estimates directly to this population, we predict an employment decline that could be as large as 530,000 to 940,000 in response to this group of individuals being made newly eligible for free or heavily subsidized health insurance. This would represent a decline in the aggregate employment rate of as much as 0.3 to 0.6 percentage point. One should exercise considerable caution when applying our results to the ACA for at least two reasons. First, if TennCare enrollees had a higher valuation of health insurance than the average individual in the subpopulation of relatively low-income childless adults with employer-provided insurance, our estimates provide an upper bound of the potential labor supply decrease. Second, the TennCare disenrollment occurred during a period of general economic expansion. Consequently, it may have been relatively easy for disenrollees to move into the labor force and find employment.

Labor market conditions are a potentially important source of the differences between our results and the notable lack of statistically significant changes in employment in the Oregon Health Insurance Experiment (Baicker et al. 2013), because individuals may have entered the labor force but been unable to secure health insurance through the labor market because of the severely limited availability of jobs during the Great Recession.[36] This would be broadly consistent with the work of Crepon et al. (2013), who provide evidence that the displacement effects of a job training experiment are sensitive to local labor market conditions. The effect of public health insurance eligibility on employment may thus depend on the extent of job rationing in the labor market. Applying this logic to the ACA, individuals facing a slack labor market in the aftermath of the Great Recession may have

36. One implication of this hypothesis is that because of the weak labor market, the Oregon lottery may have affected labor force participation and unemployment, but not employment. The administrative data studied by Baicker et al. (2013), however, are not able to separately identify changes in labor force participation from changes in employment. Beyond the differences in labor market conditions, there are also important differences in demographic and socioeconomic characteristics between our sample and the Oregon lottery sample (as we describe in Online Appendix Table A1). Additionally, the work of Finkelstein et al. (2012) shows no evidence of crowdout in their sample, which may also be an important source of the differences in employment effects.

relatively limited employment options, and this may attenuate the aggregate employment effects.

We emphasize that our predicted employment declines arise from changes in labor supply and not labor demand. Therefore, the effects do not necessarily imply a welfare loss for individuals choosing to leave the labor force after receiving access to non-employer-provided health insurance. Changes in labor demand from the ACA may be important, as well, but they are well beyond the scope of this analysis.

Finally, we believe that our empirical estimates inform recent theoretical work that extends models of optimal social insurance to capture realistic features of health insurance markets. For example, Chetty and Saez (2010) augment the framework of Baily (1978) to show how crowdout affects the optimal generosity of public health insurance. In this article, we document spillovers onto the labor market that are not captured by existing theoretical models and yet are likely also determinants of the optimal generosity of public health insurance.

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SUPPLEMENTARY MATERIAL

An Online Appendix for this article can be found at QJE online (qje.oxfordjournals.org).

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