NBER WORKING PAPER SERIES

IMPACT OF PREMIUM SUBSIDIES ON THE TAKE-UP OF HEALTH INSURANCE: EVIDENCE FROM THE 2009 AMERICAN RECOVERY AND REINVESTMENT ACT (ARRA)

Asako S. Moriya
Kosali Simon

Working Paper 20196
http://www.nber.org/papers/w20196

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 2014

Impact of Premium Subsidies on the Take-up of Health Insurance: Evidence from the 2009 American Recovery and Reinvestment Act (ARRA)

Asako S. Moriya and Kosali Simon

NBER Working Paper No. 20196
June 2014, Revised August 2015
JEL No. I13,J64

ABSTRACT

We study the coverage impacts of a 65-percent health insurance premium subsidy which targeted employer-insured workers who lost their jobs between September 2008 and May 2010. Our research represents the first econometric analysis of the American Recovery and Reinvestment Act (ARRA) COBRA subsidy and contributes to a better understanding of consumer responses to government subsidized private health insurance and discussions surrounding Affordable Care Act (ACA) policies. Using data from the Survey of Income and Program Participation (SIPP) and a difference-in-differences estimation strategy, we find that the subsidy is associated with a substantial increase in own-name employer coverage among the targeted group. We estimate a -0.38 to -0.27 price elasticity of demand for health insurance, depending on the specification. This suggests that consumers are somewhat more price sensitive than previously thought, although there are caveats to generalizing from past settings to individuals affected by ACA subsidies. We also find that part of the increase in subsidized coverage was offset by a decrease in unsubsidized non-group insurance.

Asako S. Moriya
Agency for Healthcare Research and Quality (AHRQ)
540 Gaither Road
Rockville, MD 20850
Asako.Moriya@ahrq.hhs.gov

Kosali Simon
School of Public and Environmental Affairs
Indiana University
Rm 443
1315 East Tenth Street
Bloomington, IN 47405-1701
and NBER
simonkos@indiana.edu

1. INTRODUCTION

As private health insurance is historically closely tied to employment in the U.S., with almost 70 percent of non-elderly employees being covered by employer plans in 2010,[1] job separations have led to high rates of uninsurance (Gruber and Madrian, 1997). To bridge coverage gaps between jobs, the Consolidated Omnibus Budget Reconciliation Act (COBRA) of 1985 requires most employers to offer coverage to formerly-insured employees for up to 18 months after job termination. But few unemployed workers take up continuation coverage, likely due to its high cost, as COBRA does not require any employer contribution (Lambrew, 2001).

Despite several policy attempts to add health insurance assistance to unemployment benefits, no comprehensive COBRA subsidy was available until the American Recovery and Reconstruction Act (ARRA) of February 2009. Under the ARRA, employer-insured workers who lost their jobs involuntarily between September 2008 and May 2010 could qualify for a 65-percent premium subsidy for up to 15 months.[2] This subsidy reduced the cost of COBRA considerably; on average, the subsidy totaled about $724 per month for family coverage and $261 per month for single coverage.[3] The amount is well within the range of subsidies provided through Affordable Care Act (ACA) Health Insurance Marketplaces, which gives a family of four earning 250 percent of the Federal Poverty Level (FPL) a 65- percent premium subsidy (Fernandez and Gabe, 2012).[4]

We estimate the impact of the ARRA subsidy on health insurance take-up by comparing changes in own-name employer coverage (which is often called just 'COBRA' when offered by a former employer) in periods when the subsidy is in effect to periods when the subsidy is absent, among the treatment group (former workers eligible for COBRA) relative to the changes among the control group

[1] These are author calculations using the 2008 Survey of Income and Program Participation (SIPP) panel.
[2] PL 111-5, American Recovery and Reinvestment Act of 2009 (2009).
[3] These numbers are based on average monthly total premiums for employer-sponsored insurance (ESI) in 2009 ($1,115 for family coverage and $402 for single coverage) (Kaiser/HRET, 2009).
[4] The individual mandate, which imposes a fine for being uninsured, acts to further reduce the price of health insurance. However, individual reactions to fines may be non-symmetric relative to subsidies (CBO, 2010; Baicker et al., 2012).

(former workers ineligible for COBRA). We supplement this analysis by investigating the effect of the subsidy on uninsurance, and relatedly, whether there are spillover effects onto other forms of insurance. The use of a control group that also experienced involuntary job loss but was ineligible for COBRA (and thus ineligible for the subsidy) helps to account for contemporaneous trends in insurance coverage before and after the policy changes through a difference-in-differences (DD) estimation strategy; we test beforehand whether insurance coverage of the control and treatment groups have trended similarly in periods when the subsidy is unavailable, and we also explore the use of alternative control groups. We conduct our empirical analysis using data from the Survey of Income and Program Participation (SIPP), a nationally representative panel study of households with detailed information on insurance status and labor market characteristics that is uniquely suited for our analysis.

We find that the 65-percent premium subsidy is associated with a substantial increase in own-name employer coverage by those eligible for the subsidy, implying a price elasticity estimate of between -0.38 to -0.27, depending on the specification. This finding is somewhat higher than the elasticity estimates in the existing literature both for employer insurance as well as more recent non-group health insurance studies, although the literature has produced a wide range of estimates. We find evidence that the majority of this subsidy-induced take-up translated into a reduction in uninsurance but that the increase in own-name employer coverage was also partially offset by a decrease in non-group insurance.

The generous 2009 ARRA subsidy provides contemporary evidence on the price elasticity of demand for health insurance to inform ongoing policy discussions. Other than the extension of the tax deduction for health insurance to the self-employed (Gruber and Poterba, 1994), the ARRA was the only instance of a government premium subsidy for the individual purchase of health insurance prior to the ACA.[5] ACA Marketplaces provide subsidies of about $15 billion annually towards the purchase of non-group coverage for approximately 8 million Americans in 2014 (CBO, 2015; ASPE, 2015). Although research establishing the price responsiveness to current ACA subsidies will take time to evolve, debates

[5] An exception is a very limited subsidy through the Trade Adjustment Assistance Reform Act (TAARA) of 2002 PL 107-210.

on changes to financial incentives for individual health insurance have taken place even after ACA implementation (e.g. Supreme Court cases of 2012 and 2015 regarding the individual mandate and subsidies in Federal Marketplaces), and broadening the evidence base of existing elasticity studies serves well to inform these debates. This research is also relevant for assessing effectiveness of stimulus spending policies. Research to date shows that some ARRA stimulus programs increased economic activity on net while others simply caused intertemporal substitution in activity (e.g. Chodorow-Reich et al., 2012; Mian and Sufi, 2010).

2. BACKGROUND: COBRA AND 2009 ARRA SUBSIDY

The COBRA of 1985 requires employers with 20 or more employees to make a worker's employer-provided health insurance coverage available for up to 18 months after job termination. Almost all states have extended these provisions to employers with fewer than 20 employees through "mini-COBRA" laws.[6] However, former employees who elect coverage must pay the entire premium, plus up to two percent more for administrative costs. Since the employers usually pay a portion of the premium for current employees, the premium under COBRA is four to six times the contribution individuals made while they were employed.[7] Although employer coverage is generally less expensive than private non-

[6] As of 2009, forty states and the District of Columbia had expanded COBRA regulations to small employers (National Conference of State Legislatures, http://www.ncsl.org/issues-research/health/state-cobra-expansions-for-small-businesses408.aspx,last accessed April 1, 2013). During our data period, Pennsylvania implemented a "mini-COBRA" law in June 2009 (Pennsylvania Act 2 of 2009) and Connecticut extended the maximum duration of COBRA coverage from 18 months to 30 months (Connecticut Public Act 10-13). Massachusetts provides health insurance assistance (either premium assistance or direct coverage) to unemployment insurance claimants whose family income is less than 400 percent of the federal poverty limit through the Medical Security Program (MSP). The MSP was applicable to those who took up the ARRA subsidy, and it reduced the costs of COBRA coverage to seven percent of the premium. Our results are robust to the exclusion of these states.

[7] On average, the employer pays 83 percent of the premium costs for single coverage and 73 percent for family coverage (Kaiser/HRET, 2009), although in theory, employees pay the costs in their entirety through reduced wages to the extent they value those benefits (Summers, 1989).

group health coverage, only about 19.4 percent of all eligible employees take up COBRA, while 32.3 percent of eligible workers became uninsured, and the remainder obtained other forms of coverage. [8]

Research on the effects of federal and state COBRA laws that exploits variation in the introduction date and the generosity of these laws across states and over time finds that the policy has increased private sources of coverage. Gruber and Madrian (1997) use those who lost their jobs and did not have employer insurance at their previous job as the control group and find, using the 1984-1988 panels of the SIPP, that COBRA laws of one year reduce the probability of losing private insurance among those who lost a job and were eligible for COBRA by 4.2 percent (or 2.5 percentage points). This implies a price elasticity of demand for COBRA coverage of about -0.1 because, on average, non-group coverage tends to be about 40 percent more expensive than employer policies.

Many proposals have been advanced to increase the take-up of COBRA, such as offering subsidies, tax credits, and a loan program (CBO, 1998; Rice, 1999; Lemieux, 2001; Gruber, 2001). The House and the Senate repeatedly considered proposals for premium subsidies for COBRA coverage between 1996 and 2001, but no such attempts became law.[9] The TAARA of 2002 established a very limited health care tax credit (HCTC) for the purchase of qualified health insurance by displaced workers, which includes COBRA coverage. It is mainly available to workers who can prove they have been adversely affected by foreign trade; according to GAO (2010), total HCTC participation amounts to about 26,000 individuals per year.

The 2009 ARRA was the first policy measure aimed at increasing the take-up of COBRA coverage applicable to a broad population. Under this act, individuals were eligible for the 65-percent premium subsidy if they were COBRA eligible, lost their jobs involuntarily between September 1, 2008,

[8] This estimate comes from SIPP data, June 2010 to March 2012. Other forms of coverage are ESI in own name (through new employers) (30.7 percent), employer coverage as dependents (10.1 percent), non-group private insurance (5.1 percent), government-provided insurance (4.2 percent), and unknown sources (1.1 percent). Berger et al. (1999) estimates the COBRA take-up rate to be 24.6 percent using the April 1993 CPS Employee Benefit Supplement (this supplement is not available for more recent years).

[9] See the Transitional Health Insurance for Workers Changing Jobs Act of 1996, S. 2149, 104th Cong. (1996) and the Economic Recovery and Assistance for American Workers Act of 2001, S. 1732, 107th Cong. (2001).

and May 31, 2010, and if they were ineligible for other group health coverage (such as a spouse's or new employer's plan) or Medicare. Individuals were ineligible for the subsidy if their adjusted gross income was more than $145,000 (or $290,000 for joint filers); between $125,000 and $145,000 (or $250,000 and $290,000 for joint filers), the amount of the subsidy was phased out.

The ARRA premium subsidy became available on February 17, 2009, and could be drawn for up to 15 months. Those who lost their jobs before the ARRA but who became eligible for the subsidy retroactively (those who lost their jobs during September 1, 2008 - February 17, 2009) were given a second chance to elect COBRA coverage. Employers were mandated by the ARRA to notify former employees of the subsidy, through which the individual paid 35 percent of the premium, while their former employers paid the remaining 65 percent and received federal tax credits as reimbursement.

Internal Revenue Service (IRS) data shows that two million households claimed the ARRA subsidy in 2009 (U.S. Treasury Department, 2010b), at a price tag to the government of $2 billion. This estimate may be imprecise due to multiple counting of employees; Fronstin (2010) estimates that 700,000 nonworking adults received the subsidy by August 2009. A study by the U.S. Treasury Department (2010a), using a sample of unemployment insurance recipients in New Jersey, estimates that between 25 and 33 percent of those who were eligible for the subsidy elected COBRA coverage, while Graetz et al. (2012) estimates the COBRA take-up rate to have been 38 percent during the subsidy period, using survey data from Kaiser Permanente-Northern California. In the only prior report that comments on the effect of the subsidy, Bovbjerg et al. (2010) use information from various convenience samples of employers and find that the take-up rate of COBRA was higher by two to 20 percentage points (depending on the employers studied) in the period with the subsidy compared to other periods. The wide range of estimates in these prior studies and the lack of an experimental study emphasize the need for research using national representative data and a quasi-experimental design.

3. PRIOR STUDIES ON PRICE ELASTICITY OF DEMAND FOR HEALTH INSURANCE

During the past two decades, a sizable literature has estimated individual demand for health insurance and found a large range of elasticity estimates. These include a set of papers using employer subsidized insurance as the context and a set that focuses on individually purchased insurance. Some studies use observed differences in prices, and others circumvent potential endogeneity problems with more exogenous tax-policy based price differences or by asking willingness-to-pay survey questions.

The first strand of research exploited variation in employee contributions and concluded that in the context of employer sponsored insurance, employees are fairly inelastic. Using data from the Small Business Benefit Survey conducted in seven cities in 1991-1993, Chernew et al. (1997) examines the effect of employee out-of-pocket premium costs on the take-up of coverage among low-income single workers. They find small elasticity estimates of about -0.05. Blumberg et al. (2001) use nationally representative Medical Expenditure Panel Survey (MEPS) data with more control variables than used in Chernew et al. (1997), to regress take-up as a function of employee contributions, but still conclude that employee elasticities are very low (-0.04). However, firms may set employee contributions to reflect worker demand for health insurance, making it hard to draw causal conclusions from such comparisons.

Gruber and Washington (2005) overcome the hurdle of endogenous employee contributions by studying the introduction of tax deductibility for federal employee premium contributions. Using a detailed dataset of all federal employees over 1991-2002, they estimate an elasticity in the range of -0.02. Although their paper is closer to a natural experiment study than earlier studies, some of their tax price variation comes from state, time and income differences across individuals. Moreover, a change in tax deductibility may not be perceived by the employee as a price reduction, and the authors conclude that "relative to a premium subsidy where all workers are fully aware and understand its savings implications, these estimated effects may be lower bounds." Recent evidence from Germany shows that demand elasticities increase by a factor of four when premium differences between plans are expressed in more transparent terms (Schmitz and Ziebarth, forthcoming).

By using responses to a benefits design survey which asked workers at one firm whether they would accept health insurance at different employee prices, Royalty and Hagens (2005) provide another source of exogenous price variation and find an elasticity estimate that is small and statistically insignificant from zero. However, hypothetical questions lack external validity, and it is hard to generalize from one firm. All these studies of employer premiums discussed so far conclude that providing subsidies to those already offered generous coverage which they declined is not likely to elicit a response, but these studies suffer to varying degrees from problems of endogeneity, salience, or external validity.

Most studies of the price elasticity of demand for employer insurance use the employee portion of the premium as the relevant price that factors into the take-up decision, even though economists tend to agree that workers bear the full cost of their health insurance. Assuming that employee contributions are roughly 20-30 percent of total premiums, the price elasticity estimates in the employer literature will be 3.3 to five times larger if the total premium is used as the base. It is unclear how one should treat the full premium cost but COBRA coverage may be viewed as closer to non-group coverage in this regard because former employees are responsible for the full premium. The literature studying non-employer sponsored coverage has used changes in the federal tax deductibility of health insurance premiums for the self-employed, starting with the Tax Reform Act of 1986 which allowed for a 25 percent deduction. Gruber and Poterba (1994) study how the change in tax price affects take-up among the self-employed compared to employed workers between 1985 and 1989 and find a high elasticity in the -3 to -1 range. The amount of the deduction increased in subsequent years to 30 percent by 1996 and then to 100 percent in 2003. Selden (2009) also uses those employed as a control group for the self-employed and continues to find high elasticity estimates in a similar range when using MEPS data for 1996-2004. Heim and Lurie (2009) use tax records of the self-employed to study the changes in the deduction during 1999-2003. They innovate by including individual-level fixed effects to control for selection into self-employment based on the deduction, and find that their estimates are halved from -0.6 to -0.3 by the use of fixed effects. Heim and Lurie (2009) also find that the deduction increases the amount of insurance purchased on the

intensive margin as well. Gumus and Regan (2013), the most recent paper in this strand of research, point out that Heim and Lurie (2009)'s data only captures those who are self-employed by an income based definition, and that individual tax data cannot correctly measure the right tax price applicable to the family. They reexamine the changes in premium deductibility for the self-employed from 1996 to 2003 using CPS data, and find no effect of the tax price on health insurance take-up. Thus, these studies initially suggested large elasticity estimates, which subsequent papers showed were likely overstated, and more recent studies show no or very small responsiveness among this population.

Although the use of tax-price variation solved potential problems inherent in the earlier literature, the self-employed and federal employees may not be representative of all workers or all those purchasing insurance on their own. A set of papers have also studied the individual health insurance market directly using methods other than tax price variation (as tax deductibility of employer insurance does not extend to the individual market). Elasticity estimates in the range of -0.2 to -0.6 from three studies (Marquis and Long, 1995; Marquis et al., 2004; CBO, 2005) are used in the CBO simulation model underlying the ACA projections (CBO, 2007, p.21). A challenge in this literature has been obtaining exogenous sources of variation in the price of non-group health insurance policies; even when prices are accurately observed, they could be correlated with the design of the insurance plan and enrollee characteristics. The studies address these issues by using regional variation in prices for a standard nongroup insurance product across MSAs (Marquis and Long, 1995); Marquis et al. (2004) push further by modelling changes in price of nongroup coverage in California, and CBO (2005) instruments for price with state policy changes. The elasticity estimates obtained in these studies could possibly be biased due to plan detail inaccuracies in the available data and because prices could correlate with demand. Krueger and Kuziemko (2013) improve on prior studies by using self-reports of willingness-to-pay for health insurance among the uninsured and find an overall price elasticity estimate of -1.0. However, this study also suffers from the concerns in Royalty and Hagens (1995) in the use of hypothetical answers.

Thus, although the literature using employer data finds low elasticity estimates typically well below -0.1, and the individual market studies using observational data showed medium range elasticities

in the -.2 to -.6 range, the literature using tax price variation for the self-employed initially showed large estimates which more recent studies place as closer to 0. Past studies have faced numerous estimation challenges, and are based on small changes in price,[10] thus there is still a need for complementary ways to estimate demand, especially given the role of subsidy policy under the ACA.

4. HYPOTHESES

To provide context for our hypotheses regarding the effect of the premium subsidy on the take-up of health insurance, we first discuss a conceptual framework for insurance decisions made by COBRA-eligible individuals. Individuals value the reduction in financial risks provided by health insurance and maximize their utility subject to the available set of insurance options, given exogenous individual characteristics that affect the demand and availability of insurance. The comprehensive set of other insurance options potentially available to COBRA-eligible individuals include coverage from a spouse's employer, purchasing unsubsidized private non-group health insurance, obtaining insurance from a new employer, obtaining public insurance, or becoming uninsured. We expect that own-name employer coverage from former employers would increase substantially due to the ARRA's 65-percent price reduction.[11] The only alternative source of coverage we expect to decrease unambiguously in response to the ARRA subsidy is non-group coverage, which is more expensive than COBRA for a policy of similar quality. We may also see some reduction in other forms of coverage, but generally those are much lower in marginal costs to the enrollee than COBRA, and thus we think this unlikely to change at the margin due to the subsidy.

[10] CBO (2007) notes regarding the non-group market studies that "The literature may not be a useful guide for subsidies that are much above 50 percent; observed premium variation above that level is rare" (p.21).

[11] We do not expect that this subsidy would lead to supply side changes in plan design, as it might in the case of federal employees health insurance tax deductibility, because former employees are only a small fraction of those purchasing employer plans. To the extent that the subsidy may change which of the offered plans is chosen by workers, we think this would be part of how a subsidy affects insurance take-up (see Cutler and Zeckhauser (2000) for review). It is also possible that a subsidy reduces any premium assistance that employers might have provided through severance packages, although our search for such details to the best of our ability does not suggest employers typically provide this type of unemployment assistance.

5. DATA

We examine the impact of the ARRA subsidy on insurance outcomes using data from Waves 1-11 of the 2008 SIPP panel, which conducted longitudinal interviews with approximately 50,000 households between August 2008 and March 2012. Every four months, a quarter (a 'rotation') of SIPP respondents are asked about their insurance and job status in the current and past three months. Due to concerns about recall bias, we only use insurance information pertaining to the interview month. Although job loss could occur at any time in our survey, we must verify that an individual held employer coverage while employed to know their COBRA eligibility status. We measure whether own-name employer coverage was held by the end of the wave in which an individual lost his or her job, which allows us to study take-up within the first four months after job loss. The ARRA subsidy was available only to those who lost jobs involuntarily, so all other job loss cases are removed from our data set using a variable that asks about the reason for job loss. Since August 2008 is the earliest month for which the insurance information is available in our dataset, we can follow job losses that occur from September 2008 onwards; the earliest month we observe insurance among those eligible for COBRA is by the next interview date, in December 2008. Since the ARRA subsidy was available to those who lost their jobs involuntarily between September 2008 and May 2010, our dataset contains job losses of all those eligible for the subsidy and also job losses occurring during a two year period after the subsidy ended.[12] Monthly

[12] We considered appending the 2004 SIPP panel to the 2008 panel to include the period prior to the start of the subsidy so that our DD estimate could contain two non-subsidy periods, but we discovered that some key variables measuring COBRA appeared to have changed in processing between panels. We confirmed this with SIPP administrative staff, and decided that while we cannot append the data sets for our DD estimate, we can use the 2004 panel to examine trends in outcomes for treatment and control groups during another non-subsidy period to judge whether the control group can serve as appropriate counterfactuals; we present results of these confirmatory tests later.

information on health insurance status enables us to measure the impact of the subsidy more precisely than information from other surveys, such as the CPS, which only contains yearly information.[13]

6. METHOD

To understand how the ARRA subsidy provision affects take-up of targeted health insurance, we compare own-name employer coverage when the subsidy is in effect to when the subsidy is absent, among the population eligible for subsidy (our COBRA eligible treatment group) to the employer coverage rate of a control group of those who lost a job involuntarily but did not hold own-name employer coverage prior to job loss and are thus ineligible for COBRA. We also separately examine the effect of the subsidy on employer dependent coverage, non-group private coverage and government-provided coverage using the same DD design, to investigate substitution effects.

The ARRA subsidy became available on February 17, 2009, and those who lost their jobs during September 1, 2008 - February 17, 2009 became eligible for the subsidy only retroactively. Because we examine insurance status only on the next interview date after the job loss occurred, our data set includes some individuals who would later be eligible for the subsidy retroactively but whose insurance take-up was measured in our analysis before they learned of the subsidy, and we must ensure that these individuals are not considered 'treated'. For example, we measure employer insurance at the next interview date (in this case, December 2008, before the subsidy was announced) of SIPP first-rotation individuals who lost their jobs in September 2008 to December 2008. These individuals, and all other COBRA eligible individuals whose insurance take-up is measured when the subsidy is not in effect, are considered not treated, and compared to those COBRA eligible individuals whose insurance is measured when the subsidy is in effect, and to non-COBRA eligible individuals.

[13] The MEPS provides monthly insurance information, including information on COBRA coverage; however, its sample size is small. The MEPS Household Component contains about 12,000 families per year relative to the approximately 50,000 households in the SIPP.

We expect that the ARRA subsidy only affects those who are eligible for COBRA, but given our identification only comes from comparing take-up between time periods, the use of a control group is very important for disentangling the policy effect from other changes over time that affected unemployed workers, such as fewer job opportunities in tight labor markets, as well as the declining take-up of employer insurance in general (Vistnes et al., 2012). Gruber and Madrian (1997) use the same control group as ours (those losing jobs at the same time but not eligible for COBRA) in their study of the effect of the COBRA law itself. Our empirical specification further adjusts for confounding effects of the economic climate by including the state monthly unemployment rate as a regressor.

While Gruber and Madrian (1997) study any private insurance coverage as their outcome because they lack more detailed data, we examine own-name employer insurance. Although we expect the subsidy to only affect COBRA coverage, we use own-employer insurance for two reasons—one is to have a consistently defined dependent variable for the control and treatment groups, and the other is that, as mentioned by Gruber and Madrian (1997), those with COBRA may mistakenly consider it own-name employer coverage from a current employer in the SIPP. We have also conducted our analysis using only (self-reported) COBRA coverage for the treatment group, and find that results are very similar when we do this as well as when we estimate a "single difference" study without a control group. When we present elasticity estimates, we consider the magnitudes from all three specifications. We also consider the use of an alternative plausible control group to verify that our results are not sensitive to the choice of our main control group. This new group is comprised of those who held employer coverage at the same time as the COBRA eligible worker, but did not lose a job during the subsidy period.[14] Prior to estimating the DD models, we formally test that the time trends in all outcomes are not statistically different between the

[14] We considered other alternative control groups but abandoned their use due to small samples, measurement issues in the SIPP, or lack of likely comparability to the treatment group: those who were eligible for COBRA coverage and lost their jobs voluntarily; those who work for small firms in the ten states that did not extend the COBRA law to them; and those who lost jobs involuntarily and were eligible for COBRA but income ineligible for the ARRA premium subsidy.

treatment and control groups during the period when the subsidy is not in effect, as this would add to our confidence regarding the appropriateness of the DD design.

We obtain a DD estimate of the effect of the subsidy on COBRA coverage by a regression of the following form:

$$[1]\ Y_{ist} = \alpha + \beta\, Treat_i + \gamma\ Subsidy_t + \delta\, Treat_i \cdot Subsidy_t + Z_{ist}\zeta + J_{ist-1}\eta + \rho\, Unempst + \lambda\ UBst + \xi s + \theta t + \varepsilon ist,$$

where all individuals have lost jobs involuntarily at time *t*, Y_{ist} represents an insurance outcome (e.g. own-name employer coverage) measured on the SIPP interview date following the job loss, for individual *i* in state *s* and time *t*. $Treat_i$ represents an indicator for those eligible for COBRA, and thus the ARRA policy, and $Subsidy_t$ represents an indicator that insurance was measured when the ARRA premium subsidy was available (job loss was during September 2008-May 2010 and the interview date occurred after February 2009). δ is our main parameter of interest and captures the average causal effect of the ARRA premium subsidy on insurance outcome, Y_{ist}.

We use several other control variables that help us isolate the effect of the subsidy through the specification above. Z_{ist} represents demographic and socioeconomic characteristics for the individuals that capture demand for health insurance, and includes measures for age and its square term, gender, race/ethnicity, marital status, highest education attained, and whether the individual has children younger than eighteen years old. J_{ist-1} represents job characteristics during the previous wave, which pertain to the job that was lost. The variables included are log of hourly wage, union membership, length of job tenure, industry fixed effects, and occupation fixed effects.[15] Including job characteristics as well as individual demographic and socioeconomic characteristics is important because these are highly correlated with their demand for health insurance. $Unemp_{st}$ is the monthly state unemployment rate, which captures economic conditions at the local level. Improved economic conditions could make the individuals more likely to

[15] See Tables A1 and A2 in Appendix for details about industry and occupation categories included in the analysis.

take up coverage because their prospect of future income is higher. UB_{st} is the number of weeks of unemployment benefits available in the state at the time of job loss, which is publicly available from the Department of Labor. We expect that availability of unemployment benefits, which changed during this time period, may influence take-up of insurance coverage among those who have lost their jobs. For example, those who are eligible for longer periods of unemployment benefits may decide to seek insurance relative to those who expect their job search period will need to be shorter because of limited unemployment benefits eligibility. We include state fixed effects (ξ_s) to control for time-invariant state specific characteristics, and we control for time and seasonality fixed effects (θ_t) through indicator variables for each quarter and for each year.

We use block-bootstrapped standard errors blocked at the time (year-month) level following Cameron et al. (2008) to account for the fact that our identification comes from the trends between only two groups, the treatment and control individuals.[16] We use a linear probability model for ease of interpretation, although the results hold qualitatively when we use both Logit and Probit models. All results presented are estimated with survey weights.

7. RESULTS

7.A. Graphical Presentation and Trends Tests

As an initial approach to investigating the difference in own-name employer coverage for those losing jobs in the periods with and without the subsidy, for the treatment group relative to the control group, we plot conditional time trends in Figure 1. Figure 2 shows corresponding trends for any coverage. We obtained these estimates from a regression that includes individual demographic, socioeconomic and job characteristics, the state unemployment rate and the state maximum weeks of unemployment benefits

[16] An exception is our subgroup analysis shown in Table 3 where we used cluster-corrected standard errors at the time (year-month) level because some sample sizes are too small to support estimation by block bootstrap. We also calculated cluster-corrected standard errors for all other tables (results available upon request), and confirmed that the results are almost identical between these two methods. We prefer block-bootstrapped standard errors when feasible because it employs weaker assumptions than cluster-corrected standard errors.

available. Each data point of the solid and dashed lines in Figure 1 represents the own-name employer insurance take-up rate by the date of job loss, averaged at the half-year level, for the treatment and control groups separately. The first (dotted) vertical line represents those losing jobs during the second half of 2008. During this period, about 20 percent of individuals in the treatment group were eligible for the ARRA subsidy when their take-up was measured, while the remaining 80 percent represented by this point are considered ineligible. That is, of those losing jobs in September to December 2008, only those who lost their jobs in November or December of 2008 stand a chance to have their insurance measured at a time when they knew they were eligible for the subsidy (if their next interview date is after February 17th, 2009), and these individuals amount to 20 percent of all individuals in the treatment group who lose their jobs in this half-year.[17] The vast majority (about 85 percent) of the individuals losing jobs in the first half of 2009 were interviewed at a time when they knew they were eligible for the subsidy. The second vertical line represents those losing jobs in the first half of 2010, where the vast majority of them were eligible for the COBRA subsidy (all but the June 2010 job losses) regardless of when their insurance outcomes are measured. Among those losing jobs during the second half of 2010 and beyond, no one is eligible for the subsidy.

Figure 1 shows that own-name employer insurance increased between the second half of year 2008 and the first half of 2009 as more individuals represented by these dots became eligible for the ARRA subsidy, and the rate stayed high between the second half of 2009 and the first half of 2010 when almost all the individuals represented by these dots were eligible for the subsidy. The rate decreased sharply in the second half of 2010 when none of the individuals were eligible for the subsidy and stayed low afterwards. During the whole study period, the own-name employer insurance rate for the control group showed a steady and slightly decreasing trend. Our use of DD strategy should remove any common

[17] An alternative way to draw Figure 1 is to include only those who are eligible for the subsidy in the points before the second half of 2010. We decided to include all individuals, as the Figure tells the same story in this format, and highlights the way the treatment effect is captured in our data,

effects that occur in workplaces and labor market nationwide, for example, in reaction to national changes in the cost of health insurance and the demand for labor.

We formally test whether the difference in insurance trends between the treatment and control groups during the period of the 2008 SIPP panel with no subsidy is statistically significant by regressing take-up rates on a linear time trend, an indicator for the treatment group, an interaction of these terms, and other control variables included in our main specification. The first set of rows in the first column of Table A3 in Appendix shows that the coefficient of an interaction of the linear time trend and an indicator for the treatment group is not statistically significant and that the coefficient magnitude is small. We further test whether the trends differ between the two groups during the 2004 panel, which was conducted from January 2004 to December 2007, prior to the subsidy. The second set of rows in the first column of Table A3 shows, reassuringly, that the difference in trends is small and not statistically significant during the 2004 panel as well.

7.B. Regression Results

Table 1 shows descriptive statistics of key control variables for the treatment and control groups, for those losing jobs when the subsidy is in effect and when it is absent. There are only fairly small differences between time periods in individual characteristics (in marital status and education) which reduces the concerns that those losing jobs inside and outside the subsidy periods may be very different along observable factors. Although we noted that trends in insurance outcomes between treatment and control group individuals are similar during periods without a subsidy, there are time invariant differences between control and treatment group in almost all measured characteristics—all individual characteristics means are statistically significantly different (significance levels not shown). The individuals in the control group tend to be younger, female, Hispanic, single, and childless; to not be a member of a trade union; and to have less education, a lower hourly wage, and less job tenure, when compared to the treatment group. Individuals in these two groups have similar state unemployment rates associated with their observations, but the number of weeks of unemployment benefits available at the time of job loss

was longer among the control group than among the treatment group. While these differences are not surprising, they emphasize the importance of controlling for individual characteristics in our regression model.

The first column of Table 2 shows the effect of the ARRA subsidy on own-name employer insurance using our DD strategy. The first set of rows presents the estimates without controls for observable characteristics, and the second to fourth sets of rows present the estimates with control variables gradually added (the fourth set of rows correspond to Equation [1]). Adding control variables does not affect the magnitudes of the effects in a meaningful way, which is reassuring. In results not reported, we added a further interaction between the state unemployment rate and the treatment group indicator, and found our results were largely unchanged. The estimate with all controls shows that the implementation of the ARRA subsidy is associated with a 5.4-percentage-point increase in the own-name employer take-up rate. Dependent variable means are presented towards the bottom of the table. The mean employer insurance rate when the subsidy is not available is 0.439; since we judge the elasticity with respect to the COBRA subsidy, we also present the COBRA rate among the treatment group, which is 0.221. The 5.4 percentage point increase amounts to a 24.4-percent-increase from the base COBRA rate among the treatment group, and this in turn implies a -0.38 price elasticity of demand, as the subsidy reduces the price by 65 percent. We present alternative methods of calculating elasticity estimates in the sensitivity analysis section, where we find a range of -0.38 to -0.27.

7.C. Subgroup Analysis

In Table 3, we analyze whether the subsidy had different impacts on own-name employer coverage among subgroups that likely differ in their demand for such coverage and may respond differently to a subsidy. We perform this analysis by running a regression separately for each subgroup, defined along income and health status. First, we separate the observations into those with current (post job loss) monthly family income <138 percent, 138-400 percent, and >400 percent of the federal poverty

level (FPL) to have roughly equally-sized groups as well as to stay close to relevant policy parameters: ACA Medicaid eligibility ends at 138 percent of FPL, and the Marketplace subsidies phase out completely at 400 percent of FPL. About a quarter of the sample has incomes above 400 percent of the FPL. The first set of rows shows that the effect of the subsidy is not statistically significant for those whose current income is below 138 percent of FPL, but becomes statistically significant and larger in size for those in the 138- 400 percent of FPL and for those whose income is 400 percent or more of FPL. The subsidy increased own-name employer coverage by 6.1 percentage points (26.7 percent) among those with income 138-400 percent of FPL and by 16.8 percentage points (69.0 percent) among those with current income 400 percent of FPL or more. This indicates price elasticity estimates of -0.41 and -1.06, respectively. Those with low incomes may not respond to a subsidy because the absolute costs are still high and there may be public sources of coverage available to some family members. Our results suggest that the price elasticity among subpopulations eligible for the Marketplace subsidies could be higher than the elasticity among lower income groups; this price elasticity could be amplified in the presence of fines for being uninsured applicable after 2014. While we do not see the expected effect of diminishing elasticity at the highest income levels, this turning point may occur at levels much higher than four times the poverty level.

The second set of rows shows the effects of the ARRA subsidy by health status. COBRA coverage is subject to adverse selection: a survey finds that health care costs for COBRA enrollees are about 150 percent of that of active employees in 2008 (Spencer and Associates, 2009). Previous reports raise the possibility that subsidies for COBRA coverage could alleviate adverse selection because the lower price might induce those with lower marginal benefit to elect coverage (Fronstin, 1998). On the other hand, even the subsidy may still elicit less take-up response among the healthy than the sick. Since the SIPP does not contain information on chronic health conditions in any waves, we use a self-reported-health variable that takes values of "Excellent," "Very Good," "Good," "Fair," and "Poor." We find the subsidy significantly increases own-name employer coverage by 5.9 percentage points (25.5 percent) among those whose reported health is less than "Excellent," while the effect is not significant among

those whose reported health is "Excellent." The difference in coefficients between these subgroups is however not statistically significant and that the results are somewhat sensitive to the exact thresholds of self-reported health status we use to separate the groups.

7.D. Analysis of Any Coverage and Other Insurance Outcomes

Estimating the effect of the ARRA premium subsidy on the probability of having any insurance coverage is helpful in understanding the overall success of the stimulus spending. Individuals could substitute away from other coverage to own-name employer coverage due to the subsidy, or move from being uninsured to insured. Our analysis of any coverage and other types of coverage is a straightforward extension of our initial DD framework, and uses the same specification as Equation [1].

Figure 2 shows the rates of any insurance coverage among the treatment group (represented by a solid line) and control group (represented by a dashed line). Each data point represents the rate of any coverage, within four months of job loss, for those who lost jobs during the half-year. The rates trend similarly between the treatment and control groups during the subsidy period, but the treatment group rate goes down after the subsidy ended at the end of the first half of 2010 and stays lower for the rest of the time, while the control group rate stays almost the same throughout the study period. The second to fifth columns of Appendix Table A3 confirm that the difference in trends between the groups is small and not statistically significant for any coverage as well as the rates of employer dependent coverage, non-group coverage and government-provided coverage during the period of the 2008 panel without the subsidy and also during the 2004 panel.

The second column of Table 2 indicates that the implementation of the subsidy is associated with a 4.4-percentage-point increase in any source of insurance coverage ($p<.10$). This is equivalent to a 11.5-percent decrease in uninsurance from its baseline of a 0.38 (1-0.62 since means shown are for the complement of uninsurance) when the subsidy is not available. This finding suggests that the premium

subsidy decreased uninsurance among the treatment group. However, part of the increase in COBRA coverage was offset by a decrease in the availability of other sources of coverage. The third to fifth columns show that while the effects on employer-dependent coverage and on government-provided coverage are statistically insignificant, non-group insurance decreases by 2.2 percentage points (52.0 percent).

8. SENSITIVITY ANALYSIS

We test the stability of our elasticity parameters first by considering alternative specifications. In the main specification, we define our dependent variable as an indicator for being covered by own-name employer insurance and zero otherwise because we use a control group of those who are not eligible for COBRA and following the measurement error reasons in Gruber and Madrian (1997). Since this measure includes not just COBRA coverage but also own-name employer coverage through new employers, our main estimates could reflect spillover effects in re-employment. We address this concern by changing our outcome variable slightly: in this alternative specification, the outcome variable takes a value of one among the treatment group only if they have COBRA coverage per se, while the control group dependent variable is unchanged. The second column of Table A4 shows that our DD estimate using this specification is 0.049, which is slightly smaller but not statistically different from our main estimate. This coefficient estimate indicates a 22.1 percentage-point increase in COBRA coverage, and we obtain a price elasticity estimate of -0.34 this way, compared to the -0.38 estimate in our main specification.

Our main specification uses a control group that also separates from employers, but who did not receive employer insurance while they were employees. Next, we use an alternative control group of those who had insurance from their employers at the time that the treatment group lost their job, but this new control group remained continuously employed. Since such individuals could differ in many aspects from the individuals in our treatment group and because there are a large number of such workers, we used propensity-score matching and chose individuals who were similar in terms of observable

characteristics used as control variables in our main specification (only weeks of unemployment benefits variable is not included since this variable is not relevant to the propensity of losing jobs involuntarily among those with employer insurance in the previous wave.) This approach allows us to separate out contemporaneous time trends in employer-related coverage; the individuals in this alternative control group likely faced similar fear of losing their jobs and income as the individuals in our treatment group and made their insurance choices accordingly during economic downturns. Our outcome variable now takes a value of one if individuals in the treatment group have own-name employer coverage through their former employers or if individuals in this alternative control group have own-name employer coverage through their current employers and takes a value of zero otherwise. The third column of Table A4 shows that the ARRA subsidy is associated with an increase of 4.2 percentage-point in COBRA coverage among the treatment group relative to the alternative control group. This DD estimate suggests a price elasticity estimate of -0.29, which is somewhat smaller than the -0.38 estimate from the main specification.

Finally, we ran a single-difference regression, in which we compare the difference in COBRA take-up between during and outside the subsidy period among the treatment group. We included all the control variables used in our main specification (except time fixed effects that are highly collinear with an indicator variable for the subsidy period) to capture any compositional changes between these two periods among the treatment group. The fourth column of Table A4 shows that the ARRA subsidy increased COBRA coverage by 3.9 percentage points (17.8 percent) although this is significant only at the 10 percent level. This implies a price elasticity estimate of -0.27. The single-difference strategy yields a smaller estimate (although not statistically significantly different from our main specification) possibly because we could not account for the general decreasing trend in employer insurance.

We noted that SIPP does not cover the first half of the year 2008. There is no other data set that allows us to identify the treatment group of those who have coverage through a former employer and are ARRA-subsidy eligible. However, CPS allows us to look at a similar concept. We look at own-name coverage through ‘former or current employer’ for those who report themselves as unemployed for 16 weeks (close to our SIPP definition). Figure 3 shows that the pattern of coverage is very consistent with

our results. The rate of those who reported having own-name employer coverage is high in the year 2009, when the subsidy was available for a majority of the year.

Although we have estimated our model using a linear probability specification for ease of interpretation, we also estimate Equation [1] using both Probit and Logit nonlinear specifications. We obtain implied marginal effects of similar magnitude as the linear estimates shown in Table 2; for example the marginal effect on own-name employer coverage is estimated as 0.055 and 0.054 when using Probit and Logit models, respectively, and these estimates are almost or exactly the same as the estimate obtained in Table 2 and are significant at the 5-percent level.

9. DISCUSSION AND CONCLUSION

Although there were several calls for policies to assist with health insurance costs for the unemployed (e.g. CBO, 1998; Families USA, 2009), no such provision existed until the 2009 ARRA premium subsidy. Even though this policy ended in 2010, the ACA now provides premium assistance for COBRA-eligible workers under 400 percent FPL in the form of Marketplace subsidies, and our estimates help predict insurance responses.[18] COBRA itself still remains relevant in the post ACA time period as about a quarter of job losers in our sample have incomes above 400 percent of FPL. In this paper, we analyze the effects of this 65-percent ARRA subsidy and find that it led to substantially increased health insurance take-up, implying price elasticity estimates of -0.38 to -0.27. These numbers are somewhat larger than those emerging from prior papers, suggesting that consumers maybe more price sensitive than a close read of the literature might otherwise predict. We find evidence that uninsurance reduced as a result of the stimulus policy, but that the increase in continuation coverage was also partially offset by a decrease in non-group insurance.

[18] Although draft ACA implementation rules had proposed that COBRA-eligible individuals would be ineligible for the Marketplace subsidy, final regulations extended ACA subsidies to COBRA-eligible individuals (Code of Federal Regulations, 2013). In states without a Medicaid expansion, subsidized health insurance is not available to those workers with incomes under the federal poverty level after job loss.

Our research contributes to a better understanding of consumer responses to government subsidized private health insurance and discussions surrounding Affordable Care Act (ACA) policies. In addition to the recent U.S. Supreme Court cases that discussed financial incentives for private insurance in the form of the individual mandate, and subsidies on Federally Facilitated Marketplaces, we are likely to see continued debates on the use of premium subsidies as a policy tool, even before price responsiveness evidence from the ACA has evolved. Our paper broadens the base of existing studies that inform these debates. This work also adds to papers that evaluate the effectiveness of stimulus spending policies, such as the ARRA's increased Medicaid matching funds, the first-time homebuyer tax credit, or the "cash for clunkers" program (Brogaard and Roshak, 2011; Chodorow-Reich et al., 2012; Mian and Sufi, 2012).

When using estimates from this research to inform health policy discussions, one must consider the limits to generalizing from the ARRA experience. The price elasticity magnitude could depend on several factors that differ between the COBRA setting, and for example, those of the ACA. First, COBRA coverage is intended to bridge a gap in insurance coverage caused by job termination. Because of its temporary nature, the demand for COBRA coverage could be low compared to more permanent coverage. Second, those eligible for the ARRA subsidy are likely to have experienced a recent loss of income, and this could reduce their responsiveness to the subsidy. If employers had decided to lay off their workers just before the date when the subsidy ended, knowing that the workers could benefit from the ARRA subsidy, this could bias our estimate in an unknown direction if these workers are systematically different. We find that in our sample there is no evidence of a change in the number of involuntarily lost jobs around the time when the subsidy ended, which is reassuring. Third, the types of individuals who are generally seeking coverage in the non-group market could differ substantially from those individuals who have had employer coverage while employed, as is the case for those eligible for COBRA.

Aside from studying the elasticity of demand for health insurance, the ARRA premium subsidy presents an opportunity to explore several other behaviors related to health and labor economics. It is well established that generous unemployment benefits can reduce job search efforts and prolong the period of

unemployment (Mortensen, 1977; Krueger and Mueller, 2010). Subsidies to search could also lead to better eventual job matches because workers would be less likely to settle for the first jobs they are offered (Gruber and Madrian, 1997). Given the close relationship between labor market participation and health insurance, the effect of the ARRA subsidy on labor market outcomes remains an important topic for future study.

References

The Assistant Secretary for Planning and Evaluation (ASPE), U.S. Department of Health and Human Services. 2015 "Health Insurance Marketplace: Summary Enrollment Report for the Initial Annual Open Enrollment Period." Available at http://aspe.hhs.gov/health/reports/2014/marketplaceenrollment/apr2014/ib_2014apr_enrollment.pdf (last accessed on July 31st, 2015).

Baicker, K., W. J. Congdon, and S. Mullainathan. 2012. "Health Insurance Coverage and Take-up: Lessons from Behavioral Economics." *Milbank Quarterly*, 90(1): 107-134.

Berger, M. C., D. S. Black, F. A. Scott, and A. Chandra. 1999. "Health Insurance Coverage of the Unemployed: COBRA and the Potential Effects of Kassebaum-Kennedy." *Journal of Policy Analysis and Management*, 18(3): 430-448.

Blumberg, L. J., L. M. Nichols, and J. S. Banthin. 2001. "Worker Decisions to Purchase Health Insurance." *International Journal of Health Care Finance and Economics*, 1(3-4): 305-325.

Bovbjerg, R. R., S. Dorn, J. Macri, and J. Meyer. 2010. "Federal Subsidy for Laid-Off Workers' Health Insurance: A First Year's Report Card for the New COBRA Premium Assistance." Health Policy Center, Urban Institute. Available at http://www.urban.org/uploadedpdf/412172-laid-off-workers.pdf (last accessed on April 1st, 2013).

Brogaard, J., and K. Roshak. 2011. "The Effectiveness of the 2008-2010 Housing Tax Credit.". Available at SSRN: http://ssrn.com/abstract=1882599.

Cameron, A. C., J. B. Gelbach, and . L. Miller. 2008. "Bootstrap-Based Improvements for Inference with Clustered Errors," *The Review of Economics and Statistics*, 90(3): 414–427.

Chernew, M., K. Frick, C. G. McLaughlin. 1997. "The Demand for Health Insurance Coverage by Low-Income Workers: Can Reduced Premiums Achieve Full Coverage?" *Health Services Research*, 32(4): 453-470.

Chodorow-Reich, G., L. Feiveson, Z. Liscow, and W.G. Woolston. 2012. "Does State Fiscal Relief during Recessions Increase Employment? Evidence from the American Recovery and Reinvestment Act." *American Economic Journal: Economic Policy*, 4(3): 118-45.

Code of Federal Regulations. 2013. "Eligibility for Premium Tax Credit," Title 26 Code of Federal Regulations, Section 1.36B-2 (April 1, 2013).

Congressional Budget Office (CBO). 1998. Proposals to Subsidize Health Insurance for the Unemployed. Available at http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/3xx/doc317/subhi.pdf (last accessed on April 1st, 2013).

Congressional Budget Office (CBO). 2005. "The Price Sensitivity of Demand for Nongroup Health Insurance." CBO Background Paper. Available at cbo.gov

Congressional Budget Office (CBO). 2007. "CBO's Health Insurance Simulation Model: A Technical Description." CBO Background Paper. Available at cbo.gov

Congressional Budget Office (CBO). 2010. "Will Health Insurance Mandates Increase Coverage? Synthesizing Perspectives from Health, Tax, and Behavioral Economics." CBO Working Paper 2010-5. Available at cbo.gov

Congressional Budget Office (CBO). 2015. "Updated Budget Projections: 2015 to 2025." Available at cbo.gov.

Cutler, D.M., and R.J. Zeckhauser. 2000. "The Anatomy of Health insurance." in *Handbook of Health Economics,* ed. A.J. Culyer and J.P. Newhouse. Amsterdam: Elsevier. 1a: 563-643.

Families USA. 2009. "Squeezed! Caught between Unemployment Benefits and Health Care Costs." Available at http://www.familiesusa.org/resources/publications/reports/cobra.html (last accessed on April 1st, 2013).

Fernandez, B., and T. Gabe. 2012. "Health Insurance Premium Credits in the Patient Protection and Affordable Care Act (ACA)." Congressional Research Service.

Fronstin, P. 1998. "Health Insurance Portability: COBRA Expansion and Job Mobility." *EBRI Issue Brief*, 194.

Fronstin, P. 2010. "The Impact of COBRA Premium Subsidy on Coverage." *EBRI Monthly Newsletter*, 31(6): 8-12.

Government Accountability Office (GAO). 2010. Health Coverage Tax Credit Participation and Administrative Costs. GAO-10-521R.

Graetz, I., M. Reed, V. Fung, W. H. Dow, J. P. Newhouse, and J. Hsu. 2012. "COBRA ARRA Subsidies: Was the Carrot Enticing Enough?" *Health Services Research,* 47(5): 1980-1998.

Gruber, J. 2001. "Strategies to Expand Health Insurance for Working Americans." *Inquiry*, 38(2): 225-231.

Gruber, J., and B. Madrian. 1997. "Employment Separation and Health Insurance Coverage,." *Journal of Public Economics*, 66(3): 349-382.

Gruber, J., and J. Poterba. 1994. "Tax Incentives and the Decision to Purchase Health Insurance: Evidence from the Self Employed." *Quarterly Journal of Economics,* 109: 701-733.

Gruber, J., and E. Washington. 2005. "Subsidies to Employee Health Insurance Premiums and the Health Insurance Market," *Journal of Health Economics*, 24: 253-276.

Gumus, G., and T.L. Regan. 2013. "Tax Incentives as a Solution to the Uninsured: Evidence from the Self-Employed." *Inquiry*, 50(4): 275-295.

Heim, B. T., and I. Z. Lurie. 2009. "Do Increased Premium Subsidies Affect How Much Health Insurance is Purchased? Evidence from the Self-employed." *Journal of Health Economics*, 28(6): 1197-1210.

Kaiser Family Foundation and the Health Research & Educational Trust (Kaiser/HRET). 2009. Employer Health Benefits: 2009 Annual Survey. Kaiser/HRET.

Krueger, A. B., and I. Kuziemko. 2013. "The Demand for Health Insurance among Uninsured Americans: Results of a Survey Experiment and Implications for Policy." *Journal of Health Economics*, 32(5): 780-793.

Krueger, A. B., and A. Mueller. 2010. "Job Search and Unemployment Insurance: New Evidence from Time Use Data." *Journal of Public Economics*, 94(3-4): 298-307.

Lambrew, J. 2001. "How the Slowing U.S. Economy Threatens Employer-Based Health Insurance." The Commonwealth Fund. Available at http://sphhs.gwu.edu/departments/healthpolicy/CHPR/downloads/511_Lambrew_slowing_economy.pdf (last accessed on April 1st, 2013).

Lemieux, J. 2001. Transitional Health Coverage: A Tax Credit for COBRA. Progressive Policy Institute.

Marquis, S., M. B. Buntin, J. J. Escarce, K. Kapur, and J. M. Yegian. 2004. "Subsidies and the Demand for Individual Health Insurance in California." *Health Services Research*, 39(5): 1547-1570.

Marquis, S., and S. H. Long. 1995. "Worker Demand for Health Insurance in the Non-Group Market." *Journal of Health Economics*, 14(1): 47-63.

Mian, A., and A. Sufi. 2010. "The Effects of Fiscal Stimulus: Evidence from the 2009 'Cash for Clunkers' Program" (No. w16351). National Bureau of Economic Research.

Mortensen, D. T. 1977. "Unemployment Insurance and Labor Supply Decisions." *Industrial Labor Relations Review*, 30(4): 505-517.

Rice, T. 1999. Subsidizing COBRA: An Option for Expanding Health Insurance Coverage. Kaiser Family Foundation.

Royalty, A. B., and J. Hagens. 2005. "The Effect of Premiums on the Decision to Participate in Health Insurance and Other Fringe Benefits Offered by the Employer: Evidence from a Real-World Experiment." *Journal of Health Economics*, 24(1): 95-112.

Schmitz, H. and N. Ziebarth, forthcoming "Does Price Framing Affect the Consumer Price Sensitivity of Health Plan Choice*?" Journal of Human Resources*.

Selden, T. M. 2009. "The Impact of Increased Tax Subsidies on the Insurance Coverage of Self-Employed Families: Evidence from the 1996–2004 Medical Expenditure Panel Survey." *Journal of Human Resources*, 44(1): 115-139.

Spencer, C. D. and Associates, Inc. 2009. Spencer's Benefits Reports. Available at http://hr.cch.com/news/benefits/061009.asp (last accessed on April 1st, 2013).

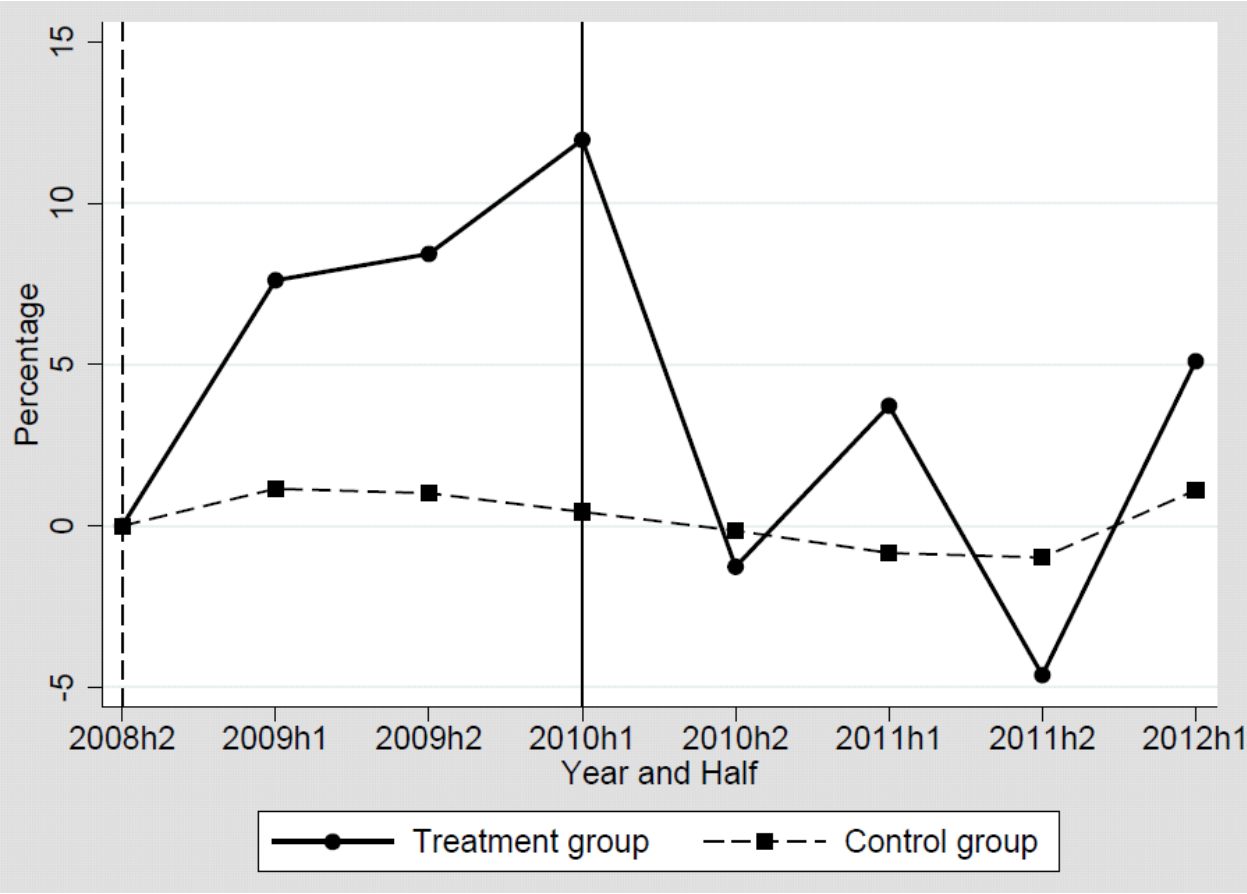
Summers, L. H. 1989. "Some Simple Economics of Mandated Benefits." *American Economic Review (Papers and Proceedings)*, 79(2): 177-183.

United States Department of Treasury. 2010a. COBRA Insurance Coverage Since the Recovery Act: Results from New Survey Data. Available at http://www.treasury.gov/resource-center/economic-policy/Documents/cobra%20final%20report.pdf (last accessed on April 1st, 2013).

United States Department of Treasury. 2010b. Interim Report to The Congress on COBRA Premium Assistance. Available at http://www.treasury.gov/resource-center/tax-policy/Documents/COBRAInterimReport.pdf (last accessed on April 1st, 2013).

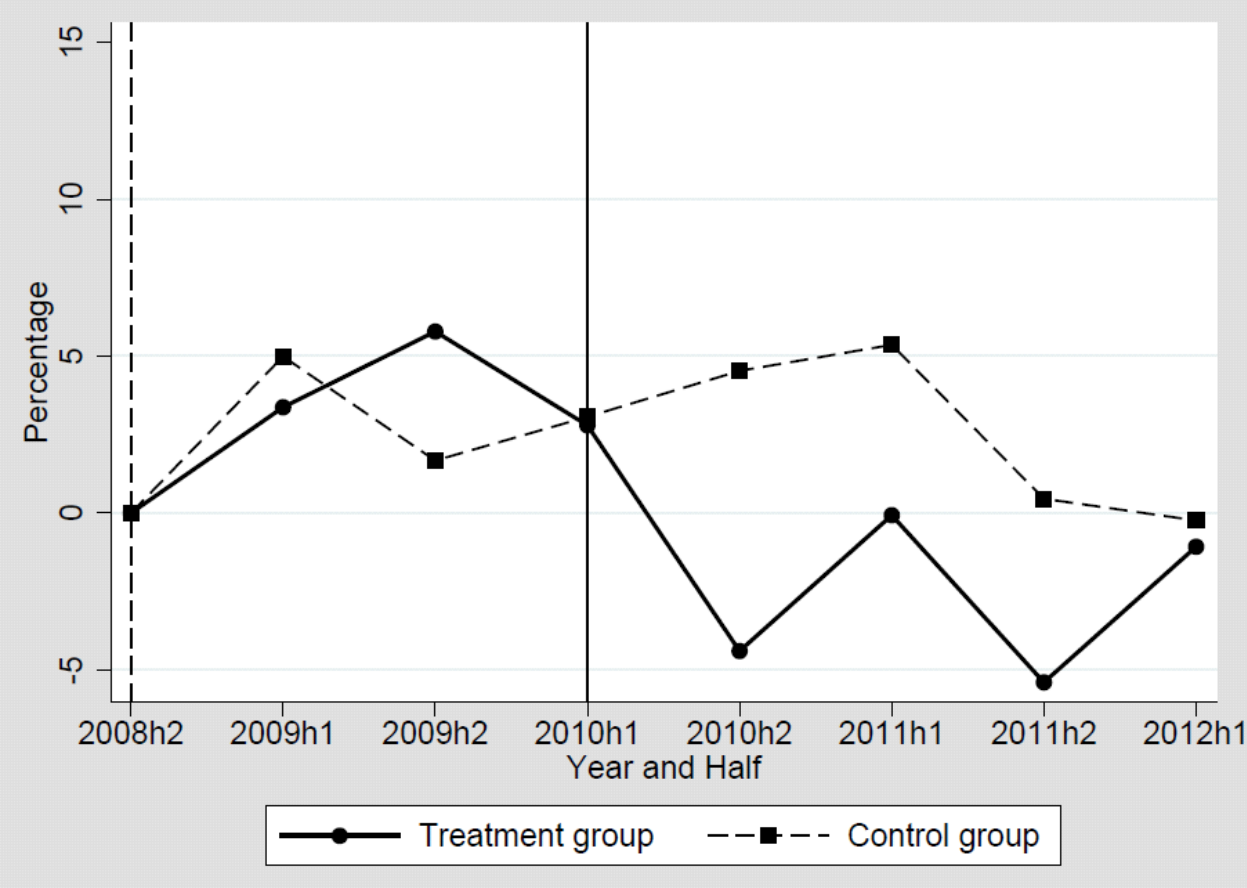
Vistnes, J., A. Zawacki, K. Simon, and A. Taylor. 2012. "Declines in Employer-Sponsored Insurance between 2000 and 2008: Examining the Components of Coverage by Firm Size." *Health Services Research*, 47(3): 919-938.

Figure 1. Conditional Rate of Own-Name Employer Coverage, Treatment and Control Groups, 2008-2012



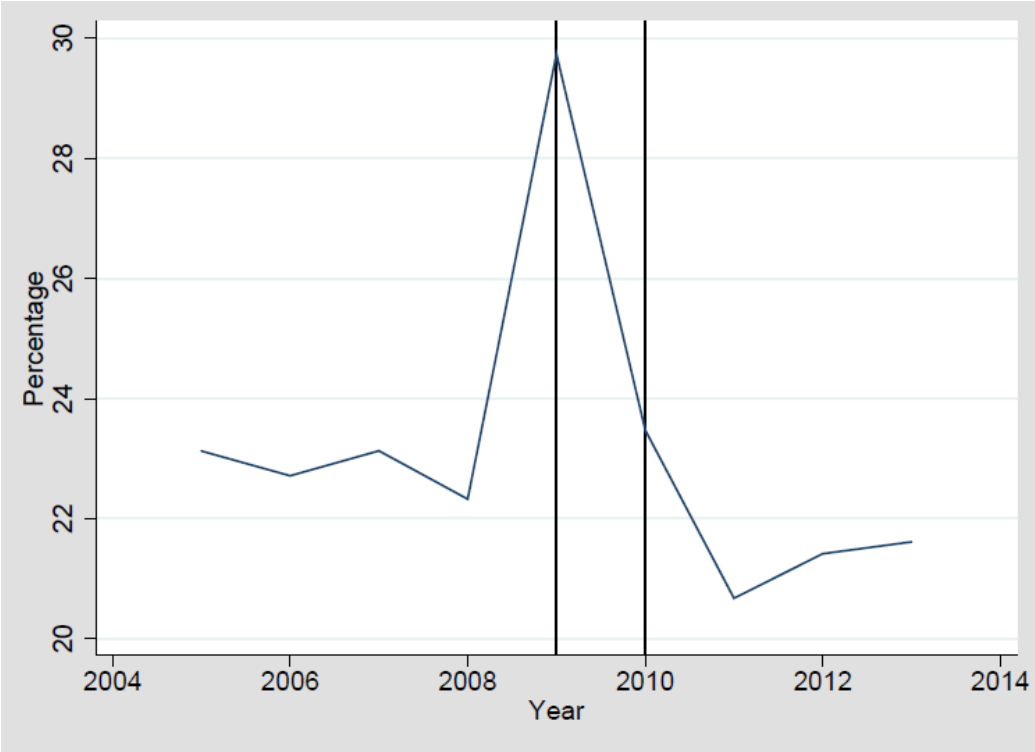
Notes: (1) Sample estimates from the 2008 SIPP panel for the treatment group (involuntarily unemployed workers who are COBRA eligible) and for the control group (similar workers not eligible for COBRA), using data from September 2008 to March 2012. (2) Employer coverage is taken from the most recent reference month of the wave during which job termination occurred. Conditional coverage numbers come from a regression for own-name employer insurance that includes the interactions of indicator variables for either the treatment or control group and indicator variables for each half-year in which individuals lost their jobs (the omitted category is the second half of 2008, the starting point), as well as all the control variables included in our main specification. We plot the coefficient estimates of the indicator variables for each half-year for the treatment and control groups. (3) The first (dotted) vertical line represents the second half of 2008, in which about 20 percent of individuals in the treatment group were eligible for the ARRA subsidy when their take-up was measured. Those who lost their jobs in November or December of 2008 were eligible for the subsidy if their take-up was measured after February 17th, 2009. The subsidy became available to the majority of these individuals in the first half of 2009 (except for about 15 percent of individuals whose take-up was measured before February 17th, 2009). The second (solid) line represents the second half of 2010, in which the ARRA subsidy became unavailable. See text for further details regarding the sample.

Figure 2. Conditional Rate of Any Insurance Coverage, Treatment and Control Groups, 2008-2012



Notes: (1) See Notes (1) and (3) under Figure 1. (2) We use information on any insurance coverage collected in the most recent reference month of the wave during which job termination occurred. We regress an indicator for any insurance coverage on the same variables mentioned in Note (2) under Figure 1.

Figure 3. Own-name Employer Insurance Rate among the Unemployed whose Unemployment Duration is 16 Weeks or Less



Notes: (1) Sample estimates from the 2004-2013 Annual Social and Economic Supplement of the CPS, using the information on health insurance coverage in the previous year among those whose unemployment duration is 16 weeks or less in March of the current year. (2) The first vertical line represents the year 2009, when the ARRA subsidy became available to the majority of those eligible. The second vertical line represents the year 2010, when the subsidy became unavailable.

Table 1. Means of Demographic, Socioeconomic, and Job Characteristics: Treatment and Control Groups, Periods With and Without Subsidy

Panel A: Treatment Group			
	with subsidy	without subsidy	
Demographic characteristics			
Age	41.29	41.40	
Indicator: female	0.35	0.36	
Indicator: white	0.70	0.68	
Indicator: African American	0.11	0.12	
Indicator: Hispanic	0.13	0.14	
Indicator: Asian	0.03	0.03	
Indicator: married	0.47	0.50	*
Indicator: separated or divorced	0.22	0.20	
Indicator: does not have kids under age 18	0.67	0.67	
Education			
Indicator: less than high school	0.07	0.09	
Indicator: high-school graduate	0.26	0.28	
Indicator: some college	0.43	0.39	**
Indicator: college graduate	0.17	0.18	
Indicator: graduate degree	0.07	0.07	
Labor status (previous job)			
Union membership	0.15	0.16	
Log of hourly wage	3.90	3.84	
Job tenure in months	74.50	69.58	
State-level variable			
Monthly unemployment rate	9.57	8.75	***
Number of weeks of unemployment benefits	73.95	78.96	***
Number of observations	1,115	1,389	

Panel B: Control Group

	With subsidy	without subsidy	
Demographic characteristics			
Age	35.69	35.29	
Indicator: female	0.42	0.43	
Indicator: white	0.56	0.58	
Indicator: African American	0.14	0.14	
Indicator: Hispanic	0.25	0.24	
Indicator: Asian	0.03	0.02	
Indicator: married	0.46	0.41	***
Indicator: separated or divorced	0.12	0.14	*
Indicator: does not have kids under age 18	0.58	0.59	
Education			
Indicator: less than high school	0.19	0.16	**
Indicator: high-school graduate	0.34	0.35	
Indicator: some college	0.34	0.37	
Indicator: college graduate	0.11	0.10	
Indicator: graduate degree	0.03	0.03	
Labor status (previous job)			
Union membership	0.04	0.04	
Log of hourly wage	2.82	2.89	
Job tenure in months	32.56	28.39	**
State-level variable			
Monthly unemployment rate	9.58	8.94	***
Number of weeks of unemployment benefits	75.16	80.10	***
Number of observations	2,206	2,104	

Notes: (1) Weighted estimates from the 2008 SIPP panel, using data from September 2008 to March 2012.
(2) ***, **, and * indicate that means differ in a two-tailed t-test between the first column and the second column, with statistical significance of 1 percent, 5 percent, and 10 percent, respectively.

Table 2. Regression Results: Effects of the ARRA Subsidy on Health Insurance Outcomes

	Employer coverage in own name	Any coverage	Employer dependent coverage	Non-group insurance	Government -provided
no control variables included	0.056**	0.040	-0.014	-0.021**	0.020
	(0.024)	(0.026)	(0.021)	(0.009)	(0.018)
demographic and socioeconomic characteristics added	0.054**	0.042*	-0.003	-0.023**	0.016
	(0.024)	(0.024)	(0.020)	(0.009)	(0.017)
job characteristics further added	0.052**	0.044*	-0.003	-0.023**	0.019
	(0.024)	(0.025)	(0.020)	(0.009)	(0.017)
time FEs, state FEs, and state monthly unemployment rate added	0.054**	0.044*	-0.002	-0.022**	0.015
	(0.023)	(0.025)	(0.019)	(0.010)	(0.017)
<u>Dependent Variable Means</u>					
Treatment group, null period	0.439	0.623	0.097	0.043	0.035
Control group, null period	0.038	0.491	0.240	0.034	0.173
Treatment group, subsidy period	0.490	0.645	0.077	0.031	0.037
Control group, subsidy period	0.032	0.475	0.238	0.043	0.153
<u>COBRA coverage</u>					
Treatment group, null period	0.221				
Treatment group, subsidy period	0.251				
N	6,814	6,814	6,814	6,814	6,814

Notes: (1) Weighted estimates from the 2008 SIPP panel, using data from September 2008 to March 2012.
(2) The first four sets of rows contain the coefficient from an interaction of the subsidy period dummy and the treatment group dummy, with standard errors in parentheses. Each set of rows corresponds to a different regression that includes a different set of control variables described above.
(3) Dependent variables— column 1: indicator variable that equals 1 if the individual is covered by employer (including COBRA coverage) in own name and 0 otherwise; column 2: indicator variable that equals 1 if the individual is covered by health insurance from any source and 0 otherwise; column 3: indicator variable that equals 1 if the individual is covered by an employer as a dependent and 0 otherwise; column 4: indicator variable that equals 1 if the individual is covered by non-group private insurance and 0 otherwise; and column 5: indicator variable that equals 1 if the individual is covered by government-provided insurance and 0 otherwise.
(4) Superscripted notation next to the coefficient indicates the level of statistical significance from a two-tailed t-test. ***1-percent level, ** 5-percent level, and * 10-percent level.
(5) Standard errors are block-bootstrapped, clustered at the year-month level and are based on 1,000 resamples.
(6) Demographic and socioeconomic control variables are gender, age, age squared, race/ethnicity variables, marital status variables, an indicator for having children, and education variables. Job characteristics are occupation dummies, industry dummies, job tenure, log of hourly wages, and union status of the previous wave. State-level characteristics are monthly unemployment rate and the number of weeks of unemployment benefits available at the time of job loss in a particular state. State fixed effects and year and quarter fixed effects are included.

Table 3. Effects of the ARRA Subsidy on Own-Name Employer Coverage, by Subgroup

Current Family Income	Less than 138% FPL	138% FPL or more, less than 400% FPL	400% FPL or more
Subsidy effect	-0.002	0.061**	0.168***
	(0.043)	(0.029)	(0.052)
Mean of COBRA coverage among the treatment group, no subsidy period	0.181	0.227	0.243
N	2,531	2,629	1,654
Health Status	"Excellent"	Less than "Excellent"	
Subsidy effect	-0.019	0.059**	
	(0.048)	(0.027)	
Mean of COBRA coverage among the treatment group, no subsidy period	0.1980	0.230	
N	1,392	4,679	

Notes: (1) Each set of rows contains the coefficient from an interaction of the dummy variable for the subsidy period and the dummy variable for the treatment group, with standard errors in parentheses.
(2) Dependent variable is an indicator variable that equals 1 if the individual is covered in own name by employer insurance and 0 otherwise;
(3) Other regressors are the same as those in the fourth set of rows in Table 2.
(4) Standard errors are clustered at the year-month level.
(5) Individuals are of less-than-excellent health if their self-reported health status is very good, good, fair, or poor. Information on self-reported health is obtained from SIPP's Wave 4 Topical Module.
(6) See Notes (1), (4) and (6) under Table 2.

Appendix

Table A1. Industry Categories

Sector	Description
11, 21	Agriculture, Forestry, Fishing, and Hunting; Mining, Quarrying, and Oil and Gas Extraction
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52, 55	Finance and Insurance; Management of Companies and Enterprises
53	Real Estate and Rental and Leasing
54	Professional, Scientific, and Technical Services
56	Administrative and Support and Waste Management and Remediation Services
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services (except Public Administration)
92, 22	Public Administration; Utilities

Note: Categories are based on the 2007 North American Industry Classification System (NAICS) 2-digit codes. The numbers of individuals who were in the following three categories are small in our sample: "Mining, Quarrying, and Oil and Gas Extraction;" "Utilities;" and "Management of Companies and Enterprises". We merge each of them respectively with "Agriculture, Forestry, Fishing, and Hunting," "Public Administration," and "Finance and Insurance," respectively, based on similarity in characteristics and mean hourly wage.

Table A2. Occupation Categories

SOC High-level aggregation	Title
1	Management, Business, Science, and Arts Occupations
2	Service Occupations
3	Sales and Office Occupations
4	Natural Resources, Construction, and Maintenance Occupations
5	Production, Transportation, and Material Moving Occupations

Note: Categories are based on the "high-level aggregation to 6 groups" in the 2010 Standard Occupational Classification (SOC) developed by the Department of Labor. One of the six groups, "Military Specific Occupations," is not included because the SIPP data does not include those who live in military barracks.

Table A3. Test for Equality of Trends between Treatment and Control Groups, Health Insurance Outcomes, Period Absent Subsidy

	Employer coverage in own name	Any coverage	Employer dependent coverage	Non-group insurance	Government -provided insurance
Using the period with no subsidy from the 2008 panel					
Interaction of time trend and a dummy	-0.001	-0.003	-0.002	0.0002	-0.0004
variable for treatment group	(0.004)	(0.004)	(0.004)	(0.001)	(0.001)
N	3,219	3,219	3,219	3,219	3,219
Using the 2004 panel					
Interaction of time trend and a dummy	0.002	0.003	-0.0001	-0.0005	0.0013
variable for treatment group	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
N	3,119	3,119	3,119	3,119	3,119

Notes: (1) Weighted estimates for the period absent subsidy during the 2008 panel (first set of rows) and for entire 2004 panel (the period from January 2004 to December 2007) (second set of rows).
(2) We regress our outcome variable on a linear time trend (in months), an interaction of the time trend and a dummy variable for the treatment group, and all other explanatory variables included in our main specification shown in the fourth set of rows in Table 2. The coefficient reported is from the interaction of the time trend and the treatment group, which shows whether there was a different trend for the control vs. the treatment group in the period absent subsidy.
(4) See Notes (3)-(6) under Table 2.

Table A4. Alternative Specifications: Effects of the ARRA Subsidy on Own-Name Employer Coverage

	Main specification	Use COBRA coverage as an outcome for the treatment group	Use ESI control group	Single Difference
Coefficient estimate	0.054**	0.049**	0.042**	0.039**
	(0.026)	(0.024)	(0.021)	(0.020)
Percentage change	24.5%	22.1%	19.1%	17.8%
Elasticity estimate	-0.38	-0.34	-0.29	-0.27
N	6,814	6,814	7,267	2,504

Notes: (1) The first set of rows contain: columns 1-3: the coefficient from an interaction of the subsidy period dummy and the treatment group dummy, with standard errors in parentheses; and column 4: the coefficient from the subsidy period dummy, with standard errors in parenthesis. (2) Dependent variables— column 1: indicator variable that equals 1 if the individual is covered by employer (including COBRA coverage) in own name and 0 otherwise; columns 2 and 3: indicator variable that equals 1 if the individual in the treatment group is covered by COBRA in own name or the individual in the control group is covered by employer coverage in own name and 0 otherwise; and column 4: indicator variable that equals 1 if the individual is covered by COBRA in own name and 0 otherwise. (3) Control variables included are the same as those listed in Note (6) under Table 2 (except that time fixed effects are not included in column 4). (4) See Notes (1), (3)-(5) under Table 2.