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Health insurance reform and part-time work: Evidence from Massachusetts☆

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HIGHLIGHTS

- We study the effect of the employer mandate in the Massachusetts health insurance reform on part-time work.
- We use a difference-in-differences strategy with CPS data.
- We find that the employer mandate increased part-time employment among workers without a college degree.
- Our results suggest lower-skilled workers may be vulnerable to having their hours to avoid mandates.

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ABSTRACT

A concern with requiring employers to provide health insurance to full-time employees is that employers may increase their use of part-time workers to circumvent the mandate. In this paper, we study the effect of the employer mandate in the Massachusetts health insurance reform on part-time work using a difference-in-differences strategy that compares changes in part-time work in Massachusetts after the reform to changes in various control groups. We find strong evidence that the Massachusetts employer mandate increased part-time employment among low-educated workers and some evidence that it increased part-time employment among younger workers. Our estimate of a 1.7 percentage point increase in part-time employment among workers without a college degree suggests that lower-skilled workers may be vulnerable to having their hours cut so that employers do not have to offer them health insurance.

1. Introduction

Because employer-sponsored health insurance represents an important component of compensation, the employer mandate of the Patient Protection and Affordable Care Act (ACA) presents an opportunity to significantly improve compensation, particularly for low-wage workers. However, there are fears that health insurance reform could backfire if employers seek ways to circumvent the mandate by altering staffing arrangements. As the implementation of the employer mandate was delayed until January 1, 2015 for employers with 100 or more full-time employees and until 2016 for employers with 50 to 99 full-time employees (Kennedy, 2014), evidence on its effect on part-time work is limited.

In 2006, Massachusetts passed a health insurance reform similar to the ACA along most dimensions. The similarities mean that evidence on its effect may provide insights into the effect of health insurance reforms more broadly. Beginning in 2007, the Massachusetts reform required employers with more than ten full-time equivalent employees to provide coverage to all employees who worked at least 35 h per week (McDonough et al., 2006). In this paper, we study the effects of the Massachusetts health insurance reform on the incidence of part-time work by drawing on 2000 to 2013 monthly Current Population Surveys (CPS) and implementing a difference-in-differences strategy that compares how part-time work changed in Massachusetts after the reform compared to how it changed relative to the rest of the nation. To ensure that we are not picking up spurious relationships, we implement various placebo tests and consider the robustness of the results to a variety of control groups. Because an employer mandate can affect different groups of people differently, we test for various sources of heterogeneity.

Our work contributes to a small literature about the employment effects of early state-level health insurance reforms. Kolstad and

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Kowalski (2012a) study the effect of Massachusetts' employer mandate on wages and find that employers complying with the law reduced wages by an average of $6058 annually. Although this result does not preclude some employers from trying to avoid offering health insurance by increasing their use of part-time work, Dubay et al. (2012) compare trends in part-time employment in Massachusetts with those in several comparison states and do not find sizable differences in growth after the reform. This result contrasts with Buchmueller et al. (2011), who find that Hawaii's 1974 employer mandate produced a modest shift by employers towards (exempt) part-time work (approximately 1.4 percentage points).

Our difference-in-differences analysis does not yield evidence of an effect of the Massachusetts reform on the incidence of part-time work for all Massachusetts workers. Despite finding no evidence of an overall effect, we find evidence that there were modest increases in part-time employment among workers without a college degree following health insurance reform in Massachusetts. We find suggestive evidence that young workers might have experienced a decrease in part-time work as well. The result for workers without a college degree is robust to a variety of control groups and to different ways of accounting for the Great Recession.

We contribute to the literature on the labor market effects of health insurance reform by studying the effects of the Massachusetts reform on part-time work using regression analysis that allows us to control for confounding factors. More importantly, there are reasons to think that any effects on part-time work will be concentrated among low-skilled workers. Unlike prior research, our work examines heterogeneity, which can be masked when considering average effects. These results imply that while the increase in part-time work from health insurance reform may not be dramatic for the overall population, employers may shift those with low skills—who could potentially benefit the most from employer-provided health insurance coverage—to part-time work.

The remainder of the paper is organized as follows. Section 2 provides background on the Massachusetts health insurance reform, discusses theory on the effects of employer mandates, and reviews research on the early effects of the ACA. Section 3 discusses how we construct our CPS sample and our difference-in-differences strategy. Section 4 presents the results, and Section 5 concludes.

2. Background

2.1. The Massachusetts health insurance reform

The goal of the Massachusetts health insurance reform was to attain nearly universal coverage by expanding Medicaid, subsidizing insurance purchased through the individual market, and mandating that individuals purchase coverage and employers provide it. Employers who did not offer affordable coverage by July 2007 had to pay a penalty of $295 per employee in October 2007.[1] As of July 2006, Medicaid was expanded to cover children with family incomes up to 300% of the federal poverty level, and enrollment caps for certain Medicaid programs were raised. As of April 2007, individuals without employer-sponsored health insurance or Medicaid could purchase coverage through an online marketplace created by the reform. With few exceptions, the Massachusetts law required individuals to have health insurance as of July 1, 2007 or pay a penalty. Research has found that the Massachusetts health insurance reform increased overall health insurance coverage in Massachusetts by around 5.5 percentage points with about half of this increase coming from increases in employer-sponsored health insurance and half coming from Medicaid (Kolstad and Kowalski, 2012b and Long, 2008).

2.2. The potential employment effect of employer mandates

Employers can react in a variety of ways to a mandate requiring them to provide health insurance. One way is by providing health insurance to employees and directly absorbing the costs. However, Summers (1989) argues that in competitive markets employers will pass on the costs of mandated benefit to employees through lower wages or other forms of reduced compensation if employees value the benefits. In practice, even if employees fully value the benefit, employers' ability to shift its costs onto workers in the form of lower wages may be constrained by minimum wages or union contracts. In addition, in periods of low inflation such as currently exists, employers may need to cut nominal wages in order to reduce real wages to cover the benefit cost, which can have significant adverse consequences for worker morale and productivity.

Alternatively, employers may seek to reduce the number of workers subject to the mandate by implementing changes in the way they staff, which is the focus of this paper. Employers may increase hours of some full-time employees and reduce hours worked below the 35-hour threshold for others. As theory provides no clean predictions of the employment effects of the mandated health insurance benefit, how employers respond is an empirical question.[2]

2.3. Research on early effects of the ACA

In addition to the literature on the employment effects of state-level health insurance reforms, other papers present early evidence of the ACA by using various strategies to deal with the fact that the ACA is a national law. Mulligan (2014) analyzes the subsidy formula and concludes that the subsidies could result in millions of workers having more disposable income from a part-time schedule rather than a full-time schedule. Nakajima and Tuzemen (2015) construct an equilibrium model to study the possible effects of the ACA on part-time employment. Their model predicts a small negative effect on total hours worked of about 0.36%. Two papers consider early evidence from the ACA using CPS data. Mathur et al. (2015) find some evidence of a shift from the 31–35 hour category into the 25–29 hour category after the passage of ACA in March 2010. But as that shift is not more pronounced among low-wage workers or among workers in industries and occupations most likely to be affected by the mandate, they conclude that there is little evidence that the ACA has led to an increase in part-time employment. In contrast to Mathur, Slovav, and Strain, Even and Macpherson (2015) find that part-time work has risen in industries and occupations most affected by the mandate. Thus, estimates of the early effects of the ACA are inconclusive. Studying the Massachusetts health insurance reform has the advantage that it was implemented in 2007, and so analysis of the reform's longer-term effects on part-time employment is possible.

3. Data and empirical strategy

To examine changes in part-time work after the Massachusetts health insurance reform, we draw on monthly data from the CPS. The CPS is the Bureau of Labor Statistics' monthly household survey that collects demographic and labor force participation information on individuals in about 60,000 U.S. households. The CPS sampling design

[1] Insurance offered by employers was considered affordable if employers offered to pay at least 33% of the premium cost or at least 25% of full-time employees were enrolled in the plan. The vast majority of employers complied with the law. In 2010, 4.6% of employers who were required to provide coverage were penalized for noncompliance (Goodnough, 2012). Massachusetts's employer mandate was repealed in 2013 in response to the upcoming federal employer mandate.

[2] Employers also may hire temporary workers, outsource tasks to small contract companies, and reduce their firm size so that they are not subject to the mandate. For a thorough review of the many possible ways firms may react to a mandate, refer to Schultz and Doorn (2009).

includes a household for four consecutive months, excludes the household for eight months, and then includes the household for another four months.

We draw on the demographic information collected in the CPS as well as information on employment outcomes. To create the part-time variable used in the analysis, we focus on usual hours worked at the main job. Part-time employment is coded to follow the definition set by the Massachusetts health insurance reform—people working less than 35 h—but we also consider several different hours categories to provide a more complete picture of changes in hours worked after health insurance reform.

We restrict the sample to include civilians ages 18 to 64 from 2000 to 2013. As in Buchmueller et al. (2011), we only include people who report how many hours they usually work in the main job. We do not include workers with variable hours in the sample since we need precise information on hours worked at the primary job. We also exclude from the sample anyone with imputed hours and anyone who is self-employed.[3] Refer to Appendix 1 for a more thorough discussion of the sample and variables used for the analysis.

Table 1 compares characteristics of our sample of Massachusetts workers to workers in the rest of the nation. As with all of the estimates presented in the paper, the descriptive statistics are weighted using the CPS weights. A notable difference is that Massachusetts residents have a higher average education than those in the rest of the nation. While 44% of Massachusetts residents have a college degree, only 31% of the rest of the nation does.

A challenge in studying the Massachusetts reform is that the Great Recession began soon after the reform was passed. Fig. 1, which shows unemployment rates in Massachusetts and the rest of the nation, suggests that the recession's effects were less severe in Massachusetts than in the country as a whole. A failure to account for economic conditions in the estimation strategy would confound the consequences of less severe recession in Massachusetts with the effects of health insurance reform. For this reason, in addition to including time fixed effects, we control for the monthly state unemployment rate in all regressions using data from the Local Area Unemployment Statistics published by the U.S. Bureau of Labor Statistics.[4] Because the unemployment rate is endogenous with the employment rate, we also restrict the sample to employed individuals. In other words, we estimate the effect of the Massachusetts reform on the mix of full-time and part-time employees, conditional on employment.

Another potential concern is that the recession affected some industries more than others; therefore, we also include controls for broad industry and occupations to account for the possibility of shifts towards industries and occupations with higher part-time prevalence.[5] The industry and occupation codes we use are shown in Appendix 1. To calculate changes in part-time work after Massachusetts's health insurance reform, we estimate the following equation:

$$y_{ist} = \gamma_t + \phi_s + \alpha X_{ist} + unemployment_{st}\lambda + implementation_t * MA_s\theta + reform_t * MA_s\beta + \epsilon_{ist}, \quad (1)$$

where t indexes the year and month of the observation, s indexes the state, i indexes the individual, y is an indicator for the individual working part-time, γ is a vector of time fixed effects, ϕ is a vector of state fixed effects, X is a vector of individual controls that includes years of education, age, sex, race, occupation, and industry, *unemployment* is the unemployment rate in state s and month t, *implementation* is an indicator for the individual being observed from July of 2006 to June of 2007, *reform* is an indicator for the individual being observed in July of 2007 or later, and *MA* is an indicator for the individual being a Massachusetts resident. The β coefficient captures how, conditional on being employed, the likelihood of working part-time changed for Massachusetts after the reform compared to how it changed for the control group.

To adjust for the fact that the basic monthly CPS interviews the same person up to eight times, we cluster standard errors at the individual level.[6] We choose this level of clustering to be conservative.[7] But as there are concerns about understating standard errors when there are few treated states, we also assess statistical significance based on a series of placebo estimates following Buchmueller et al. (2011), who assess the statistical significance of their estimates of the effects of Hawaii's 1974 health insurance reform by comparing the Hawaii estimate to the distribution of a series of placebo estimates. To generate the placebo estimates, we re-estimate Eq. (1) but set the *implementation* and *reform* variables equal to 1 for each state and Washington, DC separately. This procedure gives us 50 placebo estimates of β. We would be concerned about our ability to estimate an effect of the Massachusetts reform if many of the placebo estimates were similar in magnitude to the Massachusetts estimates. For each positive estimate of the effect of the Massachusetts reform, we report the percentage of placebo estimates larger than the Massachusetts estimate. For each negative estimate, we report the percentage of placebo estimates smaller than the Massachusetts estimate.

There are reasons to believe employers may have more of an incentive to adjust hours for lower skilled workers than they do for higher skilled workers. As explained above, because of the minimum wage, employers may be constrained in their ability to reduce wages of low-paid workers. Employers may also have more of an incentive to change the part-time status of low-paid workers because providing

Table 1
Descriptive statistics.

	Massachusetts		Rest of U.S.	
	Mean	St. Dev	Mean	St. Dev
Male	0.50	0.50	0.52	0.50
Black	0.07	0.25	0.12	0.33
White	0.88	0.33	0.81	0.39
Hispanic	0.07	0.25	0.14	0.35
Age	40.09	12.13	39.58	12.14
College	0.44	0.50	0.31	0.46
High school	0.94	0.24	0.91	0.29
Part-time	0.19	0.39	0.15	0.36
Works more than 40 h per week	0.20	0.40	0.19	0.39
Works 35 to 40 h per week	0.61	0.49	0.66	0.48
Works 30 to 34 h per week	0.06	0.23	0.05	0.21
Works 15 to 30 h per week	0.11	0.31	0.09	0.28
Works less than 15 h per week	0.03	0.17	0.02	0.14

NOTE: The sample comes from the 2000 to 2013 basic monthly CPS and includes all wage and salary workers ages 18–64 except individuals with imputed or variable hours of work. All tabulations are weighted using CPS weights. The sample has 156,275 individuals from Massachusetts and 8,185,116 individuals from the rest of the United States.

[3] We do not include observations with imputed values for hours because the Census imputation procedure may introduce bias in our results. Despite concerns about imputed values, we obtain similar results if we keep observations with imputed values and the self-employed. We discuss imputed values in more detail in Appendix 1.

[4] We have tested the robustness of the results to controlling for unemployment in a variety of ways, such has including unemployment squared and controlling for separate unemployment rates by educational attainment. Results are similar in these alternate specifications.

[5] The CPS changed occupation and industry codes in 2004. We deal with these coding changes by creating separate indicator variables for pre-2004 and post-2003 for each industry and occupation. The point estimates are nearly identical when we restrict the sample to include only years after 2003 so that we can include consistent controls.

[6] Statistical inference is not straightforward when applying a difference-in-differences strategy to study the policy change of only one state. Bertrand et al. (2004) demonstrate how serial correlation can lead to drastically understated standard errors of the difference-in-differences estimator if not taken into account. They suggest accounting for serial correlation by clustering standard errors, but other research shows that clustering standard errors when there are few treated clusters can exacerbate the downward bias in estimates of the standard errors (Conley and Taber, 2013 and Buchmueller et al., 2011).

[7] Other research on the Massachusetts reform has often clustered standard errors at the state or state-year level. When we calculate standard errors in either of these ways, our standard errors become much smaller but the null hypothesis of no effect is rejected for a greater share of placebo laws as well.

Fig. 1. Unemployment in Massachusetts compared to the rest of the nation. NOTE: The data come from the U.S. Bureau of Labor Statistics. The shaded regions indicate recessions, according to the Business Cycle Dating Committee of the National Bureau of Economic Research.

lower-wage workers with health insurance would represent a larger percentage change in their overall compensation than it would for higher wage workers. Finally, higher wage workers are more likely to have health insurance even before the reform, since overall compensation is correlated with health insurance. In the year before Massachusetts underwent reform, 68% of people working 35 h or more per week with college degrees had insurance through their own employers according to the March CPS, while only 51% without college degrees had insurance through their own employers. Similarly, 51% of people under the age of 35 had insurance through their own employers, while 64% of people 35 and older had insurance through their own employers. These numbers suggest the potential for a larger effect on the hours of lower educated and younger workers. For these reasons, we show results for different education levels and ages separately in addition to showing estimates of Eq. (1) for the full sample. We also show separate estimates for men and women.

4. Empirical evidence of the effect of the Massachusetts health insurance reform on part-time work

Table 2 displays the estimates of the effect of the Massachusetts reform from Eq. (1). In Panel A, the dependent variable equals one if the worker works less than 35 h per week and zero otherwise. The point estimate of the effect of the Massachusetts reform on the likelihood of working part-time is 0.4 percentage points for the whole sample. The estimate is not statistically significant, and eleven placebo estimates are larger than the point estimate. In columns 2 and 3, we run separate regressions based on workers' education levels. We find that workers without a college degree are 1.7 percentage points more likely to work part-time hours in Massachusetts after the reform, which represents an 8.0% increase in part-time work for those without a college degree. The estimate for Massachusetts is larger than all but one of the placebo estimates. We find no evidence that employees with a college degree experience an effect of health insurance reform on the likelihood that they work part-time hours. The estimates for male and female employees are not statistically different from each other, from the estimates for the full sample, or from zero. In columns 6 and 7, we run separate regressions for workers under the age of 35 and for workers 35 or older. We find weak evidence that workers younger than the age of 35 may experience an increase in part-time work. The estimate of 1.1 percentage points is significant at the ten-percent level, but six placebo estimates are larger than it.

In Panels B–F, we test for changes in the distribution of hours worked by setting the dependent variables to be indicator variables for different levels of hours. Panel B examines how the likelihood of working more than 40 h per week changes after Massachusetts's health insurance reform. All estimates are statistically indistinguishable from zero. Panel C considers how the likelihood of working just above the threshold changes. Workers without college degrees are 1.3 percentage points less likely to be working 35 to 40 h, though several placebo estimates are larger in absolute value than the Massachusetts estimate. This estimate provides suggestive evidence that the decrease in full-time work largely came from workers near the threshold. The estimate for workers under the age of 35 of −0.016 indicates that young workers near the threshold may also have been shifted to part-time work.

Panel D considers the possibility that workers are shifted to just below the threshold. We find no evidence of an increase in workers working 30 to 34 h per week. Panel E considers how the likelihood of working 15 to 29 h per week changes after the reform and provides evidence that the bulk of the increase in part-time work for workers without a college degree comes from an increase in the likelihood of working 15 to 29 h, which suggests that employers are not necessarily restricting hours to just below the threshold. In Panel F, we display evidence that the likelihood of working up to 15 h also increases for those without a college degree as well as for workers under the age of 35.

A health insurance mandate also may increase hours among full-time workers. As the employer health insurance premium represents a fixed cost per worker, employers may wish to increase hours among full-time employees to reduce the number hired who are eligible for health insurance. Similarly, employers who shift some workers to part-time work may need their full-time employees to work more hours to compensate. In Panel G, we estimate the effect of the reform on hours worked conditional on workers working at least 35 h. We do not find evidence that the reform changed hours for full-time workers for any of the samples.[8] One possible explanation for this null result is that employers may be reluctant to increase hours above 40 since they would have to pay overtime rates.

In Tables 3 and 4, we consider the sensitivity of the estimates of the effect of the Massachusetts reform on working less than 35 h per week. Although we present estimates for all samples, we focus the discussion on workers without a college degree since they were the ones for whom we found the strongest evidence of an effect of the Massachusetts reform. Table 3 considers the robustness of the results to different control groups. In Panel A, we restrict the sample to include only New England states. If New England experienced a regional shock that coincided with

[8] We urge caution with the results that condition on working full-time because any increase in part-time work changes the sample of full-time workers.

Table 2
The effect of the Massachusetts reform on hours worked.

	Full sample	Bachelor degree	No bachelor degree	Men	Women	Age less than 35	Age 35 or older
Panel A: works less than 35 h per week							
Estimate	0.004	−0.002	0.017***	0.004	0.004	0.011*	0.002
S.E.	(0.004)	(0.005)	(0.006)	(0.004)	(0.007)	(0.007)	(0.005)
Percent of placebo estimates larger/smaller than the Massachusetts estimate	22%	42%	2%	20%	34%	12%	32%
Panel B: works more than 40 h per week							
Estimate	−0.002	0.002	−0.004	−0.004	−0.001	0.005	−0.006
S.E.	(0.004)	(0.007)	(0.004)	(0.006)	(0.004)	(0.006)	(0.005)
Percent of placebo estimates larger/smaller than the Massachusetts estimate	32%	50%	30%	32%	34%	40%	22%
Panel C: works 35 to 40 h per week							
Estimate	−0.002	0.000	−0.013**	0.001	−0.003	−0.016**	0.004
S.E.	(0.005)	(0.008)	(0.006)	(0.007)	(0.007)	(0.008)	(0.006)
Percent of placebo estimates larger/smaller than the Massachusetts estimate	50%	52%	16%	42%	42%	6%	32%
Panel D: works 30 to 34 h per week							
Estimate	0.000	0.002	0.000	−0.002	0.002	0.001	0.000
S.E.	(0.002)	(0.003)	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)
Percent of placebo estimates larger/smaller than the Massachusetts estimate	52%	18%	48%	22%	36%	40%	34%
Panel E: works 15 to 29 h per week							
Estimate	0.001	−0.004	0.010**	0.003	−0.001	0.001	0.002
S.E.	(0.003)	(0.004)	(0.005)	(0.003)	(0.005)	(0.005)	(0.004)
Percent of placebo estimates larger/smaller than the Massachusetts estimate	30%	82%	4%	18%	52%	36%	22%
Panel F: works less than 15 h per week							
Estimate	0.003*	0.000	0.008***	0.003*	0.003	0.009***	0.000
S.E.	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Percent of placebo estimates larger/smaller than the Massachusetts estimate	10%	44%	0%	2%	18%	0%	50%
Panel G: hours conditional on working full time							
Estimate	−0.050	−0.022	−0.079	−0.065	−0.025	0.073	−0.104
S.E.	(0.075)	(0.131)	(0.080)	(0.111)	(0.096)	(0.124)	(0.092)
Percent of placebo estimates larger/smaller than the Massachusetts estimate	30%	48%	28%	38%	44%	34%	26%

NOTE: *, **, and *** indicate significance at 10%, 5%, and 1% respectively. Each cell is the coefficient on the Massachusetts reform from a separate regression of Eq. (1) that controls for state, sex, race, education, age, the unemployment rate, industry, occupation, and the year-month of the observation. The data come from the 2000 to 2013 monthly CPS, and all regressions are weighted using CPS weights. The sample includes wage and salaried employees ages 18–64, excluding those with imputed and variable hours of work. In Panels A through F, the sample sizes are for each column are 8,341,391; 2,652,538; 5,688,853; 4,192,918; 4,148,473; 2,952,536; and 5,388,855. In Panel G, the sample sizes for each column are 7,031,881; 2,357,554; 4,674,327; 3,825,116; 3,206,765; 2,308,258; and 4,723,623.

the Massachusetts health insurance reform, restricting the control group to the rest of New England would cause the results to fall to zero. With this alternative control group, the coefficient on the Massachusetts reform rises in absolute value for employees without a college degree but is similar to the original estimate. In Panel B, we include workers from New York, Pennsylvania, and New Jersey in the regression so that the control group now consists of the Northeast states. With this new control group, the point estimate rises to 2.6 percentage points for the subsample without a college degree, providing more evidence that regional trends towards part-time employment are not driving the results.

Next, we construct a synthetic control group for Massachusetts using the method described in Abadie et al. (2010). The synthetic control method produces for all non-treatment states a set of weights that minimizes the difference between the pre-intervention outcome and predictors in the treated state and the pre-intervention outcome and predictors in the weighted average of non-treatment states. As implementing the synthetic control method requires that each state-year combination have only one observation, we first collapse the data to the state-by-year level by taking means of key variables. We then select the combination of states that most closely matches Massachusetts from January 2000 to June 2006 based on the following variables: the percentage of the sample working part-time; the percentage of the sample that is male, the percentage of the sample that is black, white, and Hispanic; the percentage of the sample that has completed college; the average age of workers in the state; and the annual state unemployment rate. Following the Fitzpatrick (2008) and Courtemanche and Zapata (2014), we then multiply the weights from the synthetic control method by the CPS weights to adapt the synthetic control strategy to individual-level data and account for the sampling design of the CPS.[9] Finally, we re-estimate Eq. (1) with these new weights. The weights provided as the synthetic control for Massachusetts are shown in Appendix 2.

We first implement the synthetic control method separately for each subsample so that the synthetic control method matches outcomes and characteristics for the subsample.[10] The results are shown in the Panel C of Table 3 and provide corroborating evidence that workers without a college degree were more likely to work part-time hours after the Massachusetts health insurance reform. The estimated effect of the Massachusetts reform on the incidence of part-time employment among workers without a college education is 2.5 percentage points in this specification, which is larger but not statistically different than the estimate from the original specification.

[9] We implement the synthetic control method and obtain the weights for the synthetic Massachusetts using the Stata module "synth" (Abadie et al., 2011).

[10] When implementing the synthetic control method for the samples split by education status, we do not include the percentage of the sample with a college degree to help determine the synthetic control. Similarly, when implementing the synthetic control method for the samples split by sex, we do not include the percentage of the sample that is male to help determine the synthetic control.

Table 3
Robustness tests—alternative control groups.

	Full sample	Bachelor degree	No bachelor degree	Men	Women	Age less than 35	Age 35 or older
Panel A: New England control group							
Estimate	0.009**	0.000	0.020***	0.006	0.011	0.008	0.010*
S.E.	(0.004)	(0.006)	(0.006)	(0.004)	(0.007)	(0.007)	(0.005)
n	902,569	332,779	569,790	440,619	461,950	283,367	619,202
Panel B: Northeast control group							
Estimate	0.014***	0.003	0.026***	0.008*	0.018***	0.017**	0.012**
S.E.	(0.004)	(0.006)	(0.006)	(0.004)	(0.007)	(0.007)	(0.005)
n	1,752,725	633,736	1,118,989	865,449	887,276	566,371	1,186,354
Panel C: synthetic control group (separate control states)							
Estimate	0.008	0.000	0.025***	0.002	0.007	0.009	0.005
S.E.	(0.006)	(0.006)	(0.006)	(0.004)	(0.009)	(0.008)	(0.006)
n	569,725	2,652,538	418,929	404,409	227,774	270,552	306,109
Panel D: synthetic control group (uniform control states)							
Estimate	0.008	−0.001	0.014*	0.005	0.013	0.011	0.007
S.E.	(0.006)	(0.008)	(0.008)	(0.006)	(0.010)	(0.010)	(0.007)
n	569,725	248,527	321,198	276,482	293,243	195,205	374,520

NOTE: *, **, and *** indicate significance at 10%, 5%, and 1% respectively. Each cell is the coefficient on the Massachusetts reform from a separate regression of Eq. (1) that controls for state, sex, race, education, age, the unemployment rate, industry, occupation, and the year-month of the observation. The data come from the 2000 to 2013 monthly CPS, and all regressions are weighted using CPS weights. The sample includes wage and salaried employees ages 18–64, excluding those with imputed and variable hours of work.

Implementing the synthetic control separately for each subsample is appealing because the control groups consist of states that have trends in part-time work that are parallel to the corresponding Massachusetts subsample. But as many states are given zero weight from the synthetic control method, the control states change for each sample, which can make comparisons across estimates difficult. In Panel D, we use the weights for the synthetic control group for the full sample for each subsample.

The estimated effect of the Massachusetts health insurance reform for people without a college degree is 1.4 percentage points and is significant at the ten-percent level. The results from using different control groups support the finding that Massachusetts workers with low education are more likely to work part-time after the reform. Panel A of Table 2 displays weaker evidence of an increase in part-time work for workers under the age of 35. The point estimates for these alternative control groups are not substantially different from the estimate in Panel A, but in three out of four cases, we cannot reject that they are significantly different from zero at conventional levels.

Another possible concern with these results is that controlling for unemployment and only focusing on the employed may not be sufficient to fully account for the recession. The first two panels in Table 4 consider the robustness to accounting for the recession in different ways. In Panel A, we estimate models that include an indicator variable for recession months interacted with Massachusetts. For the recession dates, we follow the National Bureau of Economic Research dates of December 2007 to July 2009 and March 2001 to November 2001. These new recession-Massachusetts interactions mean that the effect of the Massachusetts health insurance reform is identified only from non-recession, post-reform variation. The estimate for non-college-educated workers shown in Panel A is again similar to the main estimate. In Panel B, we include non-working people and no longer control for employment. The point estimate falls to 0.8 percentage points but is still significant at the five-percent level and represents a 5.8% increase in part-time employment for Massachusetts residents without a college degree.

We next perform another placebo test by replicating the original analysis using pre-reform data that sets July 2001 as the reform date. If we obtain similar results from placebo regressions that set the reform date to coincide with the previous recession, we would be concerned that the recession and not health insurance reform was causing part-time work to increase for those without a college degree in Massachusetts. For this placebo test we use data from the ten years immediately prior to the Massachusetts reform went into effect (1997 to 2006). The results are shown in Panel C of Table 4. In all cases, the estimates

Table 4
Robustness tests—alternative controls for the Great Recession.

	Full sample	Bachelor degree	No bachelor degree	Men	Women	Age less than 35	Age 35 or older
Panel A: including working with controls for recession							
Estimate	0.004	−0.004	0.020***	0.000	0.007	0.012	0.002
S.E.	(0.004)	(0.006)	(0.006)	(0.004)	(0.007)	(0.007)	(0.005)
n	8,341,391	2,652,538	5,688,853	4,192,918	4,148,473	2,952,536	5,388,855
Panel B: including non-working with controls for recession							
Estimate	0.002	−0.004	0.008**	−0.001	0.003	0.005	0.000
S.E.	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)	(0.005)	(0.004)
n	11,992,348	3,291,755	8,700,593	5,570,007	6,422,341	4,317,137	7,675,211
Panel C: placebo analysis with 1997 to 2006 setting 2002 as the treatment date							
Estimate	0.001	0.006	0.000	0.006	−0.005	−0.008	0.006
S.E.	(0.004)	(0.006)	(0.006)	(0.004)	(0.007)	(0.007)	(0.005)
n	5,882,086	1,709,409	4,172,677	2,970,778	2,911,308	2,167,984	3,714,102

NOTE: *, **, and *** indicate significance at 10%, 5%, and 1% respectively. Each cell is the coefficient on the Massachusetts reform from a separate regression of Eq. (1). All regressions control for state, sex, race, education, age, industry, occupation, and the year-month of the observation. Regressions for Panels A and B also control for Massachusetts-recession interactions. Panels A and C control for the unemployment rate, while Panel B includes non-working people in addition to the employed. The data come from the 2000 to 2013 monthly CPS, and all regressions are weighted using CPS weights. The sample includes wage and salaried employees ages 18–64, excluding those with imputed and variable hours of work.

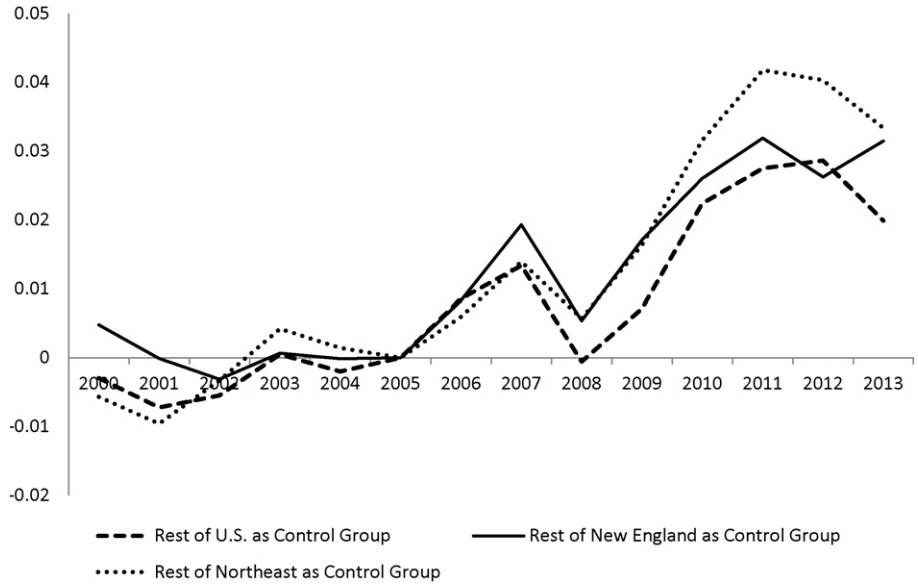

Fig. 2. Part-time work for workers without a college degree in Massachusetts compared to the rest of the nation, Northeast States, and New England. NOTE: The graph displays the coefficient estimates on the Massachusetts-year interactions from three separate regressions of Eq. (2) that control for state, sex, race, education, age, the unemployment rate, industry, occupation, and the month of the observation. The data come from the monthly CPS, and all regressions are weighted using CPS weights. The sample includes wage and salaried workers ages 18–64, excluding those with imputed or variable hours of work.

are statistically indistinguishable from zero. These results provide more evidence that a differential response to recession is not the reason that those without a college degree experience an increase in part-time work after the Massachusetts health insurance reform.

A related concern is that there may have been a pre-existing trend towards more part-time employment among low-educated Massachusetts workers. Even though the synthetic control method chose states with trends similar to Massachusetts, we consider this possibility further by estimating the following equation:

$$y_{ist} = \gamma_t + \phi_s + \alpha X_{ist} + unemployment_{st}\lambda + \sum_{k \in K} mass_s^k \beta_k + \epsilon_{ist}, \qquad (2)$$

where $mass_s^k$ is an indicator variable equal to one in Massachusetts in year k, K is the set of all years in the data other than 2005, and all other variables are defined as in Eq. (1). Each β_k can be interpreted as the difference in the incidence of part-time work between Massachusetts and the rest of the nation for year k, relative to the difference in the 2005 base year, which is zero by construction.[11]

Fig. 2 displays coefficients from three separate regressions that use the rest of the nation, the rest of New England, and the rest of the Northeast as control groups. The difference between part-time work in Massachusetts and all three control groups remains steady until 2006. Coincident with the law being passed in 2006, part-time work began to increase in Massachusetts relative to the rest of the nation, to the rest of New England, and to the rest of the Northeast. The coefficients fall during 2008 and 2009 as all states experienced an increase in part-time work during the Great Recession and then increase again after the trough of the Great Recession. Although disentangling the Great Recession from the Massachusetts reform is difficult, Fig. 2 suggests the Great Recession is not the cause of the increase in low-skilled part-time work for Massachusetts.[12]

[11] The difference in the incidence of part-time employment in Massachusetts relative to the rest of the country in 2005 is captured by the state dummy variables.

[12] In results available upon request, we also test for the effect of the Massachusetts reform on earnings and wages using the Outgoing Rotation Group of the CPS. We find weak evidence that workers without a college degree experience a drop in their weekly earnings. A fall in earnings for people without a college degree would not be surprising since these people are working less, but as Kolstad and Kowalski (2012a) use panel data to study the effect on wages, we believe their framework is better suited to studying the effect of the reform on wages.

5. Conclusion

In this paper, we study the effects of the Massachusetts health insurance reform on part-time work. We find strong evidence that the Massachusetts health reform modestly increased part-time employment among low-educated workers and provide suggestive evidence that young workers also experienced an increase in part-time work. These results indicate that low-skilled workers may be vulnerable to having their hours reduced because of health insurance reform, an unintended effect of the law.

Although analysis in Dubay et al. (2012) that compared trends in part-time employment in Massachusetts with those in several comparison states did not show sizable differences in growth, that study did not separately examine trends among low-educated or low-wage workers, where we believe any impacts would be concentrated. Our estimates are consistent with those of Buchmueller et al. (2011), who find the incidence of part-time work rose for low-skilled workers after Hawaii's health insurance mandate.

Our findings may shed light on the longer-term effects of the employer mandate in the ACA on part-time employment. The ACA and Massachusetts reforms are similar, although the employer mandate in the ACA is arguably stricter, as it imposes higher penalties and a lower hours threshold for part-time work. In addition, employer-sponsored health insurance was already high in Massachusetts, and employers were typically more supportive of the reform. For these reasons, the effects of the ACA employer mandate on part-time employment could be greater than the effects of the Massachusetts reform that we uncover.

Our analysis also underscores the importance of considering differences in the impacts of a mandate across workers. Certain groups, such as low-skilled workers, are more likely to be vulnerable to having their hours reduced. Analysis that only examines aggregate impacts may miss important heterogeneity among groups.

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