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Effects of Health Care Reform on Hospital Staffing Decisions:

Evidence from the Massachusetts Health Care Reform Law

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Author Note:

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Abstract

Previous studies have observed a significant increase in hospital expenditures, but not in hospital employment, as a result of the 2006 Massachusetts Health Care Reform Law. This paper investigates the impact of the Massachusetts health care reform on the salaries and work hours of hospital employees in order to ascertain whether the observed expenditure increase resulted predominantly from employees earning higher salaries, or working longer hours. This research can offer new insights into the supply-side effects of the Massachusetts reform, as well as implications for the effects of health care reform at the national level. A difference-in-differences technique is applied to hospital-level panel data from 2000-2009 to compare changes in the total salaries, total average hourly wages, and total hours of Massachusetts hospitals to those of surrounding states. Changes in the salaries of employees specifically involved in general and intensive care are analyzed as well. I find that the reform increased Massachusetts hospitals' total salaries by 6.2 million dollars, and total average hourly wages by 38 cents, but did not have a significant impact on total hours. Specifically, I find that salaries for hospital employees responsible for general care increased by 2.1 million dollars as a result of the reform, and salaries of intensive care employees increased by 0.78 million dollars. These results suggest that the observed increases in hospital payroll expenditures resulting from the Massachusetts reform stem from a rise in employee salaries or a shift in employment toward higher-paying positions, rather than employees working longer hours.

Keywords: health care reform, Massachusetts, hospital salaries, hospital employment

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The Patient Protection and Affordable Care Act (ACA) that was passed by Congress in 2010 has many important economic implications. As its provisions take effect through 2014, many changes will take place in the health care and health insurance markets. Beginning in 2014, the Health Coverage Requirement portion of the ACA will require that individuals who can afford to do so obtain basic health coverage, or else pay a fee to help offset the costs of caring for uninsured Americans. When the Health Coverage Requirement takes effect, the number of insured individuals will increase, which means that hospitals may expect demand for health care services to increase as well. This expectation of an increase in demand for health care as a result of the ACA will likely impact hospitals' input decisions, which may have important implications for the labor market for medical professionals in terms of employment and salary changes.

It is not yet possible to study the effects of the ACA since the Health Coverage Requirement will not be fully implemented until 2014. Fortunately, the 2006 Massachusetts Health Care Reform Law known as "Chapter 58", which includes many provisions very similar to those of the ACA, provides an excellent opportunity to study the effects of such a policy on a smaller scale. Using a difference-in-differences strategy (Woolridge, 2007) to compare changes in Massachusetts to changes in surrounding states, one can determine the impacts of the Massachusetts health care reform, which can help generate implications for the national reform. One important difference to note between the ACA and the Massachusetts Health Reform Law is that the Massachusetts reform only expanded Medicaid coverage for children with family incomes up to 300% of the federal poverty line (FPL), whereas the national reform expands Medicaid broadly to all individuals under the age of 65 who earn up to 133% of the FPL (The

Henry J. Kaiser Family Foundation, 2012). Given that the Medicaid eligibility expansion that accompanies the Affordable Care Act is far greater than that which accompanied the Massachusetts reform, it is not completely clear how the results of this study translate to the national picture. However, this research can still provide insights that lay the groundwork for future studies, and assist hospitals and policymakers in forming realistic expectations about the impacts of the national reform.

In one such study examining the impacts of the Massachusetts health care reform on hospital inputs, Cozad (2012) found that the reform did not significantly affect the number of hospital employees (p. 16). As Cozad (2012) explains, the fact that the reform did not significantly increase employment suggests that there was no realized change in overall demand for hospital care as a result of the reform (p. 16). However, other findings reported by Cozad (2012) suggest that the health care reform did change various aspects of the nature of care that hospitals provide (p. 18). Developing an understanding of the ways in which the nature of hospital care changes in response to health care reform is important because it can help us better understand the implications of reform at the national level. Cozad (2012) found that the Massachusetts reform decreased the number of annual ambulance trips by 16 percent, which implies a substitution toward scheduled care services and away from more costly emergency care services (p. 18). The findings of Kolstad and Kowalski (2012) corroborate the idea that the reform changed the nature of hospital care; they found that hospital patients' average length of stay decreased by one percent as a result of the Massachusetts reform (p. 27). Additionally, Cozad (2012) found that the reform increased payroll expenditures by 5.38 million dollars (p. 20). The implications of this payroll expenditures increase are the focus of this paper, which examines the impact of the

Massachusetts health care reform on hospitals' total salaries and total hours worked, as well as the salaries of general and intensive care hospital personnel specifically.

While Cozad's (2012) results indicate that hospital employment was not significantly impacted by the reform, her finding that post-reform hospital payroll expenditures did increase significantly suggests that hospital employees are either working longer hours to accommodate more outpatient treatment, or experiencing an increase in wages (p. 20). Analyzing the total salaries and total hours worked for all employees of the hospitals in the data set can give insight into whether rising salaries, longer hours, or some combination of the two, are happening as a result of the health care reform.

If analysis shows that the reform significantly increases total salaries but not total hours, this would suggest that a rise in wages, rather than work hours, is responsible for the observed increase in hospital expenditures resulting from the health care reform. The next goal, then, is to find out whose salaries are increasing. General and intensive care personnel comprise an important segment of hospital employment, so examining the effects of health care reform on these heavily utilized hospital functions can yield important implications for labor costs. The finding by Cozad (2012) that hospitals saw a shift toward scheduled care procedures as a result of the health care reform makes general care salaries a particularly important area of investigation because most of these scheduled procedures involve general care. If both the demand for general care procedures and the labor costs associated with these procedures are found to increase as a result of the Massachusetts health care reform, this will be important for hospitals to consider so that they can form more realistic expectations of changes in demand and expenditure costs, which may allow for increased efficiency as the national reform comes into play.

If, on the other hand, analysis shows that both total hours and total salaries increase as a result of reform, then examining general and intensive care salaries may be helpful in providing a step forward in discerning which changes are most responsible for generating the observed increase in payroll expenditures as a result of health care reform. While these findings cannot conclusively determine which scenario is responsible for the rise in post-reform hospital payroll expenditures, they can offer valuable insight as to which may be the better candidate for further study. If the salaries of the hospital personnel responsible for treating general and intensive care patients in post-reform Massachusetts increase significantly relative to pre-reform Massachusetts and surrounding states, this would suggest that an increase in wages may be the driving factor for the rise in payroll expenditures, and thus merits further study along these lines. Conversely, if general and intensive care personnel salaries in post-reform Massachusetts do not significantly increase, this might indicate that the increased hospital payroll expenditures stem from hospital employees working longer hours rather than earning higher salaries, or perhaps that other types of employees are earning higher wages as a result of health care reform.

Data & Methods

This paper uses the statistical software package Stata and annual hospital-level data from the years 2000 through 2009 to investigate the impact of the Massachusetts health care reform on various measures of hospital salaries and total work hours. The data are collected from the Centers for Medicare and Medicaid Services and the American Community Survey, and were generously provided by Dr. Melanie Cozad of Furman University. The panel contains 10,286 observations from hospitals in Massachusetts and the surrounding states of Connecticut, Delaware, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, and Vermont, as well as the District of Columbia.

I first analyze the impact of the Massachusetts health care reform on hospital wages and hours in order to determine which factor contributes more significantly to the rise in payroll expenditures observed by Cozad (2012). I then analyze the impact of the reform on hospital salaries specifically, focusing on the salaries of general care and intensive care employees. A difference-in-differences approach is used to ascertain the impact of the health care reform policy by comparing changes over time in Massachusetts hospitals to those in surrounding states. Massachusetts hospitals, which were exposed to reform in the second time period (2007-2009), function as the treatment group, while hospitals in the surrounding states, which were not exposed to reform in either time period, function as the control group.¹

The basic specification used in the regressions is:

$$\begin{aligned}
 y_{ijt} = & \beta_0 + \beta_1(after)_t + \beta_2(policy)_{jt} + \beta_3(population)_{jt} + \beta_4(poverty)_{jt} + \beta_5(income)_{jt} \\
 & + \beta_6(education)_{jt} + \beta_7(smokers)_{jt} + \beta_8(employment)_{jt} + \beta_9(insurance)_{jt} \\
 & + \beta_{10}(discharges)_{ijt} + \beta_{11}(employees)_{ijt} + \theta_i + \lambda_t + \varepsilon_{ijt}
 \end{aligned}$$

¹ The post-reform period is specified as the years 2007-2009 because, although the Massachusetts reform was enacted in 2006, it was not fully implemented until July 2007 (Raymond, 1).

Descriptions and summary statistics of the variables included in the regressions can be found in Table 1. The dependent variable, y , measures a certain staffing factor in hospital i , in state j , in year t . The chosen dependent variables include one measure of hospital work hours, *total hours* (in thousands), as well as four measures of hospital salary impact: *total average hourly wage* (in dollars), *total salaries*, *general care salaries*, and *intensive care salaries* (in millions of dollars). The dummy variable *after* equals 0 for the years 2000-2006, and 1 for the years 2007-2009, which represent the post-reform time period. *After* is interacted with a Massachusetts dummy variable, which equals 0 for comparison states and 1 for Massachusetts, in order to create the *policy* variable. Thus, the explanatory variable of interest is *policy*, which captures the effect of the health care reform. Seven other independent variables are included in the specification in order to control for differences between hospitals in Massachusetts and the surrounding comparison states. These time-varying state variables include *population*, reported at the state level in thousands; *poverty*, the number of individuals living in poverty in the state; *income*, reported in chained 2005 dollars; *education*, the number of individuals in the state who hold a bachelor's degree; *smokers*, the number of individuals in the state who smoke; *employment*, the number of employed individuals in the state; and *insurance*, the number of individuals in the state who have health insurance coverage. Changes in utilization are controlled for by the inclusion of *discharges* and *employees*. *Discharges* is a common measure of hospital utilization that gives the annual total patient discharges for the hospital, while *employees* controls for changes in the number of hospital employees. Finally, θ_i controls for hospital fixed effects, λ_t controls for year fixed effects through year dummy variables, and standard errors are clustered at the state level.

Table 1: Description of Variables

Variable	Description	Sample Mean (Standard Deviation)
Total Salaries (dependent variable)	Sum total of salaries of all hospital employees, including wages, salaries, paid time off, sick time, and severance/bonus, expressed in millions	70.895 (96.887)
Total Average Hourly Wage (dependent variable)	Total average hourly wage for all hospital employees, expressed in dollars	24.30 (7.05)
Total Hours (dependent variable)	Total annual hours worked by all hospital employees, created by dividing <i>Total Salaries</i> by <i>Total Average Hourly Wage</i> , expressed in thousands	2.756 (3.117)
General Care Salaries (dependent variable)	Salaries of personnel who provide direct care for general routine care of adult and pediatric patients, expressed in millions	11.218 (14.468)
Intensive Care Salaries (dependent variable)	Salaries of personnel who provide direct care for intensive care patients, expressed in millions	2.832 (3.502)
After	Dummy variable equal to 1 if year is in post-policy period of 2007-2009, 0 if year is in pre-policy period of 2000-2006	0.29 (0.46)
Policy	Treatment variable capturing effect of health care reform, created by multiplying <i>After</i> by a Massachusetts dummy variable that equals 1 if the state is Massachusetts, 0 otherwise	0.03 (0.17)
Population	State population, reported in thousands by the American Community Survey	10.300 (6.026)
Poverty	Number of individuals in the population living in poverty	1.163 (0.854)
Income	Real income, in chained 2005 dollars	409.000 (243.000)
Education	Number of individuals in the state who hold a bachelor's degree	3.085 (1.754)
Smokers	Number of individuals in the state who smoke	2.124 (1.294)
Employment	Number of individuals in the state who are employed	4.896 (2.728)
Insurance	Number of individuals in the state who have health insurance coverage	8.998 (5.142)
Discharges	Annual number of total patient discharges	0.008 (0.010)
Employees	Total number of hospital employees, including administration and support staff	0.001 (0.002)

The sample mean and standard deviation are reported in millions for all variables except *policy*, *total average hourly wage*, and *after*.

Figures (1)-(5) compare the averages of *total salaries*, *total average hourly wages*, *total hours*, *general care salaries*, and *intensive care salaries*, respectively, for Massachusetts hospitals in the years 2000 through 2009. These graphs provide visual evidence of the trends that the average hospital in Massachusetts saw for these variables during the time period. All four salary measures (*total salaries*, *total average hourly wages*, *general care salaries*, and *intensive care salaries*) exhibit increases during the post-reform period (2007-2009). *Total hours* seems to increase initially, peaks around 2008, and then begins to decline.

It is difficult to deduce from the graphs whether or not there is a break in the pre-existing trends in Massachusetts around the implementation of the reform, as one would expect if the reform did in fact impact these factors. Figures (6)-(10) in the Appendix display the average trends for all five dependent variables (*total salaries*, *total average hourly wages*, *total hours*, *general care salaries*, and *intensive care salaries*) for the comparison states. Since the comparison states did not undergo health care reform in 2006, one would not expect the trends in these states to exhibit a break around this time to the same extent that Massachusetts does. As with the Massachusetts graphs, it is difficult to tell visually whether or not the comparison states saw any break in pre-existing trends, and if so, to tell how changes in these states compare to those in Massachusetts. These graphs thus highlight the need for further analysis in order to ascertain whether the 2006 Massachusetts reform truly impacted the trajectories of salaries, wages, and hours for hospitals in Massachusetts.

Figure 1: Total Salaries Trend in Massachusetts

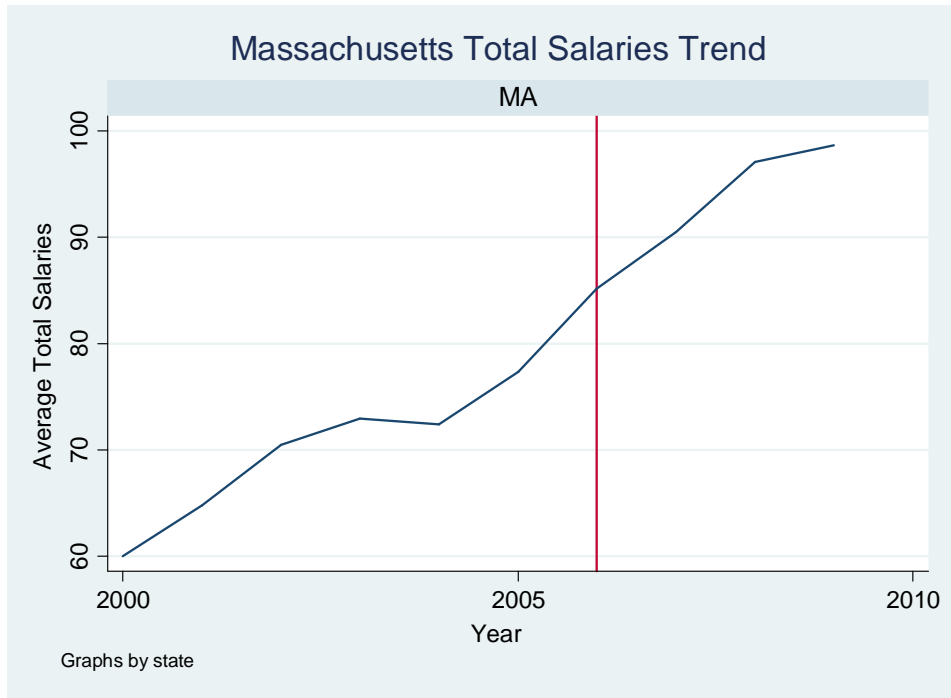


Figure 2: Total Average Hourly Wages Trend in Massachusetts

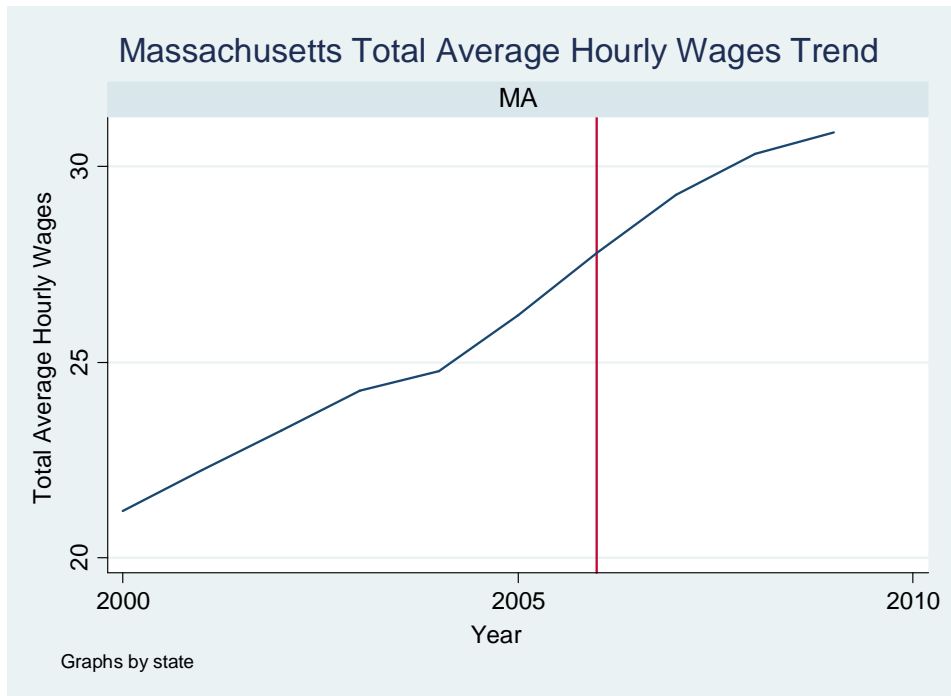


Figure 3: Total Hours Trend in Massachusetts

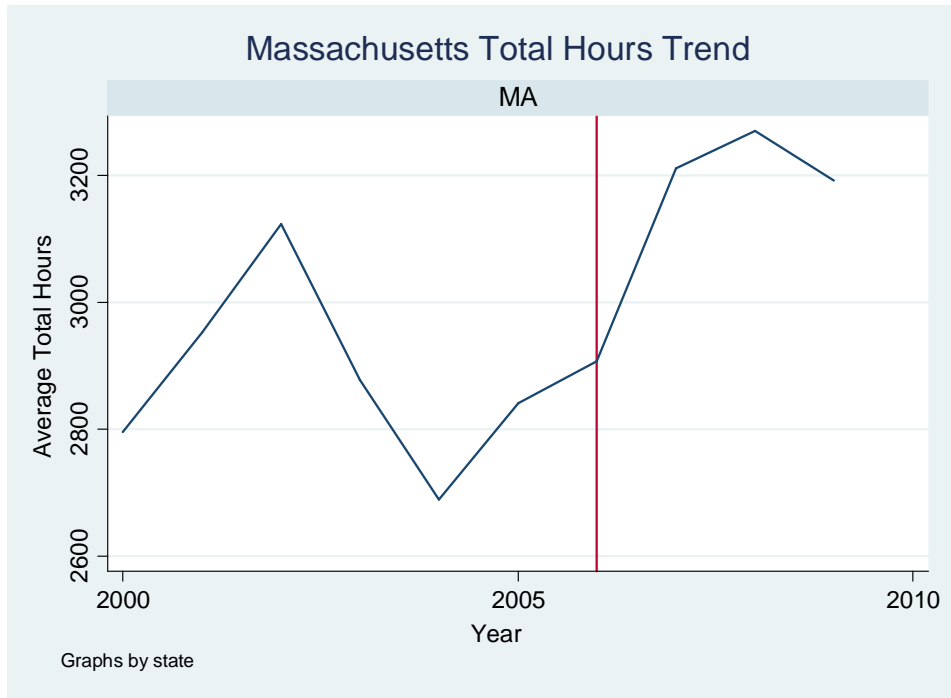


Figure 4: General Care Salaries Trend in Massachusetts

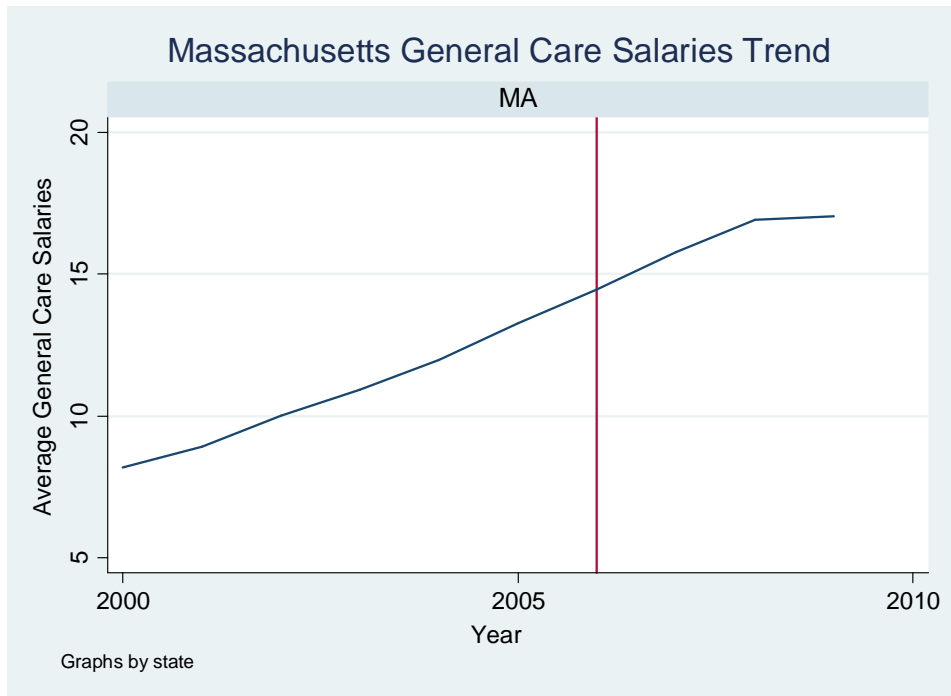
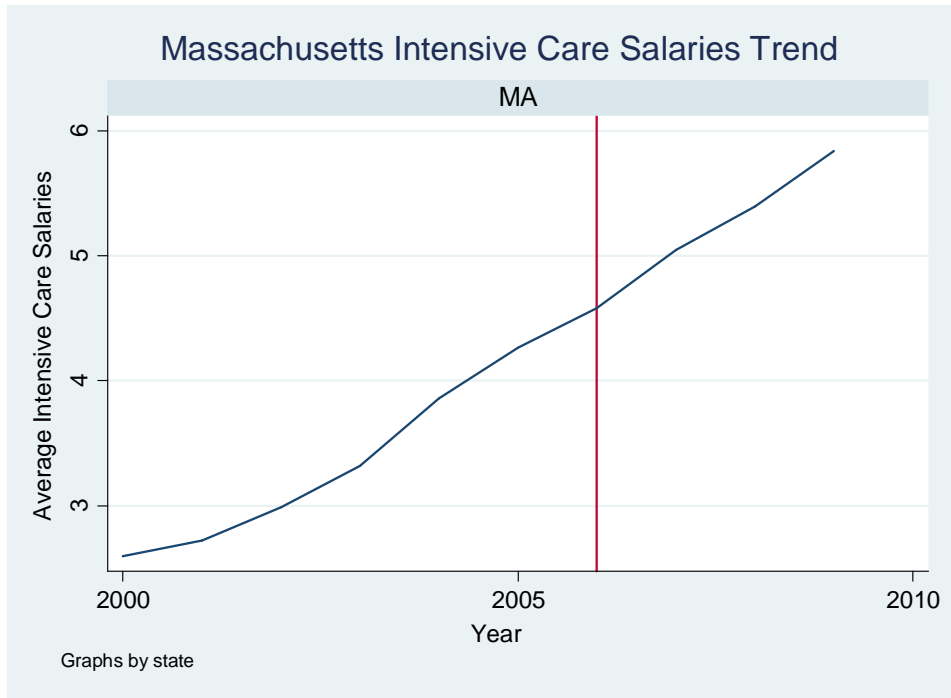


Figure 5: Intensive Care Salaries Trend in Massachusetts



Results

Impact of Massachusetts Reform on Hospital Salaries and Hours

Coefficients reported in the tables represent the effect of a unit change in the independent variable on wages in dollars, salaries in millions of dollars, and hours in thousands. The first two columns of Table 2 report the results of the regressions with *total salaries* (in millions of dollars) as the dependent variable of choice. Column (1) gives the results for the total salaries regression run on the full sample of 1,097 hospitals, while Columns (2)-(4) report the results of the total salaries, total average hourly wages, and total hours regressions run on a smaller subsample of 1,034 hospitals for which observations of all three dependent variables (salaries, wages, and hours) are available. *Total average hourly wage* (in dollars) is the dependent variable of choice for the regression in Column (3), and *total hours* (in thousands) is the dependent variable of choice for the regression in Column (4).

Note that in Table 2 below (and later in Table 3 as well), the coefficients of most independent variables (*poverty, education, smokers, employment, insurance, discharges, and employees*) appear as zero only due to scaling of salaries in millions of dollars and of hours in thousands, and rounding. For example, while Table 2 shows a coefficient of 0.000 million for *education* in Column 1, the true value of the coefficient is 0.000015495 million, or 15.495.

Table 2: Impact of Massachusetts Reform on Total Hospital Salaries, Wages & Hours

	Total Salaries (Full Sample)	Total Salaries (Subsample)	Total Average Hourly Wage	Total Hours
After	32.469 (8.30)**	33.165 (8.25)**	8.641 (20.79)**	426.682 (5.48)**
Policy	5.602 (4.43)**	6.212 (5.05)**	0.379 (2.46)*	46.744 (1.68)
Population	-0.000 (2.36)*	-0.000 (2.49)*	-0.000 (1.04)	-0.000 (2.47)*
Poverty	-0.000 (2.59)*	-0.000 (3.04)*	-0.000 (0.61)	-0.000 (2.91)*
Income	0.000 (1.68)	0.000 (1.92)	-0.000 (1.69)	-0.000 (0.35)
Education	0.000 (3.97)**	0.000 (3.90)**	0.000 (2.55)*	0.000 (2.52)*
Smokers	0.000 (1.00)	0.000 (0.82)	0.000 (0.06)	0.000 (1.54)
Employment	-0.000 (2.14)	-0.000 (2.62)*	-0.000 (2.30)*	-0.000 (1.10)
Insurance	0.000 (2.01)	0.000 (2.15)	0.000 (3.77)**	0.000 (1.09)
Discharges	0.008 (5.68)**	0.008 (5.79)**	0.000 (4.96)**	0.176 (7.33)**
Employees	0.003 (1.00)	0.002 (0.99)	-0.000 (1.92)	0.074 (1.54)
Constant	197.297 (3.05)*	187.377 (3.41)**	29.706 (3.72)**	4,301.699 (3.63)**
Number of Observations	8335	7855	7855	7855
Number of Hospitals	1097	1034	1034	1034
R-squared	0.51	0.53	0.26	0.49

Robust t statistics in parentheses; * significant at 5%; ** significant at 1%

The effects of the Massachusetts health care reform are captured by the treatment variable *policy*. The coefficients on the *policy* variable in Columns (1)-(2) show that the reform significantly increases total salaries for both the full sample and subsample of hospitals. Both coefficients are significant at the 1% level. For the full sample of hospitals, the reform corresponds to a 5.602 million dollar increase in total salaries in Massachusetts hospitals relative to those in surrounding states. For the smaller subsample of hospitals, the reform corresponds to a 6.212 million dollar increase in total salaries for hospitals in Massachusetts relative to those in surrounding states. Column (3) shows that the reform also significantly increased the total

average hourly wages for the subsample of hospitals by approximately 38 cents an hour. This result is significant at the 5% level. Column (4) shows that the reform did not significantly affect the total hours worked by employees in the subsample of hospitals.

These results show that hospital salaries, but not work hours, increased as a result of the Massachusetts health care reform. This suggests that the post-reform payroll expenditure increase observed by Cozad arose from hospital employees in post-reform Massachusetts experiencing an increase in wages, rather than working longer hours. This finding may help generate implications for the Patient Protection and Affordable Care Act, which is currently being implemented at the national level and bears many similarities to the Massachusetts reform. Given the larger Medicaid eligibility expansion that accompanies the Affordable Care Act, it is not completely clear how this result translates to the national picture. However, the fact that the Massachusetts health care reform has exerted upward pressure on hospital salaries yields positive implications in regard to the national reform because this existing upward pressure may combat the possible downward pressure exerted on hospital salaries by some of the other provisions of the reform, such as Medicaid expansion, reimbursement cuts, and employer coverage requirements. Further study is needed regarding the impacts of the Medicaid expansion at the national level.

Impact of Massachusetts Reform on Hospital Salaries

In the second specification, I investigate the question of whose salaries are increasing as a result of the reform. This specification examines the impact of the Massachusetts reform on the salaries of hospital employees involved in general versus intensive care. Understanding the impact of the health care reform on salaries for these two branches of care is important because general and intensive care are two heavily utilized functions within a hospital. It is also especially important to understand the nature of the changes in labor costs for the general care sector given the probable increase in patients' utilization of general care services as a result of the reform. General and intensive care salaries also provide a good starting point for research into specific salary impacts because data for other categories of care are not as extensively available for analysis.

This specification uses the general format discussed above. The dependent variables are *total salaries*; *general care salaries*, which reports the salaries of personnel who provide direct care for general, routine care of adult and pediatric patients; and *intensive care salaries*, which reports the salaries of personnel who provide direct care for intensive care patients. All three dependent variables are expressed in millions of dollars. In order to increase comparability across the results, the specification is run on a subsample of 751 hospitals for which observations are available for all three dependent variables (total salaries, general care salaries, and intensive care salaries).² Results can be found in Table 3. The remark made on p. 15, regarding the appearance of zero coefficients, applies to Table 3 as well.

² When run on the full sample of hospitals, the coefficients on *policy* for the total salaries and intensive care salaries regressions are still positive and significant at the 1% level; the coefficient on *policy* for the general care salaries regression is also still positive, and is significant at 5% level.

Table 3: Impact of Massachusetts Reform on Hospital Salaries

	Total Salaries	General Care Salaries	Intensive Care Salaries
After	35.142	6.455	1.346
	(7.70)**	(5.15)**	(7.34)**
Policy	9.180	2.067	0.777
	(5.83)**	(4.25)**	(8.94)**
Population	-0.000	-0.000	0.000
	(1.82)	(1.25)	(0.05)
Poverty	-0.000	-0.000	-0.000
	(3.10)**	(3.53)**	(3.95)**
Income	0.000	0.000	0.000
	(2.03)	(2.48)*	(2.38)*
Education	0.000	0.000	0.000
	(3.73)**	(3.77)**	(1.68)
Smokers	0.000	0.000	0.000
	(1.35)	(0.65)	(1.10)
Employment	-0.000	-0.000	-0.000
	(2.00)	(1.56)	(1.44)
Insurance	0.000	0.000	0.000
	(1.58)	(0.07)	(0.36)
Discharges	0.008	0.001	0.000
	(5.76)**	(7.41)**	(8.35)**
Employees	0.002	0.000	0.000
	(0.97)	(0.87)	(0.90)
Constant	176.650	32.222	1.283
	(2.54)*	(2.18)*	(0.50)
Number of Observations	6433	6433	6433
Number of Hospitals	751	751	751
R-squared	0.53	0.53	0.35

Robust t statistics in parentheses* significant at 5%; ** significant at 1%

The positive, statistically significant, coefficient on *policy* in Column (1) reaffirms the finding from the first specification that total hospital salaries increased as a result of the reform. Column (2) shows that general care salaries increased by 2.067 million dollars as a result of the Massachusetts reform, and Column (3) shows that intensive care salaries also increased significantly as a result of the reform, by 0.777 million dollars.

This finding that both general and intensive care salaries increased as a result of the reform is important because it provides additional insight into the nature of the changes that two of the most heavily utilized sectors within hospitals undergo as a result of health care reform. Such information regarding labor cost and salary implications may be useful to both hospital

administrators and policymakers. The increase in general care salaries is of particular interest given the accompanying increase in demand for scheduled general care services observed by Cozad (2012) as patients substitute away from emergency care services as a result of the reform (p. 18). Further study is needed regarding the impacts of the Massachusetts health care reform on the salaries of hospital employees involved in functions other than general and intensive care.

Conclusion

This work considers the effects of the 2006 Massachusetts health care reform on hospital salaries and work-hours. A difference-in-differences technique is used to identify the effects of the reform on the total salaries, total average hourly wages, total hours, general care salaries, and intensive care salaries of employees in Massachusetts hospitals. I find that the reform significantly increased total salaries by 6.2 million dollars and total average hourly wages by 38 cents per hour, but did not significantly impact total hours. Therefore, the increase in hospital payroll expenditures observed in previous literature can be attributed to a rise in employee salaries, rather than an increase in the number of hours employees are working. Specifically, I find that salaries for general care and for intensive care personnel increased significantly as a result of the reform. This result may have important implications for labor costs given that these are two heavily utilized functions within hospitals, and that the demand for general care services is likely to increase as a result of health care reform because more people are gaining access to health insurance, and can thus substitute away from emergency care and toward scheduled procedures.

More sophisticated and advanced treatment of these models may change the flavor of the results, but I anticipate that the results are robust. However, future research employing more advanced econometric analysis is necessary. This research could be improved by fully accounting for the possibility of serial correlation in the data. The presence of serial correlation causes the standard errors to be understated, which increases the probability of Type I error. While beyond the scope of this undergraduate level paper, a block bootstrapping method employing a large number of bootstrap replications, as utilized by Cozad (2012) and Kolstad and Kowalski (2012), may be useful in addressing serial correlation within this data. Another issue to

be accounted for in future research is the possibility of inflationary effects. However, it is unlikely that inflation in Massachusetts differed significantly from inflation in surrounding states during this time period, so this issue should not significantly impact the results. Finally, additional consideration of the impacts of the larger Medicaid expansion portion of the Affordable Care Act, as well as the impact of health care reform on hospital employees involved in other types of care beyond general and intensive care, could also improve this research.

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Appendix

Figure 6: Total Salaries Trends for Comparison States



Figure 7: Total Average Hourly Wages for Comparison States

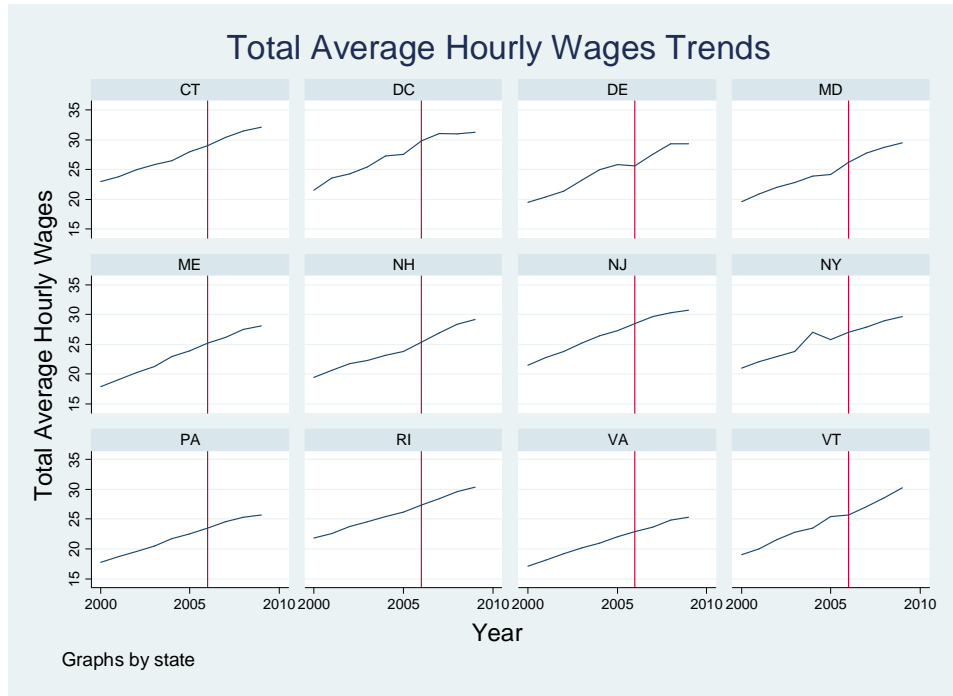


Figure 8: Total Hours Trends for Comparison States

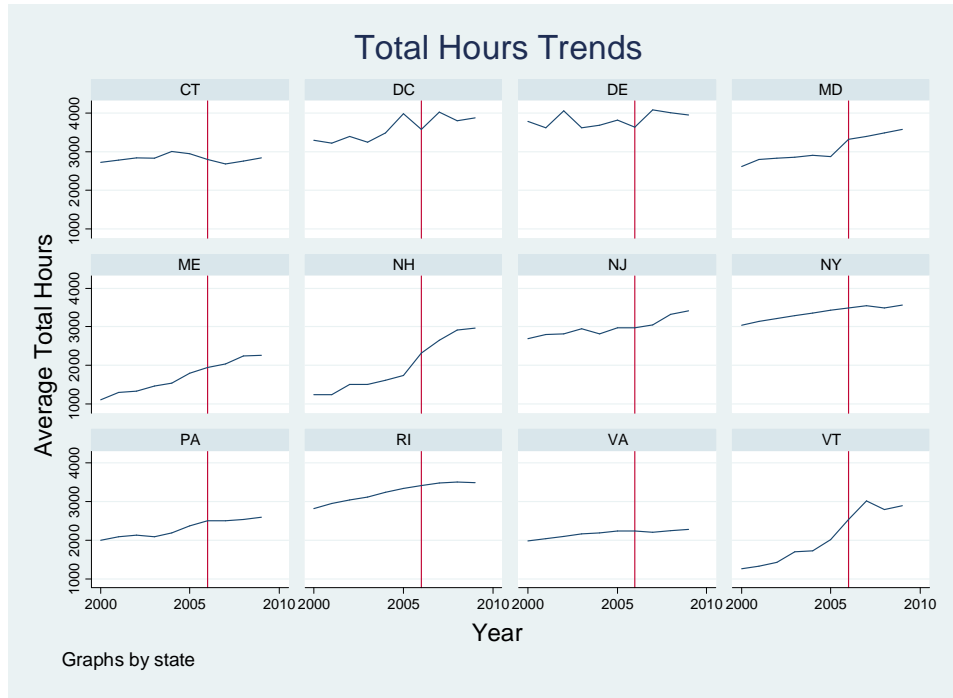


Figure 9: General Care Salaries Trends for Comparison States



Figure 10: Intensive Care Salaries Trends for Comparison States

