THESIS

THE ECONOMIC IMPACT OF MASSACHUSETTS HEALTHCARE REFORM ON EMPLOYMENT

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ABSTRACT

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In 2006, the state of Massachusetts pass a law entitled, “An Act Providing Access to Affordable, Quality, Accountable Health Care”, which reformed the healthcare market within the state in an attempt to achieve universal coverage. This paper attempts to establish a link between healthcare and employment. Using the National Inpatient Sample, North American Industry Classification System and data from the St. Louis Federal Reserve, a time series model was created to test the impact of Medicaid and private insurance before and after the implementation of the healthcare reform. Additionally, the state of California is used as a control to ensure the accuracy of the model.

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Introduction

Massachusetts has always been on the forefront of healthcare reform. In fact, the state can be called one of the most progressive in the quest for the lowest uninsurance rate. For this reason, I have chosen to examine the link between healthcare reform and employment in Massachusetts. Instead of utilizing a break point econometric model, I will use non-stationary time series variables in a cointegration statistical model to determine if healthcare reform has had a positive impact on the employment at the state level.

In the seven years since the passage of An Act Providing Access to Affordable, Quality, Accountable Health Care, or "Chapter 58", as it is colloquially known, the initial results have been positive. Massachusetts has the lowest uninsurance rates in the country and overall health has improved. It worked so well that in 2010 President Barak Obama adopted many of the policy's programs in the creation of the Patient Protection and Affordable Care Act (PPACA) at the federal level.

Much effort has been spent by authors chronicling the reform, but many fail to examine the secondary impact such policies can have on the economy. This is why I have chosen to concentrate my focus on the reform's influence on employment. Health's impact on employment has been well document in past economic literature and will be examined later, but it is an overlooked area of study when looking at "Chapter 58" and its effect on the state of Massachusetts.

The first section of my analysis focuses on the history and implementation of healthcare in Massachusetts. This section looks at some of the earliest forms of reform in Massachusetts and its impact on the 2006 legislation.

Following the discussion of healthcare reform, I will examine a handful of key economic works which focus on healthcare economics and the impact of the reform on Massachusetts. This section will contain works looking at past Medicaid expansions, the connection between productivity and employment, the effect the reform had on premiums and the improvements to overall health.

The next section focuses on my data sources and the creation of the variables. Because the variables were created solely for this model, I spend time explaining the creation and structure of the medical variables. Special care is given to the explanation of the creation of the employment data because it is based on a past research in time series modeling.

The theory section of the paper focuses on the econometric basis for my paper. This section contains discussion of cointegration, the VECM technique, and the intuition behind modeling employment statistics.

The results of my model are discussed in section six. This section contains both discussion of variable trends, the setup of the model and the results. My model is split into three different specifications; two for Massachusetts and one for the control state, California.

The final sections of the paper, limitations and conclusion, are a discussion of the limitation of my model and a summary of my findings respectively. The limitations section examines issues involved with using a time series model and some of the restrictions placed on the model. The conclusion acts as a final summarization of my findings.

Massachusetts Healthcare Overview

Massachusetts' connection to healthcare did not start in 2006, but rather it dates back nearly twenty years to the late 1980's. In 1988, then Governor, Michael Dukakis passed legislation to mandate employer sponsored healthcare for their employees. This reform had a much steeper penalty for those not willing to cooperate than current legislation. Employers would have to pay $1,680 per employee every year they did not comply with the minimum requirement. While this reform was signed into law, it was never widely accepted or enforced; thus making its impact minimal. However, the 1988 reform directly led to the creation of the state's uncompensated care pool, a state funded trust to reimburse hospitals for unpaid bills, which twenty five years later is still in effect. (McDonough, et al. 2006).

In 1996, a second wave of healthcare reform swept through Massachusetts. This time, instead of mandating universal coverage, the state focused on expanding Medicaid coverage. The state was able to expand coverage because it received Section 1115 waivers from the U.S. Department of Health and Human Services. These waivers grant states the ability to test new methods for administering Medicaid by granting federal funding in the form of intergovernmental transfers or (IGTs). I focus on Section 1115 waivers and their impact on "Chapter 58" later in this section. This expansion nearly doubled the amount of people covered under MassHealth (Medicaid) and set the stage for the sweeping legislation to come in the next decade (McDonough, et al. 2006).

The current form of healthcare reform, "Chapter 58", could not be possible without its predecessors. This iteration of reform combines the employer mandate, individual mandate, and Medicaid expansion to achieve universal coverage. Many contribute the sustainability of

"Chapter 58" to the idea of "shared responsibility", where no one sector bears the burden of the reform more than any other.

The year 2006 was a confluence of events to ensure the passage of "Chapter 58". First, prior to its passage, Massachusetts already had a lower uninsurance rate than the rest of the nation, 9 percent as opposed to 16 percent in 2005. Additionally, more employers offered health insurance than in any other state (Gruber 2008). Finally, on average, Massachusetts' employees earned more than their counterparts in other states (Courtemanche and Zapata 2012). All of these characteristics contributed to the state's willingness to adopt change.

At the state level, the federal government was forcing Massachusetts' hand in order to retain their Section 1115 waivers. As Gruber explains, "The state was using phantom state dollars to generate a federal match by transferring dollars to providers that were matched, and then returned to the state" (Gruber 2008). Before the reform, the government was matching $385 million of healthcare spending through intergovernmental transfers (IGT). In 2005, the federal government was looking to cut funding to many of these IGTs. To maintain the influx of federal funds, Massachusetts enacted two distinct policy actions. First, they rebranded state-only medical expenditures as funds going directly to the uninsured. Second, they began to transition from safety net programs for hospitals towards subsidizing an individual's ability to purchase health insurance (Gruber 2008).

The final piece of the puzzle was the Uncompensated Care Pool. By 2005, this pool had amassed nearly $500 million (Gruber 2008). This money was eventually used to help bank roll "Chapter 58". Since universal coverage would lower the rate of uninsured, the need for compensating hospitals for treatment of the uninsured would shrink.

Many components to "Chapter 58" effect both the government and the private sector equally. The new reform accomplished merging the small and non-group insurance market. This was accomplished by the creation of "The Connector". "The Connector" is a marketplace where individuals can see the different healthcare plans they can purchase. It should be noted, this is not a monopoly and "The Connector" does not set the prices, but rather acts as a one-stop shop to ensure individuals know their healthcare options. Before the reform, individuals, who were not a part of a group plan, were forced to pay higher premiums because the cost to insure a single person was higher than a group. With "The Connector" in place, single individuals are not subject to these higher premiums and instead, are treated as if they are in the small group market. "The Connector" is split into three different groups, bronze, silver, and gold, with gold being full coverage, silver being 80% of the gold coverage and bronze being 60% of gold coverage. Within each group there are at least six choices of health plans from various providers (Gruber 2008).

The cost of establishing "The Connector" was around 25 million dollars, which came from the state budget. By 2009, "The Connector" became self-sustaining by receiving a percentage of each health plan purchased through "The Connector". If the cost ever outweighs the revenue, the government secured private loans and funding to make up the difference (Raymond 2007).

With the implementation of both an employer and individual mandate, rules were established to ensure compliance. First, the state created Section 125 accounts, which allow employees to pay their premiums from their pre-taxed income. The penalty for non-compliance was set at $295 per employee without health insurance, which is a decrease from the Dukakis reform. In fact, the year after implementation, this penalty only accounted for 5 percent of total cost (Seifert and Swoboda 2009). For individuals who choose not to buy health insurance, they

are forced to forfeit their state-level tax returns and in certain cases, pay half of the lowest insurance premiums (Raymond 2007).

One of the first parts of the reform to be implemented was expansion to MassHealth (Medicaid) and the creation of Commonwealth Care and Commonwealth Choice. The first step was increasing the threshold for state subsidized healthcare from 200% to 300% of the poverty line. Additionally, all children, 300% over the poverty line, are covered by MassHealth (McDonough, et al. 2006). All adults, 100% over the poverty line, are covered under MassHealth, where they pay no deductible or premium. People from 100% to 150% over the poverty line pay around $18 a month, whereas those between 250% to 300% over the poverty line pay around $105 a month through the Commonwealth Care program. Those over 300% may not qualify for state subsidized care, but they can buy from the state program in the form of Commonwealth Choice (Raymond 2007).

The last piece of the policy to note is the change from the Uncompensated Care Pool to the Health Safety Net Trust Fund. Originally, the plan called for the phasing out of the pool because achieving universal insurance coverage would make such a pool irrelevant. Before the Uncompensated Care Pool could be phased out, hospitals lobbied to keep this provision and were successful because universal coverage would not happen overnight (McDonough, et al. 2006).

The total costs of such a large policy implementation are still unknown and may continue to be for the foreseeable future, but some agencies have reported costs from the first few years. In a report prepared for the Blue Cross and Blue Shield Foundation, Seifert and Swoboda (2009), found the year after implementation (2007), $25.5 billion was spent on healthcare; marking a 23% increase from the year before implementation (2005). They find employers are responsible

for 48% of the healthcare cost. Individuals pay around 25% and the government pays the remaining 27%. Employers bear such a large burden because in 2007, nearly 73% of employers offered some sort of healthcare coverage and the government collected a total of $7.7 million from the remaining employers refusing to offer insurance (Seifert and Swoboda 2009). As stated earlier, because of the IGT, Massachusetts only pays around half of the actual cost of the reform, with the federal government paying the other half (Gruber 2008).

Previous Literature

While "Chapter 58" was only enacted seven years ago, the breadth of economic literature on the subject is wide. Many authors choose to examine the immediate impacts of healthcare reform, i.e. its impact on overall health, premium rates, and cost, but few have branched out to examine its impact on external economic topics, such as employment. Even though many articles do not directly deal with the impact on employment, their findings have a significant influence on the market.

Before looking at research related to Massachusetts, it is important to examine the effects of past Medicaid expansion. In 2008, the Oregon Health Plan Standard (Medicaid) opened its enrollment for the first time in nearly six years to 10,000 new applicants. Because the demand was so high, the eventual enrollees were chosen by lottery (Finkelstein, et al. 2011).

Finkelstein (2011) tested a variety of different areas and her findings show the importance of Medicaid expansion. She found a 25% increase in spending per new participant due to expanding Medicaid coverage (Finkelstein, et al. 2011). Additionally, Finkelstein studies the effect of Medicaid expansion on financial strain. She finds no change in the overall amount of financial strain caused by the expansion of Medicaid. However, she does find a large decrease in the amount of unpaid medical bills. Unpaid medical bills account for a large portion of unpaid bills in collection. By limiting the amount of unpaid medical bills, the cost of care decreased (Finkelstein, et al. 2011). This is an important finding for my model because my theory is predicated on the idea; the gains from healthcare out-weigh the losses sustained by residences having to pay for the state sponsored option.

To account for the impact healthcare has on productivity, Hadley (2003) provides an overview of recent developments in health economics literature. While much of his paper looks at insurance's impact on health, he does devote a section to insurance's influence on worker productivity. The consensus across the field is poor health leads to reduced annual income or as Hadley explains, "…poor health reduces annual earnings from work, primarily through reduced labor force participation and work effort in conjunction with a small effect on productivity" (Hadley 2003).

Hadley refers to a variety of different authors, who tested how illness affects labor participation in the work force. Hadley cites JP Smith, who found at the onset of a major illness, work hours decrease by 4 hours a week. This is important to note because the loss of working hours can lead to an employee being fired or passed over for a promotion in lieu of a worker who can full participate (Hadley 2003).

Hadley (2003) then cites Barbra Wolfe and Steven Hill and their work on single mothers' participation rates. They find single mothers with disabled children are less likely to enter the workforce. In the same study, they find increasing healthcare for children, not tied to Aid to Families with Dependent Children/Medicaid's prohibitions against work, would increase single mothers' labor force participation. Other studies have found women are 20% less likely to participate in the workforce when a parent is ill. Spouses' workforce participation decreases if their husband/wife becomes ill (Hadley 2003). These are significant results because health insurance can benefit these groups and allow them to participate fully in the economy. First, for mothers with disabled children, since "Chapter 58" has a major focus on fully insuring children, the negative participation effects to mothers would be partially and maybe even fully negated.

For the other groups, insurance affords the privilege of preventative care, which can lead to early detection of serious illness and shrink the severity and length of the illness.

Now it is time to analyze works specializing in the impact of the Massachusetts' reform on the state and its residents. Because the reform was not enacted until mid-2006 and full implementation did not take place until mid-2007, literature on the subject was not widely available until late 2008. Long, Stockley, and Yemane (2009) utilize some of the earliest data on the reform to model both the overall uninsurance rate and its impact on employer sponsored insurance. There was a 6.6 percentage point decrease in the uninsurance rate after the first year, 3.1 percent of the increase is due to new employer sponsored health insurance, with the other 3.5 percent being due to public and other healthcare options. Even with this wide drop in the uninsurance rate, there was no evidence of private health insurance providers being crowed out by the new public option, i.e. Medicaid expansion and the creation of Commonwealth Care and Commonwealth Choice plans. Instead, the gains were driven by low income adults gaining access to healthcare for the first time. In this area, there was a total increase of 17.3 percent coverage with 5.6 percent of that coming from employer sponsored insurance (Long, Stockley and Yemane 2009). These are important findings for my study because increasing the burden on employers can lead to less job creation and since there is no evidence of crowding out, the number of insurance firms will not shrink; resulting in no loss in jobs in that sector.

Cogan, Hubbardy, and Kesslerz (2010) examine the effect the reform had on healthcare premiums. They find after implementation, premiums increased 5.9 percent over the national average, when factoring the trend of Massachusetts premiums prior to the implementation of "Chapter 58". This amounts to an extra $262 dollars a year. For employers with under 50 employees, premiums increased by 6.8 percent for single coverage and nearly 14.4 percent for

fully family coverage (Cogan, Hubbardy and and Kesslerz 2010). Mandating employers to offer healthcare coverage has led to higher costs on small business owners, who normally have smaller profit margins than their larger counterpart.

The year 2010 marked one of the first uses of the Nationwide Inpatient Sample to examine Massachusetts' health reform. Kolstad and Kowalski (2010) focus on the reform's effect on healthcare utilization, but for the purpose of this paper, I will only focus on their work with hospital efficiency and hospital costs. They find there is no change in the composition of the patients being discharged; meaning people did substitute the type of coverage. Additionally, they find the number of beds, within hospitals reporting changes in patient composition, grew after the implementation of the reform. They report around a 2.5 percent increase in the number of beds within these hospitals. Along with the increase in the number of beds, they found growth in the number of discharges due to decreased length of stay. They report almost 58 more discharges per quarter after the implementation of the reform. As with any business, more turnover, leads to increases in efficiency and creates larger profit margins.

In the same vein, Kolstad and Kowalski examine the effect the reform had on emergency room visits. Many authors have pointed out emergency room visits comprise a large portion of unpaid medical bills because emergency rooms are not allowed to refuse service, regardless of ability to pay. Additionally, many uninsured patients choose the ER over outpatient options because of the lack of refusal of service. Emergency room care is usually more expensive than other options, thus raising overall medical costs. They find a 5.2 percent decrease in the number of ER admissions (Kolstad and Kowalski, The Impact of Healthcare Reform on Hospital and Preventitive Care: Evidence from Massachusetts 2010).

The last major area of study this paper focuses on is the reform's effect on cost. Their study finds no change in cost. Most of the cost statistics are insignificant and therefore change was not observed. This finding illustrates the reform did not cause extra bureaucratic costs leading to increased medical costs (Kolstad and Kowalski, The Impact of Healthcare Reform on Hospital and Preventitive Care: Evidence from Massachusetts 2010).

Courtemanche and Zapata (2012) looked at the gains in health caused by the reform. They find nearly 61,667 residents transitioned to very good to excellent health. This is important in the context of productivity. With more people reporting better health, less man hours are lost annually. This transition to better health cost the government $11,465 every year, with Massachusetts paying for only half of the cost. They find no link between increases in moral hazard to the increased coverage. This means people are not adopting dangerous habits because now they are newly insured (Courtemanche and Zapata 2012).

The final article of note for my model was created by Kolstad and Kowalski (2012). In this piece they focus on the employer mandate and its effect on premiums. While they do use some econometrics, their model is mainly a theoretical study of labor supply and demand, when offering or not offering health insurance. They theorize the individual mandate causes the workers' labor supply curve to shift down. Workers will be willing to bypass wages if health insurance is offered. Their model looks at the employer mandate on both wages and total hours worked. Additionally, they examine efficiency loss due to the mandate as opposed to a wage tax.

Kolstad and Kowalski begin by estimating the actual loss of hourly wages due to employers offering insurance. They find a $2.61 decrease in hourly wages between those with employer sponsored health insurance (ESHI) and those without EHSI. They find companies contribute $6,105 per family after the reform. The cost of providing insurance to a formally

uninsured employee is $5,576. Extrapolating the loss of wage over a year, employers gain $5, 426.72, which is less than the average amount they contribute for employee healthcare. In addition to the reduced wages, Kolstad and Kowalski find a decrease of 1.183 hours worked per week from employees with EHSI (Kolstad and Kowalski, Mandate-Based Health Reform and the Labor Market: Evidence from the Massachusetts Reform 2012).

Their examination of the welfare impact of the reform garners some interesting results. They find people in Massachusetts value 76 cents out of every dollar employers spent on healthcare. Finally, they find that the deadweight loss due to the distortions the employer mandate are 5% less than those of a tax based reform (Kolstad and Kowalski, Mandate-Based Health Reform and the Labor Market: Evidence from the Massachusetts Reform 2012).

While previous literature cited the high cost of additional premiums for employers due to the employer mandate, this model helps to illustrate, while employers are taking on additional costs, they adjust their wages accordingly to mitigate losses. Additionally, it shows as long as employees value healthcare, they are willing to accept reduced wages for the sake of healthcare.

Data

Time series analysis requires a specific dataset to ensure valid results. The data needed to cover both medical costs and employment, while stretching back far enough to capture the fluctuations of the Massachusetts' healthcare market. Additionally, economic indicators for both the state and federal economy were included to capture outside trends.

Because of the way many institutions report medical expenditures, certain types of data are superior to others. Overall medical expenditure seemed like the logical choice, but the lack of separation between public and private expenditure limited the interpretability of the model. The ability to separate expenditure types became the main focus of the data set because it granted me the ability to test the different layers of the reform and how they effected employment.

The Nationwide Inpatient Sample (NIS) acted as the perfect proxy for healthcare costs, while yielding the necessary variety of expenditure types. The Nationwide Inpatient Sample was created as a part of the Healthcare Cost and Utilization Project (H-CUP) administered by Agency for Healthcare Research and Quality (AHRQ). This dataset is a joint effort between federal, state, and private health organizations to create a nationally representative survey of every inpatient visit to participating hospitals in participating states in a given year. The goal of the dataset is to have an approximately eight million visits from nearly one thousand hospitals nation-wide. This amounts to a twenty percent sample of the nation's "…non-Federal, short-term, general, and other specialty hospitals, excluding hospital units of institutions…" (Healthcare Cost and Utilization Project 2010). Included in this description are specialty inpatient facilities, public hospitals, and educational hospitals.

This data does have its own set of drawbacks. The most noticeable being: not all states are included in the set. In fact, when the data set started in 1988, only eight states enlisted, but as time progressed, state participation rates have increased drastically. In the last year data was available, 2010, forty five out of the fifty states were involved in the NIS.

Another issue with the NIS data set is based on the involvement of individual hospitals. Hospitals are not required to participate in the data set. Without the stipulation of continued participation, hospitals are free to drop out of the data set from year to year. Some hospitals remain in the set through all 20 years, but a majority of the hospitals swap in and out over the time period. I used the average total cost of each state for each period, instead of total cost to account for this issue. By using average total cost, I can examine the overall trends without worrying about the data being biased by changes in the number observations.

It is important to note, while the overall yearly NIS dataset is nationally representative, once it is broken down to a state by state basis, it does not act as a state wide representation. Ideally, I would like the data to act as a complete representative of the state, but upon checking the data for California and Massachusetts, both states have hospitals representing the major population centers of their respective state and the overall number of hospitals never strays far from the twenty percent goal. When extrapolating this method to additional states, it will be important to make sure the above characteristics hold true.

The final drawback to the dataset is the anonymity of participants. Because of the sensitive nature of the data, it is impossible to see if one person's insurance choice changed over time. Because of this lack of information, I will not be testing for crowding out caused by the reform. As discussed in the literature review, previous studies have examined this issue and

found there is no indication of crowding out. Additionally, I cannot examine if one person is responsible for multiple visits in a given year. Because of this, I will not be commenting on the overall health or moral hazard issues caused by the reform. Once again, many previous authors have devoted time to this issue.

While the Nationwide Inpatient Sample does have its share of drawback, its advantages are far more significant. Because this dataset is a collection of individual visits, it lends itself well to aggregating the data in a variety of ways. The first step was to aggregate the data into state level totals.

Once the data was separated by state, the next step was to separate the data by both primary insurance payer and month. The month variable is the month the patient was discharged from the hospital for a specific visit in a given year. The insurance variable is more complex. There are six different categories of insurance: Medicare, Medicaid, private insurance, self-payment, no charge, and other. Medicare and Medicaid are described as both fee-for-service and managed care patients using Medicare and Medicaid, respectively, as their primary form of payment. Private insurance is the collection of Blue Cross, other commercial carriers, and private HMOs and PPOs. Self-payment encompasses patients who cite no form of insurance. No charge is where the hospital does not bill the patient. The final category, other, is the collection of discharges billed to other government programs including, but not limited to, workers compensation, Civilian Health and Medical Program of Uniformed Services (CHAMPUS), Civilian Health and Medical Program of the Department of Veterans Affairs (CHAMPVA), and Title V (Healthcare Cost and Utilization Project 2005).

The final step to creating the medical variables was to aggregate the separated variables by total charge of the visit. I chose to use the total charge as reported from the original source. This variable is the original total charge as reported by the hospital. This is preferable to choosing the total charged after being cleaned because the cleaning technique differs from state to state and year to year and thus creates more standard error in the data. Total charge does not include professional fees or non-covered fees; H-CUP removes these fees if they are included from the original source. This variable is the fees charged to the actual payer (whether it be insurance or self-pay) and not the total cost of the visit. As a result of this definition of total charge, some charges are only listed as their copay amount (Healthcare Cost and Utilization Project 2005). This definition is preferable because it accounts for the variation in payment between different types of insurers.

The next step was to create the employment data. Based on the work of Cutler, England, and Weiler (2003), I utilize their model for aggregating employment sectors. In their paper, the authors focus on aggregating the sectors into a small collection of county-level basic (export) and non-basic (local) sectors via cointegration (Cutler, England and Weiler 2003). In my model, these basic and non-basic sectors will be created using state-level data. The sectors were aggregated by his undergraduate economic forecasting classes and reviewed by Dr. Cutler and myself. The class used the cointegration method discussed in the paper to ensure each sector follows both economic logic and statistical significance instead of relegating an industry into a sector based on a few characteristics. The source of the data before cointegration was the North American Industry Classification System (NAICS) from the United States Census Bureau.

Using the standard two-digit aggregation of the NAICS has potential economic drawbacks. Many of the industries do not fall solely into specific sector, but are still aggregated

together because they share a few key characteristics. The biggest issue facing the standard form of aggregation is cointegration. If cointegration exists in the data, standard modeling techniques will not work and if used the results will be biased. Instead, the data must be aggregated to correct for cointegration.

The starting point for the aggregation process is the four digit employment data. This level of aggregation offers enough uniqueness for each type of industry, while still having significant numbers of employees in each sector. From here, the students began to run the Johansen pairwise cointegration test to see which sectors are related to each other. The purpose of this test is to see if there is a cointegration relationship between two sectors. Every sector was checked against each other and then the sectors, which were cointegrated, were aggregated together. While the output of these tests was the main determinant, economic theory was used for sectors which either fell into two sectors or were unrelated to other sector. The goal was to aggregate the individual four digit sectors into five to ten "Super Sectors".

This method yields some interesting results. Because each state's employment is comprised differently, each state has a different number and type of "Super Sectors". While this limits direct comparability of sectors, it allows a better sense of the actual makeup of each state's employment market. This is a benefit in my model because I am trying to see how healthcare affects employment throughout Massachusetts.

The final two pieces of data I used to round out my dataset account for state and national economic trends. Both come for the Federal Reserve Economic Data (FRED) dataset administered by the St. Louis Federal Reserve Bank. The first is known as the CredAbility Consumer Distress Index for Housing. This index is made up of 65 separate data points from

government, public, and private data which is then evaluated and combine to create a single data point assessing confidence in a certain area. For my model, I chose to use the housing index because during the process of cointegrating the "Super Sectors", it was discovered the index was a good instrument for overall state-level confidence in economic activity.

The final variable is the federal government's current expenditure. This variable is the current total amount of money the United States government spends quarterly. Because "Chapter 58" receives a large portion of its funding from the federal government, it is important to include current expenditure to ensure we capture federal funding patterns in the model.

Theory

Throughout this paper, I utilize the econometric technique known as the vector error correction model. Because of the nature of the model, it is important to devote time discussing the theory involved with such a technique. In this section, I will review how an error correction model works.

In its simplest form, cointegration occurs when two or more non-stationary variables "move together" or impact each other's outcome. In statistical terms, cointegration occurs when two or more non-stationary variables, which are integrated, can be combined to produce a linear combination, which is stationary.

The ideas behind cointegration are the basis for the vector error correction model, or VECM as it is commonly referred. This model examines the distance from the long term equilibrium and the magnitude of the disequilibrium. Additionally, the short run effects are affected by disequilibrium of the long run equilibrium.

To illustrate the theory of the model, I will present a simple version of a VECM model.

(1) $Y_t - \beta X_t = \varepsilon_t$

In equation 1, Y_t and X_t are cointegrated variables. ε_t is a stationary output, which represents the size of a shock to the system. This model illustrates the correction technique, where if X is positive, then Y has the opposite sign (negative) in order to return the long term equilibrium, which means $Y_t = \beta X_t$. The system corrects through the β estimate. Thus to see the changes to X_t and Y_t, the equation is rearranged as,

(2) $\Delta X_t = -\alpha_X(Y_{t-1} - \beta_1 Xt_{-1}) + \varepsilon_{Xt}$

(3) $\Delta Y_t = \alpha_Y(Y_{t-1} - \beta_2 X_{t-1}) + \varepsilon_{Yt}$

In equations 2 and 3, the α's act as the speeds of adjustment of the model, and the β's serve as correction terms. The ε's still capture the shock. These two equations show, when the change to one variable is positive, the other variable must move in the opposite direction. Equations 2 and 3 have separate interpretations. In equation 2, since α_X has the same sign as β_1, X_t does not clear because the β_1 is moving in the same direction as the shock; causing the model to continue to move away from equilibrium. In equation 3, however, α_Y has the opposite sign as β_2 and the model clears.

Using sector based employment data changes the composition of the model. Since I am basing my model on the work of Cutler, England, and Weiler (2003), I will be separating the NAICS employment data into basic and non-basic sectors. A non-basic sector is considered local, meaning the majority of its inputs and outputs are locally based. Some examples of basic sectors are retail, education, and utilities. On average, the products produced by these sectors are consumed locally, and thus the local community receives extra benefits from the goods. Basic sectors, on the other hand, are comprised of export based goods. This is why sectors like manufacturing and trade are considered basic. While the community benefits from the employment, the people do not receive the benefits of a majority of the goods produced. Since the local people are not the ones consuming the goods, the basic sectors are affected more heavily by the outside market than non-basic sectors. Thus an outside recession can lead to employment losses and the local government cannot utilize policy action to stabilize the sector because the shock is from an external source.

This dichotomy lends its self well for use in an error correction model. In the case of my model, the "Super Sectors", which were comprised mostly of non-basic 4-digit sectors, were chosen as cointegrating vectors. The theory behind choosing non-basic sectors as cointegrating vectors is non-basic sectors are more vulnerable to shocks caused by local policy change. If the basic sectors were the cointegrating vectors, they would not capture the effects of the healthcare reform, but rather other national trends, which may not be Massachusetts specific.

Below is an expanded version of the simple model, but basic and non-basic sectors were added. This model operates under the same theory, but X_t and Y_t are non-basic sectors and Z_t and W_t are basic sectors.

(4) $Y_t - \beta_1 Z_t + \beta_2 W_t = \varepsilon_t$

(5) $X_t - \beta_3 Z_t - \beta_4 W_t = \nu_t$

As discussed above, the non-basic sectors are used as the cointegrating vectors. This means, when there is a shock to these sectors it is captured in ε_t and ν_t and they will tell how fast the model will need to correct in order to go back to long run equilibrium.

In the expanded model, the β have a more specific meaning. Each β explains how the sector they are estimating reacts to the shock, i.e. β_1 explains how Z_t responds to a shock in Y_t and β_3 explains how Z_t responds to a shock in X_t. To find if a vector clears, apply the same intuition as in the simple model, but the interpretation changes. For the cointegrating estimates, a clearing vector means the non-basic sector corrects itself after a shock. With all other estimates explain how the basic sector changes to react to the shock in the non-basic sector.

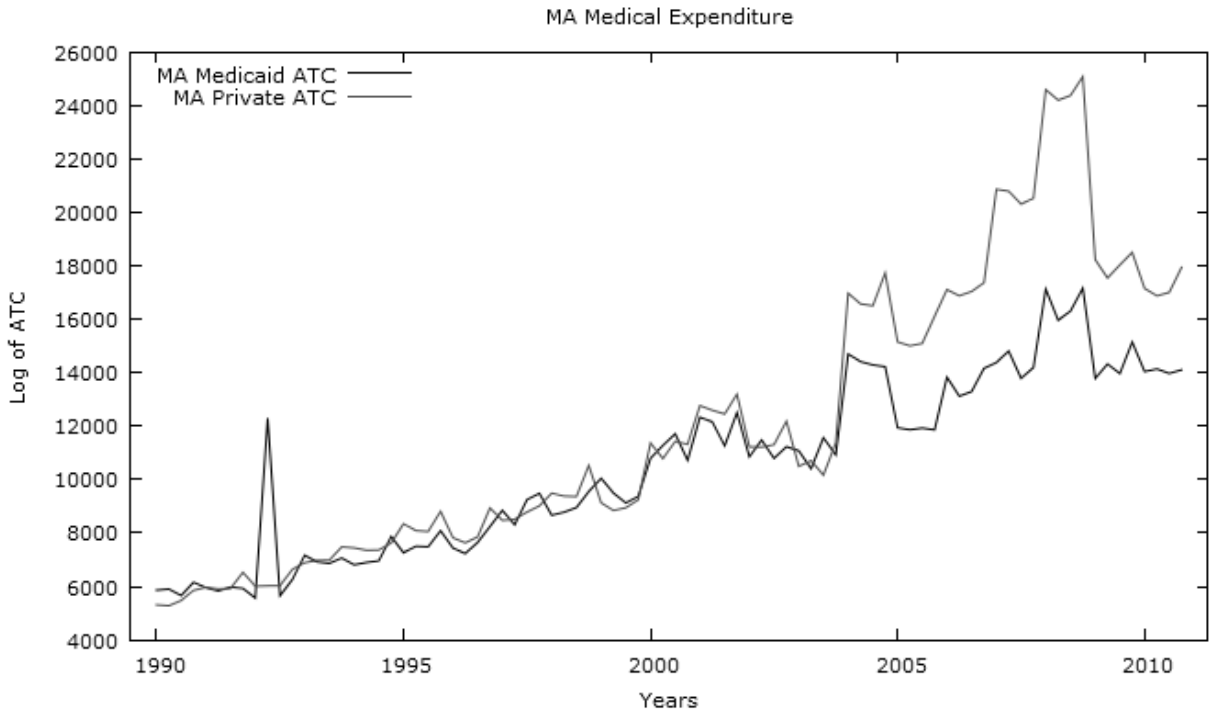
Model Results

Before running the model, explanation why certain data points are preferred to others is necessary. As mentioned in the data description, there were six distinct insurance types, but I only chose to use two. I chose to use Medicaid and Private insurance because these two variables were the most affected by the reform. Medicare has little bearing on the employment market because to be eligible for coverage individuals must be over 65 and at this age, most individuals covered are out of the employment pool. Additionally, Medicare is a federal program and states have little impact on the programs policies. Self-pay and free-of-charge did not have enough data points to be considered creditable and were not included as not to affect the results. While this limits my ability to talk about transition from uninsured to insured, the other two variables will capture the rise in insured residence. Finally, the "other" category was not included because the programs included in this data set, like Medicare, were not largely affected by the implementation of the reform and are run from a federal level.

Additionally, California was chosen as the control state for three main reasons. First, California tried to pass such a reform, but the reform stalled in the state congress. Second, California has a Medicaid program which looks like Massachusetts prior to the implementation of the reform. Finally, it is one of the few states which chose to participate in the Nationwide Inpatient Sample from its creation. This is beneficial because both Massachusetts and California were exposed to the same sampling distortions due to H-CUP policy changes.

With any econometric model, it is important to examine the raw data to notice any trends. The trends in the employment data were examined prior to this study and will not be included in this paper for the sake of brevity. The medical data, on the other hand, has not been examined. Below, Graph 1 and Graph 2 show the average total cost series are non-stationary. Additionally,

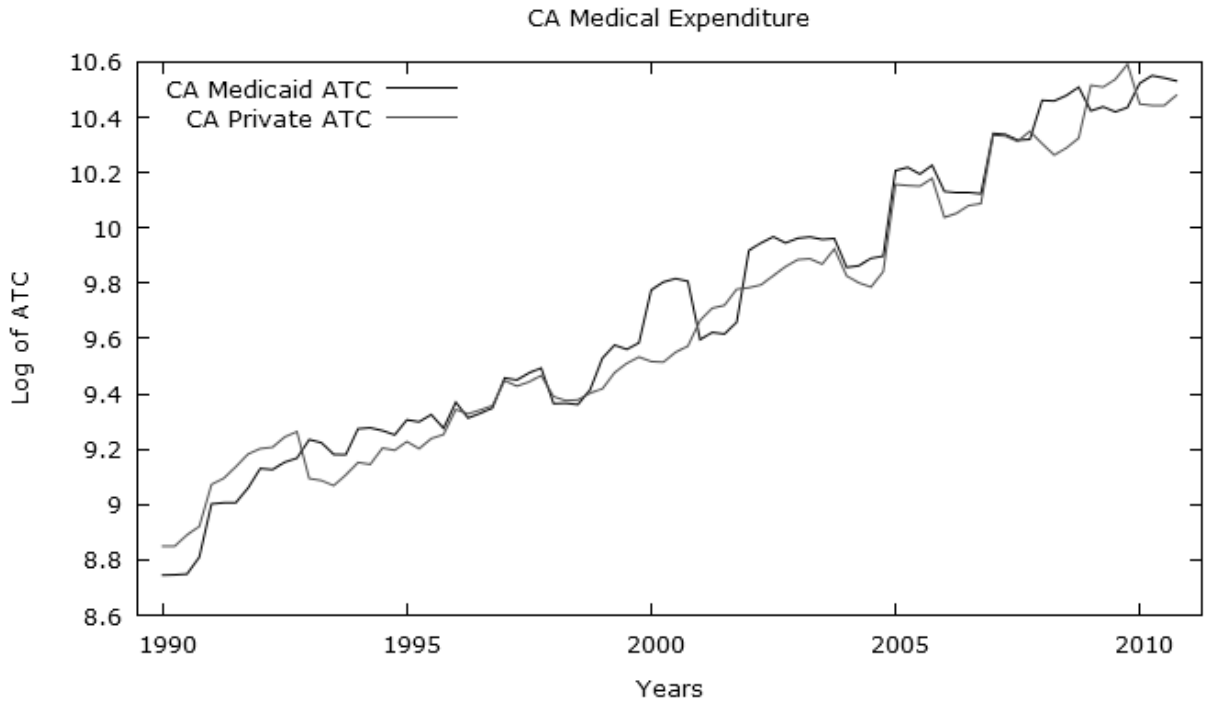
we see for a large proportion of Massachusetts' history, the percent change of Medicaid and private ATC move together. Even with the passage of the Dukakis reform and the Medicaid expansion of 1996, the series still move together. Then in 2004, there is a massive increase in both ATCs with private exhibiting a larger growth than Medicaid. While the reason for this jump is unknown, this could be a contributing factor to Massachusetts' need for reform. It should be noted, after implementation there is a flattening of the ATC, which may mean in the coming years the series could become stationary.



Graph 1- Massachusetts Medical Average Total Cost (1990-2010)

California has many of the same characteristics of Massachusetts prior to 2005, which is to be expected to due to their similar Medicaid structure. California has more points where the quarterly change of Medicaid's ATC is more expensive than Massachusetts' and around 2006, cyclical pattern beings, where Medicaid and private insurance change positions as the more

expensive option. There is also no leveling off of the ATC as seen in Massachusetts. Additionally, the quarterly average total cost is always more expensive in California than in Massachusetts.



Graph 2- California Medical Average Total Cost (1990-2010)

I hypothesize that Medicaid will have a positive impact on employment, whereas private insurance will have a negative impact. This premise is based on the idea of net effect. I believe the productivity gains from healthcare will out-weigh the cost to residents because it allows people, who are not economically stable, to receive the benefits of healthcare and increase their productivity level. Private insurance has a negative effect because it is associated with employer sponsored insurance and people in high tax brackets. The people in these groups, who previously elected not to have/offer healthcare, are now forced to carry a heavier burden and this burden is passed on in the form of reduced employment options and less discretionary spending.

I chose to use three types of specification of my model. The first model is the full sample size for Massachusetts. In this model, the date range is set from the first quarter of 1990 to the fourth quarter of 2010. In the restricted Massachusetts model, the variables are structured the same, but the date range is restricted from the first quarter of 1990 to the third quarter of 2007. The third quarter of 2007 was chosen because across previous literature, most authors identified this as being the end of implementation period of "Chapter 58". The final model is the full model for California. This model samples the same time frame as the full Massachusetts model. As the "Super Sectors" are different than Massachusetts, I will not be direct comparing any variables other than Medicaid and private insurance.

The first step of interpreting the model is examining the significance of the β values. Table 1 has the results for the full Massachusetts model. The model results show the manufacturing and education sector, retail and professional business services sector and CredAbility Consumer Distress Index for Housing are insignificant. This means it is not possible to tell what the deviation from the equilibrium is for these variables. On the other hand, the professional business services sector, federal expenditures, Medicaid and private insurance variables are significant.

Since the Medicaid and private insurance equations are both significant, I can examine these variables further to see the impact they have on the model. Concurrent with my previous hypothesis, Medicaid has a positive impact with all variables, except the transportation and utility sector, and private insurance has a negative impact for all variables, except for the same sector. Both the estimated values for β and the equations for the cointegrating systems are below.

Table 1 - Full Massachusetts Model (1990/Q1-2010/Q4) - Estimates

		Con, Man, Trade, and Finance	Durable Goods and Retail Trade	Trans and Utility	Retail Trade	Education	Education and Leisure
Man and Education	Estimate	5.0185	14.831	-29.637	5.6354	25.187	124.6
	Standard Error	-4.9381	-15.029	-30.58	-5.7963	-23.678	-123.68
Retail Trade and Profession Business Services	Estimate	-1.3521	-3.2965	5.6611	-1.3603	-4.8573	-24.653
	Standard Error	-2.3324	-7.0987	-14.444	-2.7378	-11.184	-58.416
Profession Business Services	Estimate	3.1296*	9.2801*	-19.025*	3.5585*	14.681*	77.26*
	Standard Error	-1.7044	-5.1874	-10.555	-2.0006	-8.1728	-42.688
MA Housing Index	Estimate	0.05242	0.38477	-1.1872	0.12921	0.5916	4.0161
	Standard Error	-0.64034	-1.9489	-3.9655	-0.75163	-3.0705	-16.038
Federal Expenditure	Estimate	-1.882***	-6.032***	12.45***	-2.3124***	-9.570***	-49.438***
	Standard Error	-0.58666	-1.7855	-3.6331	-0.68862	-2.8131	-14.693
MA Medicaid ATC	Estimate	-1.5307*	-4.7463*	9.7687*	-1.8052*	-7.399*	-39.124*
	Standard Error	-0.87663	-2.668	-5.4287	-1.029	-4.2035	-21.955
MA Private ATC	Estimate	2.0549***	6.557***	-13.50***	2.4299***	10.02***	53.19***
	Standard Error	-0.58344	-1.7757	-3.6131	-0.68484	-2.7976	-14.612

*** - 99% confidence ** - 95% confidence * - 90% confidence

As previously mentioned in the theory section of the paper, I was free to choose the specification of the identity matrix from the cointegrating vector. All of the tables for the estimates will have the identity matrix suppressed from the table, but know the model was run with the matrix included and can be seen in the cointegrating systems below. I chose the standard identity matrix, which has all zeros except for 1's on the diagonal. For both the full and restricted Massachusetts model, the matrix size is 6x6 and the full California model's size is 4x4.

Table 2-Full Massachusetts Model- Cointegrating Systems

$$1CMTF_t + 3.13P_t - 1.88FE_t - 1.53MATC_t + 2.05PATC_t = \varepsilon_{CMTF}$$
(-1.70) (-0.59) (-0.88) (-0.58)

$$1DR_t + 9.28P_t - 6.03FE_t - 4.75MATC_t + 6.56PATC_t = \varepsilon_{DR}$$
(-7.1) (-1.79) (-2.67) (-1.78)

$$1TU_t - 19.03P_t + 12.45FE_t + 9.78MATC_t - 13.50PATC_t = \varepsilon_{TU}$$
(-10.56) (-3.63) (-5.43) (-3.61)

$$1RT_t + 3.56P_t - 2.31FE_t - 1.81MATC_t + 2.43PATC_t = \varepsilon_{RT}$$
(-2.00) (-0.69) (-1.03) (-0.68)

$$1EDU_t + 14.68P_t - 9.57FE_t - 7.40MATC_t + 10.02PATC_t = \varepsilon_{EDU}$$
(-8.17) (-2.81) (-4.20) (-2.80)

$$1EDUL_t + 77.26P_t - 49.44FE_t - 39.124MATC_t + 53.19PATC_t = \varepsilon_{EDUL}$$
(-42.69) (-14.69) (-21.96) (-14.61)

Since the medical variables are significant, it is time to examine the speeds of adjustment. The first step is investigating if the cointegrating vectors clear their own equation. The construction, manufacturing, finance, and trade sector is both significant and positive; the vector does clear. The durable goods and retail trade sector clears because it is significant and has a negative sign. Transportation and utility has a positive sign, but is insignificant; it does not clear. The retail trade sector clears, as well as the education sector, but the education and leisure sector, does not clear because the vector is insignificant and has the incorrect sign.

Table 3 - Full Massachusetts Model (1990/Q1-2010/Q4) – Speeds of Adjustment

	$\varepsilon c_{MTF(t-1)}$	$\varepsilon_{DR(t-1)}$	$\varepsilon_{TU(t-1)}$	$\varepsilon_{RT(t-1)}$	$\varepsilon_{EDU(t-1)}$	$\varepsilon_{EDUL(t-1)}$
Construction, Manufacturing, Trade, and Finance	-1.7365*	0.28607	0.36841	0.32263	0.13978	0.083721
Durable Goods and Retail Trade	0.84124	-1.0067*	-0.3166	-0.24233	-0.01241	0.023775
Transportation and Utility	-1.0668	0.59176	0.32044	0.036948	-0.13292	0.073191
Retail Trade	0.23138	0.093636	0.15646	-0.86199*	-0.03665	0.065387
Education	2.6488	-1.466	-0.43049	-1.1664	-0.44295*	0.1054
Education and Leisure	-0.23779	-1.1301	-0.37793	-0.51895	0.39177	0.00155
Manufacturing and Education	0.21725	-0.58185	-0.16301	0.005969	0.076767	0.006642
Retail Trade and Profession Business Services	-1.3507	0.94362	0.71584 (-)	-1.0575 (-)	-0.0792	0.17988 (+)
Profession Business Services	-1.1979	2.5818	1.1432	-1.9359 (-)	-0.30291	0.16397
MA Housing Index	-0.68423	0.71073	0.22411	0.39129	0.042571	-0.03026
Federal Expenditure	-1.0973	-0.04198	-0.01202	-0.44645	0.53301 (+)	-0.03459
MA Medicaid ATC	-5.0351	-3.5979	1.1683	-1.0002	3.4292 (+)	0.31661
MA Private ATC	-1.8972	-0.9261	2.1477	-3.9125	3.2439 (-)	0.27346

* - Vector Clears (+) – Pushes equation back to equilibrium (-) - Pushes equation out of equilibrium

While the other employment sectors are important, for medical costs, there is little interpretability as Medicaid and private insurance are the main focus of this paper. Although most of the speeds of adjustment are insignificant for the Medicaid and private insurance equations, the education sector's speed of adjustment is significant. The speed of adjustment for education has the correct sign, which means, when there is a shock to a variable in the Medicaid equation, the education sector corrects to bring it back to equilibrium. This is promising because the education sector contains the healthcare industry. For the private insurance equation, while the education speed of adjustment is significant, the sign is the same as its estimated β value.

Because they both have the same sign, when there is a shock to the private insurance average total cost equation, education pushes it farther out of equilibrium.

The restricted model, while utilizing the same setup, provides different results. As before, I will first examine the estimates (β) and then the speeds of adjustment (α). In this model, more of the β's are significant. Instead of seeing full equations be insignificant, only certain variables are. In both the manufacturing and education sector and the professional business services sector, the β associated with the transportation and utility sector are insignificant. The only other two insignificant variables are in the housing index equation and are the education sector and the education and leisure sector. The Medicaid and private equations are all significant and all have the same sign, but they are the opposite of the sign in the full model. This means between the middle of 2007 and the end of 2010 something happened which changed the impact of insurance on the local sectors.

Table 4 - Restricted Massachusetts Model (1990/Q1-2007/Q3) – Estimates

		Con, Man, Trade, and Finance	Durable Goods and Retail Trade	Trans and Utility	Retail Trade	Education	Education and Leisure
Manufacturing and Education	Estimate	1.8944***	0.89534***	0.58226	2.0057***	1.396***	12.163***
	Standard Error	-0.7127	-0.2042	-0.5278	-0.7052	-0.3103	-3.972
Retail Trade and Profession Business Services	Estimate	-0.947***	-0.6138 ***	-0.523***	-0.8295***	-0.3947***	-3.528***
	Standard Error	-0.3062	-0.0877	-0.2268	-0.3030	-0.1333	-1.7067
Profession Business Services	Estimate	0.8009***	0.3099***	0.2810	0.6382***	0.2986***	4.1923***
	Standard Error	-0.2298	-0.0659	-0.1702	-0.2274	-0.1001	-1.281
MA Housing Index	Estimate	-0.289***	-0.1422***	-0.254***	-0.3296***	-0.0462***	-1.039***
	Standard Error	-0.1328	-0.0381	-0.0984	-0.1314	-0.0578	-0.7404
Federal Expenditure	Estimate	1.7931***	0.5598***	1.159***	1.822***	0.5077***	10.074***
	Standard Error	-0.1355	-0.0388	-0.1003	-0.1340	-0.0590	-0.7550
MA Medicaid ATC	Estimate	0.3936***	0.0860***	0.397***	0.3772***	0.1574***	2.379***
	Standard Error	-0.1018	-0.0292	-0.0754	-0.1007	-0.0443	-0.5672
MA Private ATC	Estimate	-1.504***	-0.4597***	-1.029***	-1.5362***	-0.7502***	-8.992***
	Standard Error	-0.0886	-0.0254	-0.0656	-0.0877	-0.0386	-0.4939

*** - 99% confidence ** - 95% confidence * - 90% confidence

Table 5- Restricted Model Cointegrating Systems

$$1CMTF_t+1.89ME_t-.95RP_t+.80P_t-.29HMA_t+1.79FE_t+.39MATC_t-1.50PATC_t=\varepsilon_t$$
(-0.71) (-0.31) (-0.23) (-0.13) (-0.14) (-0.10) (-0.09)

$$1DR_t+.90ME_t-.61RP_t+.31P_t-.14HMA_t+.56FE_t+.086MATC_t-.46PATC_t=\varepsilon_t$$
(-0.20) (-0.09) (-0.07) (-0.04) (-0.04) (-0.03) (-0.03)

$$1TU_t-.52RP_t-.25HMA_t+1.16FE_t+.40MATC_t-1.03PATC_t=\varepsilon_t$$
(-0.23) (-0.10) (-0.10) (-0.08) (-0.07)

$$1RT_t+2.01ME_t-.83RP_t+.64P_t-.33HMA_t+1.82FE_t+.38MATC_t-1.54PATC_t=\varepsilon_t$$
(-0.71) (-0.30) (-0.23) (-0.13) (-0.13) (-0.10) (-0.09)

$$1EDU_t+1.40ME_t-.39RP_t+.30P_t+.51FE_t+.16MATC_t-.75PATC_t=\varepsilon_t$$
(-0.31) (-0.13) (-0.10) (-0.06) (-0.04) (-0.04)

$$1EDUL_t+12.16ME_t-3.53RP_t+4.20P_t+10.07FE_t+2.38MATC_t-8.99PATC_t=\varepsilon_t$$
(-3.97) (-1.71) (-1.28) (-0.75) (-0.57) (-0.49)

The speeds of adjustment tell a different story. Fewer cointegrating vectors clear than the previous model; in fact, five out of the six vectors do not clear. The only clearing vector is the durable goods and retail sector. While I am not going to focus on the other employment sectors equations, there are more significant speeds of adjustment than the previous model. In the Medicare equation, four out of the six speeds of adjustment are significant; the full model only had one significant speed of adjustment. The movement for these α's are split. The error correction terms associated with the retail sector and transportation and utility sector push the equation back into equilibrium. On the other side, the education sector and education and leisure sector push the equation out of equilibrium. It should be noted, the speeds of adjustment are larger for the terms pushing the equation back to equilibrium. The private equation has less significant correction terms, but as before, they are split. The retail sector pushed the equation back to equilibrium, whereas the education sector pushes it out of equilibrium.

Table 6 - Restricted Massachusetts Model (1990/Q1-2007/Q3) – Speeds of Adjustment

	$\varepsilon c_{MTF(t-1)}$	$\varepsilon_{DR(t-1)}$	$\varepsilon_{TU(t-1)}$	$\varepsilon_{RT(t-1)}$	$\varepsilon_{EDU(t-1)}$	$\varepsilon_{EDUL(t-1)}$
Construction, Manufacturing, Trade, and Finance	-0.1593	-0.7495	-0.0239	1.0667	-0.1897	-0.09992
Durable Goods and Retail Trade	0.6247	-1.4957*	-0.0678	0.9172	0.1131	-0.19171
Transportation and Utility	-0.9176	-0.0984	0.3193	1.403	-0.5929	-0.07153
Retail Trade	-0.0046	0.2542	0.4737	-1.100	-0.1665	0.14279
Education	1.3279	0.1029	-0.8320	-2.7332	-0.5300	0.39638
Education and Leisure	0.91379	-2.2263	-0.2535	-0.8112	0.3348	0.11045
Manufacturing and Education	0.8498 (-)	-1.4158 (+)	-0.1533	1.4983 (-)	-0.4292 (+)	-0.27601 (+)
Retail Trade and Profession Business Services	-0.5410	0.2689	0.3559	-1.2432	-0.1149	0.27363
Profession Business Services	-1.883	3.1947	1.1274	-6.4298	0.3860	1.1337 (-)
MA Housing Index	-0.985 (-)	0.5615	0.8896 (+)	1.8271 (+)	-0.2730	-0.26626 (-)
Federal Expenditure	1.3554 (-)	-1.6534 (+)	-0.9121 (+)	0.2457	0.55320	-0.14166
MA Medicaid ATC	5.1941	3.3503	-8.3022 (+)	-20.422 (+)	5.3448 (-)	3.2139 (-)
MA Private ATC	5.3607	-2.2101	-1.5208	-14.748 (-)	4.8403 (+)	1.7566

* - Vector Clears (+) – Pushes equation back to equilibrium (-) - Pushes equation out of equilibrium

The difference between the two models tells an interesting story. While there may be other factors at play, it would seem, once healthcare reform was fully implemented; it had an effect on the local sectors. As mentioned before, in the period before implementation, Medicaid and private insurance had opposite signs after implementation. Before implementation, rising Medicaid ATC had a negative impact on employment in the local sectors. The reason for the

change in sign is there was less inflation of prices due to unpaid medical bills and coverage could expand.

Prior to the reform, state subsidized coverage only affected those at the poverty line. This is important because the federal poverty level was around $10,000 a year for a single person. A person making this much is not usually a full time worker and thus is not usually included in the labor force statistics. This means, prior to implementation, private healthcare was almost the only option for a member of the labor force. This is why private insurance has a positive impact prior to "Chapter 58"; private insurance was capturing a large part of the positive gains from healthcare. After the implementation, the state subsidized option became an option for a greater part of the work force and thus the true impact of private insurance was felt.

Additionally, the reform required all larger employers to offer health insurance. Previous authors have found increased costs to employer due to the new legislation in the form of rising premiums. Rising premiums mean the insurance pool has more risk in it and thus payments need to be higher to cover the higher probability of insurance use. If the insurance pool has more sick people, the average total cost for a procedure will increase because the severity of the average visit will increase. Thus in order for the private insurer to continue to receive the same amount of profit, they must increase premiums. The public option does not have to worry about turning a profit, merely providing healthcare. Therefore increasing the risk pool in the public option does not lead to more burden being placed on individual directly, but rather can be spread over the population in the form of taxes.

A final point to note is, prior to the implementation of the reform, lower income residents were forced to either choose more expensive private options or go without healthcare.

After implementation because of the expansion to MassHealth and the birth of "The Connector", people were able to find affordable healthcare. This led to the productivity gains from healthcare for groups not usually included in healthcare, while not changing the spending habits of individuals. Because people's spending habits did not change, there was not a consumer confidence shock leading to a fall in employment

Once again the education sector clears in the restricted model. This is important to note because this sector contains a majority of the healthcare industry. As with the estimates, the reform caused the effects of the speeds of adjustment for the education sector to change. Before the reform, changes to the healthcare industry would lead to Medicaid being pushed farther out of equilibrium and after the reform changes to the healthcare industry pushed the equation back to equilibrium. This important because if the government wants help mitigate the effects of a shock to Medicare prices, they can use measures which benefit healthcare employment levels. The consolidation of effect means the government can better control the public option through policy implementation aimed at the healthcare market.

Since there is a definite connection between reform and employment in Massachusetts, California will be used as a control to ensure outside factors are not biasing the results. In order to confirm the finding in Massachusetts, I hypothesis the full California model will have the characteristics of Massachusetts prior to the implementation of "Chapter 58".

As before, the estimates will be examined first. While there are more insignificant estimates (β), this does not mean the model is telling the same story as the full Massachusetts model. In fact, this model has something the other two models did not, an insignificant medical cost variable. In this model, Medicaid is fully insignificant. This means, under this specification

of my model, there is no connection between Medicaid and employment in the local sectors. Additionally, the private equation has the same sign as the restricted Massachusetts model. This is promising because without reform in both states, private insurance has a positive impact on employment.

Table 7 - Full California Model (1990/Q1-2007/Q3) – Estimates

		Services	Development	Retail	Government
Manufacturing	Estimate	15.842***	9.0045***	-11.326***	45.771***
	Standard Error	-5.1882	-3.9812	-3.6137	-14.1
Exports	Estimate	-3.4613***	-2.9237***	2.5193***	-10.071***
	Standard Error	-1.8616	-1.4285	-1.2967	-5.0593
Electrical Manufacturing	Estimate	-4.0184	0.81187	1.7997	-10.985
	Standard Error	-4.9483	-3.7971	-3.4466	-13.448
CA Housing Index	Estimate	0.143	0.2704	-0.18041	0.3562
	Standard Error	-0.26313	-0.20191	-0.18327	-0.7151
Federal Expenditure	Estimate	3.6987***	3.2162***	-2.7914***	10.752***
	Standard Error	-0.83004	-0.63694	-0.57814	-2.2558
CA Medicaid ATC	Estimate	0.62859	0.29951	-0.41563	1.6939
	Standard Error	-0.49947	-0.38327	-0.34789	-1.3574
CA Private ATC	Estimate	-4.5577***	-3.6462***	3.2322***	-12.499***
	Standard Error	-0.58387	-0.44804	-0.40668	-1.5868

*** - 99% confidence ** - 95% confidence * - 90% confidence

Table 8- Full California Model Cointegrating Vectors

$$1SER_t+15.84MAN_t-3.46EX_t+3.70FE_t-4.56PATC_t=\varepsilon_t$$
(-5.19) (-1.86) (-0.83) (-0.58)

$$1DEV_t+9.00MAN_t-2.92EX_t+3.22FE_t-3.65PATC_t=\varepsilon_t$$
(-3.98) (-1.43) (-0.64) (-0.45)

$$1RE_t-11.33MAN_t+2.52EX_t-2.79FE_t+3.23PATC_t=\varepsilon_t$$
(-3.61) (-1.30) (-0.58) (-0.41)

$$1GOV_t+45.77MAN_t-10.07EX_t+10.75FE_t-12.50PATC_t=\varepsilon_t$$
(-14.10) (-5.06) (-2.26) (-1.59)

The final piece to examine in California is the speeds of adjustment. Three out of the four cointegrating vectors clear their own equation. The only one not to clear is the development variable. Since Medicaid is insignificant, the speeds of adjustment are not interpretable. This is because without knowing the estimates for the change in the short term, it is impossible to know how the distortions affect it. The private equation only has one significant speed of adjustment, the development sector, and it pushes it out of equilibrium.

Table 9 - Full California Model (1990/Q1-2007/Q3) – Speeds of Adjustment

	$\varepsilon_{S(t-1)}$	$\varepsilon_{DEV(t-1)}$	$\varepsilon_{R(t-1)}$	$\varepsilon_{GOV(t-1)}$
Services	-0.42445*	0.090915	0.07627	0.14899
Development	-0.020361	-0.06976	-1.2011	-0.2855
Retail	-0.22652	-0.24399	-0.87311*	-0.07342
Government	0.79281	-0.11226	-0.43782	-0.36666*
Manufacturing	-0.20131 (+)	0.13854 (-)	-0.27124 (+)	-0.03976 (-)
Exports	0.56577	-0.27302 (-)	-1.723 (-)	-0.57417
Electrical Manufacturing	0.011195	0.2012	0.49485	0.067751
CA Housing Index	-0.049222	0.22189	0.3042	0.036281
Federal Expenditure	1.2116 (-)	-0.34204 (-)	-1.0635 (-)	-0.62266 (+)
CA Medicaid ATC	-4.3984 (+)	0.84659	-5.7331 (-)	-0.05767
CA Private ATC	-3.3828	2.000 (-)	0.89665	0.96321

* - Vector Clears (+) – Pushes equation back to equilibrium (-) - Pushes equation out of equilibrium

With all the models complete, we can see the full story emerge. Because the California model contains many of the same characteristics of Massachusetts prior to the implementation of "Chapter 58", reform would be the likely candidate for why there is the drastic change in the Massachusetts model. The information from the California model helps alleviate concerns the

recession is the main cause of the sign change in the Massachusetts model. Because the signs for the medical variables do not change over the same periods tested in Massachusetts, the change in the economic conditions at both the state and federal level has no effect on the results in all three models. Both states felt the impact of the recession and if the recession was responsible for the sign change, California would have the same change as the post implementation Massachusetts model, but this is not the case.

The difference between the Massachusetts and California models are stark. As mentioned above, Medicaid average total cost has no impact on the local sectors. While it is not possible to know if implementing the same type of reform in California will lead to Medicaid becoming a significant variable, the finding above would lead me to believe there would be some positive effect.

The California private insurance variables can be compared to their Massachusetts' counterparts. Here the variables are significant, which means the speeds of adjustment can be interpreted. Unlike both Massachusetts models, the sector which contains the healthcare industry (Service) does not have a significant speed of adjustment. This means increasing the employment in the healthcare sector does not help or hinder private average total cost after a shock. What I do see is the development variable, which is largely made up of sectors, which contribute to California's infrastructure, is the only significant speed of adjustment and it causes the equation to fall farther from equilibrium. This tells me, when there is a shock to private average total costs, it is best to limit the amount of overall state spending on development.

Limitations

As with any statistical model, there are limitations with my method. The first revolves around the data. Many states did not choose to participate in the NIS until the early 2000's. This is a problem, when using a cointegration technique, because there needs to be a sufficient amount of data points in order to run the model. Because of this, the number of states to compare Massachusetts with was limited. Additionally, since the data is lagged two years, it is impossible to test the current state of healthcare in each state. Ideally, I would like to be able to run the model with the most current data to see the immediate impact of each policy decision, but the data does not allow this because it is such a massive collection of individual data points. This is especially prevalent now because there are only four years of data since the law's passage. While it was enough to see the immediate impact of the act, it will take time to be able to make hypotheses based on the long run impact of this policy.

Another issue with my model is it only chronicles inpatient a cost. While it does include emergency room visits and major operations, which is a large source of healthcare costs; it does miss the day to day aspect of healthcare. These outpatient costs in the long run can affect the overall health of the population, which can have their own cost reducing benefits. At such an early stage after implementation, the preventive impacts will not be as prevalent, but ten to twenty years down the line, this can lead to bias in the estimates.

Conclusion

There is no doubt "Chapter 58" has had an impact across Massachusetts. While it remains to be seen if this type of policy can be implemented across the United States, the results seem promising. Now that we are seven years out since its passage, we can look past the immediate medical impact and see it has had impacts across the economy.

Using publicly available healthcare and employment figures, my model has proven there is a connection between the passage of "Chapter 58" and changes in employment. We see in the period before its passage (1990-2007), private insurance has a positive impact on employment and Medicaid negatively effects employment in the local sectors. Prior to the passage of "Chapter 58"; residents of Massachusetts did not have a choice of publicly subsidized option and thus were forced to choose private insurers.

After the passage of the reform, the impact of both variables switch. In the full period (1990-2010), Medicaid has a positive impact on employment and private is negative. After the passage, people had a variety of choices at different costs, including for a large swath of the population, the ability to join the publicly subsidized option. Now people can have healthcare without changing their spending habits. This allows people, who normally are not part of the employment pool, to devote more time to their job and if they are unemployed, find a job.

At the same time as the passage of this legislation, the United States fell into to a deep recession, which it has not fully recovered from. To ensure the finding found in Massachusetts were not caused by anomalies in the data, California was chosen as a control. The model shows that in the full time period, California operates much like Massachusetts prior to the passage of "Chapter 58". In this specification, private insurance has a positive impact and Medicaid is

insignificant, meaning no relationship between employment and its cost can be created. This proves the sign change was not caused by accident, but rather can be attributed to the major policy change.

While the data is still limited, in this early model, there is strong evidence to suggest healthcare reform can have a significant impact on employment within a state. While my model may not be able to test to see if reform in other states is appropriate, it can help to isolate the impact of healthcare reform.

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