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How Do Changes in Medicare, Specifically The Medicare Access and CHIP Reauthorization Act of 2015, Affect Hospital Reimbursement?

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By

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Abstract

This paper studies the effects of The Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) and its impact on hospital reimbursements. Using Medicare data at the hospital level for fiscal years 2011 and 2015, this paper adds to current literature on the origin of Medicare policy changes through the use of nationwide hospital data, while including all 1,000 inpatient Diagnosis Related Group (DRG) definitions. The results from this paper suggest the emphasis that has been placed on delivering value over volume has effected hospital reimbursements. In 2011 a 1% increase in total discharges meant a 0.0213% increase in average total payments, while in 2015 the same 1% increase resulted in only a 0.00575% increase in average total payments. Also, I found that a 1% increase in average Medicare payments increased average total payments, by 0.911% and 0.939% for 2011 and 2015 respectively. So overall, treating less patients with greater emphasis placed on value became standard thanks to MACRA.

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1. Introduction

In 2016, the United States government spent $3.3 trillion on healthcare, which was 18% of the United States Gross Domestic Product (GDP), and that number is only growing (Historical, 2018). Of that $3.3 trillion, Medicare, the federal health insurance program for those over the age of 65 and those individuals with a disability, accounts for $710.2 billion (Cubanski and Neuman, 2017). Healthcare is clearly a large investment for the United States, as it ranks the highest among developed countries, spending $10,348 per person on healthcare (Sawyer and Cox, 2018).

This paper analyzes the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA), which potentially changed the way physicians and patients interact with one another. MACRA's main goals were to reimburse physicians solely based off value, rather than volume. In order for this to take place, the Sustainable Growth Rate (SGR) was repealed, while the Quality Payment Program (QPP) was implemented, along with the Merit-Based Incentive Payments System (MIPS) and the Alternative Payment Methods (APMs) to reward physicians for quality service. Historically, when a Medicare policy change is implemented it effects hospitals financial well-being. I set out to study whether MACRA effected hospital reimbursements as Medicare prices were set to be cut 30% by 2085. (Medicare Access and CHIP, 2015). Specifically, I analyzed Part A of Medicare, which is known as The Federal Hospital Insurance Trust Fund (HI).

My study contributes to the literature in a number of ways: I utilized nationwide hospital data, it pertains to all 1,000 inpatient Diagnoses Related Groups (DRG) definitions, it is not limited to a specific department or surgery type and lastly, I analyzed the most recent Medicare policy change, which had a direct effect on hospital reimbursements. This paper utilized three

datasets publicly available from the Centers for Medicare & Medicaid Services and Medicare.gov. The Inpatient Utilization and Payment Public Use File (Inpatient PUF) was used for 2011 and 2015. The last dataset was the Medicare Spending per Beneficiary (MSPB) Spending Breakdowns by Claim Type File. I utilized seven econometric models to develop a full understanding of the impact MACRA had on hospital reimbursements. These models were based on prior studies in health economics, which analyzed past policy changes in Medicare. Specifically, the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA), the Balanced Budget Act of 1997 (BBA) and the Balanced Budget Refinement Act of 1999 (BBRA). The literature showed that the PPS implementation from TEFRA had a positive impact on hospital revenues as well as costs, regardless of whether or not hospital admissions decreased. However, unlike the PPS policy change, the BBA had a negative effect on hospitals, which should not be surprising due to the fact it was implemented to prolong the HI Fund. The main paper my model is based off of is He and Mellor (2012) who analyzed the effects of Medicare changes on outpatient surgery reimbursements.

I hypothesized that the implications of MACRA would lower costs for physicians of hospitals, therefore reimbursements would increase over the four-year period studied. Also, with a greater emphasis placed on reimbursing properly for the higher value provided, I hypothesized that physicians of the hospitals would place even more emphasis on providing higher value care, because it would be incentivized accordingly. The principal agent problem states that physicians may not always be acting in their patient's best interest due to the potential existence of information asymmetry (Rosenthal and Frank, 2006).

However, despite the principal agent problem, my results were quite similar to a study conducted by White and Wu (2013), who found that a $1 reduction in Medicare inpatient

revenues is associated with a $1.55 reduction in overall net patient revenues, specifically 15 cents of profit. I found that in 2011, a 1% increase in average Medicare payments resulted in a 0.911% increase in average total payments. For 2015, a 1% increase resulted in a 0.939% increase in average total payments. In 2011, a 1% increase in total discharges resulted in an increase of 0.0213% in average total payments, however in 2015 a 1% increase in total discharges resulted in a 0.00575% increase in average total payments. This suggests that treating less patients with greater emphasis placed on value became standard thanks to MACRA. This means that the more patients admitted into the hospital and eventually discharged from the hospital does not necessarily result in more money for the hospital. This is shown due to the fact MACRA emphasizes value not volume.

The rest of the paper is organized as follows: section 2 will describe hospital reimbursements, the past and present of Medicare and the role politics plays in healthcare. Section 3 surveys related literature. Sections 4 and 5 respectively describe the data and empirical methodology employed in the study. Section 6 presents the main findings. Section 7 opens up for discussion. Section 8 discusses policy implications, with section 9 ending the paper exploring future areas of research.

2. Background on Hospital Reimbursement

Receiving healthcare from a medical professional is inevitable, even for the healthiest citizens. According to Santerre and Neun (2013), a healthcare system is an overarching group of delegated persons, tasked with the organizational arrangement and processes to ensure society makes informed and educated choices regarding the production, consumption and distribution of healthcare services. A complex and ever changing system, the United States healthcare system consists of many players, including over 900,000 physicians and dentists, approximately 6,000

hospitals and 80,000 plus nursing homes and mental health facilities all serving the 330 million citizens each and every day. A typical system is constructed in a triangular formation, containing three major entities: patients, healthcare providers (hospitals, physicians, etc.) and insurers or third-party payers. In exchange for medical services, patients pay out-of-pocket fees to the health care provider. If an individual is fully insured then they pay nothing for their medical visit; the onus is completely on the insurer. In exchange for insurance coverage, patients pay monthly premiums to insurers to help pay for medical services. And lastly, in exchange for the actual cost of the medical service provided, health care providers are reimbursed by insurers through the submission of claims (Santerre and Neun, 2013).

Hospitals are generally reimbursed through a fixed payment scheme, meaning that they are set independent to the amount or cost of medical services actually provided to patients for a given and defined treatment episode. For higher costs associated with additional services under the fixed payment scheme, hospitals bear the full financial risk. Ever since the implementation of the Prospective Payment System (PPS) in 1983, hospitals have been reimbursed for services to Medicare patients using DRGs. Today, about 1,000 DRGs exist, taking into account many categories such as: diagnoses, procedures, age, gender, discharge status and if any complications arose. For each DRG, a prospective payment exists, which is claimed to Medicare and is the reason hospitals operate under a fixed payment scheme because it incentivizes hospitals to contain costs (Santerre and Neun, 2013). According to Guterman and Dobson (1986), this classification scheme allows for equitable payment and has four essential characteristics: the first being that they are determined in advance and fixed for that specific fiscal period, second, any individual hospital's payment rates are independent of their past or present costs or charges, third, every unit or service provided is accounted for its entire price, and lastly, every hospital

either keeps, or loses the potential difference that arises between the payment rate and the associated cost. The next section goes into detail on the history, development and current landscape of the Medicare program, specifically Part A.

2A. Medicare

Medicare, America's federal health insurance program, was enacted in 1965 under Title XVIII of the Social Security Act. Primarily for individuals 65 or older, Medicare also covers individuals under the age of 65 who have a permanent disability, such as end stage renal disease (ESRD) or amyotrophic lateral disease (ALS). In 1966, Medicare cost about $7.7 billion and approximately 19 million individuals were enrolled. Today, due to the increase in both cost for healthcare as well as the aging population, Medicare reached $710.2 billion and 59 million enrollees in 2016 (Cubanski and Neuman, 2017).

There are four components to the program, however my study focused primarily on Part A, which covers inpatient hospital stays, skilled nursing facility stays, home health visits, acute care hospitals, critical access hospitals, inpatient rehabilitation facilities, long-term care hospitals, psychiatric hospitals and hospice care (including but not limited to: semi-private rooms, meals, general nursing, drugs as part of inpatient treatment and other hospital services and supplies). Services and miscellaneous items that are not covered include but are not limited to: private-duty nursing, private rooms (unless deemed necessary for medical reasons), television and phone services in the room and personal care items such as razors or slipper socks. If all the following are true, then a patient will be eligible who has coverage under Part A: if a patient can only be treated correctly in a hospital, if a patient is formally admitted to the hospital once officially ordered by a doctor to stay two or more nights, the hospital accepts Medicare as a form of payment and lastly, The Utilization Review Committee of the hospital approves one's stay

(Your Medicare Coverage, 2018). In 2016, Part A was the second largest component at $290.8 billion (Cubanski and Neuman, 2017).

Part A is funded through The Federal Hospital Insurance Trust Fund (HI). Payments to hospitals decreased by one-third from 2006 to 2016 and is estimated to be empty by 2029, which is not a good sign for hospitals (Cubanski and Neuman, 2017). In 2016, the HI Fund was primarily financed through a 2.9% payroll tax (split equally by employees and employers), which made up 87% of the entire insurance program. The remaining 13% was divided among transfers from states (8%), interest (3%), and other (2%, referring to transfers from the railroad retirement account, reimbursements from revenues from those uninsured, military wage credits and premiums of voluntary enrollees) (Cubanski and Neuman, 2017).

Part B the largest section at $313.2 billion, covers physician office visits, outpatient services, preventive services and home health visits. Part C, (commonly known as the Medicare Advantage program), is financed through monthly premiums along with premiums under Part B and allows individuals to enroll in a private health plan (such as a health maintenance organization (HMO) or a preferred provider organization (PPO)) (Santerre and Neun, 2013). Lastly, Part D, which covers outpatient prescription drugs was $106.2 billion in 2016 (Cubanski and Neuman, 2017).

As shown in Appendix A, Table 1, the deductible was $40 in 1966. Once that price was met, Medicare covered the rest of the charges until day 60. From days 61-90, the patient either pays a daily coinsurance payment equal to 25% of the inpatient hospital deductible, or the price listed in the table. On the 91st day, Medicare no longer covers hospital inpatients charges. However, lifetime reserve days are available for up to another 60 days, in which the patient pays

a coinsurance rate (which equals $670 per day in 2018).[1] Due to the fact that lifetime reserve days are a once in a lifetime component of Medicare, any day spent in the hospital after lifetime reserve days are completely paid for by the patient. As shown throughout the rest of the paper, Medicare does not operate alone, but rather as a piece to a complicated puzzle along with providers, patients and services (Guterman, 2000). The next section analyzes the relationship between politics and healthcare.

2B. Politics and Healthcare

Since the United States Constitution was implemented in 1789, the government has been comprised of three branches: executive, legislative and judicial. The executive branch carries out laws and is made up of the President, Vice President and the cabinet. The legislative branch (Congress) makes the laws and is divided amongst the Senate and House of Representatives. The judicial branch, which interprets laws, is comprised of the Supreme Court and other Federal Courts (Branches of Government, 2018).

The legislative branch, which is comprised of 100 Senators and 435 representatives, is instrumental in proposing and passing laws directly related to healthcare and more specifically, Medicare.[2] Along with the House of Representatives, Senators duties include: drafting proposed laws, confirming or rejecting Presidential nominations for heads of federal agencies, federal judges, the Supreme Court and can declare war (Branches of Government, 2018). The Senate is governed by the Vice President, who is President of the Senate. Each state elects two Senators who are each granted one vote. A Senator's term lasts for six years, however there is no limit to how many terms one can serve. Senators are equally divided into three classes for election

[1] The 1966 prices were taken from Santerre and Neun (2013), while the 2018 prices were taken from Medicare 2018 Costs at a Glance.
[2] The executive branch passes laws which are to be reviewed by the President who has final say to either pass or veto a bill.

purposes: Class I, Class II and Class III. After two years, Class I Senators face reelection, after four years, Class II Senators face reelection and after six years, Class III Senators face reelection (Qualifications and Terms of Service, 2018).

Democrats and Republicans do not agree on many controversial issues, one of them being healthcare reform. For nearly a century Democrats have been pushing for affordable care for all. The Democratic Party passed Medicare and Medicaid in 1965 under President Johnson. In 1997, under President Clinton, Democrats passed the Children's Health Insurance Program (CHIP). In 2010, due to President Obama's Affordable Care Act, 20 million Americans gained access to healthcare (Health Care, 2018). When it pertains to Medicare, Democrats wanted to keep the program as is, a public good, and lower the age of eligibility to 55 (Kenen, 2016).

As for Republicans, they highly opposed Medicare back when it was first implemented, saying it was the first step towards socialism. However in more recent years, they have been the Party known for increasing Medicare spending (Leonhardt, 2010). Their approach to Medicare was much different from the Democrats during the 2016 election process. Republicans stated they wanted to put Medicare on a more secure track, proposing to: grant individuals the option to transition to a premium support model, guarantee every enrollee an income-adjusted contribution, and to set a more realistic eligibility age as life expectancy increases (Kenen, 2016).[3]

3. Literature Review

The following sections will go through past Medicare policy changes and examine their impact on hospital reimbursements. Each section highlights relevant literature starting with the pre-Medicare era, then moving on to the Tax Equity and Fiscal Responsibility Act of 1982, the

[3] The proposed premium support model is stated to strengthen patient choice, promote cost-saving among competitors and better guard against fraud and abuse.

Balanced Budget Act of 1997, the Balanced Budget Refinement Act of 1999, the Medicare Access and CHIP Reauthorization Act of 2015 and lastly, an overview of the principal agent problem and its impact on healthcare.

3A. Pre Tax Equity and Fiscal Responsibility Act (TEFRA, 1982)

Ever since 1953, the American Hospital Association mandated that healthcare providers be reimbursed for the reasonable costs of providing services. When Medicare was legislated in 1965, it utilized the same reimbursement scheme. However, what was deemed "reasonable" was under much scrutiny up until 1982 as Medicare expenditures grew 20% annually, with no telling when it would end. (Lave, 1984). Hellinger (1975) set out to study Medicare reimbursement and specifically how hospitals set their charges for delivery, laboratory, radiology and operating room services in 1970. Back then, hospitals could decide to be reimbursed using either the departmental or combination methods. This study primarily focused on the combination method because with higher Medicare utilization they could increase the charges. The results showed that Medicare utilization did in fact have an effect on profitability of a given department which supported the hypothesis that hospitals set their rate structure in order to maximize Medicare reimbursement. While a good analysis of the initial landscape of hospital reimbursement, this study is limited as it only analyzed four specific departments in 17 short-term general hospitals in Ohio. Also, there was no use of any econometric models to interpret any potential relationships. The next section incorporates relevant studies conducted on Medicare policy changes from 1982-1997.

3B. TEFRA (1982)

TEFRA forever changed the way hospitals were reimbursed. Signed by Congress in 1982, TEFRA's impact is still present, as the Act had completely changed the way Medicare

reimbursed hospitals. The three major changes included: a per case system (instead of a per diem system), case-mix, which was taken into consideration and a maximum limit was implemented. Costs per case that were over 120% of the average were no longer considered "reasonable." TEFRA mandated that the PPS was implemented. Initially, only 468 DRGs were used to classify patients which were comprised of area wages, the location of the hospital (urban or rural) and the number of full time interns and residents on staff. These fixed payments would cover operating costs, which would allow one to hypothesize that hospitals were to be reimbursed more under this new policy. Due to the fact that hospitals were to implement the new system within a three year period, it allowed for health economists to analyze the policy changes comparing the hospitals that switched to PPS right away versus those who stuck with TEFRA (Lave, 1984).

Guterman and Dobson (1986) analyzed the impact of the transition to the PPS on inpatient hospitals, outpatient hospitals, physicians, skilled nurses and home health services. Utilizing data from the Health Care Financing Administration for fiscal years 1967-1984, the authors were able to analyze data pertaining to total Medicare benefit payments, beneficiaries and payments per beneficiary by analyzing the percent changes over the years.

The authors hypothesized that Medicare admissions would increase post PPS. However they discovered that admissions per 1,000 enrollees actually decreased 3.5% while experiencing a 44% increase in net-income. So, despite a better payment system being implemented, hospitals became less popular but their profits increased. The authors attributed this to the fact that there was a greater emphasis placed on other services such as ambulatory care, along with physician offices and non-hospital emergency and surgical centers. This was referenced by many papers as policy changes that could affect revenue seemed to change hospitals behavior when determining patient mix.

Feder et al. (1987) utilized two sets of surveys to analyze the direct policy changes of TEFRA before and after the policy implementation. The surveys were from 1982 and 1984 and were administered by the American Hospital Association. The Survey of Hospitals' Financial Status and Care to the Poor received 827 responses from hospitals who also reported valid Medicare costs. The second survey was the Annual Survey of Hospitals and received 2,819 responses. Along with these surveys, actual 1984 PPS payment rates provided by the Health Care Financing Administration (HCFA, now known as The Centers for Medicare and Medicaid Services, CMS) were used. On top of utilizing a rather comprehensive data set, the authors also utilized multivariate regressions controlling for other factors effecting behavior, HMO enrollments, and physician supply. Using the individual hospital as the unit of analysis, t-tests were used to measure the percent change for various measures of hospital care. The authors also created an index to account for the PPS potential financial impact because hospitals face different levels of financial pressure. The index measured the shift from the prior reimbursement system to the PPS and how the hospital would have been effected if a hospital did not respond to the incentives. The index was defined as:

Projected Change in the Medicare Net Inpatient Revenue= (Shift from Cost Reimbursement to PPS/Projected Total Revenue per Hospital)

Similar to Guterman and Dobson (1986), the authors found that Medicare revenues per case changed by about the same percentage for hospitals under PPS (18.1%) and under TEFRA (17.7%) in 1984. However, costs rose much more slowly for PPS hospitals (7.6%) versus TEFRA (18.1%) paid hospitals. Both studies showed how PPS was not effecting hospital behavior by constraining the growth in revenues per case and thus, the opportunity to earn a profit was influential. Also, under PPS, hospital admissions decreased 0.4% while TEFRA

hospitals increased 3.4% from 1982-1984. This study is limited due to the fact that the Projected Change in the Medicare Net Inpatient Revenue Index did not account for any institutional or behavioral changes made by a hospital after implementation of the PPS.

The last relevant empirical paper to study the effects of PPS policy change was Eldenburg and Kallapur (1995). They analyzed the responses hospitals had in 1983 to the changes in Medicare reimbursement. The authors used data from the Washington State hospitals in the Commission Hospital Abstract Reporting System (CHARS). This data consisted of 115 hospitals, which was eventually lowered to 68 hospitals due to mergers among small rural hospitals. The study accounted for hospital costs, revenues (inpatient and outpatient), units of service and full-time equivalent employees. The authors found that the ratio of Medicare outpatient revenues as a percentage of total Medicare revenues increased after 1983. This showed that hospitals began to offer more outpatient services to Medicare patients, opposed to non-Medicare patients. As shown by the literature, PPS implementation had a positive impact on hospital revenues as well as costs, regardless of whether or not hospital admissions decreased. The following section evaluates the empirical papers analyzing the Medicare policy changes from 1997-1999.

3C. Balanced Budget Act (BBA, 1997)

The next major Medicare policy change occurred in 1997. The BBA of 1997 established Part C of the Medicare program, which was initially known as the Medicare+Choice (M+C) program, but today is referred to as Medicare Advantage. The main component of the BBA was to ensure Part A's HI Fund was available in another ten years (2007). Over this ten year period over $390 billion was planned to be saved. This was attainable through the introduction of more private health plan options being available for Medicare beneficiaries. These included HMOs,

provider sponsored associations (PSOs), PPOs, Medicare Medical Savings Account (MSA) plans, private-fee-for-service (PFFS) plans, and Religious Fraternal Benefit (RFB) plans (CMS.gov). These plans, which were hosting open enrollment periods, would then take on some of the burden, which would have otherwise been all Medicare payments. Other ways in which this goal would be achieved was through the introduction of five new PPS (for both inpatient and outpatient rehabilitation hospital services, skilled nursing facility services, home health services and hospital outpatient department services) (An Examination of Key Medicare, 1997). Due to these policy changes, specifically attempting to prolong the life of the HI Fund, it would be expected that hospitals would have hurt from the BBA. Although other options would be available for patients to help afford much needed care, in terms of reimbursements from Medicare, it is expected to have negatively affected hospitals. The literature supports that notion.

Das (2013) added to the literature by analyzing how The Balanced Budget Act of 1997 and changes in revenue from Medicare effected the financial condition of nonprofit hospitals. Using Healthcare Cost Report Information System (HCRIS) data from the Centers for Medicare and Medicaid Services from 1996-2004, Das focused exclusively on HCRIS (2552-96) data for private, nonprofit, acute-care hospitals. Das utilized the following model:

$$y_{it} = \alpha_i + \gamma_t + \beta(PostBBA * MedicareShare_{1997}) + (d_{1997} * MedicareShare_{1997}) + \theta_2(d_{1997} * y_{il1996} + \cdots + \theta_9(d_{2004} * y_{il1996}) + \varepsilon_i$$

where y_{it} is a performance measure, α_i is a hospital fixed effect variable, γ_t is a fixed effect for years, $PostBBA$ is a dummy variable taking a value of one for all years post 1998, $MedicareShare_{1997}$ is a proportion of Medicare inpatient beds to total beds, d_{1997} is a dummy variable for 1997, y_{il1996} is the value of the dependent variable for hospital *i* in 1996 and $d_{1997-2004}$ are dummy variables for each individual year analyzed (1996-2004). The last two

variables are included because hospitals may be at different stages relative to their desired financial targets. Das (2013) only utilized one model to serve the purpose of explaining the changes over the studied period.

Das (2013) discovered the BBA resulted in about a 7% decline in revenue for an average nonprofit hospital. The revenue reduction significantly affected the total margin of these hospitals, which went down by 12%. Although this study supported the general hypothesis, it was limited due to the fact it only analyzed private, non-profit and acute care hospitals reactions to the policy change.

Bazzoli et al. (2004) added to the relevant literature by assessing the effects of the BBA on hospitals and comparing those to the changes experienced from the PPS, utilizing a much wider data set. Using a method similar to Feder et al. (1987), the authors utilized data from 1996-1999 which was obtained from the AHA Annual Survey and contained 1,218 hospitals nationwide. The first model used, known as the financial pressure index, analyzed the potential loss a hospital could be exposed to through a policy change. The second model, which is more relevant to my study, is the Medicare revenue change index and focused solely on Medicare revenue change. The model is given by:

$$RCI_{i,t} = \left[\left(MRPC_{i,t} - MRPC_{i,t-1}\right) * MCRADJ_{i,t-1}\right]/TOTEXP_{i,t-1}$$

where $RCI_{i,t}$ is a Medicare revenue change index for hospital *i* during time *t*, $MRPC_{i,t}$ is Medicare revenues per adjusted admission for hospital *i* during time *t-1*, $MRPC_{i,t-1}$ is Medicare revenues per adjusted Medicare admission for hospital *i* during time *t-1*, $MCRADJ_{i,t-1}$ is an estimate of Medicare adjusted admissions for hospital *i* during time *t-1,* and $TOTEXP_{i,t-1}$ is total hospital expenditures for hospital *i* during time *t-1*.

The authors found that, unlike from PPS policy change, that both high RCI and FPI hospitals did not reduce their number of Medicare patients due to BBA policy change. Intuitively, hospitals who faced the largest financial pressure made the largest adjustment to their Medicare cost base. Similar to hospitals responding to PPS implementation, the authors found that hospitals tried to limit the increase in cost of each Medicare case and attempted to extend outpatient care. This supported the notion that hospitals were experiencing tough times and were doing anything to stay profitable despite policy changes. Although utilizing data for hospitals nationwide, this study is limited due to the use of no formal econometric models.

White and Wu (2013) set out to estimate the effects of changes in Medicare inpatient hospital prices on hospitals' overall revenues, operating expenses, profits, assets and staffing from 1996-2009. The data was from the Medicare hospital cost reports (HCRs) and the final sample comprised of 2,043 hospitals. Utilizing two stage least square model regressions, the first estimation is most relevant to my study:

$$R_{h,t} = \emptyset_h + \varphi_{div,t} + \sum_{p=1}^{6} \gamma_p \, \Delta P_{p,h,t}^{inf,accum,perDCEQ} + nX_{h,t} + kZ_{MSA,t} + l_{h,t}$$

where *h* indexes hospitals, *t* indexes years, *div* indexes Census division, $R_{h,t}$ is Medicare inpatient revenue per DCEQ inflated to 2009 prices (DCEQ stands for discharge equivalent, which was developed to measure a hospital's output), $\Delta P_{p,h,t}^{inf,accum,perDCEQ}$ is the accumulated impact of payment policy *p* per DCEQ inflated to 2009 prices, $X_{h,t}$ is a set of time-variant hospital characteristics (such as case mix and local wage index), $Z_{MSA,t}$ is a set of time-variant characteristics of the market in which the hospital is located (share of the population in poverty, unemployment rate and share of the population receiving food stamps) and $\emptyset_h$ is a set of hospital

fixed effects. This model incorporated many outside factors that could potentially effect a hospital and served as good inspiration while developing my study.

Similar to Bazzoli et al. (2004), the authors found that the hospitals that experienced the most payment cuts in 1997 were also the ones that faced the largest negative impact. Showing 1% significance, the results showed that a $1 reduction in Medicare inpatient revenues was associated with a $1.55 reduction in overall net patient revenues, specifically 15 cents of profit. This shows that a loss of Medicare revenue appeared to have a negative spillover effect on total revenues. So unlike the policy change for the PPS, the BBA had a negative effect on hospitals, which should not be surprising due to the reason it was implemented. The next segment interprets the published papers that studied the Balanced Budget Refinement Act of 1999.

3D. Balanced Budget Refinement Act (BBRA, 1999)

The BBA reductions in Medicare payments were working too well. Aimed to lower payments from 8.8% to 5.6% in a five year period, the BBA actually decreased payments by an annual rate of 3.9%. This concern prompted the BBRA to institute increases in Medicare spending, which aimed to increase Medicare spending $11 billion from 2000-2002. Despite this policy change, Medicare payments were still approximately 18.2% below baseline projections made in 1997 (Guterman, 2000). Due to the initiative to increase Medicare payments, one would expect that hospital's financial well-being would increase during this time period.

He and Mellor (2012) investigated volume effects of the implementation of the outpatient prospective payment system (OPPS) legislation (which was effective in 1999, from the BBRA) on Medicare and private fee for service (FFS) patients. The authors chose Florida because it was the fourth most populous state, had the second highest state Medicare spending and accounted for over 8% of all Medicare spending nationwide.

The data utilized was from the Florida Ambulatory Discharge Data, which was obtained from the Florida Agency for Health Care Administration (AHCA). The main unit of analysis was patient discharge. Each discharge consists of the following: the total charge for the discharge, the principal payers, limited patient information, facility type and unique identification number. For my study, I borrow this model as I have obtained the same data for hospitals for both 2011 and 2015.

He and Mellor (2012) focused primarily on outpatient surgical procedures as they consisted of 47% of all Medicare payments for hospital outpatient services in 2007. The authors chose to keep the study focused on the top ten most common surgical procedures in 1999 (upper gastrointestinal endoscopy, diagnostic colonoscopy, extracapsular cataract removal, colonoscopy and biopsy, debride skin/tissue, blood transfusion service, lesion removal colonoscopy, lesion removal, removal of breast lesion and repair inguinal hernia) of the sample of hospitals studied. In 1999, there were 182 hospitals in Florida, which resulted in an average of 7,000 outpatient discharges. Due to the fact the authors focused on specific procedures and each procedure was reimbursed differently from the other, data on the Medicare reimbursement rate for each hospital, procedure of interest and year was used. For pre-OPPS years (1997-1999), the authors developed an algorithm to convert each charge to a payment using an outpatient surgery payment-to-charge ratio from each hospital's annual Medicare Cost Report. Post-OPPS implementation was much easier, as payment data was readily available. Utilizing quarterly CMS publications reporting payments, the authors then created annual measures.

The authors used the following empirical model:

$$\log(SurgCount_{ht}) = \alpha_0 + \alpha_1 \log(Payment_{ht}) + \alpha_2 \log(Coins_{ht}) +$$

$$Z_{ct}\Pi + X_{ht}\Gamma + V_{zt} + \lambda_t + \alpha_h + \varepsilon_{ht}$$

where $Payment_{ht}$ is the Medicare reimbursement rate for a given procedure in hospital h in year t and can be interpreted as a price elasticity of volume given the log-log specification, $Coins_{ht}$ is the coinsurance amount associated with each procedure in each hospital h and year t, Z_{ct} is a set of county-year-level controls (accounting for estimates of the total population size, the amount of individuals over the age 65, the percent of females in the population, the percent of Hispanics and blacks, median household income and estimates of county unemployment rates) and X_{ht} is a set of hospital-year-level controls (accounting for ownership status, teaching status, bed size, rural hospital status and critical access hospital status). λ_t and α_h are year and hospital fixed effects, while V is a dummy variable for zip codes.

The second model is given by:

$$\log(SurgCount_{ht}) = \beta_0 + \beta_1 \log(Payment_{ht}) * Share_h + \beta_2 \log(Payment_{ht}) + \beta_3 \log(Coins)_{ht} + Z_{ct}\Pi + X_{ht}\Gamma + V_{zt} + \lambda_t + \alpha_h + \varepsilon_{ht}$$

where $Share_h$ represents the share of the total number of outpatient surgeries in which Medicare FFS was the primary payer by approximating a hospital's exposure to Medicare program changes. The results showed that most elasticity estimates for $Payment_{ht}$ were positive, suggesting that OPPS induced rate cuts effect Medicare volume negatively. However, only three out of the ten surgical procedures (debride/skin tissue, removal of breast lesion and repair inguinal hernia) provided results that were significant, which offers weak evidence. On average, private FFS volume increased. The authors explained that this suggests that payment reforms that retain a fee-for-service are not effective because it increases demand for Medicare patients, therefore not actually decreasing Medicare costs. The next section describes a Medicare policy change that was not specific to hospitals, but I concluded was integral to understand when approaching my study.

3E. Other Policy Changes

While not specific to hospital reimbursement, the policy changes from 1998, which allowed females to receive biennial mammograms, is a relevant topic to study to gain a better understanding of the direct Medicare policy changes and how they affect the broader healthcare world.

Haberman et al. (2007) set out to evaluate the effects of the Medicare changes in 1998 on mammography reimbursement policy on the breast cancer stage at diagnosis disparity between Health Maintenance Organizations (HMO's) and Fee-For-Service (FFS) beneficiaries. This particular study relates to my topic because of its specific analysis of a Medicare policy change. Since 1991, Medicare covered the cost of biennial screening mammograms for women over the age of 65. However, on January 1, 1998 Medicare expanded to allow for annual screenings. Particularly important to this study was the coverage that the beneficiary uses, whether that was an HMO or a FFS. This was important because historically HMO's have been required to provide at the minimum, what FFS Medicare provides, however HMO's were also allowed to provide additional benefits.

The authors utilized 30,857 female Medicare beneficiaries ages 65-74 (diagnosed with breast cancer from 1994-2002) from the population-based linked tumor registry/Medicare claims (Surveillance Epidemiology and End Results (SEER)-Medicare). Of this data set, 34.8% were enrolled in a Medicare HMO and 65.2% were enrolled in FFS Medicare. Hypothesizing that the gap between HMO and FFS mammograms would decrease as more FFS beneficiaries would now receive a mammogram, the results supported their hypothesis. Conducted through an ordered logistic regression model with predicting earlier stage diagnosis as the dependent variable, the authors adjusted for health plan type, time period, age at diagnosis, race (black,

nonblack or unknown), marital status (married, unmarried or unknown), and geographic location. The most relevant variable to my study was the interaction term between health plan type and time period (whether being before or after a change in FFS reimbursement policy). Shown through the interaction term, HMO beneficiaries were still more likely to be diagnosed at an earlier stage, both before and after the policy change but at a decreasing rate, a relative change of 51.1%. The next section describes the specific Medicare policy change my study analyzed.

3F. Medicare Access & CHIP Reauthorization Act (MACRA, 2015)

The relevant literature all examined a policy change and how that effected hospital reimbursement. One of my contributions to the literature will analyze the changes instituted from the Medicare Access & CHIP Reauthorization Act of 2015. Supporters pushed for this bill because of its positive long-term outlook. Expert's projected that by 2048 costs will be lower compared to the prior system and by 2085 the savings will be very noticeable as Medicare prices will be 30% less in 2085 (Pear, 2015). It is unclear how large the savings may be, anywhere from $35 billion to $106 billion over a 15 year span. However, one of MACRA's main drawbacks is that it will add $141 billion to the federal budget from 2015-2025. Also, doctors may be encouraged to stay away from the sickest patients, since patient outcomes will now be factored in (Medicare Access and CHIP, 2015). Despite these arguments, MACRA passed easily, with a 92-8 vote in the Senate and a 392-37 vote in the House of Representatives (Pear, 2015).

MACRA’s main goals were to reimburse physicians solely based off of value, rather than volume. In order for this to take place, the Sustainable Growth Rate (SGR) was repealed, while the Quality Payment Program (QPP) was implemented, with two different routes available. These routes, known as the Merit-Based Incentive Payments System (MIPS) and the Alternative Payment Methods (APMs) were implemented to reward physicians for quality service. Also, by

April of 2019 all Social Security numbers will be removed from Medicare cards. Through this, less reporting burdens will allow physicians to work more efficiently and there will be greater support for multi-payer initiatives (The Medicare Access and Chip, 2015).

SGR's were enacted by Congress under the Balanced Budget Act of 1997. They aimed to regulate the costs of physician services to Medicare patients. However, payments were linked to GDP, and it became a problem because SGR's did not take into account the quality of care provided, so many physicians stopped treating Medicare patients (Shaw, 2015). So instead, MIPS was introduced, which reimburses physicians based on a score, which takes into account the quality and value of service provided. A MIPS composite score takes into account four performance categories: quality, resource use, clinical practice improvement activities and meaningful use of certified Electronic Health Record (EHR) technology. This is said to have the potential to adjust payments (either positively or negatively) by 4% by 2019, 5% by 2020, 7% by 2021 and 9% by 2022 (The Medicare Access and Chip, 2015).

The other track within QPP is rewarding physicians for utilizing APMs, which attempts to move Medicare away from FFS and more towards a payment system that is based off of outcome and overall population health (MACRA & Other Physician, 2015). Eligible APMs, which are the most advanced APMs and meet the following criteria: base payment on quality, require use of EHR technology, either bear more than nominal financial risk for monetary losses or be a medical home model expanded under Center for Medicare and Medicaid Innovation (CMMI) authority are subject to 5% lump sum bonuses (The Medicare Access and Chip, 2015).

So how will this effect hospitals? It seems that for the more quality care provided, more money will be coming into a hospital. First off, a study from Health Affairs discovered that Medicare hospital cuts could reach $250 billion by 2030. Taylor (2015) stated that if successful,

APMs are designed to keep patients out of the hospital, yet participation in APMs is the only way to increase reimbursement. Hospitals employ 70% of physicians that will be effected by MACRA, which means hospitals may be the ones paying for the administrative expenses (AHA.org). Also, it is important to point out that one quality measures report costs roughly $10,000.

3G. Principal Agent Problem

The principal agent problem is an economic framework commonly referred to as a theory or relationship throughout health economics literature. Used to analyze circumstances in which an agent, who receives a reward for services, is not driven by market forces to provide the highest level of quality service to the principal (Rosenthal and Frank, 2006). Therefore, the agent is only interested in maximizing their own utility function, which may differ from the principal's utility function. Specifically within hospitals, there are three circumstances in which this problem arises due to information asymmetry: between the patient (the principal) and the physician (the agent), between the hospital board (the principal) and physician (the agent) and lastly, between the hospital board (the principal) and each hospital department (the agent) (Ludwig et al., 2010).

In the first situation, the physician (the agent), provides medical expertise to the patient (the principal), with the patient being unaware of how well he or she is treated. This may cause the physician to act upon their own utility function by acting the most efficiently and therefore, minimizing costs. This is the situation most relevant to my study as it directly coincides with the level of quality care provided by a physician. Although just introduced into hospitals, value-based pay has been implemented in other industries. When financial incentives are introduced, one would expect the agents to react accordingly, however Rosenthal and Frank (2006) discovered that there are mixed results when analyzing pay-for-performance schemes.

In the second situation, the hospital board (the principal) hires the physicians (the agent) to provide the medical expertise to patients, without being fully informed of exactly how efficient and effective the quality of treatment being delivered is. In the last situation, the hospital board (the principal) is concerned with the treatment of all patients, while each hospital department (the agent) is only concerned with the treatment of their specific patients. The hospital board is in charge of dividing up the annual budget amongst each department, however they are not the experts regarding how many inputs go into running a department the most efficiently, therefore making it a tough decision to justify why one department may need new equipment over another (Ludwig et al., 2010).

My study contributes to the literature on many levels: first, I offer the empirical analysis of yet another Medicare policy change that will affect hospital reimbursements. Not only does my paper analyze the most recent policy changes in affect, but also analyzes the effect on hospitals nationwide for incorporating all 1,000 inpatient DRG definitions, along with a political party affiliation variable, which are not shown in previous literature regarding prior policy changes. This is not relatable to any prior policy changes because MACRA influenced the way physicians of hospitals interacted with their patients, while other policy changes aimed to simply increase or decrease Medicare spending. The impact of the implementation of MACRA will be assessed through the following data and empirical model sections below.

4. Data

The data utilized for this study was obtained from the Centers for Medicare & Medicaid Services websites, CMS.gov and Data.Medicare.gov. The two main datasets, known as, the Inpatient Utilization and Payment Public Use Files (Inpatient PUF) were used for the fiscal years 2011 and 2015, which were the first and last year's available. The Inpatient PUF only went from

2011 to 2015, so that was the only data available for my study. The following variables were provided in both data sets: DRG definition, provider ID, provider name, provider street address, provider city, provider state, provider zip code, hospital referral region (HRR) description, total discharges, average covered charges, average total payments and average Medicare payments. Due to the fact that the data set was organized by DRG definition, many provider IDs appear multiple times because of the number of DRG's treated. Since my study analyzes hospital reimbursement, I had to reconstruct the dataset to be at the hospital level, opposed to the individual level. To do this I filtered down each DRG definition per provider ID to just one observation per provider ID. This, along with filtering out unmatched provider ID with the 2015 data set, minimized the number of observations I could analyze. The filtered down files used for my study contained information on inpatient discharges for Medicare beneficiaries for 3,125 hospitals in the United States.

The following is an overview of the variables utilized in my study. Average total payment, my dependent variable, is defined as the total amount the provider receives for an item or service provided. This amount includes the Medicare Severity-Diagnosis Related Group (MS-DRG) amount, bill total per diem, beneficiary primary payer claim payment amount, beneficiary Part A coinsurance amount, beneficiary deductible amount, beneficiary blood deductible amount and DRG outlier amount. Average covered charges is defined as the amount the provider bills Medicare, while average Medicare payments is the amount of payments the provider receives from Medicare. Total discharges indicates the number of beneficiaries who were released from the inpatient hospital after receiving care. Also, as shown in the next section, all the above variables were also accounted for in their natural log forms as previous literature did the same in

their studies. Of all the variables available from the Inpatient PUF, I concluded that these variables had the largest potential to influence a hospital's financial wellbeing.

I also added a political party affiliation aspect to the Inpatient PUF to account for potential correlation between changes in state officials who have an impact on Medicare policy changes. I used the *Biographical Directory of the United States Congress, 1774-present*, which is publicly available on the United States Senate website, Senate.gov, to collect the political party for each Senator for both 2011 and 2015. In 2011, there were a total of 101 Senators because Nevada had three Senators that year (Biographical Directory, 1774).[4] The following 15 states experienced a change in political party affiliation between at least one of their Senators from 2011 to 2015: Alaska, Arkansas, Colorado, Connecticut, Indiana, Iowa, Louisiana, Maine, Massachusetts, Montana, Nebraska, North Carolina, Rhode Island, South Dakota and West Virginia. I chose to utilize Senators for my political variable because they have a direct impact on legislation passed in the United States. Governors do not have the right to vote for legislation and Representatives are not equally divided amongst all states, rather proportionally represented.[5] This is an important variable to incorporate due to a potential sway in voting due to a change in party affiliation of Senators over the years.

Appendix B, Tables 1 and 2, present the summary statistics for the Inpatient PUF. For both fiscal years, the mean of total discharges is rather close, with approximately 166 more in 2015. Unlike the mean of total discharges, the mean of average covered charges tells a much different story between 2011 and 2015. Over the four-year period there was a large increase in the mean amount Medicare was being billed by providers and due to this large increase, the

[4] In 2011, Nevada had three Senators because John Ensign resigned when his term came to an end. Dean Heller was appointed the following week and later elected to full term to join Harry Reid.
[5] Representatives are based off of state population, however each state must have one (History, 2018).

mean of average Medicare payments increased 65%, while the mean of average total payments increased 71%.[6] Due to the fact that there was a slight increase in total discharges, this suggests that trips to the hospital are becoming more expensive and Medicare reimbursement is increasing along with that.

Building on the previous dataset, the third dataset utilized was the Medicare Spending per Beneficiary (MSPB) Spending Breakdowns by Claim Type file, or, the Medicare Hospital Spending by Claim. The data contained 69,631 observations for fiscal year 2015. The variables included in the dataset include: hospital name, provider ID, state, period, claim type, average spending per episode at the hospital, state and national level, percent of spending at the hospital, state and national level and start and end date. Average spending per episode (hospital, state or national) is the average spending for each claim type at that specific level. An episode is defined as a patient's trip to the hospital.

Utilizing average spending per episode (nation) as the dependent variable, I only included average spending per episode (state and hospital) because as previously mentioned, I am only concentrated on hospital reimbursement. An MSPB episode is defined as containing all Medicare Part A and Part B claims paid during the period from 3 days prior to a hospital admission through 30 days after discharge. For each provider, the following Medicare claim types are accounted for: skilled nursing facility, durable medical equipment, carrier, home health agency, hospice, inpatient, outpatient and total. Utilizing a data set that incorporates all these variables will allow me to show the full effect of hospital reimbursement policy changes (Medicare Spending, 2018). However, this data set does not provide the total discharge variable as the prior data sets did. This data set was initially constructed at the hospital level, so all that needed to be

[6] In 2015 the United States inflation rate was 0.12%, which fell from 3.16% in 2011 (Inflation, 2018).

done was the designation of a code to each state to allow for state fixed effects. Also, provider ID fixed effects were taken into account for this model. In the next section I will discuss the econometric models used to test my hypotheses on the implementation of Medicare policy changes in 2015.

5. Methodology

In order to obtain a full understanding of the impact of MACRA on hospital reimbursement I have constructed seven equations. Primarily based on the model used by He and Mellor (2012), who utilized Medicare reimbursement rates for given procedures, hospital fixed effects and hospital-year-level controls to analyze outpatient surgical procedures. My model also stems from White and Wu (2013) and Bazzoli et al. (2004) work. White and Wu (2013) primarily focused on hospital inpatient revenues (Part A of Medicare), which tells the best story of hospital reimbursements. Bazzoli et al. (2004), utilized total hospital expenditures. I utilized average covered charges, which closely relates to their variable. My study focused on inpatient hospital stays using similar variables, controlling for both state and hospitals. I hypothesized that the implications of MACRA would lower costs for physicians of hospitals and would increase reimbursements over the four-year period studied. Also, with a greater emphasis placed on reimbursing properly for value provided, I hypothesized that physicians of hospitals, to place even more emphasis on providing higher value care, because it will now be incentivized accordingly. The following equations have been constructed to test my hypotheses. Equations 1-4 utilize robust standard errors to correct for heteroskedasticity.

(1) $$\ln(2011AvgTotPay_i) = \beta_0 + \beta_1 \ln(2011TotDis) + \beta_2 \ln(2011AvgCovCharges) + \beta_3 \ln(2011AvgMedPay) + \partial_i + \varepsilon_i$$

Equation 1 illustrates the unknown relationship between the natural log of average total payments to hospitals in 2011, to the natural logs of the number of total discharges, average amount of covered charges and average amount of Medicare payments in 2011. The equation utilizes state fixed effects. I hypothesized that an increase in total discharges, along with an increase in average covered charges billed to Medicare, would then in turn increase average Medicare payments, which would then increase average total payments to a provider. This hypothesis is based partly on White and Wu (2013), who discovered that the payment cuts in 1997 resulted in a $1 reduction in Medicare inpatient revenues and a $1.55 reduction in overall net patient revenues, however I envisioned increases to occur.

$$(2)\ \ln(2015AvgTotPay_i) = \beta_0 + \beta_1 \ln(2015TotDis) + \beta_2 \ln(2015AvgCovCharges) + \beta_3 \ln(2015AvgMedPay) + \partial_i + \varepsilon_i$$

Equation 2 illustrates the same as equation 1, however for fiscal year 2015.

$$(3)\ \ln(2015AvgTotPay_i) = \beta_0 + \beta_1 \ln(2015TotDis) + \beta_2 \ln(2015AvgCovCharges) + \beta_3 \ln(2015AvgMedPay) + \varphi_i + \varepsilon_i$$

Equation 3 illustrates the same as equation 2, this time controlling for whether or not a State experienced a change in political party affiliation between at least one of their Senators from 2011 to 2015.

$$(4)\ \ln(2015AvgTotPay_i) = \beta_0 + \beta_1 \ln(2015TotDis) + \beta_2 \ln(2015AvgCovCharges) + \beta_3 \ln(2015AvgMedPay) + \beta_4 \ln(2011AvgTotPay) + \beta_5 \ln(2011TotDis) + \beta_6 \ln(2011AvgCovCharges) + \beta_7 \ln(2011AvgMedPay) + \partial_i + \varepsilon_i$$

Equation 4 illustrates the natural log of 2011's potential impact on the natural log of 2015's average total payments. One would expect that 2011 hospital reimbursements would affect hospital reimbursements in 2015, regardless of policy implementation. This model incorporates all variables for both years, controlling for state fixed effects.

$$(5)\ 2015AvgSpendNation = \beta_0 + \beta_1 AvgSpendState + \beta_2 AvgSpendHospital + \varphi_i + \varepsilon_i$$

Equation 5 illustrates the relationship between the average spending per episode at the national level, with the average spending per episode per hospital and state as the independent variables. This specific model controls for each provider ID to see if it varies at the hospital level.

(6) $2015AvgSpendNation = \beta_0 + \beta_1 AvgSpendState + \beta_2 AvgSpendHospital + \partial_i + \varepsilon_i$

Similar to equation 5, equation 6 illustrates the same relationship, this time controlling at the state level to see if any changes occurred.

(7) $2015AvgSpendNation = \beta_0 + \beta_1 AvgSpendState + \beta_2 AvgSpendHospital + \partial_i + \varphi_i + \varepsilon_i$

Equation 7 illustrates the average spending per episode at the national level, however this time utilizing fixed effects at both the state and provider ID level. In the next section I will analyze the results obtained from each equation.

6. Results

As shown in Appendix B, Tables 1 and 2, show the summary statistics for the two years studied. It is interesting to note that in 2011 the mean for total discharges was 2,189.658, while the mean for total discharges in 2015 was only 2,354.548, which is not that much larger. However, the means for the other independent variables, average covered charges and average Medicare payments, tell a much different story. In 2011, average covered charges was $1,847,746, while in 2015, average covered charges almost tripled to $3,518,594. Also in 2011, average Medicare payments was only $432,589.5, increasing to $716,494.5 in 2015. So, in 2011, average total payments was $494,445.8 and increased to $843,794.4 in 2015. This explains that without a large increase in total discharges over the four-year period, both average covered charges and average Medicare payments experienced a large increase, ultimately increasing average total payments. This re-emphasizes the impact MACRA is having on physicians of

hospitals as they are prioritizing value and quality of care over volume. Just the summary statistics alone represent an increase in hospital reimbursement over the years.

Appendix B, Table 3, shows the estimated coefficients from the equations for the individual fiscal years. As displayed, an interesting difference among the natural logs for 2011 and 2015 exists. In 2011 (column 1), a 1% increase in total discharges meant a 0.0213% increase in average total payments, while in 2015 (column 2), the same 1% increase resulted in only a 0.00575% increase in average total payments. Also, in 2011 total discharges shows 1% significance, while 2015 total discharges shows none. This is interesting because as shown in Appendix B, Table 2, there are more mean discharges in 2015.

In 2011, a 1% increase in average covered charges increased average total payments 0.0481%, while the same increase in 2015 only increased average total payments 0.0412%. I find it interesting how much a 1% increase in average Medicare payments increases average total payments, by 0.911% and 0.939% for 2011 and 2015 respectively. Both 2011 and 2015 show 1% significance. This reiterates how prevalent Medicare payments are in hospital operations (44.3% in 2014) as they had more of an increase than average covered charges (Healthcare Finance Staff, 2014).

In column 3, the estimated standard errors are shown for 2015 utilizing Senator party fixed effects. In terms of total discharges, a 1% increase in total discharges lead to a 0.0164% increase in average total payments. This is interesting because the coefficient is bigger than the standard errors in 2015 when controlling for state fixed effects and also shows 1% significance. In terms of whether or not political party affiliation had an impact on Medicare reimbursement, the results for average Medicare payments in columns 2 and 3 are almost the same (0.939% and 0.938% respectively). Also, when controlling for Senator party fixed effects, average covered

charges actually decreased when compared to column 2. A 1% increase in average covered charges resulted in a 0.0330% increase in average total payments. Both 2011 and 2015 models show high r-squared values.

Appendix B, Table 4, shows the estimated coefficients for the natural log of 2011's potential impact on the natural log of 2015 average total payments. Opposite of when the models are independent of one another, as shown in Appendix B, Table 3, some 2011 coefficients are now negative, when regressed with 2015. In 2015, a 1% increase in total discharges resulted in a 0.0178% increase on 2015 average total payments. A 1% increase in total discharges in 2011 resulted in a 0.0296% decrease on 2015 average total payments. This suggests a strong correlation in prior hospital performances that could affect a hospital's financial well-being in future years. It is interesting to note that the only positive 2011 coefficient in this model is for 2011 average total payments. A 1% increase in 2011 average total payments resulted in a 0.6% increase in 2015 average total payments. So, although 2011 average total payments increased 2015 average total payments, 2011 average covered charges and average Medicare payments both decreased 2015 average total payments (0.108% and 0.471% respectively). This is hard to fathom as both average covered charges determine the average Medicare payments, which ultimately determines a large part of average total payments. This goes against my initial hypothesis and I conclude is due to MACRA instituting emphasis on value over volume.

Appendix B, Table 5, displays the estimated coefficients for the average spending per episode in the United States for 2015. For all the independent variables, the coefficients are rather similar, regardless of what is being controlled for. When provider ID is controlled for, regardless of whether state is too, the results are the same. For the most part, a 1 unit increase in average spending per episode at the state level resulted in just over a 1% increase in average

spending per episode in the United States for all three models. For average spending per episode at the hospital level, a 1 unit increase resulted in a rather small decrease in average spending per episode at the national level. I find it interesting that across all three models when a hospital's spending per episode increases, it actually decreases the average spending per episode in the United States. This is not an area specific to my study but something for future research to potentially address. All three models have the same r-squared values of 0.997. The next section will address key discussion points.

7. Discussion

The results are similar to the findings presented by White and Wu (2013) and He and Mellor (2012). White and Wu (2013) discovered that the payment cuts in 1997 resulted in a $1 reduction in Medicare inpatient revenues and a $1.55 reduction in overall net patient revenues, which are similar results to what I discovered. He and Mellor (2012) discovered that payment reforms that retain a fee-for-service are not effective as they increase demand for Medicare patients, not actually decreasing Medicare costs. My findings from MACRA confirm this.

As previously stated, I hypothesized that an increase in total discharges, along with an increase in average covered charges billed to Medicare, would then in turn increase average Medicare payments, which would then increase average total payments to a provider. As displayed in the results section as well as Appendix B, Table 3, this was true. I have concluded that this is because MACRA has placed a greater emphasis on providing higher quality care that the impact of total discharges on average total payments decreased from 2011 to 2015. This means that the more patients admitted into the hospital and eventually discharged from the hospital does not necessarily mean more money for the hospital, which is shown in 2015. Due to

the fact MACRA emphasizes value not volume, I can now see why this would be shown in the results.

I also hypothesized that the implications of MACRA would lower costs for physicians of hospitals, and would increase reimbursements over the four-year period studied, which was confirmed in the findings. Also, with a greater emphasis placed on reimbursing properly for quality care provided, I hypothesized physicians of hospitals to place even more emphasis on providing higher value care, because it will now be incentivized accordingly. However, it is important to note that in 2011 there were 48,944,303 Medicare beneficiaries in America, while in 2015 that number increased to 55,504,005 (Total Number of Medicare, 2016). So, although there were clear increases in the variables studied, it is unclear whether that was due strictly to policy change, as the number of Medicare enrollees and increase in cost of medical services could have also played a large role. It is important to note that no other policy changes were implemented in 2015, so if the results stand true, MACRA is the only policy change that would affect hospital reimbursements. The next section will discuss policy implications of MACRA.

7A. Policy Implications

As prior health economists have shown, Medicare policy changes could affect hospital reimbursements by either increasing or decreasing their bottom line. These policy changes did either increase or decrease bottom lines, but they did not necessarily influence the relationship between the patient and the physician as much as MACRA may have. As shown through the literature regarding TEFRA in 1982, which introduced the PPS to reimburse hospitals for the actual costs they were incurring, TEFRA had a positive influence on hospitals across the country. Guterman and Dobson (1986) discovered that despite a 3.5% decrease in admissions, hospitals experienced a 44% increase in net-income. The literature analyzing the BBA of 1997, which cut

back on Medicare spending to further prolong the HI fund, showed decreases of 7% in revenue (Das, 2013). Then, the BBRA of 1999, which was implemented to increase Medicare spending as it had slowed down too much in prior years, increased Medicare reimbursement. All these policy changes forced physicians to either change their patient mix by either admitting more or less Medicare patients depending on the legislation. However, for MACRA, that is not the case. More patients will not bring more payments, and neither will less. It is all dependent of the quality of care delivered to the patients. Like the integration of the PPS, this is a major change in health care, which changes the way physicians interact with their patients, specifically in terms of bed side manner and overall quality of care.

Utilizing CMS.gov National Health Expenditures Projections from 2017-2026 I was able to simulate the predicted impact of MACRA. Medicare spending is expected to grow approximately 8% per year on average through 2026 (National Health Expenditure, 2017). As explained further in the next section, if my study incorporated more years I would envision it to look like this: the mean of average Medicare payments in 2016 to be $773,814.06 and to grow to $1,804,255.06 in 2026 (assuming no other policy changes or out of the ordinary inflation occurs). For average total payments, assuming that for every 1% increase in average Medicare payments there continues to be a 0.939% increase in average total payments, I was able to simulate the predicted impact up through 2026. In 2026, the mean of average total payments will be $2,012,426.07. Since there are 3,125 hospitals in my study, that is $643.98 per hospital. This number does not seem to make sense, this may be due to the fact that some hospitals have 11 total discharges a year, while others have close to 37,000, so there is a wide range when it comes to hospital size.

8. Limitations

The study I have conducted is limited in two key areas. First, due to the fact MACRA was implemented in 2015, it does not mean that the effects of MACRA necessarily hit hospitals right away. Also suggested in Table 4, it usually takes a few years for hospitals to adjust institutionally before there are noticeable policy implications shown. That being said, the latest data available was for 2015. As previously stated, the results indicated signs of MACRA being implemented, but that could also just be through the organic growth of Medicare over the years. As noted by Feder et al. (1987), they did not account for institutional or behavioral changes made after implementation. I have thought hard about this, and concluded that the only way to prevent this from happening is to have a larger sample size of years within my study, because there does not seem to be a variable that could account for all potential changes a hospital would make. Also, for the Medicare Spending per Beneficiary (MSPB) Spending Breakdowns by Claim Type File, the only year available was 2015. More years would have allowed me to build a stronger model to show the policy implications over the years.

The second area of limitation exists due to an absence of variables that potentially could have explained more at the hospital level. These variables include the wage-index of specific locations in which there are hospitals, the average income level of specific locations in which there are hospitals, the average education level of specific locations in which there are hospitals, the average age of specific locations in which there are hospitals, a variable accounting for ownership status of a hospital, a county-level fixed effects variable, the number of beds within each hospital, the number of physicians within each hospital and the number of admitted patients. The wage-index variable would potentially explain the salary of the physicians working at the hospital and the average income level variable would potentially explain the wealth of a

specific area, whether or not the community would be able to afford private health insurance plans or solely rely on Medicare. The average age variable would potentially display whether or not a specific hospital provides majority of its care to potential Medicare beneficiaries. For example, in 2015, California had 5,644,384 Medicare beneficiaries, while Wyoming only had 95,055 Medicare beneficiaries. Although I did control for state fixed effects, I believe including a county-level fixed effects variable could further improve my study. Lastly, the number of bed and doctor variables would potentially show the maximum capacity to which any given hospital could operate. Obviously, a small community hospital in Wyoming cannot treat as many patients as a large research hospital in a big city in California. With the addition of these variables and datasets past 2015, my study would incorporate a more well-rounded story on the impact of MACRA on hospital reimbursements. The next section discusses the future of healthcare as well as future areas of research for health economists.

9. Future Research

Future health economists have a series of challenges ahead of them. Healthcare is undergoing a vast change and there will be many key points to pick up on. As the unemployment rate is at its lowest level in history, more Americans now have access to health insurance. It is unknown if the American system will ever become universal, meaning that everyone receives the same quality and level of care for free. What would that do to taxes? More specifically, what would that do to the Medicare and Medicaid funds? These could be areas of future research, if these changes were to become reality.

Other areas of future research relate back to my last econometric models shown in Appendix B, Table 5, where I stated that across all three models when a hospital's spending per episode increases, it actually decreases the average spending per episode in the United States.

This is not an area specific to my study but something for future researchers to potentially address. Also, as valued care becomes more and more prevalent across hospitals, future researchers will be able to conduct studies that could possibly tell a better story as it becomes a more common practice and has been mastered by all. Another potential area to explore would be looking at how different hospitals, whether it be a non-profit or a large university teaching hospital, reacted to MACRA implementation.

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Appendix

Appendix A

Table 1: Cost Sharing of Medicare (1966-2018)

	1-60 Days	61-90 Days	After 90 Days	Deductible for each Benefit Period	Monthly Premium for Part A
1966	$40	$10	-	-	-
2018	-	$335	$670	$1,340	$422/$232*

* For those who purchase Medicare Part A and have paid Medicare taxes for less than 30 quarters, the premium is $422. Anything over 30 quarters, the premium decreases to $232.

Reformatted table format and data points from (Santerre and Neun, Medicare.gov)

Appendix B

Table 1: 2011 Summary Statistics

Variable	Mean	S.D.	Min	Max
Tot. Discharges	2,189.658	2,191.944	11	25,828
Avg. Covered Charges	1,847,746	1,761,648	3,720.44	1.33e+07
Avg. Medicare Payments	432,589.5	332,663.7	2,610.4	2,023,323
Avg. Tot. Payments	494,445.8	372,382.2	3,291.319	2,131,831
N	3,125			

Table 2: 2015 Summary Statistics

Variable	Mean	S.D.	Min	Max
Tot. Discharges	2,354.548	2,785.593	11	36,977
Avg. Covered Charges	3,518,594	4,877,371	4,398.774	6.17e+07
Avg. Medicare Payments	716,494.5	920,768.6	3,148.167	8,965,807
Avg. Tot. Payments	843,794.4	1,101,113	3,966.167	1.05e+07
N	3,125			

Table 3: Natural Log of 2011 and 2015 Average Total Payments

VARIABLES	(1) 2011 Log Average Total Payments	(2) 2015 Log Average Total Payments	(3) 2015 Log Average Total Payments
Tot. Discharges	0.0213***	0.00575	0.0164***
	(0.00327)	(0.00558)	(0.00475)
Avg. Covered Charges	0.0481***	0.0412***	0.0330***
	(0.00435)	(0.00547)	(0.00378)
Avg. Medicare Payments	0.911***	0.939***	0.938***
	(0.00494)	(0.00578)	(0.00446)
Constant	0.450***	0.318***	0.375***
	(0.0214)	(0.0281)	(0.0227)
Observations	3,125	3,125	3,125
R-squared	0.998	0.998	0.997
State Fixed Effects	Yes	Yes	No
Senator Party Fixed Effects	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Natural Log of 2011's Potential Impact on Natural Log of 2015's Average Total Payments

VARIABLES	(1) 2015 Log Average Total Payments
2015 Tot. Discharges	0.0178***
	(0.00672)
2015 Avg. Covered Charges	0.109***
	(0.0108)
2015 Avg. Medicare Payments	0.876***
	(0.0113)
2011 Avg. Tot. Payments	0.600***
	(0.102)
2011 Tot. Discharges	-0.0296***
	(0.00531)
2011 Avg. Covered Charges	-0.108***
	(0.0119)
2011 Avg. Medicare Payments	-0.471***
	(0.0968)
Constant	0.0760
	(0.0530)
Observations	3,125
R-squared	0.998
State Fixed Effects	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Average Spending Per Episode Nation 2015

VARIABLES	(1) Average Spending Per Episode Nation	(2) Average Spending Per Episode Nation	(3) Average Spending Per Episode Nation
Avg Spending State	1.009***	1.008***	1.009***
	(0.00112)	(0.00104)	(0.00112)
Avg Spending Hospital	-0.0147***	-0.0132***	-0.0147***
	(0.00118)	(0.00109)	(0.00118)
Constant	7.228***	7.230***	7.228***
	(1.073)	(1.048)	(1.073)
Observations	69,630	69,630	69,630
R-squared	0.997	0.997	0.997
State Fixed Effects	No	Yes	Yes
Provider ID Fixed Effects	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1