TOWARDS AFFORDABLE AMERICAN MEDICINE:

AN EMPIRICAL ANALYSIS OF THE DETERMINANTS OF HEALTHCARE EXPENDITURES IN DEVELOPED NATIONS

And

A PRESCRIPTIVE COST-EFFECTIVENESS ANALYSIS OF POTENTIAL POLICY ALTERNATIVES

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ABSTRACT

The passage of the Affordable Care Act (ACA) is part of a continuing debate over how to combat rising health care expenditures in the United States. To judge whether it will be effective, one must first determine the causes of rising health care expenditures before considering which of several available policy alternatives provides the most cost-effective method of reforming the American healthcare system.

In its first part, this study uses panel data from 31 OECD countries in 2004, 2006 and 2008. White standard errors (diagonal and period) are utilized to compensate for heteroskedasticity. The results indicate that growth in health care expenditures is demand driven with minimal negative supply side effects in the cases of fee for service models and the portion of health care expenditures absorbed by the government. Technological advancement is found to be negatively correlated with the growth of health care expenditures. Among demand factors, higher income per capita, increased size of at risk age groups, a larger female proportion of the population, increased income equality, increased life expectancy, higher unemployment, and higher obesity rates are found to positively affect the growth rate of health care expenditures per capita. Findings suggest health care spending is price inelastic but elastic with respect to income. This implies that governments should seek to manage demand while not adversely affecting overall health.

In its second part, this study uses cost-effective analysis to conduct case studies of the health care policies of the United States, the United Kingdom and Singapore. In order to minimize bias, the author utilizes both critical case and maximum variation sampling in the selection of cases to be analyzed and a structured focus comparison methodology in the actual conduction of the policy analysis itself. The results indicate that Singapore’s health care system is the most cost-effective, followed by the United Kingdom, and the United States (whose system proved to be the least cost-effective). This study suggests that cost-effectiveness seems to be largely driven by differences in health care policy (particularly the way in which costs and demand are controlled as well as the method in which health care is financed) and the baseline health of the countries in question. Analysis suggests that income and education are not significant determinants of cost-effectiveness. Overall, this indicates that the ACA will not improve and may decrease the cost-effectiveness of the American healthcare system.

Key Words: Health Care Expenditure, Determinants, Empirical, Panel Data, Regression, Policy Analysis, Comparative, Market Based, Single Payer, Affordable Care Act

Journal of Economic Literature Classification Codes: I11, I18, C01, C23
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I. INTRODUCTION

On March 23, 2010, President Barrack Obama signed the Patient Protection and Affordable Care Act (ACA) into law, marking the first major reform of the American healthcare system in decades. The bill was formulated in response to rapidly increasing health care costs in the United States which have far outstripped the rate of inflation and the growth of similar costs in other developing countries. As Figure 1 below reveals, the United States spends more per capita than any other member of the Organization for Economic Cooperation and Development (OECD) at $8233.00 per person in 2010, a figure that equals 17.6% of its Gross Domestic Product (GDP).

The ACA, based upon a similar system adopted in Massachusetts in 2006, sought to control costs by expanding insurance coverage and creating health care exchanges. From the moment they were proposed, the reforms were deeply controversial. The law was placed on a fast track for review by the Supreme Court, which, on June 28, 2012, upheld the majority of the law.
However, the decision in *United Federation of Independent Business v. Sebelius* has far from resolved the conflict. As Friedman (2012), states in his article analyzing the decision:

“By voting with the liberal justices to uphold the bill, [Chief Justice Roberts] removed the spotlight from the Court and placed the issue of health care back in the realm of politics. […] T]he debate over the ACA will now take place in the public sphere rather than in the courtroom.”

While the court may have answered the constitutional questions surrounding the ACA, the deeper question in the minds of many is: will it work?

Answering this question first requires the exploration of a larger query: what are the drivers of health care costs in developed countries? To truly understand why expenditures in the United States are so high, there must be some point of comparison. Furthermore, by exploring what factors drive health care expenditures in those countries that are most similar to the United States, an analyst can better pinpoint why the expenditures in the U.S. are uniquely high and what policies are best suited to controlling those costs. It its first part, this study seeks to answer this question through the use of fixed effects regression model of panel data from 31 OECD countries over 3 years (2004, 2006 and 2008) (rendering a total of 93 observations). Healthcare expenditures are found to be primarily demand driven (significant coefficients are found for income, age distribution, size of the female population, income inequality, unemployment rates, average life expectancy, and the percentage of the population that is overweight) with some influences by technology, public expenditure on health care and the use of fee-for-service methods of compensating health-care providers (whose coefficients were also found to be significant).

The second question then becomes: which type of policy will most effectively control this demand while still maintaining a high-quality level of care. This study’s second part seeks to answer this question through the use of a cost-effectiveness analysis of several different archetypes of health policy: predominantly public, quasi-public, and market-driven. In doing so, it considers three policies that resemble these ideal-types: the U.S. healthcare system (with some reference to trends in Massachusetts as an indicator of the possible consequences of the Affordable Care Act), the universal health care system in the United Kingdom, and Singapore’s tri-partite health policy. The policies are evaluated based upon their
ability to control health care costs and the quality of care provided, a combination this study refers to as “cost-effectiveness.” This analysis suggests that the ACA will not increase and may decrease the cost-effectiveness of the American healthcare system, because cost-effectiveness is largely determined by differences in health care policy (particularly the degree to which states implement “free-market” systems and work to control costs) and in baseline health status. Income and education are not found to be related to the cost-effectiveness of healthcare systems.

However, before reaching further analysis of the ACA, this study begins with an empirical analysis of the drivers of health care expenditures in developed nations, before turning to the more value-laden task of policy prescription.
PART A:
DETERMINANTS OF HEALTH CARE COSTS
Many researchers have attempted, through a variety of methodologies, to shed light on the issue of increasingly high health care costs in the developed world. Most have been frustrated along the way by methodological difficulties (such as missing values for observations) and conflicting results. In Section II, this study will review the relevant empirical literature pertaining to health care costs. Following that review, Section III will set out the theoretical model on which the study is based. Section IV will describe the empirical model and the estimation technique used in the study. Section V will evaluate some preliminary statistics and explore the sample used in more depth. Section VI of the paper will discuss the diagnostic tests conducted prior to estimation. The results of the estimations and preliminary policy implications will be conveyed in Section VII. The study then briefly considers methods to improve upon this work in a brief conclusion, before proceeding to its second part. In order to provide grounding for the present study, I now turn to a review of the relevant literature.

II. REVIEW OF EMPIRICAL LITERATURE

The literature attempting to explain what causes variation in health care expenditure can, generally, be divided between that which uses econometric methods to explain overall healthcare expenditures as a function of specific variables (as this study will attempt to do) and that which explores, sometimes with somewhat primitive methodologies, the effects of an individual variable on health care spending. This review of literature will focus first on the econometric estimations (particularly those comparing OECD countries), while the individual variables will be discussed in the fourth section of the paper.

The econometric analysis of variations in health care expenditures among countries began in the latter-half of the 20th century. Newhouse (1977) provided the seminal work in the field when he conducted regression analysis on a cross-section of 13 members of the OECD. He found that the income elasticity of per capita health care expenditures was greater than one (indicating that health care is a luxury good) and that GDP per capita was capable of explaining over 90 percent of the variation in
expenditures (1977). Though his research is severely limited in that he did not include any other variables in his analysis and due to a breathtakingly small sample size (which left him with 11 degrees of freedom), his methods and findings set forth two important themes that remain constant throughout the literature: (1) the use of the double-log form, and (2) the dominance of GDP per capita as an explanatory variable. I will discuss the consequences of each of these themes at the end of the section, but for now it is important only to bear them in mind.

Basing their work on Leu (1986) and Culyer (1989), Gerdtham et al. (1992) sought to expand on Newhouse’s work, particularly by adding additional variables to the model to account for institutional and socio-demographic variation between countries. Leu’s (1986) cross-sectional analysis of 19 OECD countries suggested that increases in public provision of health care (payment for care by the government) would lead to overall expansions in health care expenditure. Culyer (1989) disagreed with this analysis, arguing, based on his own empirical work, that it was the “open-endedness” (or the number of finance sources and relative use of fee-for-service models\(^1\)) that affected health care expenditure rather than public financing. Gerdtham et al. (1992) set out to rectify these contradictory arguments as well as explore the impact of factors such as age, urbanization and female participation rate\(^2\) on expenditures. Using a double-logged cross-section of 19 OECD countries and data from the OECD’s Health Data File, Gerdtham et al. (1992) found that GDP per capita, urbanization, public financing and fee-for-service systems had a significant effect on expenditures. They again found the elasticity of health care expenditures with respect to per capita GDP to be more than 1, confirming, as had Culyer and Leu, Newhouse’s depiction of per capita GDP as a major determinant of health care expenditures. The negative coefficient for public financing and positive coefficient of the fee-for-service variable tend to support Culyer’s (1989) theory over that advocated by Leu (1986). However, the lack of degrees of freedom in this study, similar to Newhouse’s 1977 study, is troubling, as is the reduction and repetition

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\(^1\) Where the number of finance sources refers to the number of organizations or individuals (including the government) paying for health care in a system and fee-for-service models are those in which doctors are paid for each service performed rather than on salary or per patient.

\(^2\) This refers to the ratio of female consumption of health care to male consumption of health care with the theory being that females generally induce higher expenditures (due to the costs of reproduction, etc.) than males.
approach the researchers used to reach their final model and results, which may explain why the
coefficient on the public expenditures variable had the opposite sign as might be expected. The
unexpected result for public expenditures could also easily have resulted from omitted variable bias
(created by the researcher’s techniques). Furthermore, none of the aforementioned studies used the same
independent variables in their analysis. By systematically removing statistically insignificant variables
and then re-running the regression on the same data, the researchers cast doubt on their results by tailoring
the equation to their specific sample (19 OECD countries in 1987).

Given the low degrees of freedom in all of the previous studies, the obvious next step for
researchers in this area was to expand the sample size by moving to panel data analysis. Hitris and Posnett
(1992) adopted this approach in exploring data from 20 OECD countries for the 28 years from 1960 to
1987 (resulting in 560 observations). They also found a dominant effect for the GDP per capita variable
and a coefficient of elasticity above one, consistent with most of the cross-sectional studies that preceded
their analysis. Additionally, and in contrast to previous studies, Hitris and Posnett (1992) found the
coefficient of the share of public financing for health care to be statistically insignificant and the
coefficient of the age structure of the population (the percent of the population over the age of 65) to be
significant. Gertham et al. (1998) also conducted a panel-data study following their work with cross-
sectional data. They used a sample of 22 OECD countries over a 20 year period, this time including a
larger variety of structural variables (including the use of primary care physicians as gatekeepers, the
number of hospital beds supplied, etc.). Their analysis again found a strong correlation between GDP and
healthcare expenditures. This time, however, Gerdham et al. (1998) found that (with an income elasticity
lower than 1) healthcare might be better considered a necessity rather than a luxury good. Gerdtham et
al. (1998) also found higher numbers of doctors, the use of gatekeepers, systems emphasizing the
reimbursement of patients rather than doctors, and greater shares of public expenditure to be correlated
with lower levels of health care expenditure. However, as was the case in the earlier work, Gerdtham et

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3 One would assume a higher portion of costs covered by the government would positively correlate with
consumption of health care and therefore, holding the unit price of healthcare constant, resulting in higher overall
expenditures.
al. continue to use a pairing down approach where the regression equation is repeatedly re-run on the same sample and eliminating insignificant variables. The conflict between these two studies is problematic, particularly in that results appear to be highly dependent upon the formulation of the regression equation, suggesting problems in the underlying equation itself. Barros (1998) ran a similar test in 24 OECD countries and found reimbursement, the use of gatekeepers, and population aging to have no statistically significant relationship to health care expenditures while GDP was again positively related.

Batagi and Moscone (2010) reconsider these previous panel studies by conducting a panel analysis of 20 OECD countries over the period from 1971 – 2004. Like Hitris and Posnett, (1992), Batagi and Moscone (2010) found the coefficients of age and the ratio of public to private expenditures to be insignificant. They also, once again confirm the significance of the coefficient for GDP per capita variable, but find health care to be a necessity rather than luxury good. Other studies, whether panel studies or cross-sectional studies, seem to go along the same vein (whether they are examining OECD countries, regional variations within countries, or other groups of countries), confirming the dominant effect of income (GDP per capita) on expenditures, while reaching no consensus on any other variable. Ke et al. (2011) in a panel study of 143 countries over 14 years, for instance, found GDP per capita to be a highly significant (with an elasticity of health care expenditures with respect to GDP being lower than one) determinant of health care expenditures, as well as prevalence of tuberculosis and the percentage of expenditures paid by the government (but they found the latter to be positively correlated with expenditure, in contrast to Gerdtham et al. (1998)). Okunade (2005), in examining cross-sectional data from Africa, found GDP per capita and income inequality (in addition to several specific variables that apply only to developing countries) to have a significant negative effect on expenditures. Murthy and Okunade (2009), in a similar cross section of 44 African countries from 2001, found only the coefficients of per capita GDP and the amount of foreign aid received to be positive and significant. In a review of expenditures from the Swiss cantons, Reich et al. (2012) found per capita income (positively correlated), use of managed care (negatively correlated), density of specialist physicians (positively correlated),
technological progress (positively correlated), population under 5 years of age (negatively correlated), and unemployment rate (positively correlated) to significantly affect health care expenditures.

To summarize, what one can take from this lengthy recitation of conflicting estimations are the following suppositions. First, that GDP per capita (as a proxy for income) has been found repeatedly to be significantly and strongly related to per capita health care expenditures, though estimations of income elasticity for health care spending vary. Second, the share of health care expenditures covered by the government has been found to have a significant effect on health care expenditures in many studies (though the direction of this effect has varied). Third, there are a variety of structural and socio-demographic variables whose significance has been found in some cases and not in others, some of which were only included in one or two of the previous analyses. These will likely have to be evaluated independently to determine whether or not they should be included in the present analysis.

Having said that, it is important now to return to the two themes mentioned above: (1) the use of the semi-log form, and (2) the consistent strong correlation between GDP per capita and per capita health care expenditures. The first is relevant to this analysis, because it provides the empirical grounding for the use of the semi-log form in this study’s methodology. The semi-log form is appropriate because the coefficient of the independent variables show the percentage change in the dependent variable for each unit change in a given independent variable, holding all other variables constant. This is particularly useful when you are talking about health care expenditures, as the percentage change in per capita expenditures given a unit change in, for instance, the number of physicians per 1000 citizens is a much more useful statistic than a dollar figure.

The second theme, that GDP per capita has been found to be consistently and positively correlated with per capital health care expenditures, is not surprising given the clear theoretical relationship between demand and income (that income increases demand). However, it is worth considering why alternative measures, such as gross national income (GNI) or disposable income were not used. What is problematic is that GNI and disposable income exclude the income of residents within a country who are not citizens and includes the income of citizens of a country who are not residents, which
is not an accurate conceptualization of the population actually using health care within a given country. It is for this reason that the present study will utilize GDP per capita rather than GNI.

III. THEORETICAL MODEL

Having explored the empirical literature related to health care expenditures, it is time to turn to more specific analyses of individual variables to build a list of variables to be used in the following estimation. It is useful to begin with a theoretical model. As is the case with any product which is bought and sold in a market system, spending on health care is a function of both supply and demand.

Figure 2: Supply and Demand for Healthcare

As Figure 2, shows the price of health care as well as the quantity is determined by the intersection of the supply and demand curves, assuming a competitive market that is not affected by market failures. The supply curve is governed by the Law of Supply (as price increases, quantity supplied also increases) and the demand curve by the Law of Demand (as price decreases, quantity demanded increases). The equilibrium price and quantity are thus simultaneously determined. Health care expenditures are the product of those two variables (P x Q), as represented by area A in Figure 2. Changes in healthcare expenditure are, accordingly, caused by shifts in either the supply or demand curve. A study seeking to explain those changes must take into account variables that potentially shift either or both of these curves.

Shifts in the demand curve are generally caused by increases in income, changes in the prices of substitutes and/or complements, changes in tastes/expectations, and changes in the number of customers.
Though an ideal model would include such substitutes as non-traditional medicine, there are effectively no obvious, direct and measureable substitutes or complements for health care. However, it is worth mentioning that, given a limited personal income, people must choose between alternative uses of their money. In this sense, other major expenses (such as mortgages for instance) may function as a substitute for health care. Variations in these types of variables between years will be accounted for by using a fixed effects model that allows for a different intercept for each year and thus, to some degree, compensates for variables that vary over time. In a similar fashion, tastes or expectations play a diminished role in the healthcare market; although, it is worth mentioning that cultural norms concerning when it is appropriate or necessary to pursue conventional medicine (as opposed to forgoing care or trying traditional remedies) may affect demand and therefore expenditures. Aside from income, the biggest demand-side factor is best conceived as changes in the population demanding care. This is where demographic variables such as age, gender, prevalence of obesity, etc. come in. To use age as an example, (assuming that those over the age of 65 consume more healthcare) a country with a greater percentage of citizens over the age of 65 will have a higher demand for healthcare. Many of these factors are considered in the next section. Additionally, structural aspects of the health care system, like the presence of gatekeepers, should be perceived as an intervention, whether by the government or insurance companies, dis-incentivizing the consumption of expensive services and thereby shifting the demand curve leftward.

To return to basic microeconomics once again, shifts in the supply curve are generally caused by changes in input prices, changes in the prices of related goods/services, changes in the technology of production, changes in expectations, and changes in the number of producers. As was the case in our demand analysis, substitutes/complements are not really relevant to the analysis in the healthcare market. Important supply-side variables include technology, the number of suppliers of health care (hospitals, doctors, etc.) and the price of inputs (such as the salaries paid to doctors and the cost of equipment). Expectations are relevant in the supply-side to the extent that salary expectations and the like may draw greater numbers of doctors, but is not particularly relevant in its own right as it is measured by variables measuring the number of suppliers.
The literature regarding health care expenditures (as we will see in the following section) often places technology on the demand side of the equation as well, pinpointing it as a driving force behind increasing healthcare expenditures. For instance, new technological advancements (such as new bone-density testing equipment) are often pushed by doctors and demanded by patients, causing an increase in demand. If this is the case, then technology as a driver of demand would, incontrovertibly, lead to an increase in demand as the rate of technological advancement increases. Regardless of its placement, technology is theorized to have some effect on either the supply of or demand for health care.

Structural characteristics of the system, such as fee-for-service systems may also impact supply. For instance, fee-for-service models may incentivize doctors to prescribe more services in order to receive more payments (as opposed to a capitation, or per patient, or salary model of payment for health care professionals) and thus cause a rightward shift in supply. In a similar way, increased coverage of expenditures by the government may cause a shift in supply by reducing administrative costs for health care providers. By decreasing the number of payers (particularly insurance companies) that doctors must deal with government may decrease their need for bureaucracy. In addition, by consolidating more and more of the coverage in one agency, the government may be able to increase efficiency in the payment system by taking advantage of economies of scale, hence having a positive effect on the supply of health care. Both of these scenarios would cause a rightward shift in supply. On the other hand, such a consolidation might lead government to accumulate monopoly power and become less efficient, which could shift the supply curve leftward, complicating the issue still further.

Supply side variables in general are difficult to predict in terms of their effect on health care expenditures. As Figure 3 shows, assuming linear supply and demand curves, the effect of a rightward shift (increase) in supply on healthcare expenditures will depend on whether the supply curve intersects the demand curve at a point where demand is elastic (upper half of the demand curve) or at a point where it is inelastic (lower half of the demand curve). If the former, total expenditures will increase; if the latter they will decrease. For instance, technology in offering new services or making old services cheaper can
either increase or decrease total expenditures depending on the supply curve’s position with regards to the
demand curve and the extent of the shift created. Figure 3 puts this relationship into perspective:

Figure 3: Effects of a Shift in Supply

However, the effect of the percentage of health care expenditures covered by the government is
not quite so simple, because increasing the percentage of expenditures the government absorbs may
function as a subsidy to suppliers or demanders and thus increase supply or demand. Figure 4 illustrates
this analysis, where area A represents private expenditure on care and area B represents public
expenditure on care and their sum would be the total expenditure on health care in the given economy.

Each of these forces will be considered in more detail in the next section, which will explore in

Figure 4: Subsidy Effect of Greater Governmental Absorption
Reese

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depth the variables to be included in this analysis. However, before continuing into that analysis, a brief word about the dependent variable utilized is necessary. To reach the dependent variable considered in this study, and to facilitate the comparison between OECD countries that it proposes, one additional alteration to the health care expenditures variable must be made. Because it is obvious that a country with a greater population will spend more on health care, the variable must be adjusted for population. Thus the dependent variable in this study is per capita health care expenditures (or PHCE), defined as follows:

\[
PHCE = \frac{(P)(Q)}{N}
\]

Where \(P\) and \(Q\) represent the Price and Quantity of healthcare as determined by the supply and demand curves and \(N\) represents the population of an individual country.

This does not conceptually change the factors that must be considered — PCHE, like total health care expenditures, are still determined by supply and demand curves. The change simply removes population, which clearly and obviously affects expenditures, from the equation to more directly answer the question proposed by the research and conserve degrees of freedom.

IV. EMPIRICAL MODEL AND ESTIMATION METHOD

This section considers the formulation of the empirical model used in the present research and begins a discussion of estimation methods and functional form, before moving to an analysis of the sample and the independent variables in turn.

Method

The model considered uses the log of per capita health care expenditures (PCHE) as the dependent variable in this analysis. The empirical model used for this study is:

\[
\text{Equation 1: } \ln \text{PCHE}_i = f(\text{Independent Variables in Table 1}) + \varepsilon_i
\]

Where \(i = (1,2,3...31)\) and \(t = (2004, 2006, 2008)\).

This study utilizes panel data. The use of panel data requires choosing between the fixed effect, random effect, and pooled methods of estimation. Because this study considers 93 observations, the pooled method can be excluded because degrees of freedom are sufficiently high to allow for the use of a
more appropriate methodology. Second, because there is effectively no real randomness between the
cross-sections (years), a random effects model is not appropriate. A random effects model would be more
appropriate in a random sample or a sample of individuals where variation between cross sections could
fairly be said to have some random components. This is not the case in the present research. Fixed effect
models are generally preferable, because they allow the constant to vary between observation periods and
thus better account for time-related variations (discussed above with regards to complements and
substitutes) not considered in the model. Accordingly, this study uses a fixed effects approach.

For this study, the use of the semi-log functional form is the most appropriate as it allows for the
estimation of the elasticity of per capita health care expenditures (PCHE) with respect to several
independent variables. In other words, this allows the researcher to estimate the percentage change in
PCHE, given a 1 percent or 1 unit change in a given independent variable.

The Sample

Before exploring the specific the variables, it is worth taking a moment to explore the sample of
data used in this analysis. This study considers 193 observations, using data from 31 OECD countries in
2004, 2006, and 2008. Figure 3 lists the countries considered.

Figure 5: Countries Included in Estimation

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<td>Austria</td>
<td>Greece</td>
<td>Mexico</td>
<td>Turkey</td>
</tr>
<tr>
<td>Belgium</td>
<td>Hungary</td>
<td>Netherlands</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Canada</td>
<td>Iceland</td>
<td>Norway</td>
<td>United States</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Ireland</td>
<td>Poland</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>Israel</td>
<td>Portugal</td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td>Italy</td>
<td>Slovak Republic</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>Japan</td>
<td>Slovenia</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>South Korea</td>
<td>Spain</td>
<td></td>
</tr>
</tbody>
</table>

Missing variable values were estimated by either (1) using the closest year not included (i.e. filling in a
missing 2008 value with a value from 2009) or (2) averaging the two years on either side of the missing
value (with preference given to the sample years over years that were not included) to provide an
approximate statistic. Chile, New Zealand, and Sweden were the only OECD countries excluded from analysis due to the severity of missing data from these countries for the years in question.

This sample is highly suited to answering the research question posed in this study, because it uses data from an organization made up of economically developed countries that are accordingly similar to the United States. Although an ideal model would have included all 34 OECD countries, only dropping 3 countries from the analysis due to a lack of data is impressive as most previous studies discussed above were forced to exclude a substantially greater number (some even approached the exclusion of 10 OECD member states). Additionally, because this study focuses on the modern drivers of costs, it is appropriate to limit the sample to more recent years. Here again, although an ideal study would include a greater and contiguous span of years, the ability to include all states in the analysis and the limitations of available statistical estimation software necessitates the sacrifice of some years, particularly the most recent years for which data has not yet been released. This study is not adversely affected by the decision to consider every other year as many of the variables in question move slowly enough that their variation is almost as adequately captured by a bi-annual model as it would have been by an annual specification.

Independent Variables

The following table (Table 1) lists the independent variables included in this study, the definition of those variables, their data source, and the expected signs of their coefficients. The variables included are best divided into three distinct categories: those driving demand for health care, those driving the supply of health care, and those that may drive both.
### Table 1: Variables Included and Expected Coefficients

<table>
<thead>
<tr>
<th>Name</th>
<th>Definition</th>
<th>Source</th>
<th>Expected Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drivers of Demand</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnPGDP_{it}</td>
<td>Logged Per Capita Gross Domestic Product Adjusted for PPP in Constant 2005 International Dollars in Country i During Period t</td>
<td>World Bank</td>
<td>Positive</td>
</tr>
<tr>
<td>AGE65_{it}</td>
<td>Percentage of the Total Population Over the Age of 65 in Country i During Period t</td>
<td>World Bank</td>
<td>Positive</td>
</tr>
<tr>
<td>AGE14_{it}</td>
<td>Percentage of the Total Population Under the Age of 14 in Country i During Period t</td>
<td>World Bank</td>
<td>Positive</td>
</tr>
<tr>
<td>FEMALE_{it}</td>
<td>Percentage of the Total Population that is Female in Country i During Period t</td>
<td>World Bank</td>
<td>Positive</td>
</tr>
<tr>
<td>EDUC_{it}</td>
<td>Percentage of the Population Possessing a Tertiary Education in Country i During Period t</td>
<td>World Bank</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>URBAN_{it}</td>
<td>Percentage of the Total Population Living in Urban Areas in Country i During Period t</td>
<td>World Bank</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>GINI_{it}</td>
<td>Gini Coefficient of Country i During Period t</td>
<td>OECD</td>
<td>Negative</td>
</tr>
<tr>
<td>UNEMP_{it}</td>
<td>Unemployment Rate in Country i During Period t</td>
<td>World Bank</td>
<td>Positive</td>
</tr>
<tr>
<td>LIFE_{it}</td>
<td>Average Life Expectancy of Citizens in Country i During Period t</td>
<td>World Bank</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>OVW_{it}</td>
<td>Percentage of Adult Population (Ages 15+) with a BMI greater than 25 kg/m² (Qualifying as Overweight) in Country i During Period t</td>
<td>World Bank</td>
<td>Positive</td>
</tr>
<tr>
<td>GKEEP_{it}</td>
<td>Dummy Variable where Countries in which the Standard Procedure Requires Primary Care Physician Referral to See Specialists Receive a Value of 1 and Otherwise 0</td>
<td>Gerdtham, 1996</td>
<td>Negative</td>
</tr>
<tr>
<td><strong>Drivers of Supply</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOCTOR_{it}</td>
<td>Number of Practicing Physicians per 1000 People in Country i During Period t</td>
<td>OECD</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>BED_{it}</td>
<td>Number of Hospital Beds per 1000 People Available in Country i During Period t</td>
<td>OECD</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>FEE_{it}</td>
<td>Dummy Variable where States in which the Standard Procedure is to Pay Physicians on a Per Service Basis Receive a Value of 1 and Otherwise 0</td>
<td>Gerdtham, 1996</td>
<td>Ambiguous</td>
</tr>
<tr>
<td><strong>Drivers of Both Supply and Demand</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RD_{it}</td>
<td>Percentage of GDP devoted to Research and Development</td>
<td>World Bank</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>PUBLIC_{it}</td>
<td>Percentage of Total Health Care Expenditures Covered by the Government in Country i During Period t</td>
<td>World Bank</td>
<td>Ambiguous</td>
</tr>
</tbody>
</table>

### Drivers of Demand for Healthcare

Demand curves are generally shifted by changes in income or in the population demanding the service in question. The empirical evidence in support of the theoretical premise that increases in income will, in the aggregate, increase demand for care and therefore expenditures has already been discussed. The other variables to be examined are primarily socio-demographic variables, such as the age structure of the population, which affect the number of people demanding health care as well as the type of care
demanded. Changing these variables in such a way as to increase the demand for care, for instance increasing the proportion of the population over the age of 65, should also, theoretically, increase health care expenditures and decreasing that proportion should decrease expenditures.

The findings regarding the effects of these various demographic variables on health care expenditures are decidedly mixed. The age distribution of the population, particularly the number of children under the age of five and the number of adults over the age of 65, have not always been found to have a statistically significant effect on PCHE, but theory would suggest that increasing the number of people in these age groups would increase overall demand for health care as they tend to need the most care. In a similar manner, a measure of the percentage of the population that is female warrants inclusion, despite having been found not to have a significant effect on expenditures (Gerdtham et al., 1992; Gerdtham et al., 1998), because, theoretically women would be expect to have higher health care costs than men due to reproductive costs and longer life expectancies (Meerding, Monneux, Polder, Koopmanschap, & van der Maas, Paul J., 1998). Theory would also suggest that increasing levels of education would have some effect on health care although the direction of that effect is ambiguous. Increased education levels might lead people to be more concerned about potential health problems and thus more likely to seek medical treatment, or (conversely) might lead them to take better care of themselves and invest in preventative care, driving down health care expenditures. This study includes variables measuring the percentage of the population over the age of 65, the percentage of the population under 14 (as no data was available specifically for the under 5 population), the percentage of the population that is female, and the percentage of the population having obtained a tertiary (greater than high school education).

Urban concentration, income inequality, unemployment and poverty rates are easily justifiable variables for inclusion in the present study. Though they have not always been found to have a significant effect on PCHE, there are strong theoretical reasons for their inclusion. Urban concentration was included by Gerdtham et al. (1992) and found to be significantly and negatively correlated with health care expenditures, in contradiction to Leu (1986), who found it to be positively correlated. These conflicting
results could be attributable to greater access to care, especially preventative care, in urban areas or to increased poverty; however, the variable does not seem to have been included in later analyses. Thus, the effect on health care expenditures of increased urban concentration is relatively ambiguous. Regardless of this fact, the theoretical logic of including a variable to measure urban concentration justifies its inclusion. Okunade (2005) justifies his inclusion of income inequality measures in a cross-sectional analysis of African countries by arguing that increased spending on health care or improvements in the health status of the poor are unlikely in countries that have high concentrations of wealth (and therefore greater income inequality), particularly because there is little impetus to adopt social welfare measures and the poor cannot spend money they do not have on healthcare. While these effects are likely less apparent in developed countries, economic theory would still suggest that healthcare spending will be higher in countries where more people are able to afford healthcare (those with lower income inequalities). The effects of the poverty rate in a country are likely to be negative for the same reason, although there is a possibility that these two measures may be too highly correlated to be included simultaneously. This study will use the GINI index as a measure of income inequality and a proxy for poverty (actual poverty rates were not available) and the total percentage of the population living in urban areas as a measure of urban concentration. The unemployment rate is also included, because it may affect the ability of individuals to access health care. With income held constant, the main difference between those who are employed and those who are not should theoretically be the availability of free time. This would increase the ability of these individuals to obtain healthcare, because they don’t have to take off time from work.\(^4\)

Of the studies discussed above, only Ke et al. (2011) considered the prevalence of certain types of diseases, in this case tuberculosis, and found it to have a significant positive effect on health care expenditures. While, as with income inequality, the difference among developed members of the OECD are likely less pronounced than in the countries in that analysis, research such as that of Meerding et al. (1998) suggests that different types of illness have widely varying impacts on expenditures. Particularly

\(^4\) It is also possible that the stress (or emotional hardship) of rejection and/or the continuing unsuccessful search for employment decrease the health status of these individuals, which would also lead them to consume more care.
where the United States is concerned, the impact of obesity on those expenditures is of special importance and a matter of controversy in the literature. Although no formal empirical models have been used, several studies have attempted to gauge the impact of obesity on expenditures. Thorpe et al. (2004) for instance used a regression model to control for other variables and attempted to forecast spending for individuals to determine the effect of obesity on overall spending, essentially saying that any expenditures not explained by the regression had to have been caused by obesity, which he had not included in the regression. They estimated that obesity could account for 27 percent of the increase in per capita health care expenditures between 1987 and 2001 (Thorpe et al., 2004). On the other end of the spectrum, van Baal et al. (2008) found, using a simulation model, that although reductions in obesity might reduce health care expenditures in the short term, in the long-term the costs of obesity prevention coupled with increased costs due the longer life expectancies of those who would have been obese either balance out or exceed those savings. In their own words, van Baal et al.’s findings suggest that “[o]besity prevention may be an important and cost-effective way of improving public health, but it is not a cure for increasing health care expenditures” (2008). These works provide a theoretical justification for the inclusion of disease incidence variables in this study. Disease incidence is proxied by two variables in the present research. First life expectancy is used as a proxy for general health as those who live longer can likely be perceived as healthier; however, it is also possible that this variable will have a positive relationship with expenditures as those who live longer will typically consume more care. Second, the percentage of the population qualifying as overweight is included as a measure of obesity and a proxy for physical activity (assuming that physical activity is diminished where there is greater usage of motor vehicles). Life expectancy’s relationship is, accordingly, difficult to predict, but the percentage of the population that is overweight is expected to be positively related to health care expenditures.

The literature also suggests that the number of people who have, or more importantly do not have, health insurance also may drive costs. Newhouse (1991), though he focused primarily on the effects of technology, indicated in his article that the traditional theory among economists is that a spread of health care insurance leads to higher health expenditures as it reduces the amount of cost faced by consumers.
He points to analysis from Keeler and Rolph (1988) suggesting that if those currently uninsured were to become insured their expenditures on health care would double. Hadley et al. (2008), though their statistical methods depend on several substantial assumptions and unexplained estimations, provide similar analysis, suggesting that expenditures for the currently uninsured would have increased from about $86 billion to about $208.6 billion in 2008 had they been insured. However, as they note, these numbers could be lower if the currently uninsured were able to spend money on preventative care currently barred to them and thus achieve better overall health (Hadley et al., 2008). These works, while primarily theoretical, suggest that the portion of the population that is insured should have a significant effect on health care expenditures. Unfortunately, data on the number of uninsured persons was not available and so this variable could not be used in this study. However, the effect of the uninsured should be proxied by the measure of income inequality as increased concentration of wealth theoretically points to higher poverty levels and thus less access to insurance and use of care.

Additionally, the literature suggests that the presence of gatekeepers (primary care physicians who control access to specialists and therefore keep demand in check) also has a significant effect on health care expenditures. The principle behind the increased use of HMOs in the United States had been the idea that the presence of gatekeepers, namely primary physicians whose referral is necessary for patients to be approved to visit specialists, can help to control costs by preventing unnecessary visits to specialists whose services are typically more expensive. The panel study conducted on OECD countries by Gerdtham et al. (1998) and the work of Reich et al. (2012) in the Swiss cantons, certainly support this hypothesis as both found the presence of gatekeepers to have a significant effect on health care expenditures. However, studies focused purely on evaluating the impact of the use of gatekeepers have found precisely the opposite. In a randomized trial, Martin et al. (1989) found that, although participation in such a plan did marginally reduce visits to specialists, the total decrease in expenditures on health care were statistically insignificant. Similarly, in an examination of the results of the opening of a system that had previously utilized gatekeepers, Ferris et al. (2001) found that “there was little change in the percentage of visits to specialists as a proportion of all visits.” These contradictory results are, clearly, not
generalizable; however, Barros (1998) used panel data from 24 OECD countries to study health care expenditures and concluded that the use of gatekeepers had no significant effect on aggregate health care expenditures. The contradiction does suggest that further study is warranted, and the previous findings of significance as well as the theoretical argument for their use in studies of health care expenditures merits the inclusion of the presence of gatekeepers in the present analysis. The use of gatekeepers is included in this study as a dummy variable with a value of 1 in systems in which the standard procedure is that patients wishing to see a specialist physician must first have been referred by primary care physicians and 0 otherwise; it is expected to have a negative coefficient (due to decreased use of specialists).

**Drivers of Supply of Health Care**

The drivers of supply of health care include the number and price of inputs as well as technological advancement in the healthcare market, public expenditure on healthcare and the structural characteristics of the market. In terms of inputs, many variables such as the density of specialist physicians, doctors per capita and the number of hospital beds have been found to have a significant effect on expenditures by Gerdtham et al. (1998). Others warrant further investigation with more solid statistical techniques due to the strong theoretical justification for their inclusion. Due to the limitations of data available for public use over the period in question, however, this study considers only the effects of the number of hospital beds per 1000 individuals, and the number of doctors per 1000 individuals, which should serve as fairly reliable proxies for the other variables discussed in this regard. The expected effect of number of beds and doctors is ambiguous given that the increase in these variables results in a leftward shift in supply which may either increase or decrease health care expenditures depending upon the elasticity of the demand curve.

Finally, literature suggests that the use of fee-for-service models may drive up the supply of health care and thus affect expenditures, because it incentivizes physicians to more procedures than alternative methods of funding health care, such as capitation (which pays per patient) or salary systems of compensation. This study uses a dummy variable where X takes a value of 1 if the nation’s health care
system is such that the standard procedure is to pay physicians for each service provided rather than under some alternative system (such as capitation or salary) and zero otherwise.

Drivers of Both Supply and Demand

The amount of health care expenditures paid by the government (in reducing the perceived price to demanders through intervention in the market) should theoretically affect either the supply of or demand for health care and expenditures within a given nation. However, as was discussed in the theoretical portion of this paper, the effects of that on expenditure is ambiguous. This variable is included in the form of the percentage of total healthcare expenditures covered by the government.

Technological progress is theoretically a major driver of supply and demand deserving consideration in its own right. First, it may increase supply and demand by improving existing technology and making it cheaper and therefore more accessible. Second, it may boost supply and demand by providing new, expensive procedures to treat physiological problems that are pushed by doctors and demanded by patients. Thus, the ultimate effect of technology is ambiguous, because although an increase in demand would undoubtedly increase expenditures, the impact of an increase in supply on health care expenditures is ambiguous.

Newhouse (1991), following his work on health care costs in 1977, returned to the question in 1991 to attempt to explain rapidly rising costs in the United States. He theorized that the rapid rise in costs could be mostly attributed to expenditures on medical technology and research and development and predicted that attempts to curb that expenditure might result in welfare loss (Newhouse, 1991). As Okunade and Murthy (2002) state in their cointegration analysis seeking to quantify the impact of technology on health care costs:

Despite claims that technological innovation ‘is of great significance’ in medical care […], and that ‘the pace of technological change in medicine is higher than elsewhere,’ […] the research measuring the potential contributions of technology to the rising health care costs has been very scanty.
Ahern (1993) postulated that one possible explanation for this is that technology itself is poorly understood and there is a great deal of difficulty in finding an appropriate proxy for use in econometric research. Accordingly a number of proxies have been used, including the number of specific types of medical equipment (such as MRIs) (Baker & Wheeler, 2000) or surgical procedures (Weil, 1995), which were relatively narrow conceptualizations of medical technology.

Okunade and Murthy (2002), utilized two more broad-based measures: (1) research and development spending generally (assuming that a country that spent more on R&D in general would spend more on R&D for health and to account for spillover effects) and (2) research and development spending specific to health care. They found both variables to have strongly statistically significant coefficients in separate models, controlling for per capita income; however they excluded any other explanatory variables, ostensibly to preserve degrees of freedom and arguing that they were accounted for indirectly by the income variable (Okunade & Murthy, 2002). While not entirely without flaws, past research with more problematic measures of technology (as discussed above) have also found a strong relationship between technological innovation and higher health care expenditures and there are strong theoretical reasons for including the variable, as laid out by Newhouse. This study includes a variable as a proxy for technological growth, namely R&D spending as a percentage of GDP in each country. This variable, rather than health care specific R&D spending, is utilized both because spillovers are common in R&D (Jaffe, 1986) and due to availability of data for the time period to be studied. Due to the uncertain impact of shifts in supply on health care expenditures, the expected effect of this variable is ambiguous.

V. DATA AND PRELIMINARY STATISTICS

This section considers the dataset used in this study to give the reader a general idea of the amount of variation in the present sample and provide analysis of some general trends before moving into the actual estimation of regression equations using the Fixed Effects procedure.

Table 2 provides information regarding the variables to which there are meaningful distances between numerical values. Those variables marked “N/A” are dummy variables analyzed subsequently. It
is primarily worth noticing that in most instances the median and mean values are fairly close to equal for this data set, suggesting that the sample approaches a normal distribution. The data below also makes clear that there is a substantial amount of variation in all of the variables across the sample (looking at minimums and maximums), which is vitally important in any use of regression.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Median</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCHE (per capita health care expenditures)</td>
<td>$545.84 (Turkey in 2004)</td>
<td>$7719.63 (U.S. in 2008)</td>
<td>$2877.62 (Japan in 2008)</td>
<td>$2853.89</td>
</tr>
<tr>
<td>PGDP (GDP per capita)</td>
<td>$10718.87 (Turkey in 2006)</td>
<td>$73349.64 (Luxembourg in 2008)</td>
<td>$30271.66 (France in 2008)</td>
<td>$29827.74</td>
</tr>
<tr>
<td>GINI (Gini coefficient)</td>
<td>.23 (Denmark in 2004)</td>
<td>.48 (Mexico in 2004)</td>
<td>.31 (Greece in 2008)</td>
<td>.31</td>
</tr>
<tr>
<td>DOCTOR (Doctors per 1000)</td>
<td>0.96 (Australia in 2006)</td>
<td>6.04 (Greece in 2008)</td>
<td>3.19 (Ireland in 2008)</td>
<td>3.10</td>
</tr>
<tr>
<td>BED (Hospital beds per 1000)</td>
<td>1.00 (Mexico in 2004)</td>
<td>13.98 (Japan in 2006)</td>
<td>5.30 (Switzerland in 2008)</td>
<td>5.57</td>
</tr>
<tr>
<td>URBAN (Percent of population in urban)</td>
<td>50.16 (Slovenia in 2008)</td>
<td>97.39 (Belgium in 2008)</td>
<td>77.05 (Spain in 2008)</td>
<td>75.23</td>
</tr>
<tr>
<td>PUBLIC (Percentage of health spending covered by government)</td>
<td>44.88 (U.S. in 2006)</td>
<td>86.73 (Czech R. in 2006)</td>
<td>73.44 (Slovenia in 2008)</td>
<td>71.07</td>
</tr>
<tr>
<td>R&amp;D (R&amp;D spending as a percentage of GDP)</td>
<td>0.37 (Mexico in 2008)</td>
<td>4.66 (Israel in 2008)</td>
<td>1.75 (U.K. in 2006)</td>
<td>1.86</td>
</tr>
<tr>
<td>LIFE (Average life expectancy)</td>
<td>71.65 (Turkey in 2004)</td>
<td>82.59 (Japan in 2008)</td>
<td>79.18 (Austria in 2004)</td>
<td>78.53</td>
</tr>
<tr>
<td>EDU (Percent with tertiary degree)</td>
<td>10.50 (Turkey in 2004)</td>
<td>61.10 (U.S. in 2008)</td>
<td>29.30 (Denmark in 2008)</td>
<td>28.17</td>
</tr>
<tr>
<td>AGE65 (Percent of population over 65)</td>
<td>5.59 (Turkey in 2004)</td>
<td>21.46 (Japan in 2008)</td>
<td>15.27 (Slovenia in 2004)</td>
<td>14.48</td>
</tr>
<tr>
<td>AGE15 (Percent of population under 15)</td>
<td>13.52 (Japan in 2008)</td>
<td>31.59 (Mexico in 2004)</td>
<td>17.20 (Finland in 2006)</td>
<td>18.06</td>
</tr>
<tr>
<td>GATEKEEP (Significant use of Gatekeepers)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>FEE (Significant use of fee-for-service)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>OVW (Percentage of population over weight)</td>
<td>21.85 (Japan in 2004)</td>
<td>78.56 (U.S. in 2008)</td>
<td>54.54 (Czech R. in 2008)</td>
<td>53.79</td>
</tr>
<tr>
<td>FEMALE (Female percentage of the population)</td>
<td>49.66 (Iceland in 2008)</td>
<td>53.95 (Estonia in 2004)</td>
<td>50.93 (Switzerland in 2008)</td>
<td>50.97</td>
</tr>
</tbody>
</table>

It is interesting to note several facts about the sample data displayed in Table 2. The first is that the United States has the highest value in both per capita health care expenditures and the percentage of its population overweight. Second, Japan has both the highest percentage of individuals in the upper age group and the lowest percentage of individuals in the youngest age group, indicating a quickly graying
population. It is also of interest that Mexico has the largest population of young people, Belgium has more than 97% of its population in urban areas, and Estonia has the largest ratio of females to males in its population.

Figures 6 and 7 provide information regarding the distribution of observation values among the two dummy variables included in this research. Both confirm the existence of enough variation in the dummy variables to make the coefficients found through OLS meaningful, at least from the point of view of variations in the independent variable.

![Figure 6: Distribution of Values for Variable FEE](image)

![Figure 7: Distribution of Values for Variable GKEEP](image)

In terms of general trends, the most significant trend, as shown by Figure 8, confirmed by preliminary analysis is the extent to which the United States outspends its fellow OECD member states. The massive gap between health care spending in the U.S. and the OECD average begs for an explanation and preliminary statistics can begin to point to an answer, though it important for the reader to remember that the analysis provided in this section does not hold other variables constant. That sort of statistical investigation will be conducted in the following section.
Figure 8 begins to offer an explanation by comparing the per capita GDPs of the United States in the sample years to the average per capita GDP of the other included OECD countries. The results, as would be expected given previous literature, show that the United States’ GDP is substantially higher than that of other OECD states in the sample. However, as Figure 10 shows, this does not provide an adequate explanation of the differences. In comparing the ratio of per capita health care expenditures to per capita GDP, that figure shows that, although the per capita GDP of the United States has exceeded the average of OECD countries by a relatively significant amount, per capita health care expenditures have been growing in proportion to that income at a much higher rate in the United States than in the rest of the OECD.
Figure 9: Per Capita GDP in Constant 2005 International Dollars Adjusted for PPP, OECD vs. U.S.

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2006</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>27824.71069</td>
<td>29515.90502</td>
<td>30476.24942</td>
</tr>
<tr>
<td>U.S.</td>
<td>41629.71122</td>
<td>43228.11115</td>
<td>43069.58199</td>
</tr>
</tbody>
</table>

Figure 10: Ratio of Per Capita Health Care Expenditures to Per Capita GDP, OECD vs. U.S.

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2006</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>0.086</td>
<td>0.092</td>
<td>0.100</td>
</tr>
<tr>
<td>U.S.</td>
<td>0.142</td>
<td>0.164</td>
<td>0.179</td>
</tr>
</tbody>
</table>
Accordingly, there must be an alternative explanation to income for the difference in both the amount spent per capita on health care in the U.S. and the higher rate of increase in expenditures compared to the OECD. Figures 11 and 12 suggest two alternative explanations (besides the additional possible causes to be tested in the next section) that are significant for consideration from a policy standpoint. Figure 11 compares the percentage of health care expenditures absorbed by the government in the U.S. versus the average of included OECD countries. Figure 12 compares spending on research and development between the two groups.

**Figure 11: Public Expenditure on Health Care Expenditures as a Percentage of Total Expenditures, OECD vs. U.S.**

<table>
<thead>
<tr>
<th>Year</th>
<th>OECD</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>70.350</td>
<td>45.357</td>
</tr>
<tr>
<td>2006</td>
<td>72.433</td>
<td>44.884</td>
</tr>
<tr>
<td>2008</td>
<td>72.902</td>
<td>46.042</td>
</tr>
</tbody>
</table>

**Figure 12: R&D Expenditures as a Percentage of GDP, OECD vs. U.S.**

<table>
<thead>
<tr>
<th>Year</th>
<th>OECD</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1.752</td>
<td>2.542</td>
</tr>
<tr>
<td>2006</td>
<td>1.839</td>
<td>2.608</td>
</tr>
<tr>
<td>2008</td>
<td>1.930</td>
<td>2.785</td>
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</table>
Figure 13 also suggests an additional alternative for explaining the differentiation in expenditures: the increase in obesity in the United States. The figure shows that the United States has consistently had a higher percentage of citizens qualifying as overweight when compared with the OECD average, which could explain the higher per capita costs in the United States due to the effect of this difference on demand.

These figures suggest that government in the U.S. absorbs far less of the expenditure on health care per capita than do the governments of other OECD states, that the U.S. as a whole spends a much higher percentage of its GDP on research and development (indicating a faster rate of technological growth), and that obesity may be playing a role in higher levels of expenditure. The obvious suggestion of these statistics is that higher rates of technological growth, the lower amount of health care expenditures covered by government in the U.S., and increasing levels of obesity are strong explanatory variables in the quest to understand why the U.S. spends so much more on health care than other OECD states. An informed policy then, given only these preliminary statistics, would seek to expand government coverage
of costs (possibly through a single payer system), work to combat the spread of obesity in the U.S., and attribute the rest of the difference to the faster growth of medical technology in the United States. The rest of this research is devoted to testing whether, when all other relevant variables are held constant, these preliminary suggestions are accurate and whether the suggestions they make for policy is truly the wisest course.

VI. DIAGNOSTIC TESTS

This section discusses the diagnostic tests conducted on the sample data prior to estimation of the regression equation, including tests for multicollinearity and heteroskedasticity.

Multicollinearity

Multicollinearity occurs whenever two individual independent variables are correlated with each other. It becomes problematic in Fixed Effect regression when the correlation coefficient between two independent variables exceeds approximately 0.80, because it becomes impossible to hold one variable constant while the other varies. This results in an increased standard error in the estimates of the coefficients of the correlated variables and, thus, skews their t-scores in such a way that variables that are, in reality significantly related to the dependent variable may be found to be insignificant. The most common way to test for multicollinearity is through the creation of a correlation matrix between all independent variables. Table 3 provides the correlation matrices of the independent variables included in Equation 1.

Examining the correlation matrix for each of these specifications, we find that there is some troublesome correlation between LNPGDP and LIFE (with correlation a coefficient of .726; however, it does not cross the threshold of .80 and therefore is left alone in this analysis. It is worth bearing in mind this correlation when considering the results of the study in later sections as it could explain help to explain unexpected results regarding the significance of these two variables.
<table>
<thead>
<tr>
<th></th>
<th>LNPGDP</th>
<th>AGE65</th>
<th>AGE14</th>
<th>FEMALE</th>
<th>EDUC</th>
<th>URBAN</th>
<th>GINI</th>
<th>UNEMP</th>
<th>LIFE</th>
<th>OVW</th>
<th>GKEEP</th>
<th>DOCTOR</th>
<th>BED</th>
<th>RD</th>
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<th>FEE</th>
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<tr>
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<tr>
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<tr>
<td>LIFE</td>
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<td>-0.06</td>
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<td>0.29</td>
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</tr>
</tbody>
</table>
The major multicollinearity problem lies between AGE14 and AGE65 as the correlation coefficient between these two variables is approximately 0.85. As there is a strong theoretical justification for the inclusion of both of these variables and neither is redundant, dropping them from the analysis is not a viable option; nor is increasing the sample size. The most effective way to deal with this multicollinearity then is to combine the two variables by adding them together. This will yield a single variable measuring the proportion of the population that is either over 65 or younger than 14; the result is a variable measuring the percentage of the population within two age groups perceived to be “at risk” for higher health care expenditures. Although this removes the ability of the study to differentiate between the effects of the individual age groups on health care expenditures, it is necessary to obtain more reliable results. From this point on the study will use a single variable, AGERISK (AGE65 + AGE14) to measure the impact of population age on per capita health care expenditures. The new variable has a mean value of 32.55, a median value of 32.79 and a range from 27.49 to 36.95; these factors indicate a variable that is relatively normally distributed and with meaningful variation between observations.

**Heteroskedasticity**

The next step, before considering the results of this study is to conduct a White test for heteroskedasticity. This problem is more common in cross sectional than in time series or panel models; because the time period considered in this study is so short, making the data in question primarily cross sectional, this test for heteroskedasticity is appropriate. Heteroskedasticity is caused by unequal variance of the error terms of Equation 1. Assuming correct specification, as addressed previously, this test would reveal pure heteroskedasticity (which results from variation in the error term of the correct theoretical model itself). A pure heteroskedasticity problem does not affect the coefficients themselves, but rather skews standard errors of the coefficients and thus increases the chances of incorrect determinations of statistical significance.

Heteroskedasticity can be detected by conducting a White test, which utilizes the squared residuals of the original (pooled) regression results as a dependent variable in a new estimation. The
original variables and their squares and cross-products are then used as independent variables; however, with the present sample size and 15 independent variables the use of cross-products or original variables is not possible in this instance. $nR^2$ (where $n$ is equivalent to the sample size) is then compared against the critical chi-squared value for a 5% level of significance, where the degrees of freedom is equal to the number of independent variables in the estimated equation. The null hypothesis is homoskedasticity (a condition in which there is no heteroskedasticity), whereas the alternative hypothesis is the existence of a heteroskedasticity problem. If the $nR^2$ value is greater than the critical chi-squared value, a heteroskedasticity problem exists.

The critical chi-squared value for the equation used in the present research is 24.996. Conducting a White test on the regression equation conducted using stacked data, as such a test is not possible using pooled estimation, reveals an $nR^2$ value of 39.63. The equation is thus found to be heteroskedastic. This problem must then be addressed through the use of White standard errors (which adjust for heteroskedasticity). Since I am unable to determine whether the problem stems from heteroskedasticity among the observations (countries) or cross-sections (years) a diagonal White method of estimation is used to ensure that both are adequately addressed. However, I suspect that the problem would more likely lie between countries rather than periods as variance of the error term is more likely to be equal in countries over time than between countries in the same period, because there is likely a wider and more variable variances between the states of the OECD. Accordingly, the equation is also run using a White period method of estimation. This allows for the comparison of results between the two methods and allows the researcher to see which findings are robust and which are sensitive to the methodology used to account for the effects of heteroskedasticity. This study now turns to a consideration of those results.

VII. ESTIMATION RESULTS & POLICY IMPLICATIONS

This section discusses the results of this study’s estimations, including a discussion of the fit of the equation itself, findings of significance, the magnitude of the effect of significant variables, and some of the potential policy implications of these results. Table 4 provides the results of the regression equation
including the coefficients of the variables included, their standard errors, and the level of significance of those variables that are statistically significant at a level of confidence of 10% or better.

Table 4: Estimation Results Using White Diagonal and White Period Standard Errors

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>White (Diagonal)</th>
<th>White (Period)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Std. Error</td>
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</tr>
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<tr>
<td>AGERISK</td>
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</tr>
<tr>
<td>FEMALE</td>
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</tr>
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</table>

Observations: 93  Cross Sections: 3  Adjusted R²: 0.929930

Measures of Fit

The adjusted R² value of a regression equation is a measure of the percentage of variation in the dependent variable around its mean explained by the independent variables included in the regression equation. Both of the equations ran in this study, one for each of the two methods of adjustment for heteroskedasticity, had an adjusted R² value of 0.929930 (as seen in Table 4). This value indicates that variation in the fifteen independent variables included in this study can explain approximately 93% of the variation in the log per capita health care expenditures around its mean. This high R² value suggests that the equation considered includes most, if not all, of the relevant variables affecting health care expenditures.
Significance, Magnitude and Potential Effect

The statistical significance of coefficients obtained through a regression equation is determined by the conduction of t-tests for significance. The estimated coefficients of the independent variables are considered significant if those tests indicate significance at an alpha of 10% or lower (where alpha indicates the chance that the determination of significance is incorrect). Table 4 reports variables that are significant with an alpha value of 10%, 5% and 1% respectively. What follows is a discussion of each of the significance (or insignificance) of the coefficients included in this study, the robustness of those findings across methodologies, the magnitude of the coefficients in question and a discussion of their potential effect on the growth of per capita health care expenditures. Findings of significance will be compared to the findings of previous authors throughout this analysis.

Robustly Significant Coefficients with a High Potential Effect

With a standard error of approximately 0.148, the coefficient of the logged per capita GDP can be said to be statistically significant with 99% confidence. This remains true under both methods of adjusting for heteroskedasticity, suggesting that the result is highly robust to changes in methodology. This finding is consistent with all of the empirical literature in this area, including work by Newhouse (1977), Leu (1986), Culyer (1992), Gerdtham et al., (1992 &1998), Hitris and Posnett (1992), Barros (1998), Batagi and Moscone (2010), Ke et al. (2011), Okunade (2005), Murthy and Okunade (2009), and Reich et al. (2012). As was expected, the sign of the coefficient (as in previous literature) is positive, suggesting that an increase in per capita gross domestic product will lead to growth in per capita health care expenditures. Moreover, per capita income has the strongest potential effect on health care expenditures of all independent variables, with a 1% increase in per capita GDP (holding all other variables constant) related to an average of a 1.259 percentage increase in per capita health care expenditure. This suggests that, health care is elastic with regard to income as argued by Newhouse (1977), Gerdtham et al. (1992), Leu (1986), Culyer (1989), Hitris and Posnett (1992) and in contradiction to the results of Gerdtham et al. (1998), Batagi and Moscone (2010) and Key et al. (2011).
Contrary to findings of researchers such as Barros (1998) and Batagi & Moscone (2010) who did not find the age structure of the population to be significantly related to per capita health care expenditures, the coefficient for the percentage of the population falling within at risk groups (AGERISK) was positive and robustly significant across both methodologies with an alpha value of 1%. In line with Reich et al. (2012) and Hitris & Posnett (1992), this finding indicates that the age structure of the population does affect the growth in health care expenditures. Unlike Reich et al. (2012), however, this study suggests that the number of individuals falling within at risk age groups will increase rather than decrease health care expenditures (as this study expected). It is possible that findings of significance in this coefficient results from a better specification of the variable in question and the elimination of the multicollinearity problem discussed previously. Since none of the previous studies analyzing this variable included a discussion of tests for multicollinearity, it is impossible to know if this was a problem in their samples, but given the very high correlation coefficient between the under 14 and over 65 age groups discussed previously, it is a strong possibility. The fact that these variables were included separately in previous literature may have skewed their results and this study’s analysis suggests that future researchers should be hesitant about including these variables separately in their analyses. While the magnitude of the coefficient for this variable is very small, the potential effect of AGERISK is fairly large, though not nearly as strong as that of LNPGDP. Holding all other variables constant and speaking of average values, an increase of 1 point in the percentage of citizens falling within at-risk age groups is expected to lead to a 0.029 percent increase in per capita health care expenditures. While this does not, on its face, appear to be a large change. If you consider a hypothetical state that spends $1000 per person, a 1 point increase in the percentage of the population in these groups would add 29 cents per person to the nation’s health care expenditures.

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It is surprising that previous researchers have not found such a correlation as increases in the percentage of the population in one age group would be expected to be correlated negatively with the percentage of the population in others. After all, the total percentage cannot exceed 100% in this case. Moreover, an increasing proportion of the population in the older age group suggests a greying population, particularly in developed states, which one would lead one to expect a negative correlation between that proportion and the number of people under age 15.
With an alpha of 5% under the White diagonal method of estimation and 1% under the White period method, the coefficient of life expectancy was positively and significantly correlated with growth in per capita health care spending. Although the alpha value varied between estimation methods, the findings of significance at a low alpha for both indicate that the results are robust to changes in methodology. No previous study, to the best of my knowledge, has found life expectancy to be significantly correlated with health care expenditures; however, the findings of this study suggest that nations whose populations live longer typically spend more per person on health care. This result could also suggest that those countries that are healthier may have to pay more to achieve that result. Like AGERISK, the magnitude of this coefficient is small, but the potential effect of the variable is much larger than it appears at first glance. A 1 year increase in average life expectancy is expected to result in a 0.03 percent increase in per capita health care expenditures. Returning to our previous example of a state that spends $1000.00 per capita on health care, this would amount to a 30 cent per person increase in health care expenditures from a one year jump in average life expectancy.

Robustly Significant Coefficients with a Moderate Potential Effect

This study, like Reich et al. (2012), finds the coefficient of a state’s unemployment rate in a given time period to be significantly and positively correlated with per capita health care expenditures. This finding is, moreover, both robust and in the expected direction (positive). This suggests that, when controlling for income, unemployment allows individuals greater time to consume health care services and thus leads to growing per capita health care expenditures. In terms of potential effect, the impact of this variable appears to be relatively moderate despite the very low magnitude of its coefficient. A 1 point increase in the unemployment rate is expected to result in an 0.011 percent uptick in per capita health care spending; or, to speak in terms of our hypothetical, an 11 cent increase in health care spending per person in a state that spends $1000.00 per person on healthcare.

Likewise, the coefficient of the percentage of the population that is overweight is found to be robustly significant (with an alpha of 5% under the White diagonal method and 1% under the White
period method). This study is also the first, as far as I am aware, to include a measure of obesity in a full regression analysis of the determinants of health care expenditures. In line with the theory of Thorpe et al. (2004), this study finds that increased obesity rates are positively related to growth in health care expenditures. However, as Baal et al. (2008) note, this effect may be balanced out by decreased life expectancy among the obese as life expectancy was held constant in the present research.

A 1 point increase in the percentage of the population qualifying as overweight is related with a 0.005 percent increase in per capita health care expenditures (or an increase of about 5 cents per person in our standard hypothetical). The magnitude of this coefficient is much lower than many of the other coefficients discussed thus far, but when one considers the rapid increase in obesity in the developed world (particularly in the United States) the potential effect of variable is greatly magnified.

Leaving the demand side of the equation momentarily, we find that only the percentage of health care expenditures covered by the government is negatively, significantly (at an alpha of 5% and 1% under the White diagonal and period methods respectively), and robustly correlated with declining per capita health care expenditures in contradiction to the findings of Gerdtham et al. (1992) who found it to be positively correlated. This negative relationship, in turn suggests that an increase in public expenditures does increase supply through boosted efficiency (because a demand effect could not reduce expenditures) and that this effect is larger than any demand side influence in the model. This is consistent with the theoretical work of Leu (1986) and the findings of Gerdtham et al. (1992) and Gerdtatham et al. (1998) and stands in opposition to the theory of Culyer (1989) and the findings of Ke et al. (2011) and Okunade (2005). The finding of significance in the public expenditures variable also contradict the findings of Hitris and Posnett (1992) and Batagi and Moscone (2010) who did not find the variable to be significant in their estimations. The percentage of expenditures on health care covered by the government appears to have a moderate impact on per capita health care expenditures, with a 1 point increase in the percentage of total health care expenditures covered by the government being correlated with a 0.007 percent decrease in health care expenditures (a 7 cent per person change in the language of our hypothetical state
spending $1000.00 per capita on health care). In this case, once again, the potential effect of this variable is higher than what is suggested by the small magnitude of its coefficient.

Robustly Significant Coefficients with a Low Potential Effect

The coefficient of the dummy variable regarding the use of fee for service models is robustly significant with an alpha value of 5% under the White diagonal method and 1% under the White period method. The dummy variable for fee for service models, which can only take a value of 1 or 0, indicates that societies employing primarily fee for service methods of payment would, on average and holding other variables constant, have per capita health care expenditures 0.09 percent lower (90 cents in our hypothetical) than countries that do not. This is a relatively low level of potential effect, despite the fact that the magnitude of this variable’s coefficient is higher than those of several previous variables, because the range of possible variation on this variable (0 and 1) is much lower than the others. The negative coefficients of this variables, coupled with the negative coefficient of the variable measuring the percentage of health care expenditures covered by the government if it is the result of an efficiency effect suggest, for reasons discussed in the theoretical section above (see pages 13 and 14), that health care expenditures are inelastic with respect to price. This result seems to suggest that, if people can afford health care, their spending decisions are not highly sensitive to the price of care, but that expenditures on health are highly sensitive to income.

The coefficient of the gini coefficient of country i in period t is robustly and negatively significant with an alpha of 1% across both methods of estimation. This suggests that increasing levels of income inequality and wealth concentration (and declining shares of income among the lower classes) relates to a decline in per capita health care expenditures. However, while the magnitude of the coefficient of this variable is very high, its potential effect is very low. The coefficient indicates that a one unit uptick in the gini index, which would constitute a change from complete equality to complete inequality, would only lead to a 1.63 percent decrease in per capita health care expenditures. This negative relationship between increasing levels of inequality and decreased levels of per capita health care expenditures is consistent
with the expectations of this study. This study’s finding of negative significance is consistent with those, like Okunade (2005), who have included gini coefficients in the past.

The coefficient for the percentage of the population that is female is found to be significant with alpha values of 1% under the White period method and 5% under the White diagonal method of estimation. As predicted the sign of the coefficient is positive, suggesting that an increase in the ratio of females to males in a country will cause growth in per capita health care expenditures. This finding confirms the theory put forward by Meerding et al. (1998), but is in contradiction to the work of Gerdtham et al. (1992, 1998) which did not find the coefficient of this variable to be significant. An increase of 1 point in the percentage of females in the population is expected to be associated with a 0.048 percent increase in per capita spending on health care; this would translate into a 48 cent increase in per capita spending on health care in a country that had spent $1000.00 per person on health care before the 1% change. However, the potential effect of this variable is very low despite the high magnitude of its coefficient, because the female to male ratio in any population will not change far from a 50-50 distribution, meaning the range of variation and thus the impact of the variable will be small. Looking back to the table of preliminary statistics (Table 2 on page 25), we can see that (in this sample) there is only a range of 5 points between the lowest value among all nations in all years and the highest, suggesting that there will not be much change/variation in this variable.

**Non-Robustly Significant Coefficients**

The coefficients for the percentage of the population having at least a college degree and the percentage of the population living in urban areas are not so easily interpreted. Neither coefficient is found to be significant under the White diagonal method of estimation, but both are found to be significant with an alpha value 1% under the period method of estimation. Thus, the findings themselves are not robust. This study did not make a prediction for the sign of either of these variables; the coefficients themselves suggest that greater degrees of urbanization leads to a decline in the growth rate of per capita health care expenditures whereas increased education leads to an increased rate of growth.
The findings regarding urbanization support the previous findings of Gerdtham et al. (1992) and their argument that urban residents have greater access to preventative care. At the same time, they contradict the findings of Leu (1986) and his suggestion that greater access to care in urban areas would increase expenditures. The finding with regards to education suggests that more educated individuals increases per capita expenditures, possibly because more highly educated citizens are more aware of the health dangers presented to them or because they are more skeptical of traditional health remedies.

The potential effect of these variables, like the magnitude of their coefficients, is very small. A 1 point increase in the percentage of the population with at least a tertiary level of education is associated with only a 0.003 percent increase in per capita health care expenditures; likewise a 1 point increase in the percentage of the population living in urban areas is associated with only a -0.003 percent decrease in per capita health care expenditures. Both indicate a change of around 3 cents in the case of our usual hypothetical. However, the sensitivity of these results to the method of estimation utilized makes it difficult to rely on the significance of these variables in only one of two specifications. This, coupled with their low magnitude, casts doubt on the reliability of these findings and their relevance to later policy considerations.

The finding of significance with an alpha of 5% under the White period mode of estimation for the coefficient of research and development expenditures in a country during a given time period is consistent with previous theory, but the result is not robust. Furthermore, the negative coefficient contradicts most of the previous literature including the seminal work of Newhouse (1977)\(^6\). What this suggests is that technological advancement is primarily a driver of supply (or at least that the supply-side effect outweighs the demand effect) in contradiction to much theory suggesting that increasing levels of technological advancement should increase health care expenditures. The potential effect of R&D spending as a percentage of GDP is also not impressive. A 1 point increase in the percentage of GDP devoted to research and development, holding all others constant, is associated with an average of a 0.026

\(^6\) Though it may support the idea of a supply-side effect of technology and therefore the suggestion of price inelasticity provided by the coefficients of FEE and PUBLIC.
percent decrease in per capita health care expenditures (or roughly 26 cents per person in our hypothetical). Considering that the values of this variable typically hover between 1 and 5 percent, this is not a large impact. The magnitude of the coefficient itself is also fairly small. This finding puts this study at odds with much of the literature, which tends to view technological growth as a major driver, if not the major driver, of increases in expenditures on health care. It is worth bearing in mind, however, that societal spending on research and development as a percentage of GDP is a very rough proxy for technological advancement in the health care market. A better proxy, such as that used by Okunade and Murthy (2002) might produce different results, though such numbers were not available to the researcher.

**Insignificant Coefficients**

Finally, three variables were not found to have significant coefficients in either specification: the use of gatekeepers, number of doctors per 1000 individuals and number of hospital beds per 1000 individuals. The finding with regards to beds is consistent with the work of Gerdtham et al. (1998) and other researchers; however, the finding of insignificance in the use of gatekeepers contradicts their work as well as that of Reich et al. (2012) and the findings regarding the number of doctors is in contrast to Gerdtham et al. (1998). Barros (1998), however, found results consistent with those of this study regarding gatekeepers (that is, he failed to find a significant effect for the use of gatekeepers).

**Policy Implications**

Ultimately, the questions most readers will ask after reading this barrage of results is: what does this mean? By way of an answer, this study has several important implications for policy. The first is that increases in health care expenditures are primarily demand driven. The majority of demand-side variables are robustly significant and their potential effect is much greater than those on the supply side or the coefficient of research and development as a percentage of GDP. However, this raises quite a different problem, because the vast majority of the demand-side variables are outside of the government’s control. Should government work to decrease life expectancy, prevent increases in GDP, reduce the number of females, reinforce income inequality, limit the number of births or prevent population aging?
Ultimately, these are prospects that no government hoping to remain in power for any extended period of time and especially no democratic government could attempt to implement.

There is some reason to suggest that campaigns to promote healthier eating habits and reduce obesity would help to reduce expenditures to some small degree, but the wider implication is that the government must attempt to find some way to control demand. In nations like the United Kingdom, this has often taken the form of queuing for procedures; in private insurance driven economies it has come in the form of the denial of payment for care. The challenge for any government is to find a way to do this without decreasing the quality of care and barring individuals from care in a way that is not cruel or inhumane and does not harm the health of the population as a whole. The question of how the government can do this requires the closer examination of policy options in the second part of this study, but the challenge is one that the vast majority of world governments have not yet discovered how to solve. Regardless, little if any credence should be given by the government to the findings regarding education or urbanization due to their low potential effect and the fact that the significance of even those coefficients were not found to be robust.

On the supply-side of the equation, there is some evidence to suggest that a greater absorption of costs by the government could reduce per capita health care expenditures. However, as the analysis in the previous section suggests, any move in this direction would have to be large and would likely not have a large impact regardless. The effect of a switch to a fee-for-service system would be similarly small. Therefore, it seems that the focus of any policy must be on the regulation of demand discussed previously. This conclusion is only amplified by the relatively small magnitude of the coefficient for R&D spending as a percentage of GDP and the fact that in most of the countries in the sample the amount spent on R&D is, by and large, beyond governmental control. Even if the government were to engage in a major campaign of investment in research as a result of this study, the coefficients of the estimation in this work suggest that the impact of such a campaign would be very, very small. In this, if in no other respect, the conclusions of this study regarding technology are largely similar to those of previous
researchers (there is nothing the government can or should do in response to its findings regarding technological advancement).

VIII. SUMMARY AND POTENTIAL SOURCES OF ERROR

The debate over health care in the United States will continue to rage on despite the end of the 2012 presidential campaign. The ACA’s lifespan is guaranteed for at least four years by the re-election of Barrack Obama, but its effectiveness remains an open question. This analysis sought to answer a preliminary question to an analysis of the prospects of the ACA’s success: what factors drive the growth of health care expenditures in the developing world? It further hoped to shed light on why the United States’ expenditures were so high. It found that the answer is, in a word, demand. Increases in income, increases in at risk populations, increases in females as a percentage of total population, decreasing levels of income inequality, higher unemployment rates, higher average life expectancy, and increases in the percentage of the population that is overweight are associated with higher levels of per capita health care expenditures. The effects of these variables vary greatly in terms of their potential effect on the growth of health care expenditures and their ability to inform future policymakers. Additionally, there is some evidence to suggest a negative impact for public coverage of health care expenses, use of fee-for-service systems, and technological growth.

Future researchers should seek to refine these results through the exploration of better proxies for several variables, particularly the measure of technological growth and public expenditures on health care. In moving beyond this work, the most important step for future research seeking to analyze what governments can do about health care expenditures and their persistent rise in many developed countries is to begin to analyze specific policies. In depth policy analysis should focus on the options available to governments to control demand for health care and how policies balance the interest in controlling costs.

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7 This variable is included in all previous empirical studies of the determinants of per capita health care expenditure, but it is problematic as it includes as its denominator a value that is also included as the numerator of the dependent variable and thus a negative finding (as in this study) may be a result of simple mathematics rather than actual correlation in the sample. However, lacking access any suitable replacement and based on previous work, this study included it. Future researchers should consider better measures and/or proxies for this variable.
with the goal of a healthy population. Such research is not conducive to regression analysis and is likely also beyond the scope of the field of economics in isolation. The methods employed will likely have to include qualitative as well as the quantitative research that so-often make up the bread and butter of economists. In this instance, if future researchers hope to use the results of this and other work to benefit those charged with crafting our nation’s policy, they will need to borrow from other disciplines, particularly political science, which have built the methodologies that this type of research requires. That is the path to which this study now turns.

In the interim, the debate over how best to control health care costs will continue to rage throughout the developed world and in the United States. Do single-payer systems provide a better means of controlling demand than private insurance? If so, do those benefits in terms of cost come at the expense of quality care and impermissible government involvement in private health care decisions? Having explored the causes of increases in health care expenditure, this portion of the study and those of previous researchers have provided the grounding for that debate; this study itself has critically evaluated past research and improved upon methodology. A foundation, though, is not a policy and that will and should be the subject of the second portion of this research.

*(For a listing of data sources used in this study, please see Table 1 on page 17.)*
PART B:
POLICY ANALYSIS
The previous section of this work suggested, through the use of regression analysis, that health care expenditures in developed states are primarily driven by demand rather than supply. The second task of this study, then, is to apply that analysis to the second question under consideration: what policy should the United States adopt in order to control those costs while continuing to ensure a high quality of care? To do so, it is necessary to cross-over from the purely empirical realm of Part A, into the domain of policy analysis which, as William N. Dunn (2008, pp. 2) explains, though “based on scientific methods, […] rests on processes of art, craft and persuasion […] which more than any other feature, […] distinguishes policy analysis from disciplines that prize knowledge for its own sake.” In other words, policy analysis (particularly the prescriptive brand which this study seeks to employ) necessarily differs from the empirical method discussed above, because it must by definition advocate for a particular solution, either explicitly or implicitly, and thus involves judgments based upon values (be they those of the researcher or those of the group for whom he/she advocates). For this reason, this portion of the study begins in Section IX with a discussion of appropriate methodologies for minimizing bias in policy analysis. Section X then lays out the methodology to be employed in the present study. Section XI provides a brief description of the policy systems to be analyzed in this study, before they are analyzed based on the criteria established previously in Section XII. Finally, Section XIII provides the researchers recommendations for future U.S. health care policymakers.

IX. ETHICAL METHODOLOGIES FOR POLICY ANALYSIS

Dunn (2008) defines policy analysis as “a process of multidisciplinary inquiry designed to create, critically assess, and communicate information that is useful in understanding and improving policies.” As discussed above, this purpose necessarily calls policy analysts to make judgment calls and throws open the doors to bias, particularly in “preferred policy” or prescriptive policy analysis, which attempts to recommend a solution to a policy problem (task that is based upon factual as well as value premises) (Dunn 2008). The two biggest areas of potential bias in policy analysis are in case selection and in methods used for evaluation.
Bias in the Sample

As Patton (1987) explains, in any social science analysis that focuses on only a few cases there is a risk that an overzealous or unscrupulous researcher will select cases specifically designed to emphasize a certain ideological point of view. This makes for neither good social science nor good policy analysis, as such skewed results are not an accurate guide for researchers. One method for avoiding such bias in a comparative policy analysis such as this one is to expand the scope of the sample (limited though it may be) to the broadest possible range of available policies. Patton (1987) refers to this type of sampling method as “maximum variation sampling,” which “aims at capturing and describing the central themes or principle outcomes that cut across a great deal of participant or program variation.” In other words, this type of sampling method selects cases from the broadest range of ideal types by selecting diverse characteristics for sample construction, thus minimizing the risk that a researcher will select cases that only reflect one particular point of view in order to advance his/her personal ideology. A second methodology that could be employed to reduce sampling bias is a “critical case” method of sampling, which looks for cases that are “for some reason, particularly important in the scheme of things” (Patton 1987). By looking at critical cases, a researcher is forced to address important examples and is limited in his/her ability to pick obscure cases simply in order to advance a particular point of view.

Ultimately, however, the very nature of a small-sample, qualitative approach is unable to account for the fact that it will never be generalizable even if “logical generalizations can often be made from the weight of evidence produced in studying a single, critical case” (Patton 1987). Patton (1987, pp. 51-52) explains that this is based upon the most basic purpose of qualitative research:

The logic of purposeful sampling in qualitative methods is quite different from the logic of probabilistic sampling in statistics. The power of statistical sampling depends on selecting a truly random representation sample which will permit confident generalization from the sample to a larger population. The power of purposeful sampling lies in selecting information-rich cases [emphasis in original] for study in depth.
Thus, no amount of fidelity to methodological standards will be able to fully eliminate the risk of bias in the sample. For the policy analyst, what this means is that the only way to truly combat the risk of ideological/accidental bias in a small-sample study such as this one is modesty. A study such as this one can never claim to be generalizable nor definitive, but can only suggest possible implications and avenues for future research. Thus, while this study will attempt to suggest avenues which policy makers might find most successful, it will never claim that its results are definitive or generalizable to all developed countries. Furthermore, the sampling method employed will use both maximum variation and critical case sampling in order to minimize bias as much as possible.

**Bias in the Methods**

Even if the selection of cases for analysis is not biased, the selection of data to be collected, emphasized and reported as well as the way in which that data is interpreted can be heavily influenced by researcher bias (Newman & Brown 1996). As Newman & Brown (1996) suggest, researchers face substantial discretion when deciding what data to collect and how to collect it, what is worth coding and analyzing and how results should be interpreted. Policy analysts are especially susceptible to this form of bias, because their core purpose is often advocacy for a certain action (even in the evaluation of existing programs) (Newman & Brown 1996). Analysts may be easily influenced in their decisions by ideological predispositions or feelings of loyalty to certain groups or interests, especially biased researchers may even alter their questions/methods throughout the course of the evaluation in order to emphasize certain data while downplaying contradictory facts (Newman & Brown 1996). While professional modesty regarding the scope of the implications of one’s findings again provides a key way of addressing bias, social science methodology also provides critical ways of counteracting this bias.

The Evaluation Research Society’s Standards for Program Evaluation (Newman & Brown 1996) suggest that key ways to combat bias in data analysis and interpretation, include the following:

- Provision of explicit descriptions of all sampling methods, data sources, and analytic procedures as well as justifications for choosing the procedures/sources employed;
- Provision of adequate documentation to allow the analysis conducted to be repeated by a third party;
• Exploration of cause-and-effect relationships in ways that recognize and eliminate (if possible) plausible rival explanations for phenomena;
• Use of explicit language to distinguish among objective findings and subjective opinions, judgment and speculation;
• Open acknowledgement of assumptions and limitations (including time constraints, limits on the availability of data, weaknesses in methodology, etc.); and
• Presentation in a framework that is understandable to audiences and that ties recommendations to specific findings.

The clear message in all of these criteria is that candor is an essential way to combat bias. By putting all of his/her work in the light of day, the researcher opens his methodologies up to critical examination by outside sources, allowing for the identification of bias while simultaneously providing strong incentives for its avoidance by the researcher. For this reason, all of the methods used in the course of the present policy analysis as well as the justification for their use are provided in the following section.

Additionally, through the use of a “structured focus comparison” case-study methodology, the researcher can work to reduce bias in data collection. George & Bennett (2005, pp. 67) explain that:

[t]he method is “structured” in that the researcher writes general questions that reflect the research objective and that these questions are asked of each case under study to guide and standardize data collection, thereby making systematic comparison and cumulation of the findings of the cases possible. The method is “focused” in that it deals only with certain aspects of the historical cases examined.

Such a method is predicated on defining what will be studied and how it will be measured in each case first and then applying that standardized methodology to each case to be considered (George & Bennett 2005). This sort of analysis ensures that a researcher defines his or her methods of exploration and evaluation before beginning any sort of data collection, thus limiting his/her ability to pick and choose the factors that most support his/her personal biases in mid-research by holding the researcher to pre-established methods and criteria. Second, by establishing set criteria, structured-focus comparison ensures that all cases receive the same treatment and exploration by the researcher and are evaluated using the same measurements and standards. Finally, by establishing the researcher’s methodology in detail before findings are presented, structured-focus comparison puts those methods on display for critical evaluation
and provides a standard to which readers can hold the researcher in the subsequent analysis. This research will employ just such an approach when it seeks to explore the cost-effectiveness of the various policies under consideration.

X. QUALITATIVE METHODOLOGY AND JUSTIFICATIONS

This section of the study sets out the methods/criteria involved in each of the two key steps used in the conduction of its policy analysis: sampling and cost-effectiveness analysis.

Sample Selection

As discussed above, this study will use both a maximum variation sampling technique and a strategy of selecting only “critical” cases for analysis so as to minimize potential bias in the selection of cases. To achieve maximum variation in the sample, one must first establish what spectrum of variation in which to array possible cases for selection. As this study focuses on the costs of health care and the various ways that countries attempt to contain those costs while maintaining high levels of care, it is logical to organize countries according to their method of paying for health care and controlling costs. As McLaughlin and McLaughlin (2008) explain, health care policies can essentially be arranged in this respect along a continuum ranging from “administered systems” (in which the government plays the dominant role in the provision/funding of care) to “free-market” systems which rely on private sources of funding and competition to regulate the health care market. Of course, no country’s policy can truly be said to be fully consistent with either of these ideal types; thus, they form the outer boundaries of the continuum (McLaughlin & McLaughlin 2008). Accordingly, this study considers policies approaching either end of the spectrum as “administered” or “free market” systems, while acknowledging that no system is fully one or the other. Those systems arranged around the middle of the spectrum will be defined by this study as “quasi-market” systems. The resulting spectrum is depicted graphically in Figure 14.
Having established the range of variation on which the cases have been arranged, the next step is to determine how each case can be placed onto the continuum to allow for selection. The easiest way of doing so is to examine the percentage of total health care expenditures paid by the government (as used in the previous section of this paper) provided by the World Bank because it provides a relatively direct measure of the extent of government involvement in the health care market. As the last year considered in the empirical portion of this study is 2008, values from that year will be used to sort states into the appropriate categories. States whose governments cover 65% or more (approximately two-thirds) of all health care costs will be considered to have “administered” systems; states whose governments cover 35% or less (approximately one-third) of those expenditures will be classified as having a “free-market” system; any state in which the percentage of expenditures covered by the government falls between 36% and 64% of all total expenditures will be considered to have a “quasi-market” system. A “maximum variation” sample of three states would thus include one state from each category.

The second portion of this work will again focus solely on developed countries, as the results are meant to provide policy guidance to the United States. However, as it is much harder in a qualitative setting than it is in regression analysis to hold the variables under consideration constant, this portion of the study will use a much more restricted definition of the word “developed” in order to provide for a more solid foundation for comparison. As the United States is one of the most developed countries in the world, the sample set will be restricted to the top 25 most developed states as measured by GDP per capita (adjusted for PPP and in constant $2005 dollars) in 2008. The result of this change in specification is to change the countries available for selection (by adding some and removing others) from those used in the previous section. However, as discussed above, a more restricted definition in this case allows for a more controlled comparison in this, qualitative, half of the study.

<table>
<thead>
<tr>
<th>Administered</th>
<th>Quasi-Market</th>
<th>Free-Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Government Covered</td>
<td>0% Government Covered</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 14: Continuum of Health Care Policies**
Using these two criteria as a starting point, Table 5 provides the list of countries included in the sample set under the new definition, their GDP per capita, and the percentage of its total health care expenditures covered by the government.

<table>
<thead>
<tr>
<th>Table 5: Part B Sample Set</th>
<th>GDP Per Capita ($2005 International Dollars, PPP)</th>
<th>Health Expenditures (Percentage Paid by Government)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luxembourg</td>
<td>72,176</td>
<td>84.1</td>
</tr>
<tr>
<td>Qatar</td>
<td>67,334</td>
<td>79.5</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>51,361</td>
<td>66.0</td>
</tr>
<tr>
<td>Kuwait</td>
<td>49,952</td>
<td>78.3</td>
</tr>
<tr>
<td>Norway</td>
<td>48,583</td>
<td>84.3</td>
</tr>
<tr>
<td>Singapore</td>
<td>48,160</td>
<td>31.9</td>
</tr>
<tr>
<td>Brunei Darussalam</td>
<td>46,820</td>
<td>86.0</td>
</tr>
<tr>
<td>Macao (SAR, China)*</td>
<td>46,760</td>
<td>49.9†</td>
</tr>
<tr>
<td>United States</td>
<td>43,070</td>
<td>46.0</td>
</tr>
<tr>
<td>Hong Kong (SAR, China) *</td>
<td>41,408</td>
<td>49.9†</td>
</tr>
<tr>
<td>Switzerland</td>
<td>39,567</td>
<td>59.5</td>
</tr>
<tr>
<td>Ireland</td>
<td>39,294</td>
<td>76.7</td>
</tr>
<tr>
<td>Netherlands</td>
<td>38,106</td>
<td>75.3</td>
</tr>
<tr>
<td>Iceland</td>
<td>36,626</td>
<td>83.5</td>
</tr>
<tr>
<td>Australia</td>
<td>34,238</td>
<td>68.0</td>
</tr>
<tr>
<td>Denmark</td>
<td>34,123</td>
<td>84.9</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>34,043</td>
<td>82.4</td>
</tr>
<tr>
<td>Germany</td>
<td>33,829</td>
<td>76.6</td>
</tr>
<tr>
<td>Belgium</td>
<td>33,594</td>
<td>75.0</td>
</tr>
<tr>
<td>Finland</td>
<td>33,443</td>
<td>74.4</td>
</tr>
<tr>
<td>Japan</td>
<td>31,323</td>
<td>80.8</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>30,989</td>
<td>55.7</td>
</tr>
<tr>
<td>Bahamas</td>
<td>30,335</td>
<td>45.2</td>
</tr>
<tr>
<td>France</td>
<td>30,272</td>
<td>77.7</td>
</tr>
<tr>
<td>Italy</td>
<td>28,454</td>
<td>77.5</td>
</tr>
</tbody>
</table>

* SAR refers to a semi-autonomous region within an independent country. They are included in the top 25 independently because their per capita GDP is so disparate from that of the rest of their country due to their separate economic systems.
† Separate values are not provided by the World Bank for this variable for SARs, those listed are for China as a whole.

Source: World Bank

As one can see, this data makes the selection of at least one case automatic: Singapore is the only system that our criteria would define as “free-market.” Accordingly, it is one of the cases that must be examined to abide by the stipulation that our sample be one of “maximum variation.” Additionally, because this policy analysis is intended to compare U.S. policy to that of other states, it only makes sense that it be included as one of the three cases to be examined. As the U.S. system would be qualified as
“quasi-market,” it will fill our need for a case from that category. This leaves only the selection of an “administered” system for analysis.

Of the states presented in Table 5, eighteen qualify as potential cases with “administered” systems of health care financing. This study uses two control criteria to further limit this sample and reduce the impact of factors exogenous to the model specified below. Due to the substantial amount of literature which indicates that the politics and economics of oil/resource rich renter states are vastly different from more diversified economies, this study excludes the states of Qatar, the United Arab Emirates, and Kuwait from consideration. Furthermore, states still hamstrung by massive financial crises (Japan, Italy, and Ireland) are removed from consideration due to the exogenous effects those crises may have on the variables under consideration in this study. Twelve states remain after these states are removed from analysis.

As this study seeks “maximum variation” in order to compare the impact of policy differences, policies closer to the ideal type of an “administered” system (100% of health care expenditures covered by the government) are preferred to those that are close to the border of the “quasi-market” range of the continuum. Specifically, the researcher excluded from consideration for the third case states whose governments paid less than 80% of all total expenditures. This round of attrition leaves six available cases (Luxembourg, Iceland, Denmark, the United Kingdom, Norway and Brunei Darussalam). From this set, the author selected the most “critical” case in terms of political/media salience: the United Kingdom. The cases selected for this study are thus Singapore, the United States and the United Kingdom. We now turn to the establishment of an empirical model and the creation of hypotheses.

**Empirical Model**

The dependent variable for the policy analysis portion of this study is the cost-effectiveness of the policy as defined below. The primary independent variable as suggested by the method of case selection is the state-in-question’s health care policy, particularly its method of financing health care. However, as the standards for ethical policy analysis explains, alternative explanations for variations in the dependent
variable (control variables in social scientific terms) must be explored and refuted if the analysis’ conclusions are to be believed. The vast majority of necessary control variables required by the current study and the justification for those variables can be pulled from the previous section’s empirical analysis as many of the factors related to the cost of care may also be seen to be related to health outcomes. The theoretical model that will form the basis of the analysis that follows, as suggested by the subjects under study and the preceding literature, is provided in Figure 15.  

**Figure 15: Empirical Model for Cost-Effective Analysis**

\[
\text{Cost-Effectiveness} = \text{Health Policy} + \text{Income} + \text{Baseline Health} + \text{Education} \\
\text{GDP per capita} + \text{Age Structure} + \text{Literacy} \\
\text{Gini Index} + \text{Obesity} + \text{Mean years of Education} \\
\text{Cancer Incidence Rate} \\
\]

*Dependent Variable*

One might wonder why the researcher chooses the “cost-effectiveness” of the program as a dependent variable rather than utilizing the more traditional standard in the world of policy analysis: cost-benefit analysis. The simple reason is that health care outcomes are notoriously difficult to quantify. As Dunn (2008) explains, “cost-benefit analysis […] attempts to measure all relevant factors in a common unit of values” which is typically monetary in nature. While it is arguably fairly easy to quantify the costs of providing health care in a state (by looking at expenditures per capita), it is nearly impossible to place a valid dollar value on a person’s health. Cost-effectiveness analysis resolves this problem by using “two

---

8 It would be reasonable to question why rates of innovation are not included in this model. The regression analysis conducted in Part A suggests that this is not an important explanatory variable because its effects counteract each other. Technology can both increase health care expenditures and cause them to fall; furthermore, innovation spreads quickly between developed countries. This makes it highly unlikely that technology capable of significantly improving outcomes would exist in one state but not others. Additionally, there is no good measure available to see if this is so. Accordingly, innovation is not included as an independent variable in this analysis.

9 Note that this does not imply that cost-effectiveness is an additive linear function of the independent variables. Because this study is a product of two disciplines, economics and political science, some confusion may result when switching from the economic model formulation in the first section to the appropriate political science model notation in this second part. For clarity’s sake, the economic formulation of this model would be: cost effectiveness = \( f(\text{health policy, income, baseline health, education}) \). Of course, error is assumed to also play some role in any model.
different units of value” (Dunn 2008). To quote Dunn (2008) again, “costs are measured in monetary units, while effectiveness is typically measured in units of goods, services or some other valued effect.” This is the perfect way to examine health care policy, whose goal is to minimize costs while maximizing outcomes. A cost-benefit approach thus creates four possible combinations between expenditures and outcomes as depicted in Figure 16.

**Figure 16: Levels of Cost Effectiveness**

<table>
<thead>
<tr>
<th>Strong Outcomes</th>
<th>High Costs</th>
<th>Low Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Intermediate Cost-Efficiency</td>
<td>High Cost-Effectiveness (Most Preferred Outcome)</td>
<td></td>
</tr>
<tr>
<td>Poor Outcomes</td>
<td>Low Cost-Effectiveness (Least Preferred Outcome)</td>
<td>Low Intermediate Cost-Effectiveness</td>
</tr>
</tbody>
</table>

As suggested by the table, the most cost-effective system is one with relatively low costs, but strong health outcomes. The least cost-effective is the one with high costs and poor health outcomes. The other two options fall somewhere in between; however, the researcher assumes that the more preferable option in the view of the state is to have a healthy population at a high cost as opposed to an unhealthy population with low system costs (particularly because this study focuses on the developed world).

The researcher next turns to how each is defined in the present research. The cost of healthcare in a given state will be defined here in the same way as in the first part of this study. Namely, cost will be measured by the per capita healthcare expenditures (public and private) of the state in question in 2008. The effectiveness of the health care system in a state will be measured using the two relatively standard measures of life-time health in a state: life expectancy and infant mortality rates. While perhaps not perfect measures of health, these two variables capture the overall quality of health care in a system.

Simply put, healthy people live longer (and a good healthcare system is what keeps people healthy) and a good healthcare system can be expected to reduce infant mortality substantially. A highly cost-effective system, then, would have relatively lower per capita health expenditures, but a higher average life-expectancy and lower infant mortality rate than other states. These measures will be used to compare
cost-effectiveness between the states and will also be compared against the OECD average in order to provide a sense of where the country stands in terms of general cost-effectiveness.

**Independent Variables**

This section will define each of the independent variables (including control variables) considered in the second portion of this study. To begin, health policy will primarily be defined as it was in the case selection process. However, the policies of the cases under study will be analyzed in greater detail in this section. In particular, this section will consider the recent health care reforms passed in the United States (through the lens of Massachusetts’ 2004 policy) to determine if they constitute any fundamental shift in the way health care is financed. Emphasis will also be given to the particular methods each system employs to control costs and the incentives (according to rational choice/economic theory) that each method of financing creates. Flynn (2011) suggests that systems utilizing more market-based approaches to health care (with a strong safety net) are the best able to promote cost-effectiveness. Given the relative lack of empirical evaluation of the implications of different health policies, the researcher adopts this reasoning in this study’s first hypothesis.

As the previous part of this study indicates, income plays a major role in the amount that countries spend on health care, a finding reaffirmed by the literature (Newhouse 1977, Culyer 1989, Gerdtham et al. 1992, Hitris & Posnett 1992, Gerdtham et al. 1998). This study’s qualitative analysis suggested that income is important, because those with greater incomes will purchase more health care regardless of price. Clearly the additional consumption of health care is likely to affect the health of the population. Either (A) greater consumption of health care will lead to higher overall health levels or (B) it is indicative of a general lack of health among the consumers. However, as this section also controls for baseline health levels, one would presume that the former effect would be the one that appears. However, greater consumption of health care inevitably leads to higher levels of expenditure, thus while increased income will likely yield stronger health outcomes, it will also increase costs. Accordingly, the researcher suggests a neutral role for the income variable in its second hypothesis. Income in this study will be
measured using each state’s GDP per capita in 2008 (in 2005 international dollars adjusted for PPP) as well as its Gini coefficient in 2008 (or the nearest year if not provided for 2008). The Gini coefficient is included to account for the fact that income is not always distributed equally throughout the society as GDP per capita assumes. High income inequality may mean that the ability to afford health care is concentrated among a few individuals, thus reducing overall health levels. As increased inequality likely means decreased spending on health care among the lower classes, this is also expected to have a neutral effect on cost-effectiveness which accounts for both the cost and outcomes of a state’s health care system.

The regression analysis conducted previously in this paper also found significant relationships between baseline health factors, such as the age structure of the population, and health care expenditures.\(^{10}\) This study extends that analysis as many of those variables can also be expected to impact the health of the population. In particular, this portion of the study will examine population age structure, obesity rates, and cancer incidence rates in the respective states under examination as proxies for those states’ baseline health. One would expect increased numbers of individuals in at-risk age groups, higher obesity rates, and higher cancer incidence rates to relate to both (A) higher health care expenditures and (B) lower overall health (decreased life expectancy and increased infant mortality rates). Accordingly, one would expect all of those factors to decrease the cost-effectiveness in the system. If these variables are capable of explaining all of the variation in cost-effectiveness, then clearly the policy analysis put forward in this study (hypothesis 1) is invalid. Age structure (the number in each age group) will be examined using data from the World Bank (percentage of the population under 15 and over 65) as in the previous section as well as through an examination of the state’s population pyramid. Cancer incidence rates will be measured using the rate of cancer incidence for all cancers (excluding non-melanoma skin

\(^{10}\) There is a risk that multicollinearity may exist between this variable and the portion of the dependent variable that measures effectiveness. To some degree, the healthcare system may impact cancer incidence, obesity and the number of individuals who reach advanced age (thus impacting the population pyramid). If one is going to explore the impact of baseline health on the cost-effectiveness of the health system, however, this is largely unavoidable. Furthermore, because this study is primarily focused on the impact of the policy variable, any multicollinearity will mask the impact of the other variables (such as policy) and thus make it more difficult to find a relationship among those variables. For these two reasons, this variable is included despite the possibility of issues related to multicollinearity.
cancers) per 100,000 people in the country in 2008 based upon data from the World Health Organization.

Obesity rates will be measured using data from the CIA World Factbook which presents the most recently collected adult obesity rate (defined as an having a BMI higher than 30) for each of the states analyzed. These three baseline health factors’ predicted effects are set out in hypothesis three and its sub-hypotheses.

Though it might be possible for these variables to be impacted to some extent by the availability and use of preventative health measures (particularly obesity), these three measures were chosen because they are generally outside the control of the health system. As opposed to cancer mortality rates, there is little that a health system can do, in the abstract, to prevent cancer (as its causes are still relatively speculative) and nearly nothing that can be done about aging (even if some side-effects may be controllable). As for obesity, it is possible that doctors may be able to counsel patients to take better care of themselves and restructure their diets, but in general the decision to eat healthy and exercise (or refuse to do so) operates beyond the ability of health treatment itself to control. In short, there may be some degree of a relationship between health policy and these variables, but there should not be a relationship between the methods used to control costs in a given system (the element of health policy specifically under consideration here) and these variables.

Finally, although empirical analysis did not find strong support for the idea that education affects health care expenditures, there may be good reason to think that it affects health overall for the same reason that theory suggested it should be included in the regression analysis above. One would expect more educated individuals to take better care of themselves and, because the results found in the first part of this study do not suggest a strong effect for education on expenditures, that that greater health would contribute to higher levels of cost-effectiveness. This forms the basis for hypothesis four of this part of the study. Education levels will be measured by considering the mean number of years that a state’s population attends school as well as the state’s overall literacy rate; data for both variables will be collected from the World Bank.

The preceding analysis establishes four hypotheses that set out the researcher’s expectations for the results of the following policy analysis:


**H1:** States approaching the “free-market” style of health care system will have higher levels of cost-effectiveness than those resembling the “administrative” or “quasi-market” models.

**H2:** Variations in income levels (either in GDP per capita or Gini index scores) will not be able to explain variation in the cost-effectiveness of health care systems between states.

**H3:** States whose baseline health levels are lower, as indicated by the three sub-hypotheses set forth below, will have lower levels of cost-effectiveness than states with higher baseline health levels.

- **H3.1:** States with an age structure such that there are more individuals in high-risk age groups (under 15 or over 65) will have lower levels of cost-effectiveness.
- **H3.2:** States with higher obesity rates will have lower levels of cost-effectiveness.
- **H3.3:** States with higher cancer incidence rates will have lower levels of cost-effectiveness.

**H4:** States with more educated populations will have more cost-effective health care systems.

The next section of this work will provide a description of the health care policy of each of the three cases to be examined.

**XI. SAMPLE HEALTHCARE SYSTEMS**

This section considers the health care systems of the three states evaluated by this portion of the study. Each subsection will provide a brief overview of the way in which health care is provided and paid for in the cases identified previously.

*United States*

The United States’ healthcare system is a combination of private providers and insurers and a hodgepodge of government programs, each of which absorb approximately half of the cost of health care for Americans (Clemmitt 2011). The provision of health care in the United States is almost completely privatized (with the exception of organizations such as Veterans Administration hospitals); care is provided at non-profit hospitals (some of which are run by public universities), private practitioners, and
other entities not controlled by the government. The financing for many patients utilizing these services is also private; since the 1940s, healthcare financing in the United States has been, in large part, the domain of private insurance companies and most individuals with insurance have received it through their employers (Clemmitt 2011) Individual healthcare premiums are often high, allowing employers to use their ability to “pool risk” in order to use healthcare insurance as an employment benefit for employees (Clemmitt 2011). The reason this is so stems from wage controls put in place during World War II; because employers could no longer compete for employees by offering higher wages, they turned to fringe benefits (such as health insurance) (Clemmitt 2011). This has remained largely unchanged since that time.

Of course, American healthcare financing is not completely, and not even mostly, privatized. Beginning in 1965, the U.S. government entered the healthcare market with the establishment of Medicare, which provides health care for the elderly, and Medicaid, which provides assistance to poor mothers, some of the poor, and the disabled (Clemmitt 2011). The Veteran’s Administration also provides a network of free hospitals to former members of the Armed Forces and their families. In 1997, Congress further expanded federal coverage by creating the State Children’s Insurance Program (SCHIP), which covers children in low- to middle-income families (Clemmitt 2011). The result was a health care financing system that was largely half public and half private, but in which little cost is paid directly out of pocket, except for the approximately 45 million Americans who did not have insurance (and thus must pay out of pocket, or not pay at all) prior to the passage of the ACA (Clemmitt 2011).

In March of 2010, the passage of the ACA marked the beginning of supposedly large-scale changes in the U.S. healthcare market. Most significantly, it purported to extend coverage to 32 of the 45 million Americans currently without health care coverage (Clemmitt 2011). The Act’s main initiative, the creation of state “exchanges” which would allow customers to choose from among plans offered by various insurance companies to the exchange as a whole (the idea being that the exchange would drive down costs by providing the same “risk pooling” advantages as employer-offered plans) similar to “the Connector” which forms the core of the 2006 health care reform initiative launched in Massachusetts
under Governor Mitt Romney (Clemmitt 2011). Additionally, the bill outlawed the dropping of individuals who became sick by insurance companies, barred insurance companies from denying coverage on the basis of pre-existing conditions, allowed young people to remain on their parents insurance until the age of 26, and provided for the expansion of Medicaid (although this last provision was later limited by the Supreme Court’s ruling in *Sibelius*). The government claimed that, in addition to expanding access to care, these changes would drive down costs by covering the uninsured and through the provision of exchanges. However, the reforms enacted do not appear to drastically change the way in which the U.S. handles demand or the coverage of costs; this may suggest that, overall, the effect on expenditures may not be great, even if the quality of care may improve (due to increased access). A look at the effects of reform in Massachusetts in the following sections will explore what if any impact may be expected on the cost-effectiveness of the system. However, for now it suffices to say that the U.S. remains firmly in the “quasi-market” camp, despite the changes provided for under the ACA.

**United Kingdom**

In 1946, the United Kingdom launched its National Health Service (NHS), a fully nationalized health care coverage system funded by taxpayers, to provide for the health care of all of its citizens, regardless of income (Clemmitt 2011). Of course, private healthcare providers and insurers still operate in a limited fashion in the UK, many providing for the wealthy and those who can afford to go around NHS when they are placed in a queue or denied coverage (McLaughlin & McLaughlin 2008). Although major changes in the division of responsibility will be implemented in April of 2013, the overall process of obtaining healthcare in the United Kingdom will remain largely the same (“The Changing NHS” 2013). Patients are referred for further treatment after first seeing a primary care physician, this referral may either be approved or denied for funding by an impartial review panel that makes decisions based upon local health care priorities and eligibility requirements set to determine who is eligible for specific types of care (Collins & Adams 2012). These patients may then be placed in a queue (or waiting list) for that treatment which may last as long as a year for operations such as hip replacements, coronary artery
bypass surgery and other non-acute procedures (Collins & Adams 2012; McLaughlin & McLaughlin 2008). These latter two steps form a type of rationing, which has driven many patients in the UK to private providers or to fund their own medical care where they have been denied for coverage by NHS; the current “trusts” in charge of managing expenditures have been accused of ratcheting up rationing in recent years (Adams 2012). Emergency procedures, outpatient treatments, and procedures for acute health care needs are typically not subject to rationing.

Singapore

Singapore’s health care system is different from that of either the United States or the United Kingdom. The vast majority of primary healthcare needs (about 80 percent) in Singapore are provided by private general practitioners (Callick 2008, Caplan 2008). The remaining primary health services are provided by public hospitals, other healthcare services are also split between public and private providers (Callick 2008; Caplan 2008). Moreover, hospitals are required to publish price lists that encourage consumers to comparison shop for the best prices for care; hospitals, in turn, often specialize in the performance of specific procedures in order to attract customers by offering high quality care at a lower price by focusing on their comparative advantages (Flynn 2011; Caplan 2008).

This last aspect is important, because the vast majority of care in Singapore is privately financed due to mandatory health savings accounts which require all citizens to contribute an amount roughly equivalent to 40% of their income (18% comes out of the employee’s salary, about 22% comes from employer matching contributions) (Meng-Kin 1998). This portion of the system, which is the first of Singapore’s 3Ms, is called Medisave and forms the core of the Singapore health financing model; citizens use these accounts to pay for their health services as well as those required by their immediate family (Meng-Kin 1998). Any money left over at the time of their death can be bequeathed to beneficiaries of the individual’s choosing (Meng-Kin 1998). The second plank of the system is Medishield (a low-cost catastrophic insurance system) which provides optional coverage of up to a maximum amount to those who subscribe (Meng-Kin 1998). The third plank, Medifund, is a government safety net financed from an endowed fund which picks up the health care costs of those who do not have the means to pay for care
(and which from 1993 to 1998 covered 99 percent of all claims directed to it, such as those who are poor, unemployed or have run out of coverage under Medisave and Medishield (Meng-Kin 1998).

Additionally, the government has added an Eldershield program which provides “private insurance for disability resulting from old age” (a monthly cash allowance is provided for “those unable to perform three or more basic activities of daily living”) (Callick 2008).

XII. QUALITATIVE ANALYSIS

This section will lay out the results of the cost-effectiveness analysis conducted in this portion of the study. It will begin with a comparison of the cost-effectiveness of the various systems under consideration, before turning to an exploration of each of the independent variables identified previously and evaluating the accuracy of the hypotheses laid out above.

Cost-Effectiveness

Table 6 shows the values of all of the variables included in this study’s definition of cost-effectiveness (as specified on page 61) for each of the sample states as well as the average for OECD states as a whole in 2008.

| Table 6: Cost-Effectiveness Variable Values of Sample States and OECD Average in 2008 |
|-----------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| **Per Capita Healthcare Expenditures**       | United States  | United Kingdom | Singapore       | OECD Average    |
|                                               | $7,719.63       | $3,233.60       | $1,910.63       | $3,908.07       |
| **Average Life Expectancy at Birth**         | 77.9            | 79.6            | 80.8            | 78.9            |
| **Infant Mortality Rate, per 100 Live Births**| 6.6             | 4.7             | 2.2             | 7.3             |

Data Sources: World Bank

As one can easily see, the United States clearly has the least cost-effective health care system of the states under consideration. It has the highest infant mortality rate, lowest life expectancy, and highest per capita expenditures of any of the three systems. In terms of outcomes, however, it is not far outside the OECD average, suggesting that, on the whole, the quality of care provided is fairly high. This
conclusion is supported by the fact that, outcome wise, the United States is fairly close to the other states being examined in the study. While it does have the worst numbers in every indicator, at least where outcomes are concerned the difference is not altogether meaningful. This places the United States in the “High-Intermediate Cost-Effectiveness” category demarcated by Figure 16; it has very high costs of care, but also very high outcomes.

Singapore, by contrast, is by far the most-cost-effective system. Its expenditure levels are far below those of the other two states as well as the OECD average; at the same time it has both the highest life expectancy and lowest infant mortality rate of all three states. Singapore’s citizens also appear to live longer on average than the typical citizen of an OECD state and its infant mortality rate falls below the OECD average. In total then, Singapore is best classified as falling within the “High Cost-Effectiveness” category, given its outperformance of other states in the model and the OECD in general in both cost and outcome measures.

The United Kingdom falls somewhere in the middle. Its per capita healthcare expenditures are slightly higher than the OECD average and lie between those of the United States and Singapore. In terms of outcomes, the UK’s citizens have a slightly lower life-expectancy on average than those of citizens living in Singapore, but a slightly higher average life expectancy than that of U.S. citizens. Infant mortality rates in the UK are almost directly in between that of the U.S. and Singapore. Compared to the OECD average values, the UK has a significantly lower infant mortality rate and slightly higher average life expectancy. In general then, the UK falls somewhere in between the “High Intermediate Cost-Effectiveness” and “High Cost-Effectiveness” categories. Taken together, these statistics indicate that in the sample, Singapore provides the most cost-effective healthcare system; it is followed by the United Kingdom in second place, and the United States (which possesses the least cost-effective system in the sample). We turn now to an examination of each of the independent variables that may provide a partial explanation for these observations.
Health Care Policy and Methods of Cost Control

The first of the independent variables suggested by this study is each case’s health care policy and specifically its methods of financing health care and controlling costs. In the United States, several methods are used in an attempt to control costs. So far as Medicare and Medicaid are concerned, the government typically releases schedules stating the amount the government will pay for each type of service utilized by participants. Insurance companies, prior to the passage of the ACA, could drop participants who were too expensive, or refuse to cover those whose costs would be extraordinarily high (e.g. those with pre-existing conditions). Obviously those without insurance are limited by what types of care they can afford, though they can avail themselves of emergency care, which will often eventually be written off by the hospital on its taxes if they cannot afford to pay for it. By and large, however, there is no limit on demand (although some HMOs have tried to limit costs through the use of gatekeepers and emphasis on preventative care) in the United States healthcare system. Moreover, as most coverage is third party (paid for by the employer — in large part — or by the government), healthcare may appear to be free or heavily subsidized (requires the payment of a deductible rather than the whole sum) for many Americans (Flynn 2011). In fact, according to the World Bank, Americans paid only 12.7% of total health care expenditures out-of-pocket in 2008; which means that the rest was completely picked up by third party payers (World Bank 2013). Obviously, a lower perceived price creates a higher demand and with no limiting factors, increased expenditures. In many ways, then, the U.S. system creates higher levels of demand and does little or nothing to control it (Flynn 2011). As the regression in the first part of this study suggests that healthcare is massively demand driven, this is a recipe for high health care expenditures.

Does the ACA change any of these incentives? The overwhelming answer is no; in fact, (as discussed above) the law explicitly seeks to expand coverage of Americans by third parties, which might be expected to drive up expenditures. Of course, that is only half of the story. Even if it does not save in costs, the increase in care might improve outcomes and, thereby, cost-effectiveness. To examine the impact of the ACA, we must turn to the reforms adopted in Massachusetts in 2006. Although not
identical, these reforms (which included mandating healthcare coverage for all state citizens) are similar enough to provide some idea of the potential effects of the ACA. Tables 7, 8 and 9 and their accompanying graphs compare Massachusetts to the United States (based on average values) based upon the same measures of cost-effectiveness used in the previous section from 2004 (two years before the reforms were passed) to 2009.

| Table 7: Per Capita Health Care Expenditures, Massachusetts vs. United States Average |
|---------------------------------|-----------------|-----------------|
|                                 | Massachusetts   | United States† |
| 2004                            | $6,988          | $5,411          |
| 2005                            | $7,436          | $5,726          |
| 2006                            | $8,002          | $6,028          |
| 2007                            | $8,568          | $6,318          |
| 2008                            | $8,926          | $6,566          |
| 2009                            | $9,278          | $6,815          |

†Values for the United States may differ from those used above, because of differences between calculation methods and units based upon data sources. For instance, World Bank values are adjusted for PPP, whereas Kaiser Family Foundation values are not.

Source: Kaiser Family Foundation

| Table 8: Life Expectancy at Birth, Massachusetts vs. United States Average |
|---------------------------------|-----------------|-----------------|
|                                 | Massachusetts   | United States   |
| 2004                            | 79.0            | 77.3            |
| 2005                            | 79.3            | 77.3            |
| 2006                            | 79.5            | 77.6            |
| 2007                            | 79.7            | 77.8            |
| 2008                            | 80.1            | 77.9            |
| 2009                            | 80.3            | 78.1            |
Table 9: Infant Mortality Rates, Massachusetts vs. United States Average

<table>
<thead>
<tr>
<th>Year</th>
<th>Massachusetts</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>4.8</td>
<td>6.8</td>
</tr>
<tr>
<td>2005</td>
<td>5.2</td>
<td>6.9</td>
</tr>
<tr>
<td>2006</td>
<td>4.8</td>
<td>6.7</td>
</tr>
<tr>
<td>2007</td>
<td>4.9</td>
<td>6.8</td>
</tr>
<tr>
<td>2008</td>
<td>5.1</td>
<td>6.6</td>
</tr>
<tr>
<td>2009</td>
<td>5.1</td>
<td>6.4</td>
</tr>
</tbody>
</table>

Source: Anne E. Kasey Foundation
As one can see from these tables, Massachusetts has always exceeded the United States average in per capita health care expenditures for the time under consideration, but the gap appears to widen slightly after 2006 (likely due to increased demand) when Massachusetts expenditures grew at a faster rate than the rest of the country. In terms of outcomes, one sees very little change over the period, even after the enactment of healthcare reforms in 2006, though Massachusetts’ healthcare system does appear to perform consistently better than the U.S. average. What this ultimately suggests is that, as far as demand goes, the Massachusetts plan and by extension the ACA appear to do little to control costs, but do seem to increase demand without improving outcomes. This suggests that, on the whole, the shift in policy that the ACA brings is not large in terms of cost control and may actually increase costs. In terms of health care policy then, American cost control mechanisms are pretty much exactly the same (spotty or non-existent) as they were prior to the ACA’s passage.

Most of the differences between Singapore’s health care policy and those of the United States and the United Kingdom were discussed previously; here, however, this study draws attention to the differences in methods of cost control and discusses the incentives created by Singapore’s healthcare system. Compared to the 12.7% of costs paid out-of-pocket by Americans, citizens of Singapore paid 58.4% of all health care expenditures out of their own pockets in 2008 largely due to required participation in Medisave (World Bank 2013). Both the fact that citizens are paying for a large amount of their care with their own money and the prospect of passing any unused funds to their children, provide large incentives for Singapore’s citizens to be frugal, seek the best price for care, and to minimize the amount of care necessary (such as by pursuing preventative care) (Flynn 2011). These market based incentives are magnified by the requirement that hospitals post prices for care which leads to competition, even between public and private providers, for patients (Flynn 2011). Singapore uses market incentives as a method of price control, while still providing a substantial safety net for its citizens (as discussed

11 It is important to note that, because both Massachusetts and the U.S. have the same inflation rate it is automatically held constant. Therefore, even if some of the increase in both states is caused by inflation, the fact that expenditures rose faster in Massachusetts than the U.S. as a whole suggests higher levels of demand rather than simply higher price levels.
above). This makes its markedly different from the “quasi-market” system of the United States, which provides health care largely through private entities, but removes the burden of paying for care from the majority of consumers. By way of contrast, Singapore’s “free-market” system makes consumers responsible for the majority of health costs.

Citizens in the United Kingdom, on the other hand, paid an even lower percentage of their health care expenditures out-of-pocket than their American counterparts: 10.9% of all healthcare expenditures (World Bank 2013). Unlike the United States, however, the United Kingdom employs a variety of cost-control measures, particularly its forms of rationing (as discussed above). While these are not market-based means of controlling demand, they still function to limit the use of health care services by restricting the number of people who have access to certain services. Whether it is by placing individuals in queues or denying public funding for a treatment altogether, the result is to impose a quota that reduces overall demand and thereby expenditures. The UK goes to great lengths to ensure that NHS rationing does not unduly impact health outcomes, most notably by leaving decisions on what to fund to groups of health professionals, but still run the economic risks of deadweight loss that accompany all such government imposed restrictions. Like the US, the UK increases demand by making health care appear nearly or completely free; however, the UK also implements policies to control that demand, whereas the United States, for the most part, does not.

What can one ultimately take from the exploration of this first independent variable? This studies analysis tends to suggest that Hypothesis 1 is correct. The “free-market” system of Singapore is the most cost-effective, followed by the “administered” NHS in the United Kingdom. The “quasi-market” system appears to produce the worst results in terms of cost-effectiveness. This section also provides reason to believe that the passage of the ACA will not change this distribution of results based upon the outcomes of the 2006 healthcare reforms in Massachusetts.
Income

The second independent variable included in our empirical model for this section of the study is income. Table 10 provides the GDP per capita of each of the three countries under consideration in 2008 as well as their Gini coefficients from 2008 (or the most recent year). The countries in the table have been arranged from left to right in order of cost effectiveness in order to better visualize any patterns that might emerge.

<table>
<thead>
<tr>
<th>Table 10: Income Measures for Sample States in 2008</th>
<th>Singapore</th>
<th>United Kingdom</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP Per Capita (PPP, Constant 2005 International Dollars)</td>
<td>$48,160</td>
<td>$34,043</td>
<td>$43,070</td>
</tr>
</tbody>
</table>

Source: World Bank (GDP), OECD (Gini US & UK), Singapore Department of Statistics (Gini, Singapore)

As predicted by Hypothesis 2, these numbers reveal no clear pattern. Singapore has both the highest GDP per capita and Gini coefficient, but the United States comes in second (as opposed to last in cost-effectiveness), while the United Kingdom comes in third. Furthermore, theory would suggest that the highest expenditures would be in the state with the highest GDP per capita (Singapore) which is robustly not true. Theory would also suggest that a lower Gini coefficient (indicating greater equality) would also increase expenditures, which does not appear to hold weight either. Although the United Kingdom does have higher expenditures than the Singapore., it has much lower expenditures than the U.S., despite the fact that the U.S. has a much higher Gini coefficient. No reliable pattern can be observed here either. Simply put, income does not relate in any clear way to differences in cost effectiveness in this sample, providing support for Hypothesis 2.\(^\text{12}\)

\(^{12}\) One might posit that Singapore’s compact size and high level of development combine to create this result even when controlling for population. Given the fact that Singapore was truly the only available case for the “free-market” type of system, however, no other cases were available to use in this study.
**Baseline Health**

We begin our analysis of the baseline health status of the states in our model by examining their respective age structures. In 2008, 32.85 percent of the population in the United States was either under the age of 15 or over the age of 65, compared to 33.76 percent of the population in the UK and 26.95% of the population in Singapore (World Bank (a) 2013; World Bank (b) 2013). Here again, we see no consent pattern between states, but we must delve a tad bit deeper. When you divide these two age groups, there is a slightly different story to be told; 12.67% of the United States’ population was over the age of 65 in 2008, versus 12.41% of the United Kingdom’s population and 8.65% of Singapore’s population (World Bank (a) 2013). There is, then, some evidence for the idea that aging populations may reduce cost-effectiveness. However, the gap between the US and UK on this variable is very small; it is difficult to believe that a difference of only .26 percentage points could explain the massive variation in expenditures between the two states (though it might influence the slight difference in outcomes). Similarly, a difference of 3.76 percentage points likely is not sufficient to explain the variation between Singapore and the United Kingdom on this same front. This does suggest, however, that policy alone cannot explain the difference.

Figure 17 provides the population Pyramids for each of these states:

![Figure 17: Population Pyramid Graphs for Sample States in 2008](image)
These graphs tend to support the previous analysis. All three states show signs of entering the later stages of the demographic transition (with relatively low birth and death rates), but the disproportionate nature of Singapore’s pyramid suggests that it has reached this point much more recently than either the United States or United Kingdom and thus has a relatively more youthful population. This, again, provides reason to believe that differences in age distribution, as well as differences in policy, may affect cost-effectiveness.
The other two measures to be examined regarding the baseline health status of the populations of these three states are cancer incidence rates and rates of obesity. These are provided in Table 11 below for each of the sample states in 2008.

<table>
<thead>
<tr>
<th>Table 11: Remaining Baseline Health Variables for Sample States in 2008</th>
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<tbody>
<tr>
<td><strong>Singapore</strong></td>
</tr>
<tr>
<td>Rate of Incidence for All Cancers (excluding non-melanoma skin cancers) per 100,000</td>
</tr>
<tr>
<td>Obesity Rate</td>
</tr>
</tbody>
</table>

*Source: World Health Organization (Cancer) and CIA World Factbook (Obesity)*

This data again confirms the impact of baseline health factors on cost-effectiveness. The differences in both cancer incidence rates and obesity both precisely match differences in cost-effectiveness. Singapore has the lowest levels of both cancer incidence and obesity, the United States has the highest of both, and the United Kingdom is in the middle. The wide variances in years available for obesity rates casts some doubt on that measure, but this does little to weaken the clear implications of these statistics. Clearly there are major differences in underlying health status between these states, for whatever reason, that are clearly related to cost-effectiveness. Perhaps policy does play a role here in terms of preventative care (as Singapore’s policy may incentivize such care more than the other systems), but as discussed previously, baseline health also plays a role.

However, it is also important to emphasize that, when talking about numbers per one-hundred thousand, there still is not that much difference between the United States and the United Kingdom (about 33.1 cases per 100,000) and a difference of about 100 cases per 100,00 between Singapore in the U.S. These are not insignificant differences, as the above analysis remains clear, but they also are not so large that they can completely explain the massive differences in cost between the systems (though they certainly explain part of it). The point being, that although this portion of our analysis finds almost complete support for Hypotheses 3, 3.2 and 3.3 and partial support for Hypothesis 3.1, there is still
substantial room for policy differences to play an important role. These findings do not nullify our finding of support for Hypothesis 1.

**Education**

Finally, we arrive at our last independent variable, education. Table 12 lays out the relevant data for each of the three states under examination.

<table>
<thead>
<tr>
<th>Table 12: Education Statistics for Sample States</th>
</tr>
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<tr>
<td>Mean Years of Education (2008)</td>
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<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Literacy Rate (Year in Parentheses)</td>
</tr>
</tbody>
</table>

*Source: UNDP (Schooling) and UNESCO (Literacy)*

Overall, the results with regard to education tend to be a mess. They tend to suggest that countries in which students attend school for longer have less cost-effective healthcare systems and no real relationship between literacy and cost-effectiveness. One could take the former as evidence the education increases demand for care (people know more about diseases and become more paranoid) without really raising outcomes. However, the rather small differences between the three states on this variable (less than 4 years total difference between the U.S. and Singapore) and the completely irrelevant nature of the literacy variable, coupled with the finding that education is in no way connected to expenditures in the previous section of this work, one would be better off concluding that there is no real relationship between education and the cost-effectiveness of the system. After all, if education is not related to expenditures, then the years of education numbers above would suggest that more educated populations are simply sicker, which does not make any real logical sense. This study, then, finds no support for Hypothesis 4 and concludes that there is no non-spurious relationship between education and cost-effectiveness.
XIII. POLICY RECOMMENDATIONS AND LIMITATIONS

In the end, this study concludes that the most likely explanations of differences in cost effectiveness between the states under examination are variation in cost-control measures and baseline health. The obvious implication for policy-makers, then, is to work to develop real ways of combatting costs and to improve baseline health. Although there is little politicians can do about age structure, they can work to promote preventative care and fund greater research into the causes of diseases, such as cancer. Additionally, there is evidence to suggest that the encouragement of immigration (because immigrants are typically younger individuals) can also work to reduce population aging and might actually help. The ACA is a positive step forward in at least this regard.

However, the other implication of this result is that states should move towards “free-market” systems that use market forces to regulate costs. “Administered” systems also appear to function better than “quasi-market” programs, but Singapore’s successes indicate that it is through the implementation of market-based policies that policy-makers will have the most success. This is not to say that health care should be turned into a completely “fend for yourself” arena; the Singapore case also shows the necessity of an expansive safety net. However, as economists have long argued, market forces appear to be more successful than administrative decision making when it comes to the efficient allocation of scarce resources and, thus, promote greater cost-effectiveness. Such policies also need not completely change the character of U.S. health financing either; many in the United States would not support a dramatic switch a policy that precisely mirrors Singapore’s system. Emphasis of health savings accounts plans, requirement of contributions to such plans, and other regulations could likely accomplish similar results, while maintaining the more privatized nature of the American health care system.

Ultimately, though, this study’s findings, and especially the qualitative analysis that makes up its second part cannot be conclusive. Three cases is simply not enough to generalize nor definitively mark out the course for the future of American health care policy. The limitations of such analysis were discussed at length above as were specific issues with the regression analysis conducted in the first part of our examination of health care in the developed world. More research is needed to determine if the results
obtained in these pages are accurate representations of the “real world,” and, particularly, to evaluate the accuracy of the policy directions suggested by the study’s qualitative case study approach. The extension of empirical, quantitative methodologies to the second portion of this study would be a massive first step along this path.

**XIV. CONCLUSION**

The passage of the ACA will remain controversial in the years to come. The Supreme Court’s ruling on the matter will not end Republican calls for its repeal and the debate is only likely to become more complicated as the law moves closer to full implementation in 2014. Already, some Republican governors are accepting the Medicaid expansion they originally fought against, signifying that nothing is quite so simple as it originally appears. This study sought to answer questions more fundamental than the law’s relationship to American values. Its first part explored the factors that drive health care expenditures in developed states and found that they are primarily demand driven. The second part of the study focused on what makes a health care policy cost-effective in the hopes of determining whether or not the ACA will be successful in achieving its goals. The results suggested that policies which create “free-market” type systems and which seek to improve baseline health levels are likely to be the most cost-effective. The ACA’s greater emphasis on preventative care partially addresses the later requirement, but its failure to dramatically change the way health care is financed and demand for care is managed in the United States suggest that, while outcomes may improve, cost-effectiveness will decrease due to the increased costs sparked by increased demand. Just as the debate over the ACA is far from over, it appears that the debate over how to address the increasingly uncontrollable problem of American healthcare costs is likely to continue to rage in the years to come. Though far from perfect, this study begins to shed light on where policy-makers should focus if they hope to address the issues of balancing spending with outcomes effectively. Moving towards affordable American medicine is likely to be a long process that will involve significant changes to the way that care is provided and financed in our country. It is a process that we desperately need to begin.
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