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Examining Moral Hazard in the Healthcare Insurance Market

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Abstract
This study aims to examine the effect of insurance coverage on medical expenditure in the United States. The data was gathered from the Household Component Medical Expenditure Panel Survey and is a cross-sectional data set with a sample size of approximately 1500 observations. The study also distinguishes between public and private insurance coverage to compare the potential moral hazard in the two separate markets. The results of this study suggest that insurance status, specifically public, has a strong positive effect on healthcare expenditure. This result, combined with a negative relationship between household income and healthcare expenditure, suggests that the source of financial funds rather than the ability to pay determines the demand for healthcare services. The study indicates that individuals are very sensitive to the financial incentives provided by public insurance and inefficiencies within the public insurance market should be examined by future research.

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I. Introduction

The healthcare system in the United States has long since abandoned a free market approach regarding the provision of services. Due to the critical nature of healthcare services, policies place emphasis on the provision of services to those less able to purchase health care. Since the creation of Medicare and Medicaid the government has set price ceilings, such as the freeze on Medicare physician fees from 1984 to 1986, and heavily subsidized the provision of insurance to lower socioeconomic groups (Catlin & Cowan, 17).

Government provision of insurance removes the financial incentive to make healthy lifestyle choices. Healthy lifestyle choices are potentially expensive, inconvenient, and time consuming for the individual (Jeon, et al.). However the research clearly suggests that avoiding health-risk behaviors eliminates excessive healthcare spending. Therefore, by shifting the economic burden of healthcare back to individuals the nation would potentially be able to reallocate wasted funds.

When determining healthcare policy, the issue under consideration is most often related to meeting the needs of the people rather than a discussion regarding the supply and demand of the market. Health risk behaviors increase the demand for health expenditure overtime and are potentially avoidable (Cerimele & Katon).

This study aims to examine inefficiencies within the healthcare system in the United States. Specifically the study aims to analyze the effect of moral

hazard on healthcare expenditure. Moral hazard potentially affects demand through the subsidization of healthcare. This study posses the research question, what effect does insurance coverage have on medical expenditure in the United States.

As a secondary focus this study distinguishes between public and private insurance coverage to compare moral hazard between the two separate markets. The hypothesis for this study is that individuals with insurance will spend more than those without insurance due to a decrease in financial incentives. The second hypothesis is that individuals with public insurance will spend more than those with private due a less restrictive coverage environment in the public market.

II. Literature Review

Similar to other industries, substitutes for healthcare services exist. Substitutes that are currently available for the consumption of healthcare services include healthy lifestyle choices and activities that decrease stress in place of direct medical care. Since Medicare and Medicaid were introduced in 1965, the use and intensity of personal healthcare services has consistently increased in the United States (Catlin & Cowan, 15).

The current body of research contradicts the concept that healthcare is a basic need and is unable to be controlled by behaviors outside of healthcare. For example, "a 10% relative drop in smoking in every state is predicted to be followed by an expected $63 billion reduction (in 2012 US dollars) in healthcare expenditure the next year" (Lightwood & Glance). The consumption of cigarettes

is an entirely preventable activity that contributes significantly to the healthcare expenditure of the United States.

Emergency medical visits and the utilization of potentially preventable provisions from medical providers are much more common in areas with increased economic deprivation. This could be due to the lack of prevention methods taken due to financial limitations (Davies et al.,1678). It is possible that economically deprived areas are less likely to provide healthy food sources, as highly processed, lower quality, goods are cheaper.

The current body of research clearly suggests that lifestyle is a large indicator of the need for health services. In order to examine the demand for healthcare the variation in healthy habits across numerous socioeconomic communities must be examined. Factors that have been shown to contribute to healthcare expenditure, such as tobacco use (Xu et al.), inadequate nutrition, and obesity (Cerimele & Katon), are possible determinants leading to potentially avoidable healthcare expenditure.

Previous studies suggest that individuals with lower socioeconomic status are less adaptive to changing health care beliefs. This could be due to a more constricted flow of information to the community. The negative correlation between socioeconomic status and the adoption speed of new theories regarding health could also be due to varying education levels. However, the current body of research suggests that marketing efforts are more successful among lower socioeconomic classes. The power of marketing has been researched

extensively and it is clear that healthcare centered advertising plays a large impact on the general opinion of the population (Suman et al., 7).

The literature identifies a negative correlation between education levels and smoking rates in the population of the United States, as well as a negative correlation between income and the rate of smoking ("Current Cigarette…"). It is a possibility that individuals who smoke are also more susceptible to financial incentives, as they potentially possess less income. Additionally, the negative correlation identified between education levels and the rate of smoking by the CDC has certain implications when combined with the marketing trends identified by Suman et al. as previously noted. Individuals who participate in health risk behaviors may be the most susceptible to marketing efforts. This suggests that policy recommendations targeting the lower socioeconomic classes will be impactful due to the increased effect of marketing on the demographic and the increased participation in activities that lead to higher healthcare spending of the target population (Suman et al., 7).

Increased government healthcare spending is also potentially harming the economy through an additional method. Government intervention is potentially constricting the market from moving towards supply side substitutes. A specific case provides evidence for this in India. India is currently experiencing a major shortage of qualified doctors, and has come up with alternatives to meet the large demand. Doctors only perform the most complex procedures and leave less skilled operations to employees who earn much lower wages. As a result, surgeries in India cost approximately 1/15th as much as they do in the US. India

has also decreased the cost of childbirth by implementing the services of midwives instead of doctors (Bangalore & Framingham, 102).

The lack of competition in the US market due to government intervention also potentially limits the incentive to increase the use of technology in the health sector (Bangalore & Framingham, 102). If the pressure of the free market was reintroduced it is possible that healthcare providers would decrease costs in the long term by implementing technology and utilizing less expensive employees in order to meet the demand for healthcare. The current situation regarding healthcare spending in the United States potentially allows government failure to occur.

The 63$ billion that would be saved by a 10% decrease in cigarette smoking as mentioned previously could be put towards other means in the better interest of the nation (Lightwood & Glance). Smoking is a specific health risk activity committed by of 15% of the American population and is causing economic inefficiencies ("Current Cigarette…"). A counter argument regards the inelasticity of cigarettes. Theory suggests that while a decrease in smoking would lead to less healthcare spending, it is unrealistic to assume that smoking can or will decrease due the intense commitment of smokers. However, cigarette consumption among the American population decreased from 20% to 15% during the time period of 2005 to 2015. This statistic suggests that while the decrease has been slow, cigarette consumption is not perfectly inelastic ("Current Cigarette… "). These results can be applied to other health risk behaviors, such as obesity.

The current research provides overwhelming evidence to support the theory that moral hazard is a significant burden to the economy of developing countries. However, less evidence can be found regarding developed nations and the United States specifically (Yawson et al.). In 2003 Ghana implemented a national health insurance plan to promote access to healthcare throughout the country. Studies examined the utilization of healthcare services between the insured and uninsured populations and found significant differences in healthcare service utilization between the two demographics. Insured costumers were found to use the available services much more often than those uninsured and the study provides significant support for the theory of moral hazard regarding healthcare (Yawson et al.).

It is not only consumer moral hazard that needs to be considered. Additionally in Ghana, studies recognized that multiple costumers with the same ailment were given different treatments due to their insurance status (Yawson et al.). Over diagnosis has been recognized as an issue in Ghana, as well as Uganda, specifically with Malaria patients (Ghai et al.). Less research has examined the prevalence of over-diagnosis in the United States.

The lack of available literature regarding supply side moral hazard in the United States raises questions. Corruptions within certain subsets of the healthcare industry have been identified, specifically regarding the pharmaceutical industry. Many cases suggesting corruption have occurred involving drug companies, all of which are public knowledge. Drug companies have paid large settlements in the wake of accusations regarding illegal

marketing attempts (Berns, 560). While surprisingly less research is present regarding over-diagnosis and corruption in the US regarding overall health, the body of literature is present to suggest that prescription drugs are over-prescribed (Berns, 558).

The pharmaceutical industry is directly related to health expenditure. From 2000 to 2002 physicians and clinical services increased 7.8% on average annually, driven by a “rapid increase in retail prescription drug expenditures” (Catlin & Cowan, 21). During the period, multiple new blockbuster drugs were introduced and the intensity of marketing efforts from the pharmaceutical industry increased dramatically.

The Affordable Care Act provided an estimated $100 billion in revenue to drug companies, who also rank first in lobbyist spending among all industries at $234 million in 2012. The health sector also ranked first among sectors at $486 million in 2012. Both the pharmaceutical industry and the health sector spent more on lobbying in 2009 than in 2012, 2009 being the year ‘Obamacare’ was formulated (Fields, 559).

A possible solution to consumer moral hazard, utilized in other insurance markets, is to provide incentives for behaviors that are correlated with the decreased risk of loss to the insurance company (Stewart, 194). For example, auto insurance companies provide ‘safe driver discounts’ and other incentives that encourage the individual to follow traffic laws that are in place to decrease the risk of harm to body and property. In this way, auto insurance companies reduce the risk of moral hazard. If companies granted full coverage to drivers

without considering risk, less incentives would exist for individuals to drive slower and pay more attention to safety signs and policies (Stewart, 193).

Government provided insurance essentially removes the incentives to live more carefully. Lifestyle choices that have been suggested to cause increased spending, such as a high BMI or consistent smoking, could potentially be incentivized against to the betterment of the American economy. In the pursuit of equity many policy makers attempt to make healthcare available to those who cannot afford it. It is possible, that through the pursuit of equity, individuals are indirectly being financially encouraged to continue to partake in health risk behaviors.

III. Theoretical Model

<u>Model 1 (Full Model)</u>

$$Expenditure = \beta_0 + \beta_1 Insured + \beta_2 Race + \beta_3 RegionNE + \beta_4 RegionMW + \beta_5 Sex + \beta_6 Married + \beta_7 Age + \beta_8 Exercise + \beta_9 BMI + \beta_{10} Smoking + \beta_{11} Income + \varepsilon$$

<u>Dependent Variable:</u>

- Y_1= *Individual Annual Health Care Expenditure (2014-2015)*

<u>Independent Variables:</u>

- X_1 = *Insured*

- X_2 = *Race (White)*
- X_3 = *Region (Northeast)*
- X_4 = *Region (Midwest)*
- X_5 = *Sex (Male)*
- X_6 = *Marriage Status (Married)*
- X_7 = *Age*
- X_8 = *Exercise (Participates in rigorous exercise 5 times a week)*
- X_9 = *Body Mass Index*
- X_{10} = *Currently Smoking*
- X_{11} = *Annual Income*

The model utilizes Annual Health Care Expenditure of each Individual as the dependent variable. This figure was gathered by combining the healthcare expenditure of each individual from both years of the survey, 2014 and 2015, and deriving the average annual expenditure. In order to examine the theory of moral hazard regarding the healthcare market, the independent variable in question is the insurance status of the individual, those insured compared to those not insured. The theory under examination aims to discover whether insurance coverage removes the incentive to live a healthy lifestyle. Early statistical models did not include as many factors as the full model above, however due to the model's low explanatory power the data set was examined to include more indicators of healthcare expenditure.

Many factors were included in order to account for demographic differences. Race was separated into 'White' and 'Non White'. Regional differences were also accounted for. There are many possibilities for the cause of spending variation between regions. Some possibilities include the varying costs of services as well as varying standard lifestyle. The two regions included in the data set were each selected due to their respective number of urban centers. Research suggests that the number of urban centers per mile is negatively

correlated with obesity. The expected coefficient for the northeast region is negative, as this part of the nation has the highest number of urban centers. The midwest region is expected to have a positive relationship as it has the lowest number of urban centers.

Sex was included in the model and measured as male or not. The expected coefficient was negative, as older women tend to experience health issues with more intensity than men (Yong et al.). The study hypothesized that men would exhibit lower levels of spending across the board.

Marital Status is included as the body of literature suggests a strong correlation between BMI and the marital status of an individual (Khan et al.). The expected coefficient is positive suggesting that individuals who are married will have higher levels of healthcare expenditure.

The current body of literature has illuminated a relationship between obesity, smoking, and education levels (Cerimele & Katon). Due to this relationship, current smoking status was included as an independent variable. The expected effect of smoking status is a positive relationship, suggesting an individual who smokes is likely to have higher total expenditure.

Age was not originally included in the model but was ultimately added to help distinguish between public healthcare insurance coverage. The final aspect of the study examines the difference between insurance type rather than insurance status. Including age allows for the difference to be exclusively due to the different type of insurance rather than older individuals simply needing more

coverage, specifically with the provision of Medicare. The expected coefficient for age is positive.

Exercise and Body Mass Index were included to account for expenditure due to lifestyle choices on behalf of the individual. Obesity creates demand for potentially avoidable medical services. The expected coefficient for exercise is negative suggesting that individuals who participate in regular exercise will decrease their demand for medical services. The expected coefficient for BMI is positive suggesting that individuals with a higher BMI will have a need for more medical services and ultimately have more healthcare expenditure.

Annual income is included in the model to account for the ability to pay for services. The expected coefficient is positive suggesting that as individuals have more income they will be more willing to spend money on healthcare services as the opportunity cost of alternatives will decrease.

The error term encapsulates all variation within the model not explained by the identified independent variables. After a final model has been determined the study will examine the effects of public verse private insurance on healthcare expenditure. The expected coefficient is a positive relationship between public insurance and expenditure. Private insurance includes more limitations and regulations, creating a deterrent for those intending to spend. This model provides a distinction between separate types of coverage to examine moral hazard in different financial markets, public and private.

IV. Empirical Model

In order to help smooth the data the average of spending for the individual was taken from 2014 and 2015 in order to account for any irregularities. Specifically this helps account for accidents that are less related to health lifestyle and overall health. All factors in the full model were statistically significant at the 95% level. However, many variables accounted for little variation in the dependent variable. Model 2 attempted to minimize the number of factors in order to produce more economically significant results. In order to transition from the first to the second model many variables were eliminated.

Model 2

$$Expenditure = \beta_0 + \beta_1 Insured + \beta_2 Race + \beta_3 Age + \beta_4 Exercise + \beta_5 Income + \varepsilon$$

Dependent Variable:

- Y_1= *Average Annual Health Care Expenditure (2014-2015)*

Independent Variables:

- X_1 =*Insured*
- X_2 = *Race*
- X_3 = *Age*
- X_4 = *Exercise (Participates in rigorous exercise 5 times a week)*
- X_5 = *Income*

The second model included the key variable of insurance status. Race and age were also included as they were the most significant determinants of demographic differences. Exercise was included to account for lifestyle. Income was included to account for the ability of the individual to pay for healthcare services independently.

BMI and exercise were both included in the full model in an attempt to capture the effect of activity and nutrition. Exercise was chosen to represent lifestyle in model 2, as the t-value was more significant than that of BMI. It can be

ascertained that those who are health conscious enough to exercise five times a week also make healthy choices in other areas of their lives. Due to this relationship it is acceptable to remove BMI and suggest that the model still accounts for health behavior.

Smoking, while statistically significant, was eliminated from the final model. Smoking most likely will have an impact on the expenditure of the individual all at one time. An individual could smoke for a long time without actually incurring costs. Smoking is shown to greatly affect total national expenditure on larger nationwide studies and can also be implied to increase the expenditure of the individual over the course of their life. However a two-year time period is likely not a long enough time span to accurately evaluate the incurring costs of smoking. It is also possible that an individual may have only begun to smoke, in which case the incurring costs are potentially a long way in the future.

Overall, in decreasing from 12 to 5 variables the R-squared statistic dropped by .5% suggesting that originally too many factors were included. However this was done in an attempt to explain as much of the variation as possible as early regressions struggled to produce significant R-squared statistics. In an attempt to increase the explanatory power of the full model the data set was re-examined and additional independent variables were added.

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Model 3 kept all of the factors of Model 2, except for the key variable of insurance coverage. In order to assess Model 3 the population was slightly altered. Model 3 utilized the population of individuals who had insurance only,

and examined the differences in spending among those with public and private insurance. The first variable in Model 3 is public insurance status.

Model 3

$$Expenditure = \beta_0 + \beta_1 Publically\ Insured + \beta_2 Race + \beta_3 Age + \beta_4 Exercise + \beta_5 Income + \varepsilon$$

Dependent Variable:

Y_1= *Average Annual Health Care Expenditure (2014-2015)*

Independent Variables:

X_1 = *Publically Insured*

X_2 = *Race*

X_3 = *Age*

X_4 = *Exercise (Participates in rigorous exercise 5 times a week)*

X_5 =*Income*

V. Data Sources and Description

Many different data sets were examined throughout the study in order to derive statically significant results. In order to establish statistical significance a high-powered test was needed. Due the variation within the dependent variable, and the dependence on the variation of a large number of factors, a large sample size was required. Ideally a longitude survey would be conducted to evaluate the intensity of services utilized pre and post implementation of insurance. The data needed to be applicable inside the United States as the study intended to examine the effects nationally. Results within dependent nations have been examined in the past and moral hazard specifically in the U.S. was the focus of the study.

The first data set examined United States expenditure over time. The first year encompassing accurate data for the relevant variables identified in the literature was 1991, and the data was then examined from 1991 until 2016. However the sample size was unable to produce statistically significant results. The second data set was a cross-sectional look at all 50 states in 2016. The sample size of the data was also an issue with the second data set.

The third and final data set which was ultimately utilized for the purpose of the study was gathered from the Medical Expenditure Panel Survey. The specific survey used was the most recent Household Component Survey, which analyzed approximately 15,000 households over a two year time period from 2014 to 2015. This survey was gathered nationally and provides the most accurate representation of health and healthcare services across the entire United States. The survey includes 5 rounds of interviews across 2 full calendar years. Computer assisted personal interviewing is utilized to gather information between interviews. Household statistics are reported by a single household respondent ("MEPS").

The original 15,000 entries were edited down to 9,000 entries for which responses in regards to all relevant variables were accounted for. In addition the final sample was limited to adults ages 17 and older. In cleaning the data all individuals with incomplete answers, inapplicable answers, or anyone who chose not to respond to a question needed to be removed. The elimination of data created response bias. It is unclear why an individual would refrain from answering for certain categories.

VI. Econometric Analysis

Model 2 produced an R squared of .073 suggesting that the model accounts for 7.3% of the variation in total healthcare expenditure. The model included 9,197 observations and had an F statistic of 143.81. All independent variables are significant at the 99.9% confidence level.

Race had a positive relationship with expenditure, as individuals identifying as “White” were predicted to spend $2031 more on healthcare annually holding all else constant. This result aligns with the expected relationship at the outset of the study. Age also has a positive relationship with expenditure, as each yearly increase in age was suggested to lead to a $141 increase in annual healthcare expenditure holding all else constant. This result aligns with the expected coefficient sign for age.

Exercise had a negative relationship with expenditure. This finding suggests that lifestyle plays a large part in determining healthcare spending. Individuals who exercise at least five times a week are expected to spend $2338 less on healthcare per year holding all else constant.

According to the model, individuals who have health insurance are predicted to spend $2715 more on healthcare annually holding all else constant. This result provides significant evidence for the case of moral hazard regarding the healthcare insurance market.

The one factor that did not show the expected relationship was income. Income was negatively correlated with total expenditure. The coefficient suggests

that for every a decrease of $10 in expenditure is expected to result from every $1000 increase in income. This suggests that ability to pay plays much less of a role in determining healthcare expenditure than the source of the funds. One possible explanation for relationship is the negative correlation between income and obesity identified by the literature.

The constant is -2325 suggesting that an individual not deriving a value from any independent variable would have negative healthcare spending. This constant is difficult to interpret. Specifically the variable of age presents an issue, as all subjects in the study were at least 17 years old. The predicted spending in the case of the constant would only be the case if the individual was zero years of age and received no income.

Results: Model 2

	Coefficient	Standard Error	Model
Constant	**-2324.73*** **	(453.85)	R-squared = .073
Insured	**2715.00*** **	(332.63)	Adj R-squared = .072
			N = 9197
White	**2031.07*** **	(277.09)	F (5, 9192) = 143.81
Age	**140.87*** **	(7.91)	Prob > F = 0.0000
Exercise	**-2338.70*** **	(265.14)	
Income	**-.01*** **	(.00)	

P values: *** = <.001 ** = .001 - .01 * = .01 - .05

The third model included the factors of race, age, exercise, and income, but slightly altered the key variable. Rather than examining the insured verse uninsured populations, the third model only looked at the insured population and examined differences between the types of insurance. The coefficients for each independent variable remained within 20% of the value respectively presented in model 2 throughout the transition.

The third model accounts for 7.4% of the variation within the dependent model with an R-squared of .074 and an F statistic of 112.73. All variables are statistically significant at the 99.9% confidence level.

The independent variable for type of insurance, 'public,' has a positive relationship with the dependent variable and a coefficient of 2544. The relationship is consistent with expectations and the coefficient suggests that individuals with public insurance will spend $2544 more on healthcare services annually holding all else constant.

Results: Model 3

	Coefficient	Standard Error	Model
Constant	**-103.50**	(532.43)	R-squared = .074
Public	**2544.26*** **	(369.36)	Adj R-squared = .073
			N=7066
White	**2433.90*** **	(317.96)	F (5, 7066) = 112.73
Age	**122.57*** **	(9.72)	Prob > F = 0.0000
Exercise	**-2571.93*** **	(313.41)	
Income	**-.01** **	(0.002)	

P values:	*** = <.001	** = .001 - .01	* = .01 - .05

VII. Econometric Problems

No multicollinearity exists within the model. All VIFs are under 1.2. Additionally no independent variable is correlated with another by more than 25%. There is no contradiction with the F probability. Autocorrelation does not relate to the cross-sectional data set.

One issue with the results is the presence of heteroscedasticity. Model 2 produces a chi squared statistic of 1480.52 significant at the 99.9% level. Similarities most likely exist between groups within the insured, race, exercise and income variables, skewing the variance between standard errors. Further studies should examine better linear nonbiased estimates that have a lower sampling variance in order to get closer to the true population parameter.

The model most likely suffers from omitted variable bias. When predicting health care expenditure there are many relevant factors that come into play. Omitted variable bias is most likely the cause for the presence heteroscedasticity in the model. To correct this issue, more variables were added to the full model. However, attempts to increase explanatory power were unsuccessful.

VIII. Discussion: Limitations and Implications

The fit of the final model is lower than ideal with an R-squared statistic of .074. The model leaves a large amount of variance to be explained. Due to the

nature of the dependent variable this stands to reason, as many factors contribute to the variation that are difficult to account for. The market for products and services significantly contributes to nominal outcomes of healthcare spending. The cost of services is determined by supply and demand and this study mainly focused on determining the quantity of services. Future studies should isolate spending on specific illnesses and procedures that are common, such as joint pain or heart disease, in order to control for market variations.

The cost of technology, the quantity of investment, and the marketing efforts of providers all play a role in the market. Accidents also play a large part in determining the demand for healthcare services on behalf of the individual. Genetics are an additional factor contributing to health status, especially later in life. Future studies should examine family medical history as a predictor of health.

An additional limitation of the study was due to the data available. The study uses cross-sectional data and does not account for the total expenditure of the individual over time. However with such a large sample size, the study should come close to compensating for this as it encompasses individuals across all areas of life. The sample includes those who are paying large and small amounts for healthcare compared to their lifetime average.

The results are not enough to suggest causality. This is a limitation of the data. The study identifies a correlation. However, in order to suggest causation the test would have to include panel data over a long enough period of time to account for the variation in health expenditure pre and post instigation of

insurance coverage. The dependent variable needs this time to avoid error as the behavior and situations of individuals may not lead to a change in healthcare spending in the short term, and the time span must be long enough to account for major changes down the road. Additionally the test would have to essentially provide insurance to those who did not have it before and see how spending habits were altered holding everything else constant. Or in the case of the third model, an individual with private insurance would have to be given public insurance and then monitored over to time to account for spending habits that were related purely to the different type of coverage.

However, the coefficients have significant economic implications. The coefficients suggest that between the two groups there are large differences in spending. This finding strongly supports the hypothesis that insurance coverage and public insurance coverage cause the individual to utilize health services more frequently, holding all else constant.

While significant evidence exists in previous studies to suggest that individuals increase expenditure under insurance coverage, this study contributes to the current body of literature through the results of the third model (Stewart). The finding that the coefficient and difference between the public and privately insured groups mirror the affect of those with insurance and those without is a significant addition to the current body of research. Studies have identified the positive relationship between spending and insurance coverage mainly in developing nations, and this study also contributes to the research regarding developed markets. (Yawson, et al.). The results have extreme

economical implications. If private insurance is capable of providing the coverage for required care, inefficiencies within the public insurance market need to be identified.

IX. Conclusions

The study clearly suggests that individuals with healthcare insurance spend more on healthcare than those without. However, this positive relationship is not necessarily disadvantageous to the economy. Income was negatively correlated with spending, suggesting that personal income is not spent on healthcare if possible. In essence, providing public healthcare is subsidizing healthcare.

Insurance status, specifically public, has a strong positive effect on healthcare expenditure. However income had a negative relationship with the dependent variable. This suggests that the ability to pay does not affect expenditure, but rather the source of the funds determines willingness and demand. Services are purchased with insurance that the individual without insurance would not require or value enough to attain.

If a healthier population is more productive, than the presence of moral hazard suggested in this study may actually have a positive outcome in a general equilibrium. The health of the population is a significant indicator of overall wellness and should be invested in as long as the services rendered are beneficial. Incentivizing the population to seek out healthcare when it is necessary for health is advantageous to the American economy.

The level of benefit provided determines the value of healthcare services. However, further studies should examine supplier side moral hazard. Over-

diagnosis and over-prescription have been identified in developing countries and should be examined in the U.S. market. Another potential issue is the deadweight loss from leaving the free market system. In order to reconcile for the subsidization provided by public healthcare, price ceilings should be implemented to prevent excessive price increases within the market. The freeze on Medicare physician fees from 1984 to 1986 is an excellent example of increased regulation that should be considered in the future to help eliminate the potential for supplier moral hazard.

Due to the limitations of the data, the results of this study do not necessarily confirm the theory of moral hazard as it pertains to health risk behaviors. Total expenditure is the product of market forces, social attitude, and accidents. The study required a high-powered test to observe statistical significance within the model. The study found that such large sample sizes do not exist in longitudinal data sets for all of the relevant variables. Health risk behaviors need to be examined over long periods of time in order to evaluate how the lack of financial consequences in the healthcare market affects the lifestyle choices of the individual.

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Appendices:

Regression Results: Model 1 (Full Model)

Source	SS	df	MS
Model	1.2538e+11	11	1.1399e+10
Residual	1.4568e+12	9185	158607596
Total	1.5822e+12	9196	172052526

Number of obs =	9197
F(11, 9185) =	71.87
Prob > F =	0.0000
R-squared =	0.0792
Adj R-squared =	0.0781
Root MSE =	12594

Expenditur~G	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Insured	2539.035	333.509	7.61	0.000	1885.283	3192.787
White	1810.276	284.31	6.37	0.000	1252.965	2367.586
Northeast	2151.423	381.105	5.65	0.000	1404.373	2898.474
Midwest	1080.846	354.3054	3.05	0.002	386.329	1775.364
Male	-781.8394	267.0287	-2.93	0.003	-1305.275	-258.4038
Married	-608.5471	285.0803	-2.13	0.033	-1167.368	-49.72626
Age	144.7041	8.121119	17.82	0.000	128.7849	160.6233
Exercise	-2186.02	266.5001	-8.20	0.000	-2708.419	-1663.62
BMI	64.32363	20.05948	3.21	0.001	25.00259	103.6447
Smoke	876.8982	372.3021	2.36	0.019	147.1034	1606.693
Income	-.0089118	.0025268	-3.53	0.000	-.0138648	-.0039588
_cons	-4419.051	759.2701	-5.82	0.000	-5907.39	-2930.713

VIFs: Model 1

```
. vif
```

Variable	VIF	1/VIF
Income	1.20	0.833850
Married	1.17	0.851124
Insured	1.15	0.870959
Age	1.15	0.872622
White	1.14	0.877076
Midwest	1.10	0.905593
Northeast	1.05	0.949825
Smoke	1.05	0.951327
Exercise	1.03	0.971307
Male	1.03	0.973964
BMI	1.02	0.977446
Mean VIF	1.10	

Inter-Correlation Matrix: Model 1

	Expend~G	Insured	White	Northe~t	Midwest	Male	Married
Expenditur~G	1.0000						
Insured	0.1340	1.0000					
White	0.1124	0.2035	1.0000				
Northeast	0.0640	0.0591	0.0238	1.0000			
Midwest	0.0414	0.0671	0.2153	-0.1983	1.0000		
Male	-0.0491	-0.0495	0.0349	-0.0070	0.0110	1.0000	
Married	0.0189	0.1000	0.0980	-0.0359	0.0164	0.0587	1.0000
Age	0.2241	0.2295	0.1609	0.0256	0.0058	-0.0382	0.2345
Exercise	-0.1063	-0.0085	0.0340	-0.0029	0.0152	0.0902	0.0009
BMI	0.0510	-0.0069	-0.0207	-0.0117	0.0240	-0.0354	-0.0007
Smoke	0.0200	-0.0772	0.0667	0.0073	0.0684	0.0759	-0.1037
Income	-0.0208	0.2254	0.1581	0.0020	0.0236	0.0566	0.3004

	Age	Exercise	BMI	Smoke	Income
Age	1.0000				
Exercise	-0.0871	1.0000			
BMI	0.0422	-0.1075	1.0000		
Smoke	-0.0508	-0.0033	-0.0352	1.0000	
Income	0.0354	0.0509	-0.0831	-0.1389	1.0000

Regress Results: Model 2

```
. regress ExpenditureAVG Insured White Age Exercise Income

      Source |       SS       df       MS              Number of obs =    9197
-------------+------------------------------           F(  5,  9191) =  143.81
       Model |  1.1480e+11     5  2.2959e+10           Prob > F      =  0.0000
    Residual |  1.4674e+12  9191   159655967           R-squared     =  0.0726
-------------+------------------------------           Adj R-squared =  0.0721
       Total |  1.5822e+12  9196   172052526           Root MSE      =   12636

------------------------------------------------------------------------------
Expenditur~G |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     Insured |   2714.998   332.6335     8.16   0.000     2062.963    3367.034
       White |    2031.07   277.0905     7.33   0.000     1487.911    2574.229
         Age |   140.8682   7.913679    17.80   0.000     125.3557    156.3808
    Exercise |  -2338.695   265.1387    -8.82   0.000    -2858.426   -1818.965
      Income |  -.0125843   .0023966    -5.25   0.000    -.0172822   -.0078865
       _cons |  -2324.734   453.8499    -5.12   0.000    -3214.381   -1435.087
------------------------------------------------------------------------------
```

Inter-Correlation Matrix: Model 2

	Expend~G	Insured	White	Age	Exercise	Income
Expenditur~G	1.0000					
Insured	0.1340	1.0000				
White	0.1124	0.2035	1.0000			
Age	0.2241	0.2295	0.1609	1.0000		
Exercise	-0.1063	-0.0085	0.0340	-0.0871	1.0000	
Income	-0.0208	0.2254	0.1581	0.0354	0.0509	1.0000

Regression Results: Model 3 (Type of Insurance)

Source	SS	df	MS
Model	9.6376e+10	5	1.9275e+10
Residual	1.2072e+12	7060	170986047
Total	1.3035e+12	7065	184506399

Number of obs =	7066
F(5, 7060) =	112.73
Prob > F =	0.0000
R-squared =	0.0739
Adj R-squared =	0.0733
Root MSE =	13076

Expenditur~G	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Public	2544.257	369.362	6.89	0.000	1820.197	3268.318
White	2433.903	317.958	7.65	0.000	1810.61	3057.196
Age	122.5667	9.716989	12.61	0.000	103.5185	141.6149
Exercise	-2571.931	313.406	-8.21	0.000	-3186.301	-1957.561
Income	-.0083822	.002755	-3.04	0.002	-.0137828	-.0029817
_cons	-103.5034	532.4308	-0.19	0.846	-1147.228	940.2207

Inter-Correlation Matrix: Model 3 (Type of Insurance)

	Expend~G	Public	White	Age	Exercise	Income
Expenditur~G	1.0000					
Public	0.1734	1.0000				
White	0.1000	-0.0433	1.0000			
Age	0.2199	0.4011	0.1333	1.0000		
Exercise	-0.1184	-0.0920	0.0238	-0.0956	1.0000	
Income	-0.0645	-0.3220	0.1271	-0.0244	0.0536	1.0000

Breush - Pagan Test: Model 2

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ExpenditureAVG

         chi2(1)      =  1480.52
         Prob > chi2  =   0.0000
```