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Incentivizing Enrollment: *A Study of Employee Enrollment in Health Insurance*



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by

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Submitted to The Department of Economics

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I hereby recognize and pledge to fulfill my responsibilities as defined in the Honor Code and to maintain the integrity of both myself and the College as a whole.

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Abstract

The health insurance industry has seen a spike in coverage costs over the last decade. To compensate for increasing expenses, firms have begun to offer additional, more financially sustainable plans. Specifically, firms have started to utilize High Deductible Health Plans to increase risk protection and decrease expenditures. Under the assumption that consumers are rational decision makers, lower price points are associated with an increase in quantity demanded. To incentivize enrollment, firms participate in cost sharing models to reduce employee expenditures. Sorting issues arise due to asymmetrical information and consequently adverse selection and moral hazard occur. Results from this project provide insight into consumer priorities, and in turn offer plans that are more desirable for employees and more cost-effective for employers. Employer cost sharing rates and upfront costs have a significant impact on an employee's decision to opt into the default Preferred Provider Organization health plan rather than the newly available High Deductible Health Plan.

Chapter One: Introduction

The early 20th century saw the launch of health insurance to improve healthcare coverage and distribution by making it more affordable for all interested parties. When establishing the program, economists and medical specialists alike emphasized the importance of distributing resources and expenditures across the entire affected population to promote quality and coverage. Offering various payment structures was agreed to be necessary (Ross, 2002). Under its original structure, hospitals and physicians offered health insurance to ensure payments. Following changes in tax code and frozen wages under President Roosevelt, firms started adding health insurance to comprehensive benefit packages to attract candidates. These additions were part of an effort to obtain and maintain employees (Carroll, 2017). Healthcare services can be offered to consumers through various options including the government, private firms or some combination. Specific treatments are often private goods, benefitting a specific portion of the population through exchanges of money between providers and their patients.

Although this paper focuses on private insurance plans, it is important to consider how the structures vary. (Hsiao, 1995). Insurance reduces costs at the point of sale in exchange for monthly payments and as such is demanded most often by those who foresee future medical expenditures. Enrollment in a plan has the potential to alter behavior with respect to demand for services; these behavior changes are not limited to patients—providers have also been shown to modify their behavior (Hsiao, 1995). It is possible that these changes can lead to inefficient exchanges within the market. Further research is necessary to understand these impacts.

In the last decade, firm-sponsored health insurance has begun to make up a larger portion of employee compensation and consequently has garnered more attention from researchers. Similarly, exponential growth in premiums that surpasses wage and GDP growth rates has been a

source of concern and curiosity (Kosteas & Renna, 2016). Today, firm sponsorship is one of the primary routes to coverage (Davis, 2014). The need to remain competitive with regards to compensation packages is a priority for firms in all industries, especially those that are saturated with many employers.

Since 2009, the number of firms offering health coverage has remained constant while premiums have soared. The percentage of employees in insurance plans has grown slightly but preferences for plans have changed (Kaiser, 2016). It is not believed that premium growth impacts a firm's decision to offer plans. However, there is proof that altered employee behavior is based on consequential changes in cost. Under the assumption that consumers are price sensitive, insurance companies often participate in cost sharing structures such as copayments, coinsurance rates, and deductibles to control expenditures (Barros et al., 2008). To understand what factors impact consumer decisions, two insurance plan structures are considered—High-Deductible Health Plan (HDHP) and Preferred Provider Organization (PPO). It should be noted that enrollment in one plan or another does not result in a difference in coverage but rather a change in risk. Based on design structure, PPO plans offer a general buffer against risk, whereas HDHPs have greater exposure to risk in exchange for lower premiums (Handel & Kolstad, 2015). Due to its relatively new availability, the features of the HDHPs are not yet understood leading to a lack of comprehensive understanding and a perception of additional risk. It is hypothesized that more employees would opt for a PPO plan over an HDHP as they tend to be less risky. Deviations from this trend might be the result of increased age and higher income as members of these group are more likely to frequently utilize and spend money on healthcare. Through the analysis of employer and employee cost share, the goal is to uncover what influences a consumer's decision to opt into one plan over another.

Previously, the traditional default option was a PPO plan. This plan placed minimal risk on the employees. In recent years, firms have shifted towards HDHPs as they reduce risk and incentivize employees to do research about services and treatments to find the best deals. The decision to enroll is not solely financial. Future research should be done to understand what other factors influence consumer decision behavior. Following the rollout of the additional option, it is apparent that employees have not been made aware of the benefits of enrolling in an HDHP, which has led to lower than expected plan uptake rates (Handel & Kolstad, 2015).

This senior project examines the impact of employer cost sharing and plan structure on employee behavior in the healthcare insurance industry. As the cost of healthcare continues to grow, firms are struggling to provide plans to their employees while maintaining sustainable budgets. The insurance industry is ripe with asymmetrical information and consequently adverse selection and moral hazard. Presidential administrations throughout history have proposed and implemented various bills to reduce the cost of insurance. Unfortunately, none have been able to fully tackle the issue. This might be the result of ineffective incentives, or premiums that are not feasible for the average American. Through regression analysis, this paper investigates what factors influence an employee's decision to opt for an HDHP over the default PPO plan. Results from this project have the potential to provide employers with information regarding consumer priorities, and in turn offer plans that are more desirable for employees and more cost-effective for employers. Once employers understand employee preferences and behavior, they can better structure plans and offer programs that incentivize plan uptake by all individuals, not just those who know they will have medical expenses.

Chapter Two encompasses the theoretical background surrounding consumer behavior as it pertains to the Law of Demand as well as highlights the role of adverse selection in the

industry. A literature review in Chapter Three offers background into the complexity of this issue and the industry. Previous studies are used to offer possible explanations and historical context. Where relevant, emphasis is placed on the impact of adverse selection in the industry. A brief overview of attempts to curb premium growth through new legislation is noted. Within Chapter Four the empirical framework is outlined. Chapter Five follows with an empirical analysis. Included is an analysis of each regression within the context of the methodology as well as an overview of the significance of the relationship between employer cost sharing and employee plan enrollment. A case study of Allegheny College follows the regression analysis. Results from the analysis are applied to a real-world example depicting enrollment incentives. Chapter Seven consists of a discussion of the implications of the study. Additionally, suggestions as well as opportunities for additional research are included.

Chapter Two: Theoretical Framework

This study utilizes various economic principles to explain patient and provider behavior within the health insurance industry. Economic theory assumes that consumers are rational and in turn price sensitive. Under this assumption, holding all else equal, a consumer would opt for a lower cost plan than one of the same quality at a higher ticket price. This behavior is analyzed under the assumption that the Law of Demand holds true—as a plan increases in price, the quantity demanded decreases as is the case with a downward sloping demand curve. This framework suggests that when two products or services are considered substitutes, an increase in the price of one results in an increase in quantity demanded of its alternative. In this study, if consumers are in fact rational, an increase in the cost of a PPO plan should result in decreased enrollment. Additionally, if HDHP and PPO plans are deemed direct substitutes, an increase in the cost of an HDHP will likely lead to increased enrollment in PPO plans. Given the impact of an employee's enrollment in one plan over another, it is critical for firms to understand what factors lead an employee to opt into a PPO over the more cost-efficient HDHP (Geruso & Layton 2017).

Emphasis will be placed on the role of employer contribution and cost ratios on employee enrollment behavior. In addition to assuming both plans provide the same level of care, it might make sense to assume insurance plans are a normal good, meaning that as income goes up, so does demand for insurance. This however, is not entirely applicable in practice. It would not be implausible to believe that employees in higher salary brackets would opt for more expensive healthcare if they deem it to be better coverage. However, it is also important to consider that people most often utilize healthcare plans in times of illness which often do not coincide with peak income levels. During this analysis, it is crucial to consider both the quality and utilization

of the plans. It is important to note the role of asymmetrical information within the health insurance industry.

Asymmetrical information is a historical and systematic problem within health insurance. Due to the nature of the material, the employee is privy to important information that regulations give them the right to keep private (Hsiao, 1995). Consequently, employees can enroll in plans based on health status and insurance providers cannot refuse coverage based on disclosed information (Geruso & Layton, 2017). When one party has relevant information that the other is not aware of, adverse selection can lead to inefficient exchanges (Akerlof, 1970). Adverse selection occurs prior to a transaction whereas moral hazard occurs after one party changes their behavior following an agreement and the other party is unable to enforce the original contract. Adverse selection within the insurance industry leads to inefficient sorting and consequently higher premiums. As the system currently operates, those that are most likely to purchase insurance are those that are already ill so the plans are reactive rather than proactive. Similarly, once these costlier patients enroll, they tend to opt for plans with greater coverage as they are more likely to require such services (Geruso & Layton, 2017). This behavior in the context of financing healthcare can be considered adverse selection.

To make the industry more financially sustainable, presidential administrations have worked to implement policies such as an individual mandate to increase the percentage of those insured and in turn diversify the population that is covered with respect to health status. The hope is that these policies and the contingent subsidies will reduce average health insurance costs making them more widely available (Jaspersen & Richter, 2015). Unfortunately, with increased enrollment and plan availability comes a change in decision making behavior which often leads to adverse selection and moral hazard.

People overestimate their ability to forecast future health expenditures as do health insurance companies. Similarly, risk assessment and willingness to pay vary across employees which leads to inefficient enrollment. Risk plays an integral role in employee enrollment in insurance plans (Ericson & Sydnor, 2017). If a consumer perceives their health to be of high risk and in turn expects higher medical expenditures, they are more inclined to enroll in a plan that offers appropriate care should their condition worsen. Under these assumptions, firms need to contribute to premiums at a rate that guides employees into the plans that are most financially efficient and medically appropriate. Therefore, it is critical for firms to understand the mechanics of risk perceptions as they pertain to health insurance plans. A better understanding of how employees assess risk—with regards to their health and the financial impact—can aid firms in designing more efficient and effective insurance plans.

Adverse selection is perpetuated by varying characteristics amongst employees. Varying health status in addition to age and income have significant impacts on enrollment behavior. With respect to health status, employees opt into a plan with premiums that equate to their expected medical costs; they want to pay for services they will render but not have too much coverage (Handel and Kolstead, 2015). This limits the ability for insurance companies to diversify the risk of patients within each plan. This can lead to a breakdown in the system as high-risk patients opt into plans with people with similar risks; high-risk patients enroll in high coverage plans while low-risk patients opt into more inexpensive plans (Hsiao, 1995). This leads to a death spiral in which plan premiums soar to compensate for high-cost patients resulting in low-risk patients opting out of coverage, leading to even higher premiums (Barros et al., 2008).

Further contributing to adverse selection issues is the fact that government regulations limit the ability for insurance companies to discriminate based on preexisting conditions and age.

Since most insurance enrollees are older, sicker patients, insurance companies are left to increase premiums to compensate for the higher risk customers they are covering. This has led to administrative interventions such as the individual mandate (Dunn & Shapiro, 2015). The individual mandate was instated with the hope of preventing a breakdown in the market by increasing the number of young, healthy people enrolled in insurance plans. In theory, after increasing the percentage of young enrollees, each insurance plan will be more financially sustainable. This regulation has the potential to minimize adverse selection. However, the number of available plans has the potential to limit its success. The availability of two plans perpetuates the death spiral. It is possible that when two plans are offered, the most high-risk patients will all enroll in the same plan leading to one plan having exponentially higher premiums (Gruber, 2017). This further reaffirms the need to incentivize enrollment in the appropriate plan.

In addition to adverse selection, moral hazard is prevalent within the insurance industry. Specific to health insurance, when a person is covered, they might engage in more risky behavior and less preventative care. This can lead to additional, unnecessary healthcare expenditures and is one downside of increasing the number of covered, healthy individuals. Their change in behavior might lead to previously forecasted ailments. Despite a greater percentage of healthy individuals having insurance, these additional costs have the potential to increase premiums. HDHPs inherently work to reduce moral hazard by incentivizing preventative testing and healthy behaviors. By imposing more of the upfront costs on employees, there is an incentive to maintain healthy habits to reduce healthcare expenditures. Conversely, the PPO plan does not have cost variations based on behavior as costs are predetermined.

To increase efficiency within the industry, it is imperative for firms to offer effective incentives to not only maximize overall enrollment but also promote plans that are appropriate based on the individual employees. Failure to do so has the potential to lead to a death spiral and exponential growth rates in premiums because of adverse selection and moral hazard. In addition to offering incentives, it is necessary that firms acknowledge the downward sloping demand curve as it pertains to the cost of health insurance.

Chapter Three: Literature Review

3.1 Introduction

Health insurance is a widely debated topic in American politics. Over the last decade, the cost of insurance—including premiums paid by both employers and employees—has increased exponentially, thereby leaving employers and employees alike to find funds to cover the difference (Liu, & Jin, 2015). The growth rate of premiums has surpassed the GDP, inflation, and wage growth rates (Liu, & Jin, 2015; Kostea & Renna, 2014; Newhouse, 1992). Not only do employee-sponsored insurance premiums account for an average of \$6,435 in annual expenditures each year for single coverage, they also have a significant impact on a firm's expenses (Kaiser, 2016). Additionally, corporations utilize benefits which are often made up of subsidized health insurance packages to attract and compensate employees and supplement annual salaries. Offering comprehensive benefits has the potential to reduce the minimum salary necessary to remain a competitive employer (Marquis & Long, 2001). Due to a lack of literature, little is known about the impact of growing coverage costs and what can be done to curb the exponential increases.

3.2 What are premiums?

Health insurance premiums are mandatory monthly payments in exchange for healthcare coverage. Premiums do not include additional expenditures such as copayments, deductibles, or coinsurance payments. The pricing structure of health insurance premiums is complicated by various factors that influence the final price. Ericson & Sydnor (2017) explore how premiums are set.

Under the assumption that employees wish to earn as much as possible—regardless of the form of compensation—it is critical for firms to remain competitive in the benefits package market (Marquis & Long, 2001). This includes offering comparable premium sharing rates. It is possible; however, that government legislation impacts the desirability of employee-sponsored benefits. Marquis and Long (2001) note that obtaining employer-offered insurance is preferred in regions with high taxes as it is less expensive. However, the percentage of firms offering health benefits is decreasing, as is average employer contribution to health plans (Kaiser, 2016). In their paper, Marquis and Long (2001) discuss the implications of variability in compensation packages as it pertains to geography and industry. Additionally, the behavior of competitors within the market has the potential to impact employee behavior. This is consistent with economic theory which states market structure impacts firm behavior.

3.3 Why are premiums increasing?

There are varying schools of thought as to why premiums are increasing and the magnitude of the impacts. At the macroeconomic level, unaffordable healthcare has the potential to jeopardize the entire economy (Ericson & Sydnor, 2017). Hsiao (1995) makes a case that the cause of exorbitant costs within the health sector might be the result of abnormal economics and the market's inability to self-correct. The health sector contains public and private goods, one of which necessitates government intervention while free markets promote efficiency of the other, respectively. Public goods are non-rivalrous and are accessible to all consumers. These stipulations can be applied to the healthcare industry as one person's utilization of insurance does not prohibit another's; however, costs might be altered. Conversely, private goods are rivalrous and excludable meaning they are not available to the entire population.

In recent history, there has been a shift towards the privatization of a public good, healthcare, which has the potential to foster an environment full of adverse selection and market failures. Private insurance providers operate under fewer regulations and in turn must utilize risk adjustment practices to minimize losses from adverse selection (Gruber, 2017). It has been noted that this shift has implications on the economy as well as necessitates action from politicians to aid in a smooth and efficient transition (Gruber, 2017). Hsiao (1995) believes the only way to regulate this complex market is to treat each good and service as an individual component and intervene in high-need sectors with tailored programs.

Conversely, from a microeconomic perspective, there are complex and conflicting justifications for the breakdown in the health insurance market. These range from a lack of accessible, quality care to asymmetrical information between employers and employees. Chandra and Skinner (2012) argue that innovation has resulted in more advanced, and consequently, more expensive claims. This in turn has resulted in an increase in premiums so that providers and insurers can recuperate lost profits. Similarly, a shift in the demographics of the nation towards an older population has led to increased healthcare expenditures. Similarly, the increase in high-cost patients opting for coverage have led to an increase in healthcare costs. To maintain budgets, firms have passed the increased costs onto patients in the form of higher premiums for the same insurance plans (Liu, & Jin, 2015). Competition between firms and over utilization of services also exacerbates the premium increases (Stood et al., 2017).

A consumer's willingness to pay for a good or service as the price changes can define their demand elasticity. In a study utilizing demand responsiveness as the dependent variable and various medical expenditures and employer cost-share as the independent variables, Ellis et al. (2017) confirmed that as the price of each service increases, the quantity demanded decreases.

This decrease is contingent on coverage and plan type. There are two exceptions however. For surgical procedures and dialysis, the sign is positive, signifying the opposite relationship. These medical procedures may be considered Veblen goods. Unlike normal goods, Veblen goods have an upward sloping demand curve meaning as the price of surgical procedures increases, so does the demand (Almeida, 2015). This is likely the result of consumers viewing price as an indicator for quality and safety. Empirical evidence provided by Ellis et al. (2017) demonstrates the significance of this relationship. All conclusions have been derived through the utilization of a model that allows for the consideration of consumer foresight—unlike the standard OLS estimators. This study provides insight into variation across health plan structures. Notably, within the PPO and HMO plans, consumers tended to have more stable spending behaviors when compared to their HDHP counterparts. Across plans, costlier services tended to have greater elasticity of demand; this is consistent with economic theory (Ellis et al., 2017). These findings were confirmed by Barros et al. (2008) who concluded that a direct consequence of increased premiums is decreased enrollment which often leads to even higher premiums. Handel and Kolstad (2015) examine the implications of the addition of an HDHP option. Their study measures risk aversion across plans rather than looking at the comprehensive cost, which they argue is the same between the PPO and HDHP. Given the payment structure of an HDHP in comparison to the PPO, employees view HDHPs as riskier and less desirable. Many consumers are unaware of the benefits of such a plan given its recent release. This uncertainty further reduces HDHP uptake.

As outlined by Kostetas & Renna (2014) and Geruso & Layton (2017), when more than one plan is offered, consumer behavior takes on a different trend than a single-choice scenario. This premium-increasing effect is amplified when there is an additional option to opt out of

coverage. This is the result of people enrolling in plans that either over- or underinsure them based on their forecasted health expenditures. Geruso & Layton (2017) note that insurance plans must attract patients that benefit from coverage specific to the plan in which they enroll. They propose a scenario in which two plans are perceived to be identical across all criteria. Neither plan offers affordable, quality care for cancer patients. If a patient seeking cancer treatment were to enroll in a plan that does not provide services and resources tailored to cancer treatment, selection problems arise. If a person is enrolling in a plan without preventative care for an ailment, their likelihood of requiring treatment for the respective illness increases. These issues contribute to inefficient spending on behalf of both the employee and employer.

In addition to appropriate enrollment, the demographics of those seeking coverage have a significant impact on cost efficiency for both the patient and the firm (Ericson & Sydnor, 2017; Geruso & Layton, 2017). In order to maintain financially sustainable health insurance premiums, there must be lower risk patients paying premiums to fund patients with high and frequent claims. Unfortunately, there are not enough young, healthy people to balance out the old, ill patients. Under President Obama, a new fee was introduced for deferring enrollment to increase the number of insured healthy individuals. Without incentives, many currently healthy individuals do not wish to enroll in a plan until the time comes that they require coverage. This leads to increase healthcare costs when they enroll following the onset of an illness and consequently higher premiums across the board. (Geruso & Layton, 2017). This case serves as just one example of the adverse selection that is so prevalent in the health insurance market. This is often referred to as the death spiral; a situation in which premiums increase exponentially because of too many high-risk patients without a substantial number of low-cost patients to serve

as a financial buffer for providers. As a result, premiums increase exponentially in a short period of time to compensate for increased losses (Hsiao, 1995).

To understand what causes premiums to rise and fall, Kosteas & Renna (2014) conducted an analysis of the impact of adding an additional enrollment option (which is different from previously available literature) on consumer opt-in rates in insurance plans. When both an HMO and a PPO plan were made available, employee enrollment in and contribution to an HMO plan was contingent on the same firm offering a PPO. This relationship did not exist in the reverse direction—the availability of an HMO plan did not impact PPO enrollment. Premium sharing findings were mixed pertaining to cross-premium effects. This result can be likened to the economic theory of cross-price elasticity, in which the price sensitivity of one product impacts the demand for another.

In the same study, subsequent analysis pertaining to differences in plan uptake based on wages and plan quality was performed; it was hypothesized that under a rigid wage scenario, it is most efficient for a firm to offer a low-quality plan free of charge and if an employee desires a higher quality plan, they should be held financially responsible for the difference. However, this hypothesis was not statistically proven (Kosteas & Renna, 2014). The authors did find a difference in price elasticity of basic medical procedures amongst employees enrolled in health insurance plans. Under the fixed wage scenario there was lower elasticity of demand which is consistent with economic theory. This conclusion provides insight into the impact of a firm passing premium increases onto employees. Like many other industries, within the health insurance market, when demand is elastic, lower cost per service is associated with higher demand amongst consumers (Barros et al., 2008). Kosteas & Renna (2014) found that, in addition to impacting plan uptake, the increasing premiums are affecting employer contribution

to health plans, thereby further increasing the cost of insurance for employees that opt for coverage. As premiums increase, employees are less likely to utilize employer coverage which aligns with the theory of demand; as price increases, quantity demanded decreases (Barros et al., 2008).

The authors note that the elasticities of medical treatments performed vary throughout the year which might be the result of meeting deductibles in the high deductible health plans during the first half of the year. Additionally, it is important to note that with higher-cost services the variability was not strongly correlated with cost but rather with the time of year; consumers were less price sensitive later in the year. However, it is possible that there might be a case of multicollinearity—more expensive services are more likely to reach the deductible quicker. if not immediately. It is hypothesized that this decrease in price sensitivity is the result of consumers having met their deductible and thus benefiting from greater cost protection within the HDHP (Ellis et al., 2017). Through their analysis, the authors forecasted consumer behavior based on their ability to anticipate future expenditures, after accounting for the role of deductibles.

Myopic expectations are based on the current information available rather than forecasting how circumstances might change in the future. With regards to insurance economics, differences between forward and backward myopic spot pricing show that when consumers have foresight, and consequently anticipate future spending, there is a variation in their demand elasticities across all services (Ellis et al., 2017). Understanding a customer's elasticity of demand plays a critical role in determining where moral hazards are likely to arise and can aid in plan design. Not only can disaggregated data about price sensitivity provide information about what services are more likely to be utilized, this information in its aggregated state can offer

insight into the effectiveness of a policy prior to and following implementation (Ellis et al., 2017).

When comparing PPO and HDHPs, there is little difference in total financial expenditures once copayments, co-insurance rates, premiums, and deductibles are summed up. However, there is a significant difference in employee enrollment. As noted by Handel & Kolstad (2015), when deciding what plan to enroll in, financial burden plays a large role. As such, it is hypothesized that there is a significant gap in comprehension of plan features as well as cost and benefits. This in turn contributes to gaps in enrollment, all else held equal. In their study, Handel & Kolstad (2015) found that employees were unable to identify their individual deductible rate; these results did not vary across enrollment in HDHP or PPO plans (Handel & Kolstad, 2015). This study provides additional evidence about the importance of ensuring employees are aware of each plan's characteristics and have the time and resources to make informed decisions. The benefits of potential educational programs extend to both employees and the firms through which they seek coverage.

3.4 Impact of adverse selection and moral hazard

Extensive research pertaining to moral hazards within the health insurance industry has been conducted, yet there are several explanations as to what social and economic impact asymmetrical information has on supplier and consumer behavior. It is often the case that consumers use price as a signal for quality. When there is adverse selection in a transaction, it is possible that a consumer might purchase a product using price to indicate quality. This often results in consumers paying more for a product than they value it due to incomplete information from the supplier. Moral hazard however, is when one party in a contract changes their behavior

and the other party's inability to monitor their counterpart fosters inefficient exchanges. Barros et al. (2008) discuss the importance of adequately categorizing moral hazard and adverse selection, as not doing so has the potential to lead to inaccurate conclusions.

Contributing to the skyrocketing premiums is a lack of information sharing between suppliers and demanders. The insurance industry is ripe with asymmetrical information and subsequently, adverse selection (Ericson & Sydnor, 2017). Various studies have been conducted to understand the causes and consequences of misinformation in the industry. Geruso and Layton (2017) state, "selection (adverse or advantageous) is the central problem that inhibits the smooth, efficient functioning of competitive health insurance markets." In their research, Ericson & Sydnor (2017) analyze how selection can foster an environment that perpetuates high premiums where patients are either over- or underinsured. Analysis of two theoretical models of the selection process shows how hidden information serves to increase the cost of insurance. Like Ericson & Sydnor, Geruso and Layton (2017) highlight a fixed contract in which only sicker patients opt for insurance coverage while their healthy counterparts remain uninsured. This results in higher premiums as the covered patients are sicker and thus more expensive to insure and care for. On the other hand, a plan can be designed with characteristics geared toward attracting and deterring individuals based on predetermined criteria. This endogenous contract model has the potential to reduce costs while increasing coverage efficiency (Geruso & Layton, 2017).

3.5 Can healthcare be reformed?

To curb the trajectory of exponential increases in health insurance premiums, several economists have dedicated their research to better understanding the impact of policy changes on

supplier and consumer behavior within the industry. Prior to analyzing behavioral changes, it is important to understand how policy impacts the industry. Several economists have investigated the Affordable Care Act (ACA) signed by president, Barack Obama. As part of a goal to make healthcare in the United States more universal, the ACA limits the ability of insurance companies to deny coverage to someone due to a preexisting condition. Additionally, under this legislation, subsidies are in place to aid low-income families in their quest to obtain coverage. Additionally, all individuals must have insurance of some sort or pay a penalty, if they do not opt for coverage. To make healthcare more efficient, various plans have been designed so that patients may opt into a plan that best aligns with their medical coverage needs. With these regulations, the hope was to expand healthcare coverage, affordability, and quality for all Americans by reducing adverse selection and moral hazard within the healthcare industry.

Although the intentions of the legislation were clear, during implementation, some of the plans fell short and perpetuated adverse selection amongst providers and patients. With the elimination of discrimination due to preexisting conditions, more people were covered than before the legislation was enacted. As the bill currently operates, many of those that are currently healthy are not enrolled in a plan and do not wish to until the time comes that they require coverage. The inability for insurance companies to discriminate against those that are already sick has perpetuated this behavior. Unfortunately, the fee put in place to incentivize healthy people to pursue coverage despite current perceived invincibility is not high enough—there are not enough young, healthy people to balance out the old, ill patients (Dunn & Shapiro, 2014; Gruber, 2017; Liu, & Jin, 2015).

Jaspersen and Richter (2015) study the demand effects of premium subsidies in Germany to determine if consumer reaction to government subsidies is similar in both open and mandated

insurance markets. With subsidized premiums, the net wealth of the consumer is higher; these wealth effects occur in both regulated and free insurance market operations, albeit differently. The paper highlights that when a subsidy is based on one level of coverage, the marginal benefit of such subsidies varies as plan quality changes. This in turn results in moral hazard as well as effects consumer choice and behavior. These differences can be minimized by offering fewer plans. When properly executed, subsidized premiums might propose an incentive to remain healthy in order to remain in the least costly plan and consequently gain the largest benefit from the subsidy. This however, often leads to a moral hazard issue. Without changing insurance coverage, subsidization has the potential to alter consumer behavior (Jaspersen & Richter, 2015).

The following papers study the impacts of different components of the ACA on consumer demand. Sood et al. (2017) argue that to standardize premiums and reduce growth rates, it is imperative to shift from a pay-per-visit model to a more capitalized market in which services are priced as a function of demand. They introduce a plan that utilizes innovative payment strategies to reduce the costs incurred within the healthcare industry across geographical regions despite changes in competition. Analysis showed that financial incentives were more likely to alter behavior and to create a more efficient market in which more expensive firms were more inclined to exit resulting in lower costs. However, it is not guaranteed a more capitalistic market would negate the need for a payment reform if the goal is to decrease premiums within the healthcare industry. Rather, more competitive markets are more likely to foster an environment in which payment reform is more impactful (Sood et al., 2017).

In their article, Dunn and Shapiro (2014) look at the impact of healthcare reform on physician payments. When analyzing an industry, it is important to consider impacts to both payers and providers as the behavior of one party impacts the other during transactional

exchanges. Their research found that like other industries, anticipation plays a large role in the price of services within healthcare. Dunn and Shapiro (2014) hypothesize that the increase is the result of forecasting changes in competitive concerns or demand due to anticipated changes following the proposed reform. It was noted, that the change cannot be directly attributed to one cause due to a lack of information. A major conclusion of this article is that even prior to new policy rollout, real effects of anticipated changes can be seen. These changes come in the form of differences in price as well as variations in transactions between suppliers and consumers. Additionally, results from this study should not be taken as normative prior to and during any newly developed legislation. Cost-benefit analysis should be performed to best understand how the consequences will impact all parties within the respective transactions.

3.6 Conclusion

In recent history, there has been a significant increase in average premiums across plans regardless of structure (Liu, & Jin, 2015). There are gaps in the literature pertaining to this project, but amongst the available studies, there are varying opinions regarding the causes and effects of increasing premiums. As part of an effort to slow the rate at which premiums are rising, administrations have proposed and implemented several bills to reduce the cost of insurance for both employees and the firms through which they seek coverage—the most notable being the ACA enacted under former president, Barack Obama. Unfortunately, however, none have been able to fully tackle the issue. This paper aims to uncover what impacts a consumer's decision to opt for one plan over another and to provide insight and a possible solution for curbing the exorbitant costs of healthcare coverage for both employers and employees in the United States.

Chapter Four: Empirical Framework

This chapter provides an overview of the variables that are used in analysis including information regarding the role of economic theory in the relationship between cost and employee enrollment. The expected results, in addition to the significance of each explanatory variable are discussed. The empirical analysis follows a model outlined by Geruso & Layton (2017) in which a fixed contract model offers two plans, a Preferred Provider Organization (PPO) plan with low cost sharing and a High Deductible Health Plan (HDHP) with high cost sharing. The fixed contract component implies that these two plans are the only ones offered and as such, employee enrollment behavior is impacted by price changes.

Kosteas and Renna (2014) note that PPO and HMO are the most widely available insurance plans. However, for this paper, emphasis is placed on HDHP and PPO plans as one is arguably more cost-efficient for employers whereas the other minimizes risk for employees, respectively. According to the KFF/HRET, in 2016 nearly 48% of firms offered a PPO plan and 29% offered an HDHP. Consistent with the industry, both plans have seen an increase in premium growth rates over the last decade. Previously, a PPO plan was the default plan as it offers coverage with minimal financial risk. In recent history however, more firms have begun to offer HDHPs and between 2014 and 2016 there has been an increase of 8% in the share of covered workers in HDHPs. Conversely, PPO plans have seen a 10% decrease in enrollment since 2014 (Kaiser, 2016). With regards to premium costs, HDHPs tend to have lower premiums than PPO plans, but come with higher deductible costs. HDHPs result in increased risk for the employees in order to incentivize more cost-conscious behavior (Ericson & Sydnor, 2017; Geruso & Layton 2017).

I. Models

This first model serves to test what factors impact an employee's decision to enroll in a PPO rather than an HDHP. Included in this regression are price ratio variables that offer an overview of how consumers make enrollment decisions based on the costs of one plan in relation to another. Each variable is set up with the PPO plan cost as a ratio of the corresponding HDHP cost.

$$pctenrollppo = \beta_0 + \beta_1 sddctppo_hdp + \beta_2 prmsingppo_hdp + \beta_3 pctpaidbyemprppo_hdp + \varepsilon \quad (1)$$

Model 2 uses the same dependent variable—the percentage of employees enrolled in PPO plan. But instead of looking at cost ratios between plans, this model looks at how the cost structure of each plan influences enrollment. Each variable in the regression tests for price sensitivity amongst consumers as it pertains to the upfront costs of each plan.

$$pctenrollppo = \beta_0 + \beta_1 ddctspo + \beta_2 ddctshdp + \beta_3 emprpctspo + \beta_4 emprpctshdp + \beta_5 prmmspo + \beta_6 prmmshdp + \varepsilon \quad (2)$$

Model 3 aims to provide the most comprehensive picture of how consumers decide between a PPO and HDHP. In addition to testing for financial factors, this model has the potential to uncover risk aversion amongst employees. By including expenditures that are likely to occur throughout the duration of the plan, this model serves to represent how employees adjust for expected health expenditures and in turn, avoid risk. This model also aids in analysis of total plan cost rather than focusing on only immediate costs.

$$\begin{aligned}
pctenrollppo = & \beta_0 + \beta_1pctlowin + \beta_2pctage26 + \beta_3pctage50 + \beta_4pcthighin + \\
& \beta_5sddctppo_hdp + \beta_6prmsppo_hdp + \beta_7pctpaidbyemprppo_hdp + \beta_8officevisitcoppo \\
& + \beta_9spclvisitcoppo + \beta_{10}rxhdp + \varepsilon
\end{aligned}
\tag{3}$$

Each model assumes that the probability an employee opts into a PPO plan is based on rational decision making and a downward sloping demand curve. This does not explicitly mean that a decrease in PPO premiums will lead to an increase in PPO enrollment (Barros et al., 2008). Additional characteristics of consumers such as age and health status have the potential to alter preferences. Regardless of variation amongst consumers, there is inefficient sorting across health insurance plans due to adverse selection.

The PPO plan acts as the default plan and all analysis is done with regards to PPO enrollment. For empirical purposes, focus is placed on plan cost rather than quality. Given both plans offer access to the same services and treatments at different costs it is necessary to deem them substitutes with respect to coverage quality. In terms of risk, it is widely accepted that HDHPs are riskier for employees and as such this study maintains that assumption (Handel and Kolstad, (2015). Analysis is rooted in price sensitivity as opposed to the desirability of characteristics, such as wellness programs. Examination is limited to single insurance coverage choice and any plan that includes a spouse or dependent is neglected as behavior is altered when others are involved in the decision-making process. Following preliminary analysis, variables were omitted due to multicollinearity and insignificance. This multicollinearity is likely the result of higher quality features being associated with more comprehensive plans. When a plan is more expensive, it tends to offer greater coverage and in turn the cost of those services grow at similar rates as the premium.

Data for this study was obtained through the Kaiser Family Foundation's annual Employer Health Benefits Survey (KFF/HRET). Through interviews conducted with HR personnel, information regarding the various insurance plans offered by firms as well as plan characteristics and employee enrollment data was collected. The response rate from targeted firms was about fifty percent and resulted in data aggregated from 5,732 firms in 2016. The firm-level dataset is compiled annually and includes information from private and public (nongovernment) firms of various sizes across 11 industries. Questions on the survey include cost-sharing rates, plan features, and employee enrollment rates. Of the nearly 6,000 firms surveyed, 550 provided complete information regarding the characteristics of both HDHP and PPO plans offered and covered by their company. Further analysis is limited to these 550 firms as all other observations were dropped due to missing values on the included exogenous variables (Barros et al., 2008; Kaiser, 2016). In some regressions, there are fewer observations as not all firms have plans with the same cost-sharing structures and features.

II. Explanatory Variables

pctlowin: This variable represents the percentage of employees at a firm that earn under \$26,000 annually. Amongst companies surveyed, the average percentage of employees falling into this population equaled 12%. Under the assumption that health insurance is a normal good and that consumers are rational decision makers; this variable serves to depict income elasticity amongst employees. When looking at the value of this variable within the regression it is important to assume that the plans are direct substitutes with respect to quality. Within the default PPO, when income is lower, enrollment in an insurance plan is lower. Government regulations require affordable insurance to be available to all persons. Within the context of this regression, all

insurance is through a private firm which allows for greater variation in premiums and coverage across all plans. The role that risk plays in decision making changes with income (Barros et al., 2008). If the PPO plan is less risky, it is likely that it is more desirable than an HDHP amongst those in lower income brackets. Therefore, in firms with a higher percentage of low income employees, it is expected that the PPO plan would be utilized more frequently. Note however, that the effect will likely be small as insurance premiums make up a small portion of income, especially amongst those enrolled in PPO plans.

pctage26: This variable denotes the percentage of employees under the age of 26. The mean of the sample was 17%. A person's decision to opt into a health insurance plan at all is influenced by both financial and personal factors. This variable represents the impact of age on enrollment in a PPO plan. Prior to determining the relationship between the two variables, it is important to consider what else is influenced by age. Younger people tend to be healthier and in turn less likely to opt for health insurance. Additionally, younger employees in the work force tend to have lower incomes and consequently are more risk averse. This will likely result in a preference for PPO plan over an HDHP (Barros et al., 2008; Geruso & Layton, 2017).

pctage50: The percentage of employees in each firm over age 50 is represented by this variable with the average being 32%. Adverse selection is ripe throughout health insurance. It is widely accepted that older people are more prone to illness. This usually results in an increased desire to enroll into an insurance health plan. Additionally, as people age, their income increases to a point, after which it decreases following retirement. HDHPs offer employees greater coverage as their medical expenditures increase and as a result, are more common amongst people with higher disposable income. In the context of this regression, it is predicted that companies with a

higher percentage of employees age fifty and over will have greater enrollment in an HDHP than a PPO; the sign will be negative (Ericson & Sydnor, 2017; Geruso & Layton, 2017).

pcthighin: Within the sample, the mean percentage of employees earning over \$65,000 was equal to 31%. Unlike their low-income counterparts, people with higher salaries can allocate their higher disposable incomes to different purchases. These employees are less sensitive to price. In the case of this study, that translates to greater enrollment in an HDHP (Barros et al., 2008). Maintaining the assumption that both plans are of equal quality, firms with a higher percentage of high-income employees will likely have greater enrollment in the HDHP plan as these employees are better able to take on the financial risk of such a plan. This will likely translate to a negative coefficient within the regression. Like that of the low-income variable, it is not likely that the impact will be large as insurance makes up a small percentage of disposable income (Ericson & Sydnor, 2017).

ddctspgo: This variable represents the deductible of the PPO plan offered by the firm. The average deductible of all plans was \$953 with the maximum being \$10,000. Some plans had no deductible. This study assumes that insurance deductibles fall along a downward sloping demand curve. As price increases, quantity demanded decreases. Under the assumption that employees are rational and price sensitive with regards to deductibles, it is expected that an increase in the deductible will result in a decrease in preference for that plan and consequently a negative coefficient (Barros et al., 2008).

ddctshdp: Like *ddctspgo*, this variable symbolizes the deductible of the HDHPs. The average deductible was higher at \$2,307 with the minimum being \$1,000 and the maximum being \$6,500. There is less variation in deductibles within the HDHP. In both HDHP and PPO plans, once a deductible is met, a higher coinsurance rate is activated. Amongst these firms, HDHP

deductibles are significantly higher than the PPOs which is consistent with both plan structures. It is predicted that an increase in deductible for a single HDHP plan will lead to an increase in PPO enrollment. This should hold true under the assumption that there is a downward sloping demand curve and that HDHP and PPO plans are perceived as offering the same care.

prmsppo: This variable serves to represent the monthly premium costs under the PPO plan. Premiums are the payments paid by employees to gain access to health insurance coverage. The average PPO premium was \$585 with the minimum being \$149 and the maximum totaling \$1,283. Premiums for PPO plans are higher than those of the alternative, HDHP. This sign is expected to also be negative and the justification lies in the same theories outlined in the analysis of *ddctspgo*.

prmsmdp: HDHP monthly premiums are represented by *prmsmdp*. The minimum HDHP deductible was \$181 whereas the maximum was \$1,103; the average was \$492. The same analysis employed in *ddctshdp* can be used to predict the sign of this variable. It is expected that an increase in premiums will have a positive impact on employee enrollment in a PPO plan.

rxhdp: This acts as a dummy variable to convey if the HDHP offers prescription drug coverage. Prescription drug coverage, when offered as perk of a monthly premium, can reduce expenses paid at the counter. Traditionally, HDHPs require participants to pay the full cost of the medication rather than a copay as is the case with PPO plans. When a plan offers more coverage, it perceived to be more desirable and as such enrollment in the respective plan should increase. All else held equal, if an HDHP does offer prescription coverage, it is probable that enrollment in a PPO plan will decrease as it is now seen as inferior in that respect.

officevisitcoppo: PPO plans utilize copays at the time of service. This variable represents the per visit cost to see a doctor at the office. The minimum copay was \$2 and the maximum \$50 with

the average being \$25. Assuming a downward sloping demand curve, an increase in a plan's copay would likely result in decreased enrollment in that respective plan. In this regression, it is expected that as PPO copays increase, PPO enrollment will decrease.

spclvisitcoppo: This variable conveys the copay for visiting a specialist under a PPO plan. The average cost to visit a specialist was \$38 and the minimum and maximum were \$5 and \$92, respectively. Specialist visit copays work the same way as office visit copays. Upon arrival at the office, a predetermined payment is exchanged. The PPO plans, on average, have a lower copay than the HDHPs offered by the same firms. The initial payment is not of focus but rather how a change in that value impacts enrollment. It is expected for an increase in the PPO plan's copay to result in a decrease in enrollment; the sign should be the same as *officevisitcoppo*, negative.

emprpctspgo: The percentage that an employer contributes to the premium of a PPO plan is represented by *emprpctspgo*. To make plans more affordable and desirable, employers have the option to contribute a portion of the monthly payments incurred by employees. Doing so reduces the cost burden of plan enrollment. It is expected that as employer contribution to PPO plans increases, so will enrollment; this is due to a relatively less expensive plan. Firms contribute a higher percentage of the premium to HDHPs than they do to PPO plans. This is likely part of a plan to incentivize enrollment in an HDHP as it carries less of a financial burden for the firm.

emprpctshdp: This variable denotes the percentage of each monthly premium contributed by the firm under the HDHP. Analysis of this variable uses the same logic as is discussed in *emprpctspgo* however, the sign is likely to be positive.

emprpaysfullhdp: This variable is intended to act as a dummy variable to show the impact of a firm opting to cover the entire premium of an HDHP plan. Firms might contribute 100% to incentivize enrollment in an HDHP plan rather than PPO. It is expected that when firms opt to

cover the full premium for HDHP, there will be a decrease in PPO enrollment. If this is in fact the case, this might be one effective strategy a firm can employ to get employees to behave in a way that helps their bottom line.

sddctppo_hdp: This is a cost ratio created to determine how a change in the cost ratio between single deductibles from PPO and HDHPs affects enrollment. As the value increases, meaning the cost of an HDHP in relation to a PPO plan increases, it is likely that PPO plan enrollment will increase.

prmsppo_hdp: Like that of *sddctppo_hdp*, this variable denotes the price ratio between the premiums of the PPO plan compared to the HDHP. Predictions for this variable align with those outlined in *sddctppo_hdp*.

pctpaidbyemprppo_hdp: This price ratio represents the percentage of the premium paid by the firm for a PPO plan as a fraction of the percentage paid for an HDHP. Employers contribute an annual amount to each plan to make them more affordable for employees. It is expected that as the contribution ratio between HDHP and PPO increases, the enrollment in PPO will decrease. This is the result of HDHP plans becoming less expensive when compared to PPO plans and consequently, more desirable.

The relationship between plan cost and employee enrollment has been studied by various authors. However, there is a gap in the literature with respect to employees opting for one plan over another and the factors that lead to this behavior. Similarly, due to the relatively new popularity of the HDHP structure, there is little knowledge about how employee enrollment behavior changes when firms offer an HDHP in addition to another plan. The combination of models has been designed to offer a comprehensive picture of how costs and pay schedules of

the HDHP and PPO plans alter an employee's decision to choose one plan over another. Results from analysis are revealed and discussed in the next chapter.

Chapter Five: Empirical Analysis

In this chapter, we test for what factors impact a consumer's decision to opt into the default PPO plan rather than the HDHP. Through the analysis of three models, this study finds that the biggest influencer of enrollment behavior is the upfront cost of the insurance plan. These results are consistent with predictions regarding price sensitivity and the Law of Demand. Empirical analysis starts with the most basic model provided within the empirical framework to understand how the prices of both the HDHP and PPO plans impact consumer enrollment. This chapter discusses the results of each regression with respect to the impact and significance of the explanatory variables. Each model utilizes the percentage of employees enrolled in a PPO plan as the dependent variable.

I. Methodology

Following initial analysis, tests were run to ensure that each model did not violate any of the OLS assumptions. Tests on each model revealed that OLS estimators were violated and as such adjustments were made to each regression. Given the use of cross-sectional data, significance of the models is based off the F-statistic, as it serves to better represent the dataset than the R-squared value. By looking at the variation of the means, the F-statistic tests if a group of variables is significant and looks at the joint effect on the dependent variable. If the group means are significantly different, the null hypothesis is rejected and the relationship can be deemed significant. Under this analysis, all models proved to be statistically significant; this is evidenced by a larger F-score than the associated critical value following completion of an F-test. Consequently, in each model, the null was rejected following a least squares regression analyzing variance.

A. Multicollinearity

Given the nature of the topic and the dataset, it was expected that multicollinearity would present itself as an issue. To correct for this and uphold OLS estimators, the variance inflation factor was calculated and can be seen in Appendix B. Evidence of multicollinearity was apparent in each model amongst a select group of variables. Consequently, *emprpaysfullhdp*, (a dummy variable denoting that the firm contributes 100% of the HDHP premium) was intentionally ignored in analysis. The information obtained from these variables is still conveyed by variables that remained in the model.

B. Heteroscedasticity

With regards to heteroscedasticity, a robust regression was run to uncover which models needed to be adjusted for variance differences amongst variables. Updated Breusch- Pagan Test results are in Appendix B. OLS models assume that the variances of the errors are scattered equally and thus, homoscedastic. Not adjusting for heteroscedasticity can lead to biased estimators and inflated significance factors. Model 1 proved to be homoscedastic and was left untouched. Model 2 however, required a robust regression to minimize outliers. Although Model 3 initially had heteroscedasticity, a robust equation would eliminate the ability to report an F-statistic and demonstrate significance.

II. Results

We developed three models to explain the relationship between cost sharing and employee enrollment. To best understand what costs influence consumer behavior, this paper starts with a basic model and adds variables in each consecutive regression. Each model utilizes the same cross-sectional data obtained from 550 firms that offer both HDHP and PPO health insurance plans to employees. Firm size and industry vary across observations and serve to

represent a greater sample of the population. Depending on the variables included, the number of observations ranges from 418 to 550 across models. Significance within each model is noted. Following initial regressions, tests were performed to ensure that the parameters outlined by OLS are met.

To test whether employees are sensitive to differences in pay schedules across plans, Model 1 utilizes the percentage of employees enrolled in a PPO as a function of three cost ratios. When making decisions, consumers often look at the upfront cost to determine which plan they prefer. Within the health insurance industry, the immediate, salient costs are monthly premiums and the annual deductible. This regression looks at *sddctppo_hdp* (the annual deductible of the PPO plan as a fraction of the HDHP deductible) and *prmsppo_hdp* (the cost ratio of PPO monthly premiums compared to those of the HDHP). Additionally, *pctpaidbyemployerppo_hdp* shows how employer contributions to both plans' monthly premiums influence enrollment behavior. This regression provides an overview of how consumers make enrollment decisions based on the upfront costs of one plan in relation to another.

The percentage of employees enrolled in a PPO plan is used as the dependent variable to best explain what factors influence the decision to enroll in the default plan. As a result of having a percentage point value on the left side of the equation, it is expected that the impact of each variable will be small. However, it is important to consider however that a 1% increase in enrollment at one firm might be one person whereas at another it might be five or ten people.

Table 5.1: PPO Plan Enrollment Influencers

	(1)	(2)	(3)
<i>sddctppo_hdp</i>	-0.073** (0.032)		0.0034 (0.045)
<i>prmsppo_hdp</i>	-0.162*** (0.046)		-0.176*** (0.055)
<i>pctpaidbyemp</i>	0.247*** (0.076)		0.339*** (0.089)
<i>ddctsp</i>		-0.00004** (0.000)	
<i>ddctshdp</i>		0.00004*** (0.000)	
<i>emprpctsp</i>		0.674*** (0.109)	
<i>emprpctshdp</i>		-0.144 (0.124)	
<i>prmsp</i>		-0.0005*** (0.000)	
<i>prmsshdp</i>		0.0001 (0.000)	
<i>pctlowin</i>			0.0005 (0.001)
<i>pctage26</i>			-0.0002 (0.001)
<i>pctage50</i>			0.0001 (0.001)
<i>pcthighin</i>			-0.0004 (0.001)
<i>officevisitcoppo</i>			-0.0034 (0.002)
<i>spclvisitcoppo</i>			0.0025* (0.001)
<i>rxhdp</i>			0.3927 (0.296)
Observations	550	550	418
F-statistic	8.67	12.9	3.76
Prob > F	0.0000	0.0000	0.0001
Adjusted R ²	0.0402	0.1151	0.062

Notes: For Models 1 and 2, Robust standard errors, to control for heteroscedasticity, are reported in parentheses.

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

Consistent with economic theory, as PPO deductibles increase relative to HDHP deductibles, the percentage of employees opting for a PPO plan decreases. In this regression, a one unit increase in PPO deductibles as a percentage of HDHP deductibles (*sddctppo_hdp*) leads to a .073 percentage point decrease in PPO plan enrollment. This relationship supports the hypothesis that these two plans are viewed as substitutes and that consumers are rational decision makers abiding by the Law of Demand. Additionally, the associated impact between the two variables provides insight into the decision-making behavior of consumers within the industry. It is possible that employees only consider the immediate costs such as deductibles and premiums and neglect to focus on the potential costs over the duration of the plan. Variations in health status, income, and sources of coverage all might be included in the unobserved term, ε .

The negative sign in front of *prmsppo_hdp* (the price ratio of PPO and HDHP premiums) denotes an inverse relationship between premium cost and PPO enrollment. As PPO premiums increase when compared to HDHP, enrollment in PPO plans decreases. This is likely the result of employee price sensitivity and conformity to a downward sloping demand curve. Additionally, it is important to consider that premiums are monthly payments and as such are salient. The decision to enroll in one plan or another might be based solely on premium cost as that is a guaranteed monthly expenditure and is not sensitive to health status. Consequently, this decision carries little risk regardless of what plan an employee enrolls in. The magnitude of the effect however is quite small, -.162, meaning that a one unit increase in the ratio of monthly PPO premiums compared to HDHP premiums is associated with a .162 percentage point decrease in PPO enrollment. This might be due to a series of other expenses an individual must cover in each month. It is also possible, however, that while the premium might be the most understood cost in an insurance plan, the additional costs within the plan might make up a greater portion of the

expenditures, thereby resulting in a small coefficient. Under the assumption that PPO and HDHP are substitutes, it is likely that an increase in PPO premiums with respect to HDHP premiums would result in an increase in HDHP enrollment.

As the percentage of the premium paid by an employer increases for the PPO plan relative to the HDHP (*pctpaidbyemprppo_hdp*), enrollment in the PPO increases. This relationship is expected based on the previously outlined assumptions that consumers are price sensitive and wish to be compensated as much as possible, in any form. Subsidies from the employer in the form of premium contributions have a net effect of reducing the amount an employee must pay monthly. This reduction in relative price causes an increase in quantity demanded for PPO's. In the regression, a one unit increase in employer subsidization in the PPO plan relative to the HDHP is associated with a .247 percentage point increase in enrollment in a PPO plan. The magnitude of this value is also low which might be the result of varying rates of premium contributions in addition to an array of PPO plans with different monthly premiums. The coefficient associated with this relationship is similar to the mean value of the term as outlined in the summary statistics table in Appendix A. This relationship might offer insight into how an employer can incentivize enrollment in an HDHP, which is more financially sustainable for the company. However, it is important to note that the impact of a one percent increase in employer contribution has a small effect on the percentage of employees enrolling in a PPO over HDHP. This implies that there are other factors that contribute to changes in enrollment.

After adjusting for heteroscedasticity via a robust linear regression and the elimination of outlying observations, this model follows OLS assumptions. As discussed in the methodology, the F-statistic is utilized to assess the significance of the model. When looking at the degrees of freedom (3, 546) the cumulative probability is .0000. This means in this model, the null

hypothesis—denoting that the independent variables do not collectively have a significant impact on the change in the dependent variable—can be rejected at the 1% level. With an adjusted R-squared value of 0.0402, there are other unobserved variables that might aid in explaining what influences an employee's decision to choose a PPO plan over an HDHP. It is possible however, that when deciding to opt into one plan over another, consumers consider the total cost and not just upfront expenditures. Under this assumption, employees would likely need to forecast the timing of health expenditures as the total cost of each plan is similar.

To better understand the impact of employer cost sharing on employee behavior, Model 2 utilizes employee cost and subsidy variables for each plan. Special attention is paid to upfront costs such as deductibles and premiums. By regressing PPO enrollment against the cost of the premiums and deductibles, it is possible to uncover which costs influence employees' decisions. Similarly, the inclusion of *emprpctsp* and *emprpctshdp* highlights the impact of employer-subsidized premiums within each plan. It is hypothesized that consumers focus on immediate, net costs rather than costs that will occur later in time.

After regressing individual plan payments on percentage enrollment, it is still evident that the price structure of each plan plays a large role in consumer enrollment behavior. This model provides a different perspective on how an individual plan's deductibles and premiums influence enrollment in isolation rather than as a ratio of one another. Both signs pertaining to the deductible's impact on enrollment align with expectations. The coefficient associated with PPO deductibles is -.00004 signifying that a \$1 increase in PPO deductibles leads to a .00004 percentage point decrease in PPO enrollment. The coefficient for the HDHP is the same magnitude but with the opposite relationship leading to a .00004 percentage point increase in enrollment as a result of a \$1 increase in the deductible. The association between a higher HDHP

deductible and increasing enrollment in a PPO affirms the idea that consumers view the two plans as substitutes. This variable is significant at the 99% confidence level meaning the relationship between the two is very strong and the null hypothesis can be rejected at the 1% level. The impact however, is minimal with respect to percentage change on enrollment, as evidenced by a small coefficient. This might further support the idea that lower initial deductibles lead to less price sensitivity amongst employees. Similar to the price ratio outlined in Model 1, consumers appear to be price sensitive with respect to premiums. A one dollar increase in monthly PPO premiums is associated with a .0005 percentage point decrease in employees opting into a PPO plan. The impact of an increasing PPO premium has a larger effect on enrollment than that of a higher HDHP premium (.0001). However, it should be noted that the relationship between HDHP premiums and enrollment in another plan did not prove to be significant at the 90% confidence interval in this regression.

As cost sharing increases, thereby decreasing the net cost for the employee, the plan becomes more desirable for those opting for a PPO plan. This is depicted in the regression with a coefficient of .674 denoting that a one percent increase in contribution towards the PPO plan is associated with a .674 percentage point increase in PPO enrollment. This is consistent with the Law of Demand. As the net cost of the PPO plan premiums decrease, enrollment increases. The relationship between these two variables is significant at the 1% level and the magnitude of the coefficient conveys employees' sensitivity towards employer contribution.

The lack of significance of the variable, *emprpctshdp* (percentage contributed by the firm toward HDHP monthly premiums) and *prmmshdp* (monthly HDHP premiums paid by employees) might be the result of an already lower premium for HDHPs. Consequently, in an effort to incentivize enrollment in an HDHP, employers might have to find other ways to

subsidize the plan rather than reducing the premium, as it has not proven to have a statistically significant impact. Given the lack of significance for variables denoting HDHP cost sharing and premiums, it is possible that employees enrolling in HDHPs are inherently less price sensitive and risk averse. As such, cost sharing for employees already enrolled in an HDHP is not a deciding factor. This is not to say, however, that cost sharing does not have an impact on employees opting into a PPO plan. An F-statistic of .0000 with degrees of freedom and a critical value of (6, 543) and 11.4, respectively prove that this model is significant at 99%. It can then be assumed that variables in this model, as a collective unit, provide an explanation for changes in enrollment in the PPO health insurance plans.

The final model highlights how the pay schedule of each plan impacts employee enrollment in a PPO plan. Unlike the basic regression, this model accounts for costs incurred over the duration of the plan in addition to the upfront costs, as is the case in Model 1 and Model 2. Considering that the total cost of each plan is comparable, it is important to understand the individual impact so that employers can understand how a plan's pay schedule influences decisions. Although there was little significance amongst the variables included in this regression, it still provides insight into what factors do and do not influence enrollment. Model 3 is significant at the 1% level based on the F-statistic .0000 and as such, the null hypothesis can be rejected. When analyzed in conjunction with one another, these variables prove to have a significant impact on the percentage of employees opting into a PPO plan rather than an HDHP.

In each regression, age demographics within firms did not have a significant impact on the percentage of employees enrolled in a PPO within a firm. Similarly, the relationship between income and enrollment was not significant in any regression, regardless of additional explanatory variables. It is possible that these variables are not significant as a result of the individual

mandate. Under current legislation, each person is required to have health insurance and firms are required to offer insurance to all full-time employees. These requirements, in addition to the PPO acting as the default plan, might lead to little variability. It is also possible that because the plans are of equal total cost and quality and offer the same services, people don't see one plan as better than the other.

Unlike Model 1, the cost ratio of PPO deductibles in relation to the HDHP does not have a significant impact on enrollment in a PPO plan. However, the cost of premiums is still proven to influence consumer decisions and is significant at the 95% confidence interval as the p-value is less than .05. The impact of a one unit increase in the ratio of PPO premiums with respect to HDHP premiums is associated with a .176 percentage point decrease in PPO enrollment.

Likewise, the relationship between the cost ratio denoting employer cost sharing of the premium is the same as it was in the original model however, the coefficient is larger. A value of .339 implies that a one unit increase in PPO contribution as a ratio of HDHP contribution leads to a .339 percentage point increase in PPO enrollment. Both relationships were significant at the 1% level with p-values less than .01. It appears the dummy variable signifying HDHP prescription drug coverage (*rxhdp*) does not have a significant impact on employee enrollment in a PPO. This might signify that the benefit of drug coverage is not enough to outweigh perceptions of greater cost.

A positive value of .003 associated with *spclvisitcoppo* signifies that an increase of \$1 for the copay of a visit to the specialist results in .003 percentage point increase in the PPO opt in rate. Specialist visits appear to be a Veblen good, meaning that as the price of the copay under the PPO plan increases, the quantity demanded also increases. This might depict a scenario in which consumers utilize price as a signal for the quality of the specialist, and as such are willing

to pay more in exchange for greater perceived quality. In their analysis, Ellis et al. (2017) found a similar relationship amongst surgical procedures and dialysis treatments. Their assessment of these services aligned with the assumption that price is utilized as an indicator of quality.

Through the analysis of these three models, the hypotheses that consumers are rational and price sensitive are supported. The associations between variables provide insight into how employees make decisions and in turn how companies might be able to incentivize enrollment in an HDHP rather than a PPO. Specifically, it is evident that employer cost sharing has a significant and relatively large impact on employee enrollment behavior. Based on results from this regression, when trying to shift enrollment from PPO to HDHP, it would be more effective to increase the cost of the PPO plan rather than decrease the price of the HDHP.

Chapter Six: Case Study

This chapter employs a case study of Allegheny College in Meadville, Pennsylvania to see if the results found from data analysis are applicable in a firm. Information regarding employee enrollment and plan costs was obtained through meeting minutes from Allegheny College's Finance and Facilities Committee (FFC). In 2013, the College began to offer a Qualified High Deductible Health Plan (QHDHP) in addition to the previously available Preferred Provider Organization (PPO). For simplicity purposes, the QHDHP will be treated as an equivalent of the HDHP referenced throughout the rest of this study.

Consistent with trends across the industry, healthcare costs were expected to rise and the College intended to decrease expenses through the addition of the QHDHP. According to meeting minutes, stabilization of financials was the main motivator behind the decision to offer an additional plan. Allegheny College self-funds their health insurance plans, which means that all claims for the 420 employees with coverage are paid by the College. Self-funded plans carry substantial risk for the firm. If an employee were to have a large claim, the College would be left to fund the costs, which presents itself as a huge financial risk and burden. In order to minimize the chance of having healthcare costs surpass pre-established budgets, the College released a QHDHP which carries less risk but offers the same quality coverage to employees. When compared to the PPO, the QHDHP in conjunction with supplemental insurance for large claims is more financially sustainable for Allegheny College.

Through the availability of the QHDHP, the hope was that health insurance expenditures would decrease as employees became more conscious consumers. From the employees' perspective, however, there are concerns regarding covering the cost of the deductible early in

the year. After the deductible is met, a 90% coinsurance rate kicks in to subsidize costs. Once all out-of-pocket costs are met, 100% of healthcare costs are covered by the plan. Traditional QHDHPs have more upfront costs. Whereas PPO plans distribute the costs of the plan across the year through pre-established copayments. With regards to plan structures, it is important to note that cost sharing rates vary based on salary brackets. Those in the higher salary brackets (above \$65,000) contribute a higher percentage of the premium than their lower paid (under \$50,000) counterparts, regardless of which plan they opt into.

Upon initial rollout, Allegheny College encouraged employees to shift from the PPO plan to the QHDHP through monetary incentives. Initial enrollment numbers show that 65% of employees opted into a PPO plan with the remaining 35% enrolling in the newly available QHDHP. Over the course of the year, trends show that employee healthcare expenditures decreased. It is possible that this is the result of employees spending more time looking for the most cost-effective providers and medications. To reduce upfront costs and concerns surrounding deductibles, the College agreed to contribute 50% of the deductible in year one to the Health Savings Account (HSA) of each employee enrolled in the QHDHP. HSAs serve as an account from which funds can be withdrawn and applied to the deductible to reduce expenditures at the beginning of each new year. In the first six months, the College contributed \$87,000 to HSA accounts of employees opting for the QHDHP. The hope was that the net reduction in the liability of the deductible would minimize perceived risk amongst employees, and in turn increase enrollment. In consecutive years; however, HSA contributions were reduced to \$500 and were only provided to employees earning less than \$40,000.

In 2017, additional analysis was performed to see which plans employees were enrolling in after the reduction of the HSA funding. Based on regression analysis, it is hypothesized that

the increase in net expenditures for the employee will result in decreased enrollment in the QHDHP. Consistent with predictions, after robust HSA contributions were no longer in place to incentivize enrollment, there was migration back to the PPO plan; 72% of employees enrolled in a PPO leaving only 28% in the QHDHP. This decrease supports the assumption that employees are sensitive to price and need to be incentivized to enroll in a plan that has greater perceived risk. When the incentive is not high enough, enrollment decreases.

Looking at the plan structures and employee characteristics offers the opportunity to infer which factors impact enrollment, and in turn extrapolate how employers might incentivize employees to enroll in one plan over another. As the cost of the plan increases, enrollment in that plan decreases. Meeting minutes suggest that perceived risk played a large role in hesitation about the new plan. As with any new program, education about the available services is critical to ease concerns and increase participation. Additionally, it is important to consider the need to incentivize appropriate enrollment. Despite financial benefits to the College, QHDHPs are not the most efficient plans for all employees. Due to variations in salary and health status, PPO plans might be the most efficient plan for some staff, faculty, and administrators. In these cases, no incentive would be big enough to alter behavior.

Chapter Seven: Conclusion

The final chapter of this paper reconciles findings from data analysis and real-world application to offer a comprehensive picture of what factors influence an employee's decision to opt into a PPO plan when an HDHP option is also available. Limitations and interpretations of findings with regards to firm action are discussed.

I. Discussion

Results from the regressions and case study support the assumptions that consumers are rational decision makers who are sensitive to price changes. Given the recent increase in the availability of High Deductible Health Plans, there are few studies that focus on implementation and utilization. There is even less literature that compares enrollment figures of HDHP with other health plans. Findings from this paper reflect conclusions drawn from Handel and Kolstead (2015). They note that a lack of understanding of the benefits and structures of the insurance plans leads to inefficient enrollment. Geruso and Layton (2017) discuss the importance of plans attracting the right employees to keep premium costs down and care quality up.

For firms, HDHP plans are arguably more financially sustainable as they offer the firm comprehensive risk protection. Additionally, lower monthly premiums require less firm contribution but pass along the same cost to employees. On the other hand, the risk protection afforded to the employer is at the expense of the employees enrolled in the HDHP. Handel and Kolstead (2015) argue that although there is greater risk with respect to the distribution of costs, the total costs of the HDHP and PPO plans are comparable. Regardless, the PPO plan is necessary and often the most efficient option for employees with unpredictable health and large

medical expenditures. It is necessary for firms to offer both plans but incentivize appropriate enrollment to maintain financial sustainability for both firms and their employees.

Analysis of the models utilized in this study provides insight into what factors prove to have a significant effect on employment enrollment behavior. Results from Model 1 indicate that consumers are price sensitive and make decisions in alignment with a downward sloping demand curve. As evidenced by significance across all cost-ratio variables, when a firm offers both an HDHP and a PPO plan, employees see the plans as substitutes and make decisions based on price. Deductible and premium costs play a large role in the decision-making process. This is likely the result of the saliency of these expenses. In Model 2, the percentage contributed by the firm significantly influenced an employee's decision to opt into one plan or another. This mentality was consistent across the dataset and amongst the employees at Allegheny College. Model 3 however offered perspective into how costs over the duration of the plan influence enrollment. When all costs are included, it is still the case that premiums and deductibles are the significant influencers. The that consumers utilize price as a signal of quality was supported. It suggests that consumers are willing to pay more for specialists if they perceive them as better care providers. However, predictions pertaining to the impact of copays, income and age distributions were not supported and the relationships were not deemed significant.

Through the assessment of meeting minutes, it is evident that employees value employer contributions to their healthcare premiums and savings accounts. The decrease in HDHP enrollment following the reduction in HSA contributions supports the belief that employees are price sensitive. The impact of the HSA might suggest that in order to incentivize enrollment changes, firms should increase HDHP subsidies and focus less on changing the PPO plan. It is also apparent that the PPO plan is the only feasible option for some employees despite increased

cost-sharing. Based on these findings it is important for firms to consider both intrinsic and extrinsic incentives to motivate employees to enroll in plans that offer an adequate level of coverage based on individual needs.

II. Limitations and Implications for Future Research

It is important to consider that plan level data does not offer insight into how factors other than plan structure and pay schedule impact an employee's decision to opt into one plan over another. HIPAA regulations limit the accessibility of personal healthcare information and in turn reduce the ability to complete a comprehensive analysis. Without having access to health status information, it is difficult to determine what other factors influence an employee's decision to opt into their desired plan. It is likely that age and health status in addition to access to other coverage play a role in the decision-making process. Further research should encompass individual characteristics to better understand what factors have a significant impact on enrollment behavior. Similarly, disaggregated data regarding income level and age might provide greater insight into what demographic differences alter behavior in the industry. Additionally, the comparison of other healthcare plans against the HDHP might uncover what components of each plan are desired across the entire population.

III. Conclusion

As healthcare costs continue to rise at rates surpassing wage and GDP growth, employers and employees alike have struggled to adjust. This study aimed to uncover what employees look for in a plan and offer insight into how firms can incentivize efficient enrollment. A look at previous literature and economic theories provided a basis for analysis. A gap in individual literature left room for further analysis to better explain changes in enrollment. Through regression analysis of plan-level data across various firms and industries, it became evident that

consumers are price sensitive and focus on the upfront costs of each plan. Firms can utilize this information when they design plans. Consumers respond to incentives; firms need to consider the role of firm contribution and upfront costs when deciding how to structure each plan.

Appendix A

Table A.1: Anticipation of Signs, *Models 1, 2 and 3*

pctenrollppo		PERCENT OF WORKERS WITH HEALTH BENEFITS (PPO)
VARIABLE	DESCRIPTION	PREDICTED SIGN
pctlowin	Percentage income under \$23,000	Positive
pctage26	Percentage under 26	Positive
pctage50	Percentage over 50	Negative
pcthighin	Percentage income under \$23,000	Negative
rxhdp	HDHP covers Rx	Negative
ddctspgo	Single deductible—PPO	Negative
ddctshdp	Single deductible—HDHP	Positive
prmsppgo	Premiums for single coverage—PPO	Negative
prmsdhdp	Premiums for single coverage—HDHP	Positive
officevisitcoppo	Copay office visit—PPO	Negative
spclvisitcoppo	Copay visit specialist—PPO	Negative
emprpctspgo	Percent premium paid by employer—PPO	Positive
emprpctshdp	Percent premium paid by employer—HDHP	Negative
emprpaysfullhdp	Employer pays full premium—PPO	Negative
sddctppo_hdp	Single deductible HDHP/PPO	Negative
prmsppo_hdp	Premiums for single coverage HDHP/PPO	Negative
pctpaidbyemprppo_hdp	Percent premium paid by employer HDHP/PPO	Positive

Table A.2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
pctlowin	1,933	12.04961	19.75603	0	100
pctage26	1,933	17.05767	15.98549	0	100
pctage50	1,933	32.91141	17.30876	0	100
pcthighin	1,933	31.01224	25.6411	0	100
rxhdp	845	1.00355	.0595137	1	2
ddctspdp	1,215	953.8944	1101.054	0	10000
ddctshdp	845	2307.716	1135.541	1000	6550
prmmspdp	1,215	584.9893	165.4147	149.0196	1283.333
prmmshdp	845	492.0448	128.9558	181	1103
officevisito	984	24.99085	7.404112	2	50
spclvisitcoo	965	38.09741	13.7749	5	92
emprpctspdp	1,215	.7938717	.14372	0	1
emprpctshdp	845	.8362713	.1256478	.2	1
emprpaysfulp	845	.1431953	.3504793	0	1
sddctppo_hdp	550	.4100794	.4097385	0	3.846154
prmmspdp_hdp	550	1.23916	.2881808	.2455574	2.545268
pctpaidbyemp	550	.9162632	.1711039	0	2.59456

Appendix B

Figure B.1: Model 1: *Final Regression and VIF*

```
. reg pctenrollppo sddctppo_hdp prmsppo_hdp pctpaidbyemprppo_hdp, robust
```

Linear regression

Number of obs	=	550
F(3, 546)	=	4.68
Prob > F	=	0.0031
R-squared	=	0.0455
Root MSE	=	.2977

	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
pctenrollppo						
sddctppo_hdp	-.0732596	.0345849	-2.12	0.035	-.1411955	-.0053238
prmsppo_hdp	-.1623687	.0530707	-3.06	0.002	-.2666164	-.0581209
pctpaidbyemp	.2467624	.1276696	1.93	0.054	-.0040213	.4975461
_cons	.5692995	.1354776	4.20	0.000	.3031784	.8354205


```
. vif
```

Variable	VIF	1/VIF
sddctppo_hdp	1.09	0.914098
prmsppo_hdp	1.07	0.930839
pctpaidbyemp	1.04	0.960344
Mean VIF	1.07	

Figure B.2: Model 2: *Final Regression and VIF*

```
reg pectenrollppo ddctspppo ddctshdp emrpctspppo emrpctshdp prmmsspppo prmmshdp
> , robust
```

```
Linear regression      Number of obs      =      550
                      F(6, 543)          =      11.14
                      Prob > F           =      0.0000
                      R-squared          =      0.1247
                      Root MSE        =      .28585
```

		Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
pectenrollppo							
ddctspppo		-.0000361	.0000174	-2.07	0.039	-.0000704	-1.86e-06
ddctshdp		.0000386	.0000144	2.67	0.008	.0000102	.0000669
emrpctspppo		.6735613	.1231185	5.47	0.000	.4317143	.9154083
emrpctshdp		-.143834	.1506908	-0.95	0.340	-.4398423	.1521742
prmmsspppo		-.0005177	.0001326	-3.90	0.000	-.0007782	-.0002572
prmmshdp		.000123	.000163	0.75	0.451	-.0001972	.0004433
_cons		.3596113	.1018718	3.53	0.000	.1595003	.5597223

```
.
```

```
.
```

```
. vif
```

Variable	VIF	1/VIF
prmmsspppo	1.66	0.601587
prmmshdp	1.61	0.620620
emrpctspppo	1.59	0.627876
emrpctshdp	1.55	0.646927
ddctspppo	1.37	0.729972
ddctshdp	1.34	0.745407
Mean VIF	1.52	

Figure B.3: Model 3: Final Regression, VIF, Breusch-Pagan Test

```
reg pctenrollppo sddctppo_hdp prmmssppo_hdp pctpaidbyemprppo_hdp pctlwin pct
> age26 pctage50 pcthhighin officevisitcoppo spclvisitcoppo rxhdp
```

Source	SS	df	MS	Number of obs	=	418
Model	3.12497026	10	.312497026	F(10, 407)	=	3.76
Residual	33.8480743	407	.083164802	Prob > F	=	0.0001
				R-squared	=	0.0845
				Adj R-squared	=	0.0620
Total	36.9730446	417	.088664375	Root MSE	=	.28838

pctenrollppo	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
sddctppo_hdp	.0033628	.0446787	0.08	0.940	-.0844671	.0911927
prmmssppo_hdp	-.1755436	.0546505	-3.21	0.001	-.282976	-.0681112
pctpaidbyemp	.3389998	.0892977	3.80	0.000	.1634575	.514542
pctlwin	.0005103	.0010787	0.47	0.636	-.0016102	.0026309
pctage26	-.0001639	.0010374	-0.16	0.875	-.0022032	.0018755
pctage50	.0001075	.0010112	0.11	0.915	-.0018803	.0020954
pcthhighin	-.0004477	.0006377	-0.70	0.483	-.0017012	.0008059
officevisito	-.0033755	.0024796	-1.36	0.174	-.0082499	.0014989
spclvisitcpo	.0025436	.0013578	1.87	0.062	-.0001256	.0052129
rxhdp	.3927503	.2962442	1.33	0.186	-.1896094	.97511
_cons	.1014443	.3122512	0.32	0.745	-.5123822	.7152708

```
.
. vif
```

Variable	VIF	1/VIF
spclvisitcoo	1.58	0.632354
officevisito	1.52	0.659576
pctage26	1.27	0.786283
pctlwin	1.25	0.798416
pcthhighin	1.21	0.823386
sddctppo_hdp	1.17	0.852888
pctage50	1.16	0.858450
prmmssppo_hdp	1.12	0.891863
rxhdp	1.05	0.949905
pctpaidbyemp	1.05	0.953656
Mean VIF	1.24	

```
. estat hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

Ho: Constant variance

Variables: fitted values of pctenrollppo

chi2(1) = 4.55

Prob > chi2 = 0.0330

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