



**The United States HealthCare System: Expenditures and Coverage Rates on
Public Insurance Programs**

Carla Armengol Segarra

Economia en anglès

Trang Thi Thuy Nguyen

24/05/2020

ABSTRACT

The purpose of this work is to provide new empirical evidence concerning the effect of health spending on health outcomes, suggesting a new way to study healthcare performance by setting public healthcare insurance coverage rates as an indicator of health outcomes. The unit of analysis is the United States from 1988 to 2018. A literature review about the healthcare system framework of this country is done so to understand which are the main determinants of public healthcare utilization. Then, an Ordinary Least Squares multiple regression analysis is generated, following a stationary stochastic process to robustly validate the results. Public healthcare insurance coverage rates (% population) is set as the dependent variable. The level of per capita expenditures on public healthcare insurance programs is set as the main explanatory variable (current \$). Real GDP per capita (chained 2012 \$), unemployment rate (% of labor force), tertiary education (% population), alcohol consumption (liters/capita), physicians' density (per 1000 people) and per capita income (adjusted 2018 \$) are added to control for other influencing factors of both healthcare utilization and health outcomes and to avoid the introduction of bias. Though the results obtained, a positive and significant relationship between the level of per capita expenditures on public healthcare insurance programs and public healthcare insurance coverage rates can be assumed. Empirical evidence on the significant effect of unemployment rate and physicians' density on public healthcare insurance coverage rates is also provided.

CONTENT

1. INTRODUCTION.....	4
2. THE UNITED STATES HEALTHCARE SYSTEM	5
2.1 HealthCare Expenditures	8
2.1.1 <i>Healthcare efficiency</i>	11
2.2 The Affordable Care Act as a Measure of Intervention	14
2.2.1 <i>A difficult path to healthcare integration</i>	18
3. EXPERIMENTAL RESEARCH.....	20
3.1 HealthCare Expenditures and Health Outcomes	21
3.2 The Role of Physicians	22
3.3 HealthCare Coverage and Health	23
4. QUANTITATIVE ANALYSIS.....	24
4.1 Data	24
4.2 Methodology	27
4.3 Results.....	30
4.3.1 <i>Expenditures on public healthcare insurance programs</i>	32
4.3.2 <i>Unemployment</i>	33
4.3.3 <i>Physicians</i>	35
4.3.4 <i>Non-significant results</i>	37
5. CONCLUSIONS.....	37
6. REFERENCES.....	40

1. INTRODUCTION

Universal health coverage requires that all people should be provided with good quality medical services when needed, without facing financial hardship. Indeed, the World Health Organization (WHO) stated that health and human rights must always go hand in hand.

It is also known that the national health spending and health outcomes in a society may have a strong relationship. If expenditures are high and used efficiently, there should be enough resources to ensure equality of opportunity in terms of healthcare provision and health insurance affordability. If the majority of the population can access coverage, health outcomes should be in good levels as individuals could be benefited with essential medical treatments, some illnesses and health risks could be prevented and, therefore, proper quality of life and health status should emerge. However, this definition is not applicable everywhere, like in the United States (U.S.), where access to care is so much limited and sometimes considered a luxury good.

The U.S. is the highest among the Organization for Economic Co-operation and Development (OECD) countries in terms of healthcare expenditures. Nevertheless, this huge amount of spending is not proportional to healthcare insurance coverage rates, nor health outcomes performance. Concretely, the OECD (2019) data indicators reported that the U.S. takes the third place among countries with the highest infant mortality rates ranking, being Turkey and Chile the first ones. Moreover, within the member states, the U.S. is the second one with the lowest healthcare insurance coverage rates (91,1% in 2019) after Greece, with only 35,9% of population covered under public healthcare insurance.

This kind of data led me to try to find out if there is really a positive relationship between healthcare expenditures and health outcomes and that if this is actually true, find some possible explanations as to why actual evidence shows poor levels of health outcomes and coverage rates in this country.

In order to study this relationship, the first part of this work consists on a theoretical review regarding the organizational framework of the healthcare system design in the

U.S. and the influence of health expenditures' efficiency on health status. In addition, an important measure of intervention that significantly influenced healthcare in the U.S. will be explained.

The aim of the last part is to answer the main hypothesis of the work by doing a quantitative analysis using country-level time-series data from 1988 to 2018 in order to analyze the relationship between health spending and health outcomes, as well as other influencing factors, using an Ordinary Least Squares multiple regression model done with Gretl tool. Since from my point of view the number of people covered under health insurance is an indicator of health outcomes and researchers always use other health status indicators, coverage rates will be treated as an indicator of health outcomes in this work to give a contribution to the existing literature. Given that this section could not be completed without previously doing a deep evaluation of the way researchers performed their studies, which provide empirical evidence related to health outcomes' determinants, some of them will be commented before going to the empirical research. Furthermore, as it is of common knowledge that the U.S. healthcare system is dominated by private entities, the empirical part of the work will be focused on the effect of the public healthcare spending on population covered under healthcare insurance plans offered by government. The hypothesis of this work is that expenditures on public healthcare insurance programs will have a positive impact on public healthcare insurance coverage rates.

2. THE UNITED STATES HEALTHCARE SYSTEM

Among the OECD countries, the healthcare insurance system is typically based on its public, automatic and random mechanism that seeks to achieve universal healthcare coverage.

In the U.S. healthcare system, the insurance enrollment process does not fulfill this characteristics. Instead, healthcare is essentially financed by voluntary, private employer-based and individual-based insurance plans. This means that individuals buy health insurance through employment, or through the private market individually.

Inside the employer-based insurance plans, we can find self-insurance or fully insurance programs. The first relies on the firm paying for healthcare costs and insurers administer the plan, whereas in the latter is the insurance company who takes full responsibility for facing the risks.

In this kind of financing, patients of healthcare insurance programs pay premiums, which is the monthly cost of the plan, with the amount depending on the level on risk of each individual. This means that the higher the premiums, the higher the medical expenses covered. They also pay deductibles or co-insurance, which is the amount that the policy holder has to pay Out-Of-Pocket before the insurance provider pay any amount. Furthermore, anyone that is in the need to see a doctor will have to pay a co-pay amount for the provision of health services.

Apart from the private insurance programs, the U.S. healthcare system is paid for by government programs, such as Medicare, Medicaid and other public programs offered by government that cover individuals from the provision of a certain amount of healthcare services. Medicare is health coverage for disable people and also for elderly people (65 years old or more), while Medicaid is health coverage for poor people. In a Kaiser Family Foundation (KFF) paper, Rudowitz, R., Garfield, R., and Hinton, E. (2019) report that qualifying for medicaid is difficult as there exist considerable barriers to eligibility based on the level of income, state and family number. For example, vulnerable population in terms of income is only eligible for medicaid if is resident of the state where is receiving the coverage and meet the non-financial criteria¹. This means that if an individual is poor but not enough to be in the threshold of Federal Poverty Level, won't be able to get Medicaid nor private coverage. All other people only opt for private health insurance plans, through employees and with Out-Of-Pocket spending from person's funds.

To understand the U.S. healthcare system design, it is important to look at its flexibility in terms of changing, offering and selecting insurance plans. In the Journal of economic perspectives Cebul, R. D., Rebitzer, J. B., Taylor, L. J., and Votruba, M. E. (2008), explain the fact that, mostly in the employment-based insurance programs, employees

¹ Visit: <https://www.medicaid.gov/medicaid/eligibility/index.html>

can easily change and leave insurance programs depending on their opportunity costs and preferences because employers usually offer multiple option plans. Also, if an employer group is taking part of a fully-insurance program, there is always the chance to cancel the relationship with the insurance itself because the firm has no duties with it. Consequently, turnover rates in health insurance coverage, which are the returns on relationships between insurers and policyholders, increase substantially as a result of employers and groups of employees changing insurance companies. One example is at the age of 65 and more, when people switch to Medicare from any other private health insurance plan.

Cebul et al. (2008: 95) discuss an important consequence of having such coverage product variety arguing that, in a competitive market, as the law of one price holds, there is no benefit for employers to change insurance companies. However, in the U.S. healthcare system, the law of one price does not sustain. Instead, equilibrium is found when the marginal cost of insurance and purchaser's maximum willingness to pay are met within a distribution of prices. For instance, if the purchaser is in the expensive part of the premium distribution, there will be incentives to change from one insurance company into another that better meets purchaser's preferences, generating "search frictions" among policyholders. Search frictions is a term that Cebul et al. (2008) use as one of the multiple causes for low levels of investment in future healthcare. There are scarce incentives to invest in sectors with high turnover rates (normally generated by fully-insured employer groups canceling the relationship) and short insurer-to-policyholder relationships.

Relating this statement with the first fundamental theorem of welfare economics, which assumes that all producers and consumers act as perfect competitors and no one has any market power, this assumption does not hold for the U.S. healthcare system. Insurance companies (producers) have market power and are not price takers and, therefore, this system could not be considered a perfect competitive market.

Another important factor to bear in mind is that people is not always aware of the coverage options due to lack of information and complexity of the system itself. Moreover, not all workers have access to coverage through their job either because of

high costs or because they do not receive coverage options. Tolbert, J., Orgera, K., Singer, N., and Damico, A. (2019) reported that, in 2018, 70% of non-elderly uninsured workers did not receive any health benefit offer from the employer they worked for.

Aside from actual fragmentation in coverage options, there is also fragmentation within the design itself. That is to say, among the healthcare products and services. The U.S. is characterized by its availability of high-quality hospitals, equipments and physicians that instead of promoting performance to healthcare system and health outcomes, create waste, inefficiency and stimulate fragmentation. Indeed, Cebul et al. (2008: 100) also states that highly valuable physicians develop single specialty groups, leaving primary care to a secondary phase. As a matter of fact, private wealth becomes more concentrated and the quality of public life suffers. Specialists are independent from hospital management, leading to separated relationships between hospitals, medical doctors and patients, each one with its own performance goals and strategies. Having independent healthcare system settings induces lack of coordination and communication.

The result is a huge organizational fragmentation in the financing and provision of healthcare, as well as costly governmental healthcare spending which generates difficulties to resource allocation and health improvements.

2.1 HealthCare Expenditures

Total national healthcare expenditures represent the amount spent on healthcare and related activities, including expenditures from public and private funds. The U.S. health spending has been increasing substantially since 2000, reaching an amount higher than 3,5 trillion dollars (USD) in 2018, which is more than 11.000 current USD per capita². Figure I shows that this country is the one with the highest levels of health spending among the OECD member states. This pattern also holds in terms of public healthcare spending.

The gap on expenditure difference compared to other countries is known to be, among other causes, due to the U.S. provider payment system mechanism, Fee-For-Service, in

² Visit: <https://www.healthsystemtracker.org/chart-collection/u-s-spending-healthcare-changed-time/#item-start>

which health providers are paid by the insurance company depending on the services provided. This payment method is known to end up with high utilization of care services and poor outcomes, generating over-provision of services and an increase in cost-containment efforts. According to the Department for Professional Employees (2016), this is not the only factor that determines the high expenditures levels in this country. For example, increasing rates of outpatient spending and remuneration of clinicians is a major contributor to the cost difference between other countries. Moreover, costs of prescription drugs and new technologies, rise of chronic diseases as obesity, administrative costs, doctor fees and aging population are other contributing factors.

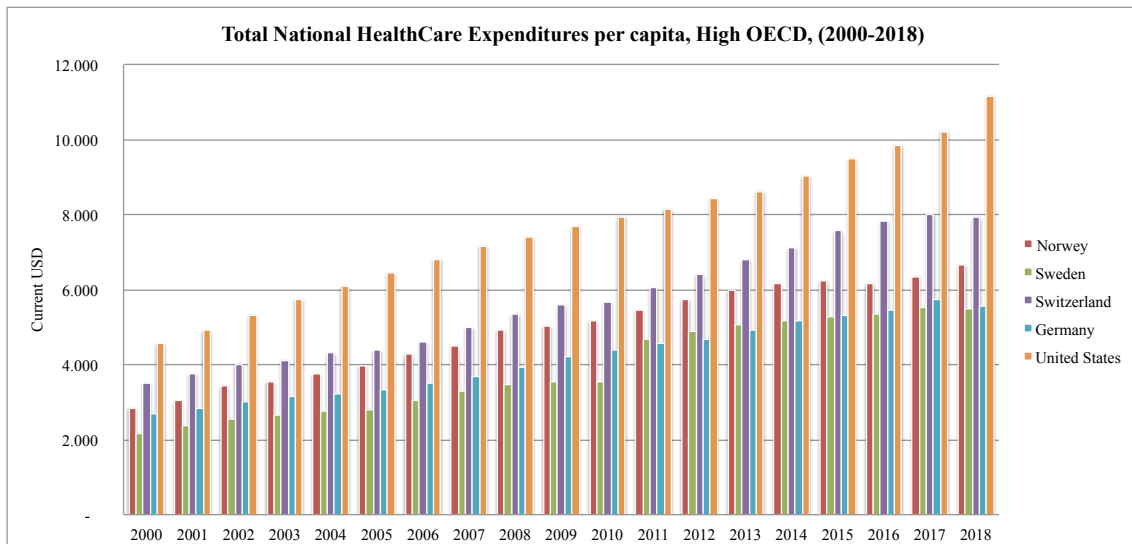


Figure I - Total National HealthCare Expenditures per capita, High OECD, (2000-2018). Source: Author's creation. Data from OECD Health Statistics 2018 (<https://stats.oecd.org/Index.aspx?DataSetCode=SHA>). Note: Figure only shows the highest OECD countries in terms of HealthCare expenditures.

The U.S. healthcare expenditures can be classified in two main groups. The government spending on health services and products (expenditures on hospitals, physicians, prescription drugs, dental services, etc) and the amount spent on the sources of funds. The main funding sources are private insurers, government insurance programs and Out-Of-Pocket expenditures directly paid by individuals. Within the expenditure types, as we can see in figure II, those ones devoted to medical services take an important role in having such high values in total health spending. Concretely, services from physicians, clinics and hospitals.

Going to the proportion of health spending by its source of funds, Out-Of-Pocket costs have been increasing since 1970 but at a lower rate than the share of health insurance expenditures. Most of the recent health spending growth is on insurance programs, both private and public. This increase in health insurance spending increases health care administration costs.

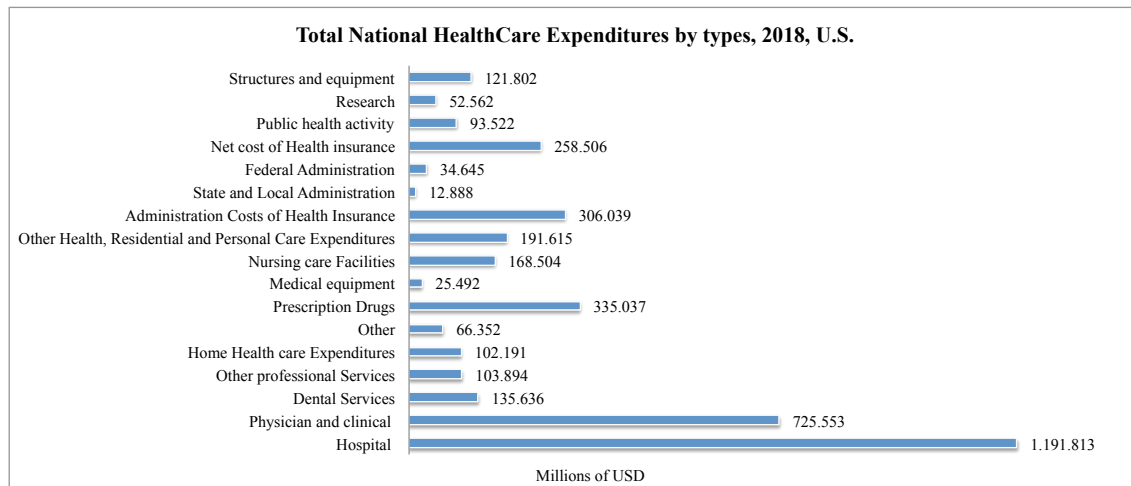


Figure II - Total National HealthCare Expenditures by types, 2018, U.S. Source: Author's creation. Data from Centers for Medicare and Medicaid Services (<https://www.cms.gov/>).

After having taken a look at the expenditure levels, one should expect also good outcome levels on the health of the population, as well as good results in terms of healthcare utilization. However, evidence shows that other countries with lower expenditure levels have either better health outcomes performance and coverage rates. For example, Switzerland has the second highest level of health spending within the OECD counties (see figure I) and, based on OECD indicators (2020), Switzerland has the highest level of life expectancy at birth (81,6 years) while the life expectancy in the U.S. is only 76,1 years.

One reason could be the presence of organizational fragmentation between healthcare settings as mentioned before. In addition, rent-seeking activities, which are aimed basically at capturing monopoly rights, also reinforce this phenomenon. As we have seen, the organization of healthcare insurance plans is based on the power of private insurance companies. Schumpeter (2018) tried to estimate profits taken by healthcare firms and found out that actually they make profits from excess benefit, much more

higher than the capital and risk they assume. Concretely, the excess profits of the health-care firms are equivalent to 200 USD per American every year. Rent-seeking activities are a consequence of lobbying, which generate an overall decrease in social welfare and increase in inefficiency because all money lost for lobbying is money lost for society.

2.1.1 *Healthcare efficiency*

The national healthcare spending of an economy is one of the main determinants to achieve efficiency within healthcare system as it provides the resources needed to maximize outcomes' quality over time.

Diverse studies are concerned about healthcare and its efficiency, like Moreno-Serra, R. (2015), who reports that fiscal sustainability is the ability for a government to maintain public finances, as of policies and expenditures, at a credible and serviceable position in long-term without changing debt burdens for future generations. Long-term sustainability is difficult to achieve in the U.S. because of the presence of abundant search frictions, which decrease incentives to invest in health. The contribution in financing and investment on healthcare is the lowest among the OECD member states. Figure III illustrates the small proportion within the national healthcare spending that is taken to invest in future generations and human capital. According to Centers for Medicare and Medicaid Services data, in 2018, only 4,84% of total national healthcare expenditures were to invest in long-term care. Low capacity to invest in long-run healthcare generates inefficiency.

Schoen, C., Davis, K., How, S. K., and Schoenbaum, S. C. (2006) designed a scorecard guide to identify benchmarks for health outcomes, quality, access, equity and efficiency performance within the health system. The scorecard performance is based on some indicators for healthcare efficiency including evidence of overuse, inappropriate care, waste, inefficient use of resources, regional variations in quality and costs, high levels of expenditures on insurance administrative costs and lack of information. All this indicators of efficiency are correlated one to another and, in the case of the U.S. health care system, the result is inefficiency.

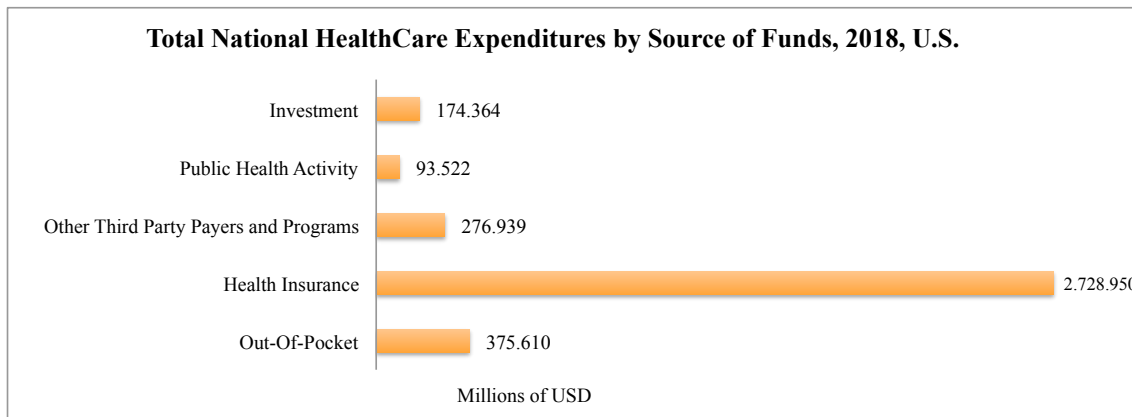


Figure III - Total National HealthCare Expenditures by Source of Funds, 2018, U.S.
 Source: Author's creation. Data from Centers for Medicare and Medicaid Services (<https://www.cms.gov/>).

Having the system dominated by high quality physicians not only creates care fragmentation and and increase in healthcare costs, but also inefficiency. Specialists often prescribe drugs or recommend certain treatments to patients that actually could be avoided if primary-care was not scarce. As well said by Ferrer, R. L., Hambidge, S. J., and Maly, R. C. (2005), when talking about performance, it is wise first to think about prevention and illness containment measures, as well as avoidable over or under treatment. Indeed, primary-care physicians (generalists) act as a primary phase triage among patients since they are sometimes more capable of perceiving injuries than specialists. Ferrer, et al. (2005) describe that, for instance, primary-care physicians increase health care system's adaptive capacity, defined as the system flexibility and ability to change in response to opportunities or disturbances. This lack of primary-care physicians and generalists produces waste and sometimes the use of inappropriate care. In addition, all money spent in maintaining high quality doctors reduces the aggregate number of physicians available in the system. Figure IV set forth the world bank last recent values regarding physicians' density. The corresponding quantity for the U.S is only 2,6 physicians per 1000 inhabitants on average, compared to 4,2 physicians per 1000 population in Germany and 4,3 in Switzerland, countries that also have complex private-public healthcare systems and high levels of health spending. This means that, compared with similar countries in terms of healthcare system design, the U.S. has approximately 50% less physicians available to deliver healthcare. This lack of availability creates overuse of Emergency Room visits for patients that need after-hours

care or that have diseases that could be prevented and avoided. Furthermore, the Ambulatory Care (AC) admission rates are also in high levels, which increases hospitalization costs. Schoen et al. (2006) estimated that 4-8 billion USD per year could be saved by decreasing 10-20% the amount of AC admissions.

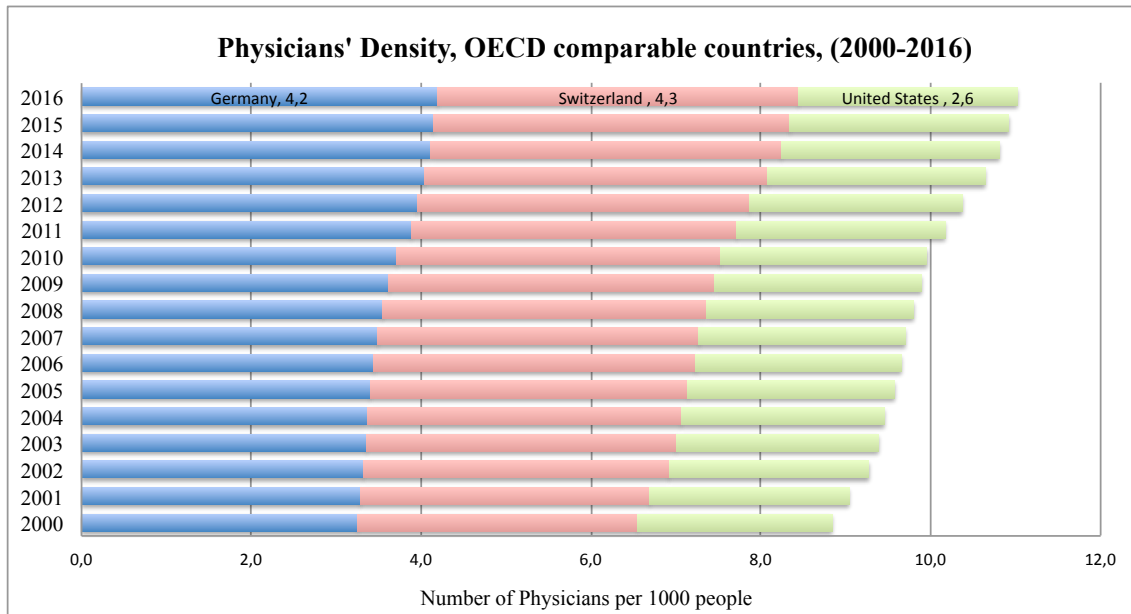


Figure IV - Physicians' Density, OECD comparable countries, (2000-2016). Source: Author's creation. Data from the World Bank (<https://data.worldbank.org/>).

Another important contributing factor that increase healthcare costs is having so many people uninsured. People that is uninsured for more than one year have to pay unaffordable Out-Of-Pocket higher prices for hospitals and services than those that have an insurance. The 2018 National Health Interview Survey of the Kaiser Family Foundation (KFF) analysis reported that, in 2017, 29% of uninsured non-elderly adults had problems paying their medical bills, compared to 14% for those that were insured. In order to pay their medical bills, uninsured population has to use savings or borrow money, putting them at risk of medical debt. This medical debt turns into bad debt or uncompensated care for providers. Hadley, J., Holahan, J., Coughlin, T., and Miller, D. (2008) define uncompensated care as the amount of care provided that has not been paid Out-Of-Pocket by patients due to the inability to pay high costs of services. Uncompensated care is normally transformed into cost-shifting by increasing costs to providers or private insurers (and patients covered by private insurance have to pay higher prices), which increases aggregate healthcare costs.

All these factors contribute to high levels of national spending on health insurance administrative costs, and to an inefficient use of resources that could be aimed at other performance strategies such as management care, prevention, or other ways to increase health outcomes' quality.

Moreover, the U.S. is not only fragmented in terms of healthcare, but also in terms of regional variations in quality and costs. Quality of healthcare changes depending on the state of residence, mostly in terms of public insurance, since each state has its own criteria and eligibility conditions for patients. Income and living standards are differentiated between states and this is also reflected in access to care. In fact, the income level determines the affordability of health insurance plans, which means that minorities are less likely to be insured than benefited population groups. Schoen et al. (2006: 470) confirmed, based on other reviews from multiple sources, that it would take more than 50% performance improvement among low income or unemployed population to achieve the levels of health experience of those from the contrary group.

2.2 The Affordable Care Act as a Measure of Intervention

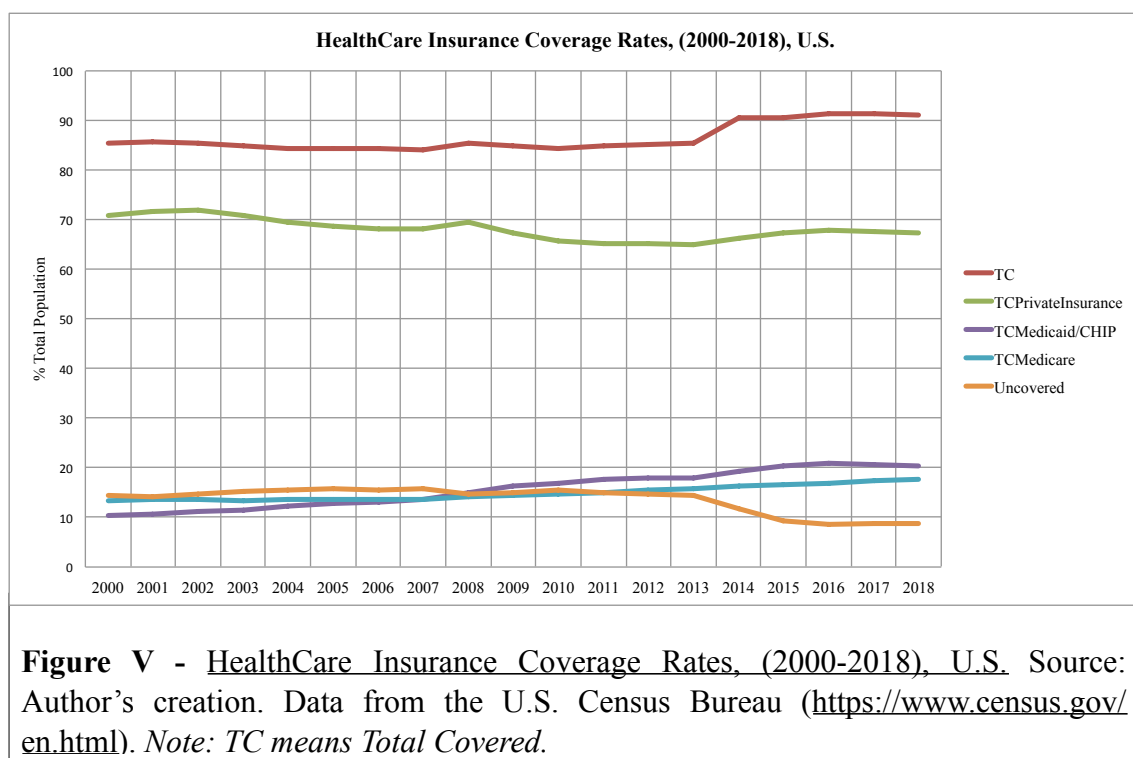
In 2010, one of the most important measures of intervention in the U.S. healthcare system, known as the Affordable Care Act (ACA), passed with the purpose to increase the availability, affordability, and utilization of health insurance³. The starting point was the reduction of restrictions regarding Medicaid non-financial eligibility conditions, to expand its coverage rates providing financial assistance. This reform was also known as the Obamacare since it was legislated under the presidency of Barack Obama. It generated incentives for employers to provide health insurance and expanded the private insurance market with the creation of marketplaces, also called health exchanges, where people could purchase health insurance. This expansion required that nearly all people not covered by their employer or a government insurance program could purchase private health insurance under the individual mandate law. The individual mandate required that most Americans should have a basic level of health insurance, or a penalty could be imposed. It also pursued the increase of protection for healthcare costs with

³ See <https://www.healthinsurance.org/obamacare/>

cost-sharing strategies and Out-Of-Pocket costs reductions for low income families. People could be provided with an income-based subsidy if premiums were not affordable. However, the size of this subsidy depended on the person's income and not all states within the country decided to expand coverage.

Together with the expansion of medicaid, other insurance programs offered by government were created, such as the Children's Health Insurance Program (CHIP), which offered coverage for young individuals whose families could not afford costs of private programs nor reach eligibility conditions to get Medicaid. It was actually a good starting point in order to improve quality performance in healthcare for future generations and also dissolve fragmentation.

As we can see in figure V, thanks to the financial assistance, which gave an opportunity to gain coverage for some of those who were not eligible for free subsidies, uninsured population rate began to decrease in 2010 when the ACA was passed, and this decline became really significant in 2014, when the ACA was fully implemented. The U.S. Census Bureau data verifies a decrease in the uncovered population rates from 15,5% in 2010 to 8,7 in 2017 approximately. As reported by the Kaiser Family Foundation (2018), with the medicaid expansion and the consequent decrease in uncovered rates, uncompensated care began to decrease and so the medical debt.



Notwithstanding the achievements, as Rice, T., Unruh, L. Y., van Ginneken, E., Rosenau, P., and Barnes, A. J (2018) accounted for, this law only succeeded for those states that chose to expand medicaid, cost protection succeeded only for people with incomes lower than 250% on the poverty level and in the employer-based insurance there was not such increase in cost protection. Still now, there are weak penalties for not having coverage and lot of undocumented individuals that are not able to take healthcare insurance coverage.

Furthermore, it is true that there has been a reduction in uninsured rates over time but the problem is that now more people is underinsured, or inadequately insured, since premiums in private insurance are rising, as well as coverage deductibles, while quality is decreasing. The Health System Tracker, based on the KFF analysis of National Health interview Survey⁴, reported that, in 2012, there was 16,9 % of non-elderly population that was underinsured, and 33,7% of U.S. citizens that were either uninsured or underinsured at an age lower than 65. Still in 2017, while the total amount regarding uninsured and underinsured decreased to 26,6% of non-elderly population, the underinsured rate was still 15,5%. In a Commonwealth Fund Organization paper, Collins, S. R., Bhupal, H. K., and Doty, M. M. (2019) reported that, of people who were insured continuously throughout 2018, an estimated 44 million were underinsured because of high Out-Of-Pocket costs and deductibles, mostly in private insurance programs.

Since the Medicaid expansion, as utilization of care has increased, the money spent per enrollee on public health insurance has decreased. As a matter of fact, prices for publicly insured are lower than before and premiums for those privately insured keep growing. However, as we can see in figure VI, on growth spending basis, expenditures on public insurance programs are rising at a higher rate than spending on private insurance. Concretely, Kamal, R., McDermontt, D., and Cox, C. (2019) detailed in an Health System Tracker article, that private insurance expenditures now represent 34% of total health spending (up from 21% in 1970) and government insurance plans represent 41% in 2018 (up from 22% in 1970). Figure VII illustrates how the increase in public health insurance spending is also reflected in health expenditures on prescription drugs.

⁴ Visit <https://www.healthsystemtracker.org/indicator/access-affordability/percent-insured/>

This path is the same among other healthcare services and products including administration costs, which are increasing for public plans, reaching private ones⁵.

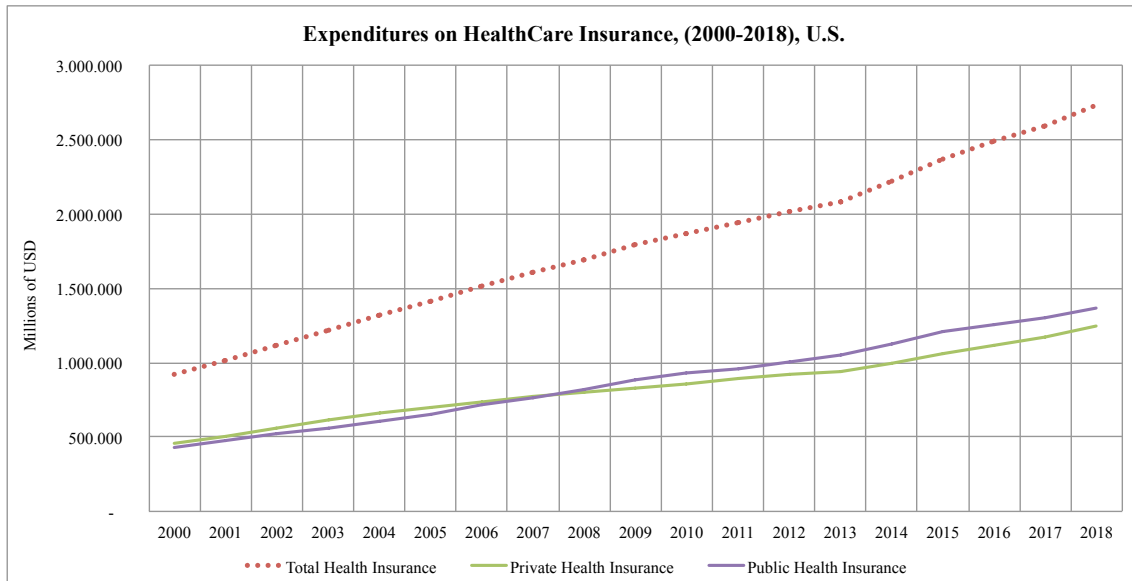


Figure VI - Expenditures on HealthCare Insurance, (2000-2018), U.S. Source: Author's creation. Data from the Centers for Medicaid and Medicare services (<https://www.cms.gov/>).

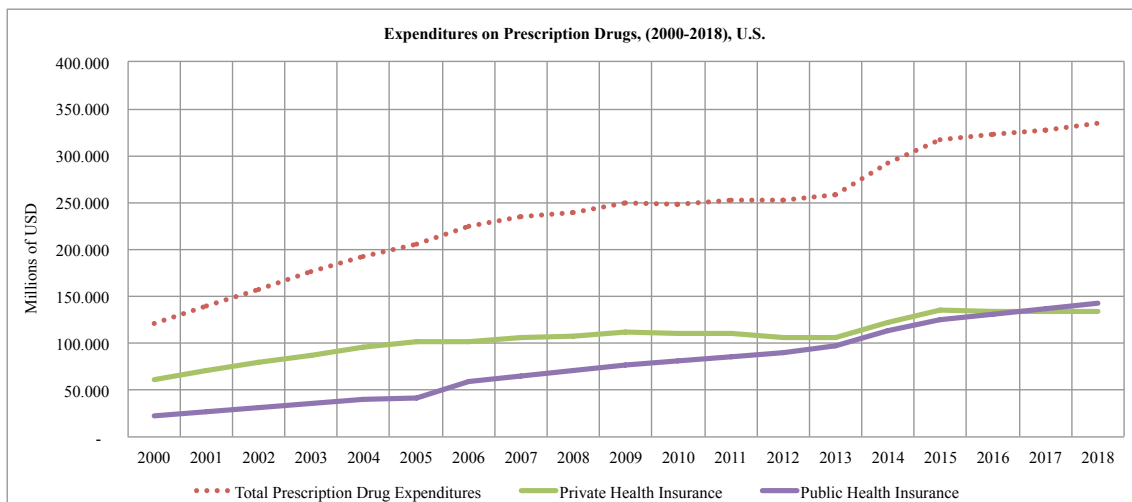


Figure VII - Expenditures on Prescription Drugs, (2000-2018), U.S. Source: Author's creation. Data from the Centers for Medicaid and Medicare services (<https://www.cms.gov/>). *Note: lines named Private and Public Health Insurance represent those expenditures on prescription drugs in the corresponding type of healthcare program.*

⁵ Visit: https://www.healthsystemtracker.org/chart-collection/u-s-spending-healthcare-changed-time/#item-nhe-trends_annual-percent-change-in-price-and-quantity-indexes-of-pharmaceutical-and-other-medical-products-1990-2018

One possible explanation for this path change of spending through government funds could be the fact that, healthcare spending has been historically driven basically by prices of health services, which were always higher than its corresponding utilization by population. This means that national healthcare expenditures were growing faster than personal consumption expenditure price index. Now, since the ACA implementation, demand for public health insurance has been rising and, therefore, the utilization of government programs and the corresponding expenditures.

Given that the successful reduction of uncovered health insurance population rates implied an increase in expenditures, organizations began to think about health policy changes to maintain and foster the sustainability of the Obamacare initiative. In fact, Burwell, S. M. (2015) supported that the department of Health and Human Services (HHS) perceived the ACA as an starting point to stimulate performance in the quality and delivery of healthcare and also to promote healthcare integration, with value-based models and alternative payment methods.

2.2.1 A difficult path to healthcare integration

In 2007, the Institute for Healthcare Improvement (IHI) developed the Triple Aim framework to encourage healthcare system performance and optimization worldwide. The basis of this framework is to improve individual experience with health, decrease costs per capita and reach a total improvement of population health. This type of innovations are difficult to be achieved without the integration of healthcare, not only within healthcare settings, but also between individuals, care providers and information itself.

The presence of healthcare organizational fragmentation in the U.S. made this type of innovations hard to be applied. However, the ACA allowed to implement some of the main strategies to carry out the Triple Aim goals. First of all, to decrease healthcare costs, alternative payment methods other than fee-for-service (paying for services provided) emerged, such as pay-for-performance and capitation approach (paying for the value of services provided). Substitution of payment mechanisms allowed the creation of Accountable Care Organizations (ACOs) that would empower for the full

integration of primary care by putting together a group of providers with the responsibility to provide all care to a given population, under a pre-agreed quality outcome and expenditure target. Actually, Medicare developed the Shared Saving Program, which promotes hospitals, physicians and care providers to integrate together with the form of ACOs. This initiative to give coordinated care to individuals has lowered the Medicare spending rate while providing high quality care. The National Association of ACOs announced that, in 2018, there were 1.7 billion dollars saved attributed to having ACOs in Medicare programs. Nevertheless, recent data from the Centers for Medicare and Medicaid Services (CMS) show a potential drop in ACOs participation due to changes in CMS legislation and organization.

All improvements in terms of healthcare efficiency, affordability and integration achieved since the Obamacare are now in danger. The decrease in the uninsured population rate stopped in 2017, and rose from 8,7% to 8,9%, in part due to the end of Barack Obama legislation.

In 2017, Republicans and the actual president of the U.S. started to consider repealing the the ACA and extending health insurance Short-Term plans up to 12 months like before the Obama regulation according to the 2018 federal rule proposed by U.S. Departments of Treasury, Labor, and Health and Human Services⁶. Short-Term plans were used as a temporary (limited to 3 months duration) source of insurance to cover population during coverage gaps. If on the contrary it was used as a primary source of healthcare, people could be penalized without any kind of financial assistance because this plans does not meet the ACA's essential coverage requirements. However, precisely because Short-Term plans are not subject to ACA regulations, insurers can charge higher cost-sharings and, as a consequence, have lower premiums. This, in turn, make this temporary coverage cheap and attractive to young and healthy people. The functioning of this programs is well explained in a Commonwealth Fund article published by Rao, P., Nowak, S. A., and Eibner, C. (2018), where the effect that would cause the extension of the Short-Term health insurance policies and the repeal of the individual mandate policy is also discussed. They reach the conclusion that if both suggestions are

⁶ Visit <https://www.dol.gov/newsroom/releases/ebsa/ebsa20181023>

implemented, it will cause healthy people to leave the ACA-complaint market, attracted to cheap short-term plans and, therefore, premiums in the marketplace will increase as individuals purchasing from the exchange will drop. As a consequence, the remaining population in there will become older and sicker. Further to this, if penalties of being without health insurance are removed, uninsured population rates will grow much more. Indeed, Rao et al. (2018) estimated that, by 2027, five million Americans will have lost individual coverage. As matter stands, it seems that the ACA intervention stimulated organizations to promote health integration with strategies that seek to decrease costs and maximize value of care. This suggest that trying to expand medical care, which increases health spending, also promotes trying to reduce the respective increase in costs associated with the expansion. However, the removal of the individual mandate policy and the extension of short-term plans will enforce the current search frictions in the insurance market and move backwards to high levels of fragmentation again. Without a rigid and persistent policy intervention and the full integration of healthcare, expenditures will keep increasing without a proper performance on coverage rates and health outcomes.

3. EXPERIMENTAL RESEARCH

This section covers all previous experimental research from where I extracted all the technical and empirical information to do the quantitative analysis of this work.

As we have seen, efficiency in healthcare expenditures is determinant for health outcomes. Also, it is well appreciated by previous literature that the level of specialists' supply in the U.S. is much more higher than supply of primary care physicians, which induces some limitations both for healthcare efficiency and good quality of health outcomes. Lot of research has ben done to study the statistical effect of health spending and physicians supply on health outcomes.

Following the ACA's success in terms of improvement in health insurance coverage rates, it is important to know about the main determinants of coverage status as well as the effect of health expansionary policies on healthcare utilization and health itself. Besides, as the intention of the quantitative part of this work is to treat healthcare

coverage rates as a measure of health outcomes, recognizing its influencing factors is crucial.

3.1 HealthCare Expenditures and Health Outcomes

In order to find out which are the main determinants of mortality rates and also if health spending could be included as one of this determinants, Or, Z. (2000) uses pooled data from 21 OECD member states to do a regression analysis accounting also for the effect other health-related variables. It appears to be a statistically significant relationship between health expenditures and health outcomes for both men and women, with elasticities being lower for men. Indeed, 12% decrease in female premature mortality in the U.S. is explained by the increase in health resources. Difference between men and women may be due to the effect of individual variables such as education, which also appears to be large and highly significant, as well as air pollution, smoking and alcohol consumption, with significant but lower relationship on health outcomes. In order to account for the quality of resources between countries, they differentiate the total amount of expenditures and the share of public financing in expenditures, whose results indicate that expenditures financed publicly are associated with better health outcomes. Crémieux, P. Y., Ouellette, P., and Pilon, C. (1999) developed a multiple linear regression and found that expenditures appear to be a strong and significant determinant of health outcomes. More precisely, they found that a 10% decrease in healthcare spending in Canada is associated with approximately 0,5% in the increase of life expectancy. The authors also control for macro variables like unemployment rate and Gross Domestic Product (GDP) per capita. GDP was in per capita terms to decrease estimates' residual effect. Furthermore, they also account for nutritional and behavioral variables to avoid introduction of bias and find precise results. Their findings are consistent with those detected by Anyanwu, J. C., and Erhijakpor, A. E. (2009) who obtained statistically significant results for the positive effect of healthcare expenditures on the decrease in infant mortality throughout 47 African countries. They accounted for the fact that in order to find robust estimators, it is better to avoid cross-country analysis because of the effect of unobserved heterogeneity that results from comparing different

countries with diverse population. After doing a panel data analysis Anyanwu et al. (2009) suggest that, the aggregate level of health spending is a poor proxy to measure the real effect of health resources on health outcomes if it is spent ineffectively. This means that is not only the amount of healthcare expenditure which has influence on health outcomes, but how this amount is spent.

Bradley, E. H., Elkins, B. R., Herrin, J., and Elbel, B. (2011) want to study precisely that, the effectiveness of healthcare expenditures. In order to do it so, they differentiate between health services expenditures and social services expenditures as both affecting health outcomes. The first are services directly related to healthcare such as long-term care, laboratory tests and curative care. Spending on social services are, instead, those indirectly related to healthcare (income supplements, housing and unemployment subsidies). Results show that, in comparison with other OECD member states, the U.S. is the only one that spends more of total health and social services expenditures on health services, rather than on social services. They also found greater association of health outcomes' quality with social expenditure as a percentage of GDP, rather than with health-related expenditures. This could be one of the many reasons for which higher healthcare spending in the U.S. does not always means improvement in health outcomes.

3.2 The Role of Physicians

Researchers confirm, in multiple studies, that specialty care is more expensive than primary-care, which makes primary-care affordable to a bigger proportion of society, mostly for the most disadvantaged people. Consequently, primary-care allows to maintain and probably improve quality of health outcomes.

Starfield, B., Shi, L., Grover, A., and Macinko, J. (2005) developed a multivariate pooled cross-sectional analysis to study the relationship of primary-care and specialists supply to some mortality indicators. The model included sociodemographic characteristics that may also cause an effect on mortality rates. Results show significant estimates explaining that the higher the ratios of specialist-to-population, the higher the mortality rates of the corresponding illnesses chosen. The reverse effect happened for primary-care. This conclusions are reinforced by another article in which Macinko, J.,

Starfield, B., and Shi, L. (2007) conclude that increasing, the number of primary-care physicians in the U.S., or decreasing specialists, would lead to well-developed healthcare system, with lower costs, better health outcomes and social satisfaction. From this studies it could be interpreted that, reducing or redistributing the organization of specialists in the U.S. would in fact give the possibility to share costs between both producers and consumers, enhancing social life.

In view of the fact that overabundance of specialty care increases health spending and that government can not afford as high expenditures as private insurers, when the Medicaid was expanded through the ACA, Ashley, M. (2012) prevented that the number of physicians in public healthcare insurance plans would decrease as public insurance coverage has increased. His guess was based on the fact that, fundings for health providers in this sector would not rise and medical doctors would not have incentives to provide healthcare to individuals covered by public healthcare insurance plans. Then, the demand for Medicaid, Medicare and CHIP would increase without the same increase of physicians' supply. This predictions are sustained by Holgash, K., and Heberlein, M. (2019) who estimated that only 71% of providers accept Medicaid patients compared to 85% who take Medicare and 90% that accept private insurance given that, in average, Medicare pay doctors only 80% of what private health insurance pays them.

3.3 HealthCare Coverage and Health

High-ranking coverage rates of healthcare insurance is the clue to achieve aggregate satisfactory quality levels of health outcomes. Indeed, Baker, D. W., Sudano, J. J., Albert, J. M., Borawski, E. A., and Dor, A. (2001) found that people without coverage is associated with bad health outcomes regardless of income, sex and ethnicity. In addition, the authors confirm those that are insured and uninsured afterwards have higher risk to become unhealthy or less healthy than before.

Levy, H., and Meltzer, D. (2004) collected information about previous studies that analyzed the possible causal relationship between healthcare coverage and health. Conclusions confirm a positive association between health insurance and health. Coverage expansion policies also seem to improve health when taking into

consideration household's income, education, individual lifestyles and morbidities. It is confirmed by a numerous quantity of studies that vulnerable population is more likely to benefit the most from health insurance. The success attributed to the healthcare measures of intervention appear to be relevant also for Currie, J., Decker, S., and Lin, W. (2008), who wanted to study the impact of income and Medicaid/CHIP eligibility on children's health. They verified that an appropriate medical care from early childhood results in better health conditions in long-term. Hence, if an individual is covered under health insurance since early age, his or her health is expected to be in good quality and then, the aggregated level of health outcomes in a society will improve as many illnesses would be prevented.

Delen, D., Fuller, C., McCann, C., and Ray, D. (2009) try to find out the main possible contributing factor for the U.S. coverage disparities. Income, education, employment, marital status and location, as well as lifestyle health related variables come out as being highly influencing to population's coverage status. On the other hand, variables of interest like the need for special equipment, activity limitations and physical health seem to be less significant on whether an individual has coverage or not. This results may suggest that it is not plainly the individual's health condition, but the social status framework and lifestyles which actually determines utilization of healthcare.

4. QUANTITATIVE ANALYSIS

After taking into consideration the reviewed existing literature regarding this topic, on this part of the work, the possible causal relationship between healthcare efficiency and health outcomes is going to be analyzed. The purpose of this section is to answer the main hypothesis of this project. Does an an increase in health care expenditures on public healthcare insurance increase the share of people covered under public healthcare insurance programs?

4.1 Data

The empirical studies in which this work is based on, use death rates, children or infant mortality and life expectancy as indicators of health outcomes. It is of common

knowledge that healthcare coverage is not a health outcome itself but, from my point of view, without good levels of coverage, the amount of healthcare spending and other determinants of health outcomes alone do not cause a significant impact.

Here, public healthcare insurance coverage rates will be treated as a health outcome indicator since my guess is that its performance in terms of enrollment causes a direct effect on the official indicators of health outcomes. Therefore, the percentage of the U.S. population covered under government healthcare insurance plans (TCPublic) is set as the dependent variable. Due to lack of historical data in some of the existing insurance programs offered by government, those ones that we are referring to will be Medicare, Medicaid and CHIP.

Since the main goal is to see which effect has healthcare efficiency on healthcare insurance coverage rates, concretely in public insurance, and papers such as Or, Z. (2000) confirm that publicly financed expenditures are related to effectiveness, per-capita⁷ healthcare spending on public healthcare insurance programs (ExpPublicHI)⁸ will be the main explanatory variable.

Some other variables are added in the model to take into account other factors that have an influence on the dependent variable. If this kind of variables were not taken into account, the estimation results would be not enough reliable since we could expect over or under estimation due to omitted variable bias. Real GDP per capita (RealGDP) is added to control for macro-economic effects, as well as unemployment rate and education rate, to account for socio-demographic effects. Moreover, it has been confirmed from previous studies that behavior and lifestyles also have an influence on health status of the population. Alcohol consumption is added to the model to control for risk factors on population's health. The physician's density⁹ (Physicians) is included in the model because while doing the research, I realized that its amount could be an important determinant of the level of population covered under healthcare insurance.

⁷ All variables expressed in monetary amounts will be in per capita terms to decrease heterogeneity, following previous experimental researcher's procedures.

⁸ All variables that are in per capita amounts are computed by the author.

⁹ For this variable, the corresponding source did not have the values for all years and averages had to be done to get the missing ones.

Finally, the level of income is also added to the model since it seems to be one of the main determinants of the U.S. healthcare insurance coverage.

Table I presents the formal definition of all variables included and the corresponding sources¹⁰ for each one.

VARIABLE	DEFINITION	SOURCE
<i>TCPublic</i>	Rate (%) of total U.S. population covered under public healthcare insurance plan (Medicare, Medicaid and CHIP).	U.S. Census Bureau
<i>ExpPublicHI</i>	Amount of per capita expenses, in current USD (dollars), spent by U.S. government on public healthcare insurance programs.	Centers for Medicare & Medicaid Services
<i>RealGDP</i>	Real Gross Domestic Product per capita, in chained (2012) USD (dollars).	U.S. Bureau of Economic Analysis
<i>Unemployment</i>	Not working population as a rate (%) of labor force (people of 16 year of age or more).	U.S. Bureau of Labor Statistics
<i>Educ</i>	Rate (%) of U.S. population having completed the highest level of education by 25-64 years-old population.	OECD Data
<i>AlcoholConsumption</i>	Annual sales of pure alcohol in liters per person aged 15 years and older.	OECD Data
<i>Income</i>	Average income earned per person in 2018 adjusted USD (dollars).	U.S. Census Bureau
<i>Physicians</i>	Number of physicians per 1000 population.	World Bank
Table I - <u>Data Description</u>. Source: Author's creation		

The main data sources are the Centers for Medicare and medicaid Services (CMS), the U.S. Bureau of Economic Analysis, the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, OECD data and the World Bank. CMS source is an official site of the U.S. that provides information and data corresponding to healthcare expenditures by types of services and source of funds for all years of interest, among other information about health insurance plans. The U.S. Bureau of Economic analysis is a website that includes information and data regarding U.S. population and its economy. This webpage allows to search for different topics and can derive you to other sources apart from the

¹⁰ To go directly to the concrete dataset of each variable see references.

principal one, like the U.S. Census Bureau. The U.S. Bureau of Labor statistics is another official source of the U.S. where data on business and employment can be found.

4.2 Methodology

The corresponding data collection takes form of time-series data representing country-level indicators of the United States population between 1988 and 2018, both years included.

The process followed in the empirical part of this work is called a stochastic process given that data is characterized by a sequence of random variables indexed by time. To put it in other words, time series data, here collected annually, is the outcome of random variables.

In spite that different types of model specifications and more than 50 regressions have been generated in order to robustly validate the results, only the most significant and consistent one is shown in this study. Eventually, the statistical model used to measure and quantify the effects and relationship between the dependent and independent variables is a multiple linear regression model bone by Ordinary Least Squares (OLS) method. Gretl (version 2016d-git) is the statistical tool used to do the analysis.

Originally, since the variables I am studying are highly correlated between each other, to avoid multicollinearity and imprecise results in the regression, correlation matrixes had been done to get rid of those variables that could cause this problem. The remaining ones are those shown in table I.

As we are working with chronologically ordered data, time-series data must hold on stationarity basis (Wooldridge, J. M., 2000). This means that the statistical properties of the series must keep constant over time because otherwise results may be unreliable. Moreover, if stationarity is not taken into account, regression results may suffer from serial correlation and heteroskedasticity disturbances (Wooldridge, J. M., 2013). Serial correlation or autocorrelation between residuals means that error terms from different periods are correlated. If serial correlation appears in the regression output, this could indicate a model misspecification, standard errors and test statistics would be no longer valid and estimates not Best Linear Unbiased Estimator (BLUE). So as to avoid this

type of disturbances, Durbin-Watson test for serial correlation, as well as Breush-Godfrey test for autocorrelation are shown together with the regression results in the following section. To get precise estimates in the linear regression and control for robust standard errors, the variance of the error terms should be constant over time. If heterogeneity of variances exists instead, the regression will suffer from heteroskedasticity. Regression results are estimated accounting for HAC (Heteroskedasticity and Autocorrelation Correction) to control for robust standard errors.

By graphically plotting time series on each variable, the presence of non-stationarity (seasonality, structural breaks, time trend or mean patterns) can be detected. Figures VIII and IX show the time series plot of two variables included in the model, with the intention to illustrate examples of stationary and non-stationary time series.

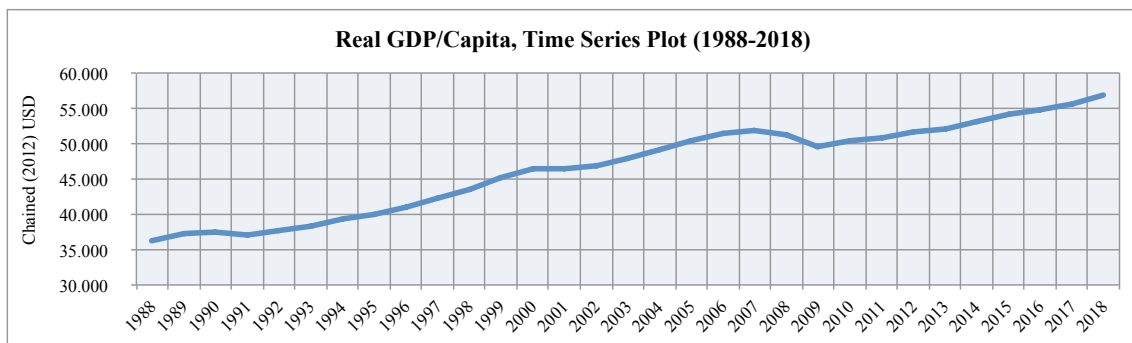


Figure VIII - RealGDP/Capita, Time Series Plot (1988-2018). Source: Author's creation. Data: U.S. Bureau of Economic Analysis (<https://www.bea.gov/tools/>). *Note: from this graph non-stationarity could be assumed since it seems that RealGDP per capita has a time trend.*

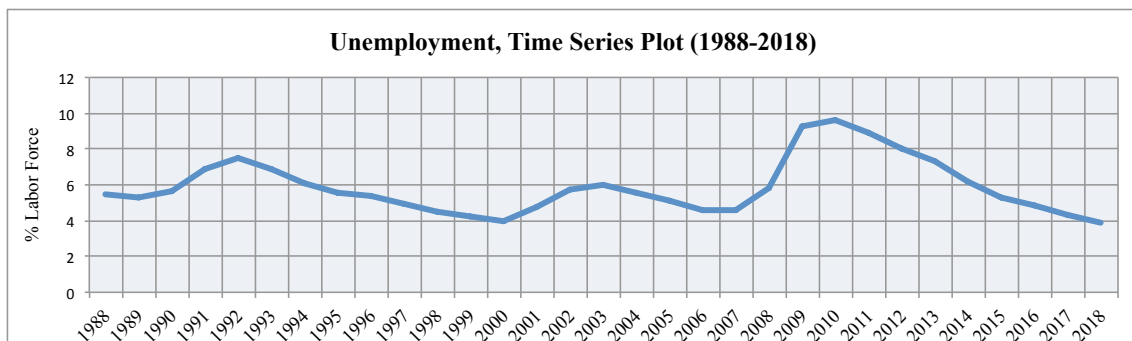


Figure IX - Unemployment, Time Series Plot (1988-2018). Source: Author's creation. Data: U.S. Bureau of Labor Statistics (<https://fred.stlouisfed.org/>). *Note: from this graph stationarity could be assumed since it seems that Unemployment does not have any non-stationarity pattern.*

The second step was to test for it using the Kwiatkowski Phillips Schmidt Shin (KPSS) test to verify whether or not data was non-stationary and which type of stationarity process should be taken into account. The KPSS test is done controlling for lag truncation parameter, which indicates the correlation between the residual values that are t time periods apart. To select the lag number the following original formula of Bartlett Kernel is used, also called Kernel Function¹¹:

$$m = [4 (T / 100)]^{(2/9)}$$

Where:

- T is the number of observations (in this case, the number of years, T=31)
- m is the lag truncation parameter, determined by the integer part of m (In this case, m= integer part of 1.0489)

After selecting the optimal lag truncation parameter, the KPSS test can be done. From the results in the table II, we can conclude that null hypothesis (H0) of stationarity around the trend can be rejected for all variables except for unemployment since its P-Value is higher than 5% significance level¹².

KPSS test (including Trend) T=31

Lag truncation parameter =1

VARIABLE	P- VALUE
<i>TCPublic</i>	< 0.01
<i>ExpPublicHI</i>	< 0.01
<i>RealGDP</i>	< 0.01
<i>Unemployment</i>	> 0.10
<i>Educ</i>	< 0.01
<i>AlcoholConsumption</i>	< 0.01
<i>Physicians</i>	0.024
<i>Income</i>	0.028

Table II - KPSS test. Where the Null Hypothesis is (H0): Data Stationarity around the trend and the Alternative Hypothesis is (H1): Non-Stationarity. Source: Author's Creation. Data: obtained with Gretl. Note: To reject the H0 the P-Value has to be lower than the 0,05 (5% of significance level). By rejecting we could conclude that data is non-stationary.

¹¹ Reference: Kwiatkowski, D., Phillips, P. C., Schmidt, P., & Shin, Y. (1992)

¹² The 5% significance level is set as the probability that allows to reject the null hypothesis in all tests of this work. 5% is commonly used because Type I and II errors that may make you incorrectly choose to reject or not the null hypothesis can be avoided.

Then, it can be concluded that the trend is stochastic and this implies that data will have to follow a stationary stochastic process by differencing the series. As a matter of fact, for those variables that are found non-stationary, first-differences are applied to de-trend the series¹³. First-difference is the change value of the series from one period to the following one ($Y_t - Y_{(t-1)}$). As first-differences are applied, the number of observations in the regression reduces to $T=30$. After transforming all non-stationary variables into stationary, the last step was to run the regression based on the following equation:

$$d_TCPublic = \beta_0 + \beta_1 * d_ExpPublicHI + \beta_2 * d_RealGDP + \beta_3 * Unemployment + \beta_4 * d_Educ + \beta_5 * d_AlcoholConsumption + \beta_6 * d_Physicians + \beta_7 * d_Income + \varepsilon$$

Where

- $d_$ is the first-difference on the corresponding variable,
- β_0 is the constant, also called the intercept,
- $\beta_1 \dots \beta_7$ are the unknown parameters corresponding to each regressor (k), that will determine the change on the dependent variable knowing the change of the regressor (independent variable) and keeping others constant,
- ε is the error term or residual parameter.

4.3 Results

Table III presents the results obtained from the regression analysis. The R-Squared tells us that a 79% of the observed variability in $TCPublic$ is explained by the other variables included in the model.

To test for serial correlation, it is useful to look at the Durbin-Watson (DW) number which can be found in this table. The DW test states that any number significantly different from 2 would indicate serial correlation among residuals. As in this case the number is 1.73, which is close to 2 but could lead to confusion and more extended proof is needed. To do it so, we should compare the DW number with the upper (dL) and

¹³ First-differences help to correct for serial correlation, heteroskedasticity and multicollinearity disturbances.

lower (dU) critical values. According to the level of observations (T=30) and regressors (k=7), the critical values corresponding to a 5% significance level are:

$$dL = 0.9256$$

$$dU = 2.0343$$

In order to reject the null hypothesis of no serial correlation we need the DW be lower than dL, and to not reject it, the DW must be higher than dU.

Model 1: OLS, using observations 1989-2018 (T=30)
Dependent variable: d_TCPublic
HAC standard errors, bandwidth 2 (Bartlett kernel)

	<i>Coefficient</i>	<i>St. Error</i>	<i>t-ratio</i>	<i>p-value</i>
const	-2.11003	0.398789	-5.291	<0.001 (***)
d_ExpPublicHI	0.00917208	0.00146624	6.255	<0.001 (***)
d_RealGDP	<0.001	0.000114529	0.6837	0.5013
Unemployment	0.219752	0.0260756	8.427	<0.001 (***)
d_Educ	0.0339837	0.0309440	1.098	0.2840
d_AlcoholConsumption	-0.194327	0.247565	-0.7850	0.4409
d_Physicians	0.322948	0.175496	1.840	0.0793 (*)
d_Income	0.000114198	0.000126360	0.9037	0.3759
<i>Mean dependent var</i>	0.410000	<i>S.D. dependent var</i>	0.600201	
<i>Sum squared resid</i>	2.144254	<i>S.E. of regression</i>	0.312196	
<i>R-squared</i>	0.794749	<i>Adjusted R-squared</i>	0.729442	
<i>F(7, 22)</i>	32.26269	<i>P-value (F)</i>	<0.001	
<i>Log-likelihood</i>	-2.992070	<i>Akaike criterion</i>	21.98414	
<i>Schwarz criterion</i>	33.19372	<i>Hannan-Quinn</i>	25.57018	
<i>rho</i>	0.114196	<i>Durbin-Watson (DW)</i>	1.730103	

Table III- Multiple Linear Regression Output. Source: Author's creation. Data obtained with Gretl. Note: (*),(**),(***) means significance at 10%, 5% and 1% respectively. The more stars, the higher the statistical significance of results.

Here, 1.73 is between the two critical values, which could mean that the test is inconclusive. However, the rule of thumb states that test statistic values in the range of 1.5 and 2.5 are relatively normal and there should be no cause of concern¹⁴.

To have a proper measure of serial correlation, the Breusch-Godfrey test helps to determine if there is autocorrelation in residuals up to a certain specified order. Test is done controlling for lag orders. Here, concretely, I apply for 2 lags, which would indicate whether or not the error values that are maximum 2 years away from the actual value are correlated. Test could be done controlling for more lags but as we are working with annual data, a lag order from 1 to 2 should be the optimal to not lose degrees of freedom.

Results shown in table IV let us conclude that there is no statistical evidence that the error terms are positively autocorrelated controlling up to order 2 since the p-value is higher than the significance level (0,05) and the null hypothesis can not be rejected.

OLS, using observations 1989-2018 (T = 30) Dependent variable: uhat
Null hypothesis: no autocorrelation
Test statistic LMF = 0.200316
with p-value = P (F(2,20) > 0.200316) = 0.82
Table IV- Breush-Godfrey Test for autocorrelation up to order 2. Source: Author's creation. Data obtained with Gretl.

4.3.1 Expenditures on public healthcare insurance programs

As expected from previous empirical research conclusions, regression results (see table III) let us confirm that there is a positive relationship between the level of per capita spending on public healthcare insurance and the rate of population covered under Medicare, Medicaid and CHIP, with statistically significant effect. Keeping other variables constant, an increase in one USD per capita on public healthcare insurance expenditures from one period to the next ($Y_t - (Y_{t-1})$) is associated with an increase of 0.00917% in public healthcare insurance coverage rates within the corresponding time

¹⁴ See more at: <https://www.investopedia.com/terms/d/durbin-watson-statistic.asp>

interval. It is important to understand that, the coefficient for this variable, here the main explanatory variable (ExpPublicHI), got lower when adding the control variables, sequentially, in the model. This means that is a significant determinant of the dependent variable (TCPublic), but not the only one.

The scatter plot in Figure X depicts a clear positive trend not only between the two variables but also in terms of years. Both per capita expenditures on public healthcare insurance and the rate of population covered keep increasing as time increases.

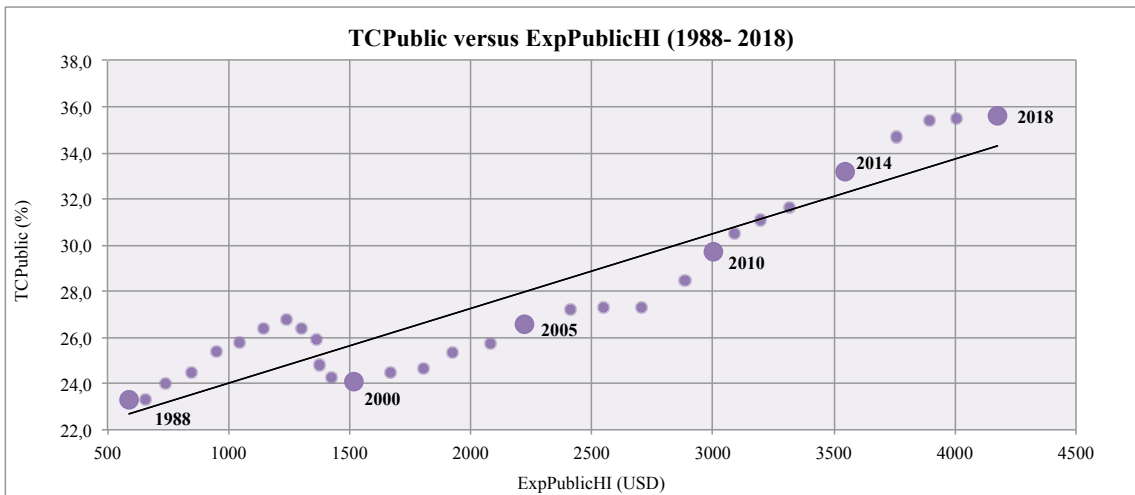


Figure X - Scatter plot of per capita Public HealthInsurance Expenditures and % of Total Covered under Public HealthCare Programs (1988-2018). Source: Author's creation. Data from U.S. Census Bureau (TCPublic) and Centers for Medicare and medicaid Services (ExpPublicHI) *Note: data is in levels, not using first-differences, to have a visual interpretation of the original trend.*

Moreover, the decrease in uncovered rates in public healthcare insurance attributed to the ACA implementation can be observed. The growth between both variables seems to be faster starting in 2010, when the health policy intervention was established (ACA), surpassing the trend line.

4.3.2 Unemployment

According to the estimation results from table III, if unemployment rate increases by 1% and other factors do not change, then, the growth rate of population covered under public healthcare insurance will increase by 0.21975%. The coefficient for the unemployment rate shows the strongest effect on the dependent variable compared with all other regressors in terms of both significance and power of relationship. The fact that

first-difference is not applied in this variable does not change the effect. All regressions produced to do this work confirmed the unemployment rate being the greatest influencing factor on the rate of population covered under public healthcare insurance programs.

On the one hand, this association is surprising since being unemployed often means being uninsured but, on the other hand, results are as expected. The fact that in the U.S. being employed normally means that people is covered under private healthcare insurance, leads those unemployed with only the possibility to be insured through government programs. Being uninsured is normally associated with having low levels of disposable household income, and disadvantaged population is often covered under Medicaid. Young individuals that are not at the age of being employed can also be covered under CHIP programs if certain circumstances are met. Moreover, as Medicare is coverage for individuals older than 65 years old and the percentage of retirement population increases after this age, the rate of population covered under Medicare insurance rises as unemployment rate increases since it involves having not working population covered. From the scatter plot in figure XI, a positive upward trend can be recognized between the two variables.

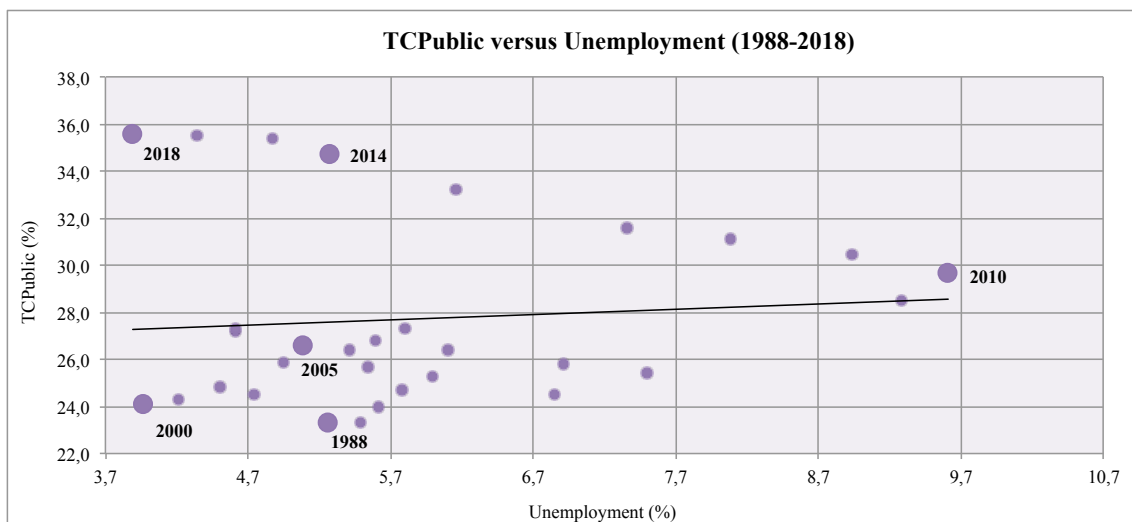


Figure XI - Scatter plot of Unemployment rate and % of Total Covered under Public HealthCare Programs (1988-2018). Source: Author's creation. Data from U.S. Census Bureau (TCPublic) and U.S. Bureau of labor statistics (Unemployment) *Note: data is in levels, not using first-differences, to have a visual interpretation of the original trend.*

On the other hand, if we look at the trend regarding its evolution in terms of years, it seems that since 2010, unemployment starts decreasing as public healthcare insurance coverage rate goes up. This pattern may suggest that after the ACA implementation there was a decrease in the unemployment rate. One possible intuition could be that the introduction of subsidies to make healthcare more affordable to low income individuals generated an increase in health expenditures. This growth in health spending was possibly translated into an increase in the demand for labor in this sector to compensate for the rise in expenditures and, in turn, a decrease in aggregate unemployment rate.

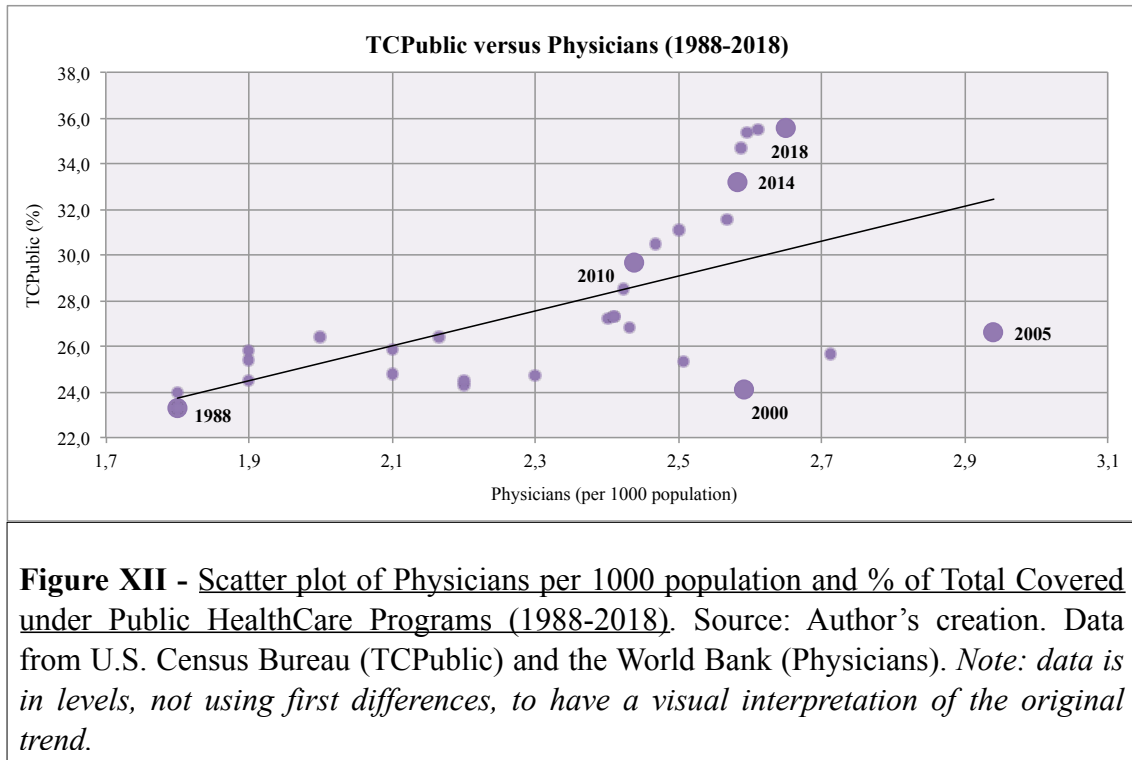
Nevertheless, deeper research concerning the effect of ACA measures on employment should be done to reach consistent conclusions. By looking at the scatter plot of this two variables using first-differences TCPublic, dispersion between points becomes lower, and the trend line steeper, suggesting that even though it may be the case that unemployment got reduced when public healthcare insurance coverage rate began to increase after 2010, the positive relationship between the two variables also persists.

4.3.3 Physicians

Estimation output in table III indicates statistically significant effect of physicians on the rate of population covered under healthcare insurance programs. If there is an increase by one unit of physicians (per 1000 people) from $t-1$ to t , keeping other regressors constant, there will be a 0,32294% increase in the rate of population covered under public health insurance from $t-1$ to t . In spite of this, the effect is only significant at 10%, which means that the relationship is not as powerful as the one between unemployment or ExpPublicHI and TCPublic. After generating the scatter plot applying for first-differences (in TCPublic and Physicians), the slope is much more flatter than the one shown in figure XII, meaning that the linear trend is not much significant in fact.

To have a better look, the scatter plot (see figure XII) shows a positive trending between the two variables. However, at a certain point, this increase is not so clear. For some points, starting at 2,4 physicians (per 1000 population), the rate of population covered can either increase or decrease. In 2005, almost 3 physicians per 1000 population was

associated with a 26% of population covered. After the ACA was established (2010), lower amount of physicians is associated with higher coverage rates on public healthcare insurance programs.



This could be a consequence of the lacking availability of primary-care physicians in the U.S. healthcare system. Following Ashley, M. (2012)¹⁵ intuitions, public healthcare coverage rates may decrease as physicians increase because when the ACA was established, the demand of public healthcare insurance increased substantially without a corresponding increase in the number of physicians available in public healthcare insurance programs. In fact, according to Holgash, K., & Heberlein, M. (2019)¹⁶, lot of physicians refuse to provide care to population covered under Medicare, Medicaid or CHIP insurance programs because they get inferior remunerations than what they earn giving medical treatment to individuals privately insured. In accordance with this interpretation, by reducing the number of specialists and increasing the number of generalists, physicians would not be so much expensive, there would be more resources available within the healthcare system, the amount of medical doctors per 1000 people

¹⁵ See section 3.2 of this work.

¹⁶ See section 3.2 of this work

would increase and the rate of population covered under public healthcare insurance would rise. This beliefs are consistent with the observed relationship between the two factors. Even though from 2010 to 2018 the supply of physicians is lower than in 2005, there is still a positive relationship between the two variables (i.e. if physicians increase, healthcare insurance coverage rates grow).

4.3.4 Non-significant results

Other variables taken to control the effect on the dependent variable appear to have a non-significant impact. While no consistent conclusion can be extracted from the results of this work regarding this variables, they can give us a certain understanding about their relative importance on the total outcome. It seems that alcohol consumption has a negative effect on the number of population covered under public healthcare insurance programs while Real GDP per capita, education and income seem to have a positive impact on the public healthcare coverage rate.

5. CONCLUSIONS

Revising the actual functioning of the healthcare system in the United States provided some intuitions regarding the causes of healthcare inefficiency, suboptimal levels of health outcomes and disturbances of healthcare insurance coverage rates.

The Affordable Care Act (ACA) intervention meant a significant growth of national health spending, together with an increase in healthcare insurance coverage rates, mostly in public programs.

From this facts, a positive association between the increase in health spending and the growth in public healthcare insurance coverage rates could be assumed. However, the proportional increase and its real qualitative effects are subject to the way this expenditures are used and distributed. Even having high-ranking health spending, the system is dominated by private insurance companies, specialized medical doctors and fragmented healthcare settings that narrow the population's capacity to afford coverage due to high costs, which decreases health outcome's quality.

Being able to detect which are the main determinants of healthcare utilization disturbances allowed to perform a quantitative analysis that provides new empirical evidence concerning the effect of health spending on health outcomes, suggesting a new way to study healthcare performance. Instead of using official indicators of health outcomes, this work focuses on public healthcare insurance coverage rates (TCPublic) as being a health outcome indicator. The analysis is based on the United States from 1988 to 2018. The level of per capita expenditures on public healthcare insurance programs is set as the main explanatory variable (current \$). Real GDP per capita (chained 2012 \$), unemployment rate (% of labor force), tertiary education (% population), alcohol consumption (liters/capita), physicians' density (per 1000 people) and per capita income (adjusted 2018 \$) are added to the model to control for other influencing factors of both healthcare utilization and health outcomes and to avoid the introduction of bias. To get estimates about the effect of this variables on TCPublic, an Ordinary Least Squares multiple regression analysis is generated, following an stationary stochastic process to robustly validate the effects.

Through the results obtained, the hypothesis of this work can be confirmed. An increase in per capita expenditures on public healthcare insurance programs significantly increases TCPublic. Moreover, unemployment rate is found to cause a statistically significant impact on TCPublic, with a strong positive relationship. This association is a favorable indicator regarding the efforts of government to give opportunities to people that is not able to be employed. Results also indicate that, although the level of significance is low, the amount of physicians appear to have a positive effect on TCPublic. Through a descriptive data visualization process, a change in the trend of both unemployment and physicians with respect to TCPublic has been appreciated since the ACA intervention. It seems that unemployment rate started to decrease in that moment. Also, the positive effect of physicians on TCPublic may turn to negative because the growth in public healthcare insurance utilization, achieved through the ACA, was not compensated with an increase in physicians' incentives to provide care to publicly insured individuals. The origin can be associated to the fact that private insurance companies give higher remunerations to medical doctors than public insurance programs do.

All data is taken from official sources, which should give credibility to the results. However, some limitations while doing the analysis were found. Whereas in this work no significance appears, literature reviewed confirms that income has a strong impact on healthcare utilization. The contrasting effects indicate that to get significant estimates, income should be added as a dummy variable, accounting for different levels of household disposable income and controlling for the state of residence. Deeper research about the effect of the control variables on TCPublic could be done, and it would be also interesting to study the corresponding impact on private healthcare insurance coverage rates so to have a clearer view about the differences between the two types of healthcare insurance. Furthermore, the initial purpose was to distinguish between the role of physicians in order to have a proper understanding about how having such an overabundance of specialists and scarcity of generalists affects TCPublic. It was not possible since data was not open to public research. Current evidence suggest that, as specialists are central of resource allocation, reducing its supply would reduce aggregate healthcare spending and positively impact health outcomes. Nevertheless, there is lack of empirical evidence about the corresponding effect on coverage rates and I believe this opens a new research question to the existing literature.

6. REFERENCES

- Anderson, S. (November 22, 2019). Obamacare: The Affordable Care Act. Retrieved from <https://www.healthinsurance.org/obamacare/>. Accessed May 2019.
- Anyanwu, J. C., & Erhijakpor, A. E. (2009). Health expenditures and health outcomes in Africa. *African Development Review*, 21(2), 400-433.
- Ashley, M. (2012). Medicare & Medicaid Access to Care Under the Affordable Care Act. *Missouri medicine*, 109(6), 418.
- Baker, D. W., Sudano, J. J., Albert, J. M., Borawski, E. A., & Dor, A. (2001). Lack of health insurance and decline in overall health in late middle age. *New England Journal of Medicine*, 345(15), 1106-1112.
- Bradley, E. H., Elkins, B. R., Herrin, J., & Elbel, B. (2011). Health and social services expenditures: associations with health outcomes. *BMJ Qual saf*, 20(10), 826-831.
- Burwell, S. M. (2015). Setting value-based payment goals—HHS efforts to improve US health care. *N Engl J Med*, 372(10), 897-899
- Cebul, R. D., Rebitzer, J. B., Taylor, L. J., & Votruba, M. E. (2008). Organizational fragmentation and care quality in the US healthcare system. *Journal of Economic Perspectives*, 22(4), 93-113.
- Centers for Medicare and Medicaid Services. (2012). Medicaid. gov: Keeping America healthy. Retrieved from <https://www.medicaid.gov/medicaid/eligibility/index.html>. Accessed February 2020

Centers for Medicare & Medicaid Services. [Table: National Health Expenditures by type of services and sources of funds, CY 1960-2018]. Office of the Actuary, National Health Statistics Group. Retrieved from <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical>

Collins, S. R., Bhupal, H. K., & Doty, M. M. (2019, February 7). Health insurance coverage eight years after the ACA: fewer uninsured americans and shorter coverage gaps, but more underinsured. *New York, Commonwealth Fund*. Retrieved from: <https://www.commonwealthfund.org/publications/issue-briefs/2019/feb/health-insurance-coverage-eight-years-after-aca>. Accessed January 2020

Crémieux, P. Y., Ouellette, P., & Pilon, C. (1999). Health care spending as determinants of health outcomes. *Health economics*, 8(7), 627-639.

Currie, J., Decker, S., & Lin, W. (2008). Has public health insurance for older children reduced disparities in access to care and health outcomes?. *Journal of health Economics*, 27(6), 1567-1581.

Delen, D., Fuller, C., McCann, C., & Ray, D. (2009). Analysis of healthcare coverage: A data mining approach. *Expert Systems with Applications*, 36(2), 995-1003.

Department For Professional Employees (2016) The U.S Health Care System: An International Perspective. Retrieved from <https://www.dpeaflcio.org/factsheets/the-us-health-care-system-an-international-perspective>. Accessed March 2019

Ferrer, R. L., Hambidge, S. J., & Maly, R. C. (2005). The essential role of generalists in health care systems. *Annals of internal medicine*, 142(8), 691-699.

Gretl [Computer software]. (2016) Retrieved from: <http://gretl.sourceforge.net/>

Hadley, J., Holahan, J., Coughlin, T., & Miller, D. (2008). Covering The Uninsured In 2008: Current Costs, Sources Of Payment, And Incremental Costs: The cost of expanding coverage to the 16 percent of Americans who are uninsured would add 5 percent to national health spending. *Health Affairs*, 27(Suppl1), w399-w415.

Holgash, K., & Heberlein, M. (2019). Physician acceptance of new Medicaid patients: what matters and what doesn't. *Health Affairs Blog*.

Institute for Healthcare Improvement. (2007). The IHI Triple Aim. Retrieved from <http://www.ihl.org/Engage/Initiatives/TripleAim/Pages/default.aspx>. Accessed October 2019.

Kaiser Family Foundation. (2018). Key Facts about the Uninsured Population. <https://www.kff.org/>. Accessed March 2019

Kamal, R., McDermontt, D., & Cox, C. (2019, Desembre 20). How has U.S. spending on health care changed over time? Retrieved from: <https://www.healthsystemtracker.org/chart-collection/u-s-spending-healthcare-changed-time/#item-start>. Accessed January 2020

Kenton, W. (2019, July 18). Durbin Watson Statistic Definition. Retrieved from: <https://www.investopedia.com/terms/d/durbin-watson-statistic.asp>

Kwiatkowski, D., Phillips, P. C., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of econometrics*, 54(1-3), 159-178.

Levy, H., & Meltzer, D. (2004). What do we really know about whether health insurance affects health. *Health policy and the uninsured*, 179-204.

Macinko, J., Starfield, B., & Shi, L. (2007). Quantifying the health benefits of primary care physician supply in the United States. *International journal of health services*, 37(1), 111-126.

Moreno-Serra, R. (2015). The impact of cost-containment policies on health expenditure. *Fiscal Sustainability of Health Systems: Bridging Health and Finance Perspectives*. OECD Publishing, Paris.

OECD (2020), Adult education level (indicator). doi: 10.1787/36bce3fe-en. Accessed on April 2019

OECD (2020). Alcohol consumption (indicator). doi:10.1787/e6895909-en. Accessed February 2019

OECD (2019). *Health at a Glance 2019: OECD Indicators*. OECD Publishing, Paris, <https://doi.org/10.1787/4dd50c09-en>.

OECD Health Statistics (2018). Health expenditure and financing. Retrieved from: <https://stats.oecd.org/Index.aspx?DataSetCode=SHA>

OECD (2020). Life expectancy at birth (indicator). doi: 10.1787/27e0fc9d-en. Accessed on 19 February 2020

Or, Z. (2000). Determinants of health outcomes in industrialised countries: a pooled, cross-country, time-series analysis. *OECD Economic Studies*, 53-78.

Peterson-Kaiser Health System Tracker. Percent insured. Retrieved from <https://www.healthsystemtracker.org/indicator/access-affordability/percent-insured/>. Accessed September 2020.

Pittman, D. (2019, September 30). Medicare Accountable Care Organizations Generated \$1,7 Billion in Savings Last Year. National Association of ACOs. Retrieved from: <https://www.naacos.com/press-release--medicare-accountable-care-organizations-generated--1-7-billion-in-savings-last-year>. Accessed February 2020.

Rao, P., Nowak, S. A., & Eibner, C. (2018). The Commonwealth Fund. What Is the Impact on Enrollment and Premiums if the Duration of Short-Term Health Insurance Plans Is Increased? Retrieved from <https://www.commonwealthfund.org/publications/fund-reports/2018/jun/what-impact-enrollment-and-premiums-if-duration-short-term>. Accessed March 2020

Rice, T., Unruh, L. Y., van Ginneken, E., Rosenau, P., & Barnes, A. J. (2018). Universal coverage reforms in the USA: From Obamacare through Trump. *Health Policy*, 122(7), 698-702

Rudowitz, R., Garfield, R., & Hinton, E. (2019). 10 Things to know about Medicaid: setting the facts straight. *Kaiser Family Foundation*, 12. Retrieved from <https://www.kff.org/medicaid/issue-brief/10-things-to-know-about-medicaid-setting-the-facts-straight/>. Accessed September 2019.

Schoen, C., Davis, K., How, S. K., & Schoenbaum, S. C. (2006). US Health System Performance: A National Scorecard: The United States would have to improve its performance on key indicators by 50 percent or more to reach benchmark rates. *Health Affairs*, 25(Suppl1), W457-W475.

Schumpeter (2018) Which firms profit most from America's health-care system. Retrieved from Retrieved from: <https://www.economist.com/business/2018/03/15/which-firms-profit-most-from-americas-health-care-system>. Accessed April 2019

Starfield, B., Shi, L., Grover, A., & Macinko, J. (2005). The Effects Of Specialist Supply On Populations' Health: Assessing The Evidence: The evidence suggests that populations do not necessarily benefit from an overabundance of specialists in a geographic area. *Health Affairs*, 24(Suppl1), W5-97.

Tolbert, J., Orgera, K., Singer, N., & Damico, A. (2019). Key facts about the uninsured population. *The Henry J. Kaiser Family Foundation*. Retrieved from <https://www.kff.org/uninsured/issue-brief/key-facts-about-the-uninsured-population/>. Accessed January 2020

United States Census Bureau. Historical Income Tables: People. All Races. [Data File]. Retrieved from <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-people.html>

United States Census Bureau. Historical Series. Retrieved from <https://www.census.gov/data/tables/time-series/demo/health-insurance/historical-series.html>

U.S. Bureau of Economic Analysis (Last Revised 2020, April 29). Real Gross Domestic Product, Chained Dollars. [Table 1.1.6]. Retrieved from https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&nipa_table_list=6&categories=survey

U.S. Bureau of Labor Statistics. Unemployment Rate [UNRATE]. Retrieved from <https://fred.stlouisfed.org/series/UNRATE>. Accessed March 2020.

U.S. Department of labor (October 23, 2018) U.S. Department of the treasury, health and human services, and labor announce proposal to expand access to quality, affordable health coverage. Retrieved from: <https://www.dol.gov/newsroom/releases/ebsa/ebsa20181023>. Accessed January 2020.

Wooldridge, J. M. (2000). Basic regression analysis with time series data. *Wooldridge JM. Introductory econometrics: a modern approach*. Cincinnati, Ohio: South-Western College Publishing.

Wooldridge, J. M. (2013). Serial correlation and heteroskedasticity in time series regression. *Introductory Econometrics: A Modern Approach*. Mason, South-Western, 412-446.

World Bank, World Development indicators. (2018). Physicians (per 1,000 people) - United States. [Data File]. Retrieved from https://data.worldbank.org/indicator/SH.MED.PHYS.ZS?locations=US&most_recent_year_desc=true

World Health Organization. (2017). Human Rights and health. Retrieved from: <https://www.who.int/news-room/fact-sheets/detail/human-rights-and-health>

Zivot, E., & Wang, J. (2007). *Modeling financial time series with S-Plus®* (Vol. 191). Springer Science & Business Media.