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Renewable Energy Consumption: Initiatives in Colorado and Washington

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Renewable Energy Consumption: Initiatives in Colorado and Washington

Cover Page Footnote

I would like to thank Nathan Chan, Assistant Professor of Economics at Colby College, for his guidance throughout the process of this research paper. In addition, I would like to thank the students of EC472 for their suggestions and feedback.

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1. Introduction

Renewable energy is a rapidly growing sector throughout the global economy. In recent years, there has been a higher recognition of the environmental problems, such as global warming and climate change, that are affecting current day activity and that have detrimental effects in the future. Different renewable energy techniques exemplify possible strategies to overcome the earth's environmental obstacles. The transfer of the consumption of conventional energy mechanisms to renewable sources is an effective way to implement sustainability in federal, state, or local communities. The observation of trends is very important in order to maintain regulations and understand the magnitude of the negative effects. By examining state level adjustments to renewable energy consumptions, one can observe the improvements that exist within the United States. Since the renewable energy sector is increasing throughout the U.S., it would be fascinating to research the introduction of policy control for renewable energy consumption in states in comparison to the overall developments towards renewable energy consumption in the U.S.

In the early 2000s, there were few initiatives that promoted energy conservation or consumption of renewable energy on the state level that were approved. This paper will examine two initiatives that were approved in Colorado and Washington. Colorado had an initiative for renewable energy in 2004. The state planned to increase the overall percent of electricity consumption stemming from renewable sources. Washington had an initiative for energy conservation in 2006 that encompassed the installation of a new target range for energy conservation and renewable energy. See Appendix A for more information about the two initiatives.

Colorado has access to many renewable energy resources based on its geography. For example, it has the highest average elevation in comparison to any other state and has many open plains that provide space for wind energy sources. In addition, it has solar resources in the south of the state. Colorado was the, "fist state with a voter-approved Renewable Portfolio Standard (RPS)" (EIA online). At first, the initiative required that Colorado utilities with 40,000 or more customers must generate or purchase a percentage of their electricity from renewable energy sources – solar, wind, geothermal, biomass, small hydroelectricity, and hydrogen duel cells – of at least 3% in 2007 and 10% by 2015. Consumers were offered a rebate and other incentives, such as, limiting the retail rate of resources for residential customers. The initiative effects are still active because by 2020, there is a requirement in Colorado to have 30% of the electricity sold by investor-owned utilities to come from renewable energy (Ballotpedia online).

Washington has the highest electricity generation from renewable resources in the nation. This is due to its hydroelectric power, which generates seventy-five percent of the state's renewable electricity production. Although hydroelectric power is also a major resource of renewable energy consumption, it was excluded in the initiative in order to focus on other renewable energy consumption strategies. The second highest renewable resource in Washington is wind energy. The Energy Independence Act of 2006 increased energy conservation and required that utilities with 25,000 customers must access 15% of their electricity from renewable resources by 2020 in addition to verifying that their energy conservation methods were cost-effective (EIA online). Energy credits or pay penalties were a couple of the ways in which Washington administered the conservation and use of renewable energy resources (Ballotpedia online).

This paper examines the use of policy mechanisms to increase renewable energy consumption. I hypothesize that if there is an introduction of initiatives, then renewable energy consumption will increase after implementation. In addition, I hypothesize that the initiatives will effect consumption of wind energy more than other renewable energy sources based on the goals of each initiative and the accessibility to wind energy resources in the two states. The initiative for Colorado included solar and wind consumption due to the state's geographic location while the proposal for Washington focused on wind and other renewable energy consumption strategies. I am using a policy evaluation to observe the effects of the initiatives in Colorado and Washington in the years after enforcement.

2. Brief Literature Review

Grant D. Jacobsen analyzes Al Gore's documentary, *An Inconvenient Truth*. He evaluated the release of the film in relation to the purchase of voluntary carbon offsets. Furthermore, he measured how awareness and behavior is changed if people are in close proximity to a theatre or view the film. Areas that were ten miles away from the movie theatre had a causal relationship with an increase in offsets. There was a 50 percent relative increase in the purchase of voluntary carbon offsets within two months after the documentary was released (Jacobsen 2011). This was examined with a difference-in-difference model, which is the estimator I use in my paper. Although the methodology is applied in a different context, Jacobsen observes a policy change as well.

Bollinger and Gillingham observe solar energy peer effects of solar PV panels in neighborhoods. They recognize that reducing consumer uncertainty about installing solar is critical to expand the market. The market side of renewable energy is analyzed and consumers' likelihood to purchase panels is assessed (Bollinger and Gillingham 2012). My paper examines solar energy as well, but I am more interested in the overall effect of a policy change. I emphasize how government regulation increases renewable energy in an entire state rather than examining the market change within different communities.

The most similar research and analysis in comparison to my paper examine state governments' focus of energy policy leaders. The RPS is an innovative policy mechanism that raises the portion of renewable energy electrification in the electricity market (Carley 2009). Carley's paper explores the effectiveness of state energy programs, and, in particular, it observes the RPS policy implementation of the renewable energy electricity generation across states. My paper differs form this one because I incorporate initiatives and specific announcements through policy changes in states. In contrast, Carley looks at the RPS overtime and observes the compounding effects of the implementations. My paper contributes a different outlook because by using initiatives that were approved in states, there was a general consensus about the policy changes in energy conservation and renewable energy consumption strategies. This policy regulation change should result in the increase of renewable energy consumption after implementation of the initiatives.

3. Data

In order to effectively measure the change of renewable energy consumption after the announcement and implementation of an initiative, I used data sets provided on the U.S. Energy Information Administration. The data included state specific information in regards to primary energy consumption from 2000 to 2013. I assembled biomass, solar, wind, total renewable energy consumption and total energy use per year and per state from the compiled database. My ideal data analyzes the time before and after the two initiatives. Ultimately, it would have been optimal to obtain data by month or semiannually, but acquiring data per year was sufficient. To use the data most efficiently, I will observe this data in the two states that had approved initiatives: Colorado and Washington, and use a comparison group of all other states. By observing these differences, the data should provide information towards the hypothesis I predict.

I will be using Ballotpedia for information on the approved initiatives in Colorado and Washington in the mid-2000s. Advancements in income or GDP per state naturally correlate to an increase in renewable energy consumption. In order to control for this factor, I obtained panel data from the Bureau of Economic Analysis (U.S. Department of Commerce). I incorporated the real GDP by state that is chained to 2009 dollars in millions for each year to verify the increases in consumption. It confirms that the increases in renewable energy consumption are not incorrectly correlated with the time trend and are not illustrating spurious relationships. State growth may be much larger than another state due to the size of its economy, so this would not accurately predict energy consumption. Higher income and GDP correlates to increases in renewable energy use, so by using real GDP as a control, energy consumption changes are validated. Therefore, the data should account for this possible misinterpretation of causality by incorporating the numerical values of real GDP per year.

The summary statistics are an average of all of the data, not state specific. The number of observations is obtained by looking at each state for 14 years. The statistics confirm that there are extreme differences throughout states in terms of biomass, solar, and wind energy techniques. In addition, it is evident that total renewable energy consumption, total energy consumption, and real GPD growth are at very different levels in each state.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Observations	700	350.5	202.22	1	700
Year	700	2006.5	4.03	2000	2013
State	0				
Biomass (trillion Btu)	700	71.68	82.87	0.6	1555.2
Solar (trillion Btu)	700	2.19	8.20	0	109.3
Wind (trillion Btu)	700	10.81	30.56	0	342.3
Total Renewable (trillion Btu)	700	143.29	175.66	1.3	1069.3
Total Energy (trillion Btu)	700	1941.71	2063.59	126.5	12944.1
Real GDP (millions of chained 2009 dollars)	700	294.47	552.16	22	11995

Table 1. Summary statistics for different variables averaged between all states.

Wind consumption, solar consumption, and total renewable energy consumption in both states display trends that result from the initiatives. Figures 1, 2, and 3 separate Colorado and Washington out from the average consumption of the other 48 states. Figure 1 illustrates that after the initiatives were enacted, Colorado and Washington had increases in wind energy consumption. After the initiative took place in 2004, there were immediate increases in wind consumption in Colorado. There is an ambiguous trend in Washington before the initiative implementation in 2006, but there is a substantial increase after 2006 depicted by the increasing slope. By comparing Colorado and Washington to the other states in this figure, it is clear that the initiatives increased wind consumption after implementation.

In Figure 2, solar consumption is illustrated. The initiative for Colorado included more regulation towards solar consumption due to its geographic location in comparison to the proposal for Washington, which focused on wind and other renewable energy consumption strategies. Washington had very little solar consumption increases in the last decade, but there has been some progress. Although the average of the other states' solar consumption has a similar slope to Colorado's, Colorado's solar energy consumption increases as a faster rate. After the initiative in 2004, the first effects of the implementation are seen in 2005 with an increase in consumption from 0.0 to 0.2 trillion British thermal units, Btu. It is evident that the initiative increased solar consumption in Colorado after the policy change. The Colorado initiative anticipates and is in the process of regulating further increases for solar energy consumption in the future.

Figure 3 illustrates the increases in total renewable consumption of both Colorado and Washington after their initiatives. Due to Washington's hydroelectric energy, it has a much higher trend for renewable energy in comparison to Colorado and the average of the remaining states. While the average of all of the states has a steadily, increasing renewable energy consumption across the years 2000-2013, Colorado has a trend that increases at an increasing rate. It is difficult to observe the progression of total renewable energy in Washington due to its consistency of high hydroelectric energy in the treatment period after the initiative, but there is an overall increase in total renewable energy. The presentation of this data suggests that the renewable energy sector is increasing throughout the United States. In addition, the introduction of policy control seems to raise renewable energy consumption in comparison to the overall developments towards renewable energy options in the U.S.

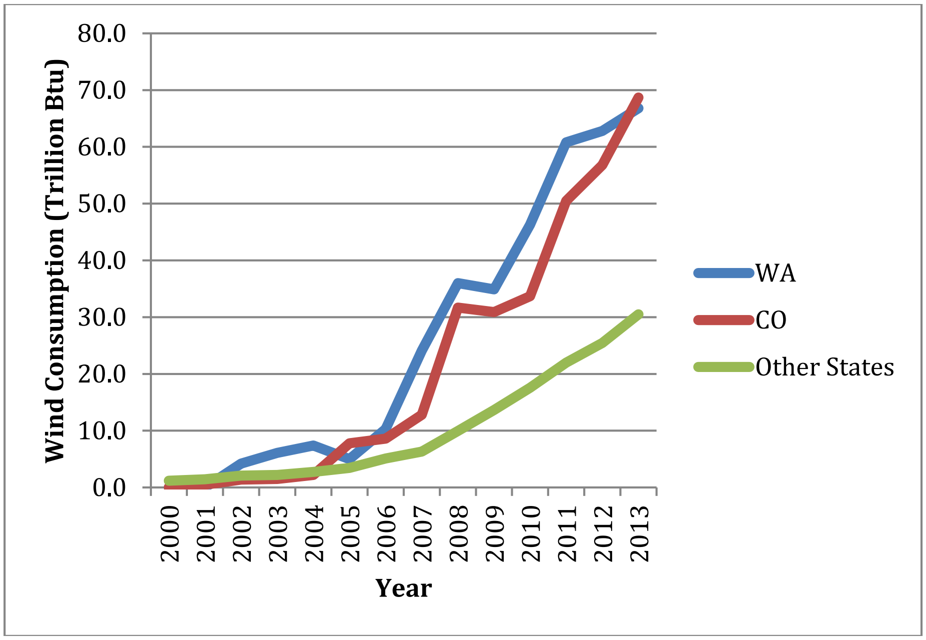

Figure 1. Wind consumption in Washington, Colorado, and the Average of the Remaining States.

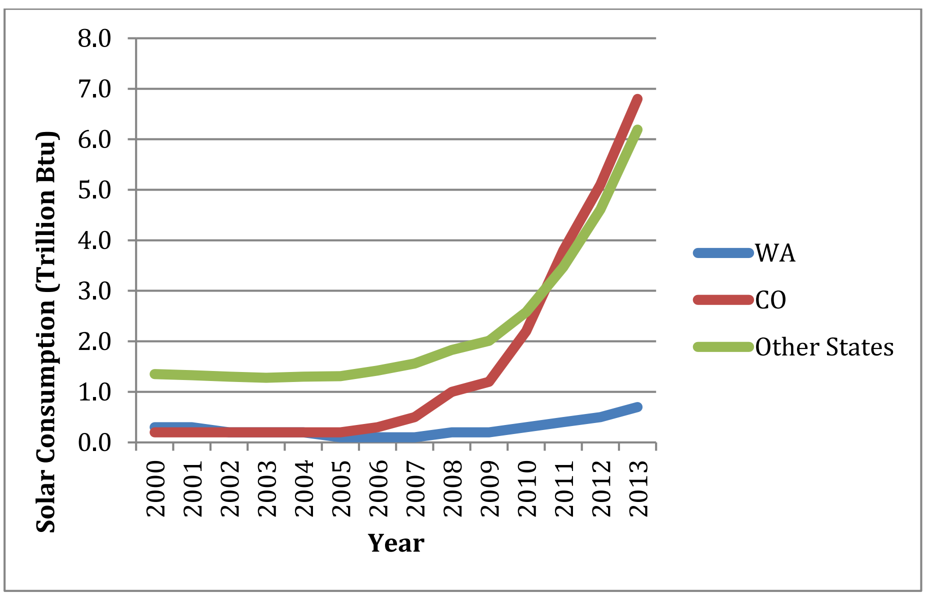

Figure 2. Solar Consumption in Washington, Colorado, and the Average of the Remaining States.

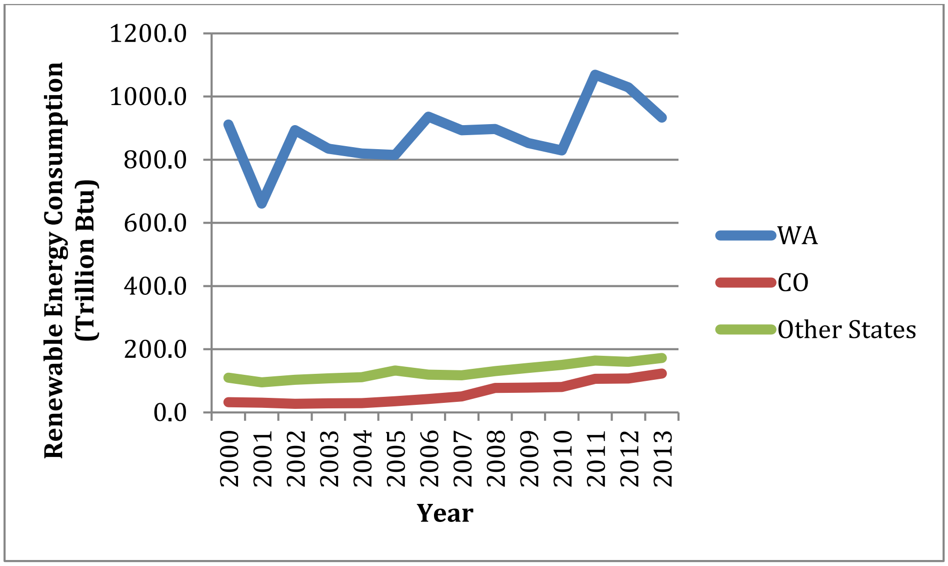

Figure 3. Renewable Energy Consumption for Washington, Colorado, and the Average of the Remaining States.

4. Empirical Results

The goal of each state government in Colorado and Washington was to increase the overall percent of electricity consumption stemming from renewable resources and to install a new target range for energy conservation and renewable energy consumption, respectively. To investigate these purposes, I will utilize a panel data model. In particular, a difference-in-difference estimator will be used to measure the influence of the change of the renewable energy consumption before and after the approval of the initiatives in Colorado and Washington. This approach identifies the impact of the initiatives by examining whether the two states with treatments had and still have significant increases in renewable energy consumption after the proposals in comparison to all other states.

The panel data model consists of one observation per state per year, which can be seen in the figures above. I employ the estimating equation for outcome Y of each state *i* in time measured per year *t* (Y_{it}) for three difference-in-difference models:

$$Y_{it} = \alpha After2004_t + \beta Colorado_i + \gamma After*CO_{it} + \delta GPD_{it} + \varepsilon_{it} \quad (1)$$

$$Y_{it} = \alpha After2006_t + \beta Washington_i + \gamma After*WA_{it} + \delta GPD_{it} + \varepsilon_{it} \quad (2)$$

$$Y_{it} = \beta(\text{Colorado or Washington})_i + \gamma\text{Diff-inDiff}_{it} + \delta\text{GPD}_{it} + \varepsilon_{it} \quad (3)$$

where each Y_{it} could take the place for different renewable energy consumption outcomes: total renewables, wind, solar, etc. in trillion British thermal units (Btu).

Equation 1 encompasses the effects of the Colorado initiative in year 2004. Coefficient α evaluates the effects after 2004 in all states. Coefficient β evaluates the effects in Colorado in years 2000-2013. These coefficients are measured by turning dummy variables on or off for the year and state of the initiative. The coefficient, γ, is the interaction variable to determine the effects of the treatment after 2004 in the treated state. This equation corresponds to the empirical results found in Table 2. Column 1 and 2 contain estimates of solar and wind energy consumption. Columns 3 and 4 pertain to the total renewable energy consumption and total energy consumption. The units in all four of these columns are in trillions of British thermal units. The real GDP is chained to 2009 dollars in millions for each year and is used as a state energy consumption control.

Equation 2 is very similar and it includes the effects of the Washington initiative after year 2006. Again, α and β are coefficients that measure the effects of dummy variables that represent the time, after 2006, and state parameters, in WA. γ is the interaction variable to determine the effects after 2006 in Washington while GDP is still a state control. Column 1 analyzes solar energy consumption, column 2 estimates wind energy consumption, column 3 evaluates total renewable energy consumption, and column 4 measures total energy consumption in Btu.

Equation 3 examines the effect of the diff-in-diff estimators in Colorado and Washington simultaneously. The explanatory variable for coefficient β is a dummy variable and is one if the effects are being observed in one of the treatment states, Colorado or Washington. Furthermore, the diff-in-diff estimator examines the treatment states after the years 2004 or 2006, dependent on the year of the initiative. The real GDP is chained to 2009 dollars in millions for each year and acts as a control. Column 1, column 2, column 3, and column 4 estimate solar consumption, wind consumption, total renewable energy consumption, and total energy consumption in Btu, respectively.

Variables	(1) Solar	(2) Wind	(3) Total Renewable Energy	(4) Total Energy
After2004	1.14*	12.65***	31.78**	-117.59
	(0.61)	(2.29)	(12.71)	(139.98)
CO	-0.89	-0.33	-85.79	-547.68
	(3.45)	(13.02)	(71.96)	(792.73)
Diff-in-Diff CO	0.85	19.33	12.97	188.48
	(4.31)	(16.24)	(89.75)	(988.70)
Real GDP	0.01***	0.01***	0.13***	1.98***
	(.00)	(0.00)	(0.01)	(0.12)
Constant	-0.11	-1.70	86.13***	1443.08***
	(0.51)	(1.91)	(10.57)	(116.41)
Observations	700	700	700	700
R-squared	0.1361	0.1156	0.1825	0.2811
Standard errors in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

Table 2. Estimates of Y_{it} for wind energy consumption, total renewable energy consumption, and total energy consumption trillion Btu in Colorado.

Variables	(1) Solar	(2) Wind	(3) Total Renewable Energy	(4) Total Energy
After2006	1.57 ***	15.03 ***	30.06***	-135.48
	(0.58)	(2.17)	(9.16)	(134.20)
WA	-1.32	1.53	723.77***	-60.78
	(2.91)	(10.84)	(45.75)	(670.23)
Diff-in-Diff WA	-1.71	26.91*	53.40	98.73
	(4.12)	(15.33)	(64.69)	(947.82)
Real GDP	0.01***	0.01***	0.13***	1.98***
	(0.00)	(0.00)	(0.01)	(0.12)
Constant	-0.12	-1.07	75.50***	1426.09***
	(0.43)	(1.62)	(6.83)	(100.06)
Observations	700	700	700	700
R-squared	0.1418	0.1422	0.5374	0.2805
Standard errors in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

Table 3. Estimates of Y_{it} for wind energy consumption, total renewable energy consumption, and total energy consumption in trillion Btu Washington.

Variables	(1) Solar	(2) Wind	(3) Total Renewable Energy	(4) Total Energy
CO or WA	-1.93	-6.73	374.82***	-197.94
	(2.23)	(8.51)	(42.31)	(511.09)
Diff-in-Diff	1.12	35.97***	54.84	-44.70
	(2.92)	(11.15)	(57.48)	(670.16)
Real GDP	0.01***	0.02***	0.13***	1.98***
	(0.00)	(0.00)	(0.01)	(0.12)
Constant	0.66**	5.98***	90.72***	1368.88***
	(0.33)	(1.27)	(6.33)	(76.41)
Observations	700	700	700	700
R-squared	0.1325	0.0904	0.3190	0.2799
Standard errors in parentheses				
***** p<0.01, ** p<0.05, * p<0.1**				

Table 4. Estimates of Y_{it} for wind energy consumption, total renewable energy consumption, and total energy consumption in trillion Btu in Colorado and Washington.

From the results, it is clear that there were increases in Colorado, Washington, and nationwide in wind consumption and total renewable energy consumption. However, the results have little significance throughout the estimation outcomes. The lack of significance for the increase of renewable energy consumption is unexpected and counters rational thinking, which is possibly due to the low sample size. Although the results are not significant, the difference-in difference estimators for solar and wind energy consumption in Colorado are positive and above the values for all of the other states after the initiative was implemented in 2004. Therefore, the policy led to Colorado having increases in solar and wind energy consumption that were above the increases throughout the United States without policy regulations. When the primarily focus is on Colorado's total renewable energy consumption effects form the initiative, the results indicate that the initiative led to a 12.97 trillion Btu increase with the use of energy stemming from renewable energy. However, this fundamental variable of interest is not statistically significant. Additionally, total energy consumption after 2004 decreased in Colorado, even though the coefficient is not significant. This result is favorable because the total energy consumption, which includes conventional energy consumption, should decrease when the state is promoting conservation in addition to increasing renewable energy consumption. By looking at the R-squared, the majority of the model was not explained by the data, so there must be other reasoning for these results. Therefore, omitted variable bias could be a problem throughout this data.

When Table 3 is analyzed, there are more significant results for the initiative in Washington. Similar to all states, Washington had increases in wind energy and renewable energy consumption after the year 2006. The difference-in-difference estimator for wind energy consumption in Washington was significant. Therefore, the initiative led Washington to a 26.91 trillion Btu increase in wind energy. This increase is also higher than the average of all other states. Column 3 has increased statistically significant results. Renewable energy after 2006 and energy consumption in Washington clearly rose when the dummy variables were switched on, which is shown by their high levels of significance. However, the interaction term, the variable of interest, is not significant. Since the total energy consumption decreased, without significance, in column 4, Washington decreased their conventional usage of energy and energy usage in general due to the new target range regulated by the policy change.

After further examination on the effects of the diff-in-diff estimators in Colorado and Washington simultaneously, there is still low significance. A coefficient that illustrated high significance is the difference-in-difference variable on wind consumption in both states. Column 2 indicates that the initiatives led to a 35.97 trillion Btu increase of wind energy consumption in the two treated states during the years of treatment. By observing the effects in column 3, the increase in total renewable energy consumption rose significantly in Colorado and Washington. Although the diff-in-diff estimator is not statistically significant, it appears that there is an increase in renewable energy policy changes in CO and WA after treatment years in relation to the control group. Finally, column 4 does not have significant results, but it shows that total energy in the two treatment states decreased. Therefore, it is probable that conventional energy decreased in the two states, as well. This suggests that the initiatives in Colorado and Washington had valid impacts on renewable energy. In addition, these impacts were apparent when there was a national increasing trend towards higher renewable energy consumption.

Since numerous results were not significant, my hypothesis is rejected. However, if complete significance is not taken into account, the results confirm my hypothesis because the signs of my results were in support. For instance, the difference-in-difference outcomes for wind and total renewable energy variables for Colorado, Washington, and both states were always positive. Thus, the initiatives generated increased levels of renewable energy in the treatment states after the implementation in comparison to all other states.

The simplicity of the model may create restrictions that distract from the relationship between the initiatives and renewable energy changes. It may be a stretch to make this connection within these state initiatives when the entire country has an overall increase of renewable energy techniques. Intuitively, a policy regulation should increase renewable energy consumption; however, more explanatory variables might be needed to explain the data more appropriately. If I was able to use quarterly data instead of annual data, some gaps in the results may be filled. This would be a more accurate representation of policy evaluation. Since the R-squared values were very low, the data was not explained very well by the model. Furthermore, the results were in unit measurements, and the results may have been different or more accurate if I found the percentages of solar, wind, and total renewable energy out of total energy. It is possible that the policy was more focused on the change in the makeup of the state's total energy consumption rather than the unit increases of energy from renewable energy sources. Finally, there is a lot of information regarding solar and wind maps that is very hard to quantify. Since the land and geographic composition of the state is related to the renewable energy accessibility, I would incorporate GIS if I had more time. I would be able to figure out the potential of renewable energy consumption in states with policy change. Finally, I would compute the effects of the introduction of initiatives on renewable energy consumption based on geographic information in order to determine if my hypothesis is further confirmed.

5. Conclusion and Summary

The results illustrate that a study as simple as this one may not necessarily reach the intuitive, rational thinking that was assumed. Before the regressions were executed, the figures illustrated that these state initiatives increased solar, wind, and total renewable energy in the two states. Furthermore, the states have hit the target ranges for the energy conservation and renewable energy consumption since implementation. By completing this study, my analysis reveals that the lack of variables may minimize the significance of the results. The lack of statistical significance and accuracy may be due to the publicity aspect of the initiative.

It is possible that the initiatives are mostly for publicity. States that have policy initiatives would look better than other states that do not have definite proposals to transition to more renewable energy strategies. It is hard to say whether the results are insignificant due to the simplicity and bias errors or because there is a misconception about state initiatives. Policy implications and programs like this one may not target the population as well as they should. In the long run, the initiatives may dwindle down and have less of an effect on the utilities. There may be a spurious relationship between the growth in the states and the increase of renewable energy use. Thus, renewable energy consumption and energy conservation may continue to increase inaccurately due to the constant increases in GDP growth within the states. In the future, a more definite correlation between the dependent and independent variables needs to be confirmed before examination.

The results left me with many lingering questions. I suspect that the lack of significant results stem from the simplicity of the experiment. Therefore, if more variables had been incorporated in this study, the results may have been different. Future research should integrate community efforts into the process of increased consumption of renewable resources and conservation. Although many Americans do care about the environment and global climate change, more tips about conservation and energy use should be provided to communities on a regular basis. If an active community is created, more people will want to or feel obligated to make changes. Since global warming and climate change are concerning environmental problems, strategies to increase renewable energy consumption is one field of research that is growing immensely. Increasing energy stemming from renewable energy resources through policy regulation is an effective strategy to conserve energy and decrease conventional energy consumption. In the future, policymakers need to implement more environmental policies to ultimately elicit renewable energy consumption.

Appendix A.

The ballot for Colorado stated:
"An amendment to the Colorado revised statutes concerning renewable energy standards for large providers of retail electric service, and, in connection therewith, defining eligible renewable energy resources to include solar, wind, geothermal, biomass, small hydroelectricity, and hydrogen fuel cells; requiring that a percentage of retail electricity sales be derived from renewable sources, beginning with 3% in the year 2007 and increasing to 10% by 2015; requiring utilities to offer customers a rebate of $2.00 per watt and other incentives for solar electric generation; providing incentives for utilities to invest in renewable energy resources that provide net economic benefits to customers; limiting the retail rate impact of renewable energy resources to 50 cents per month for residential customers; requiring public utilities commission rules to establish major aspects of the measure; prohibiting utilities from using condemnation or eminent domain to acquire land for generating facilities used to meet the standards; requiring utilities with requirements contracts to address shortfalls from the standards; and specifying election procedures by which the customers of a utility may opt out of the requirements of this amendment."

Here is the link to the official initiative:
Colorado Renewable Energy Requirement, Initiative 37 (2004)

The ballot for Washington stated:
"This measure would require certain electric utilities with 25,000 or more customers to meet certain targets for energy conservation and use of renewable energy resources, as defined, including energy credits, or pay penalties."

Here is the link to the official initiative:
Washington Energy Conservation, Initiative 937 (2006)

Literature Cited

"About the ROE." EPA's Report on the Environment. United States Environmental Protection Agency. Web.

Bollinger, B. and K. Gillingham (2012) “Peer effects in the diffusion of solar photovoltaic panels,” Marketing Science, 31(6):900-912.

Carley, Sanya (2009) “State renewable energy electricity policies: An empirical evaluation of effectiveness.” The International Journal of the Political, Economic, Planning, Environmental and Social Aspects of Energy, 37(8):3071-3081.

"Colorado Renewable Energy Requirement, Initiative 37 (2004)." Ballotpedia: The Encyclopedia of American Politics. Web.

Jacobsen, G. (2011) “The Al Gore Effect: An Inconvenient Truth and Voluntary Carbon Offsets,” Journal of Environmental Economics and Management, 61(1): 67-78.

"Profile Analysis of Colorado." U.S. Energy Information Administration. Web.

"Profile Analysis of Washington." U.S. Energy Information Administration. Web.

"Washington Energy Conservation, Initiative 937 (2006)." Ballotpedia: The Encyclopedia of American Politics. Web.