Why Do Some Nations Have More Renewable Energy Policies?

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Abstract: Some nations have considerably more renewable energy policies than others and this research is attempting to discover why. Renewable energy use is quickly growing in our world and has become a major topic in today's politics. Existing literature suggests various theories as to why some nations have more renewable energy policies than others. I test these theories with data from two major data sources; REN21, the Renewable Energy Policy Network for the 21st Century, and the International Energy Agency. I anticipate that nations with a larger number of effective political parties, higher GDPs, and larger population would have more renewable energy policies because there would be more citizens voicing their opinions about using greener technology and implementing stricter regulations for the use of green technology. If these results are confirmed they will shed light on the keys to developing more green energy policies.

Introduction

The current level of renewable energy in most countries is even lower than would be economically efficient at today's market prices. As newcomers, renewable energy technologies face a series of market barriers. Many analysts are convinced that the long-term resource scarcity fossil energy faces is still not entirely priced-in. If current prices of fossil fuels reflected their scarcity correctly, renewable energy technologies would become more competitive. The prices of fossil fuels are highly volatile due to short-term changes and incidences in the world's energy markets. Renewables are generally local energies and, as such, provide diversification of the energy mix with a security premium. It is widely agreed that renewables should have a higher

share for energy security reasons in the energy portfolio in particular in oil and gas importing countries. The use of fossil fuels is, to varying degrees, damaging to the human health and the local environment. The reduction of these impacts by technical means increases the cost of fossil fuel use. Negative environmental effects (externalities) must be reflected in the energy price. All this improves the competitive position of renewable energy technologies. Renewable energy technologies offer prospects for a dynamic industrial policy. In industrialized economies plagued by unemployment and reduced growth perspectives, as well as in some developing countries, renewable energy technologies have proven to be an option of developing industries with a future.

With all of the talk about global warming, many nations are trying to make real improvements in the way they live and the CO2 emissions that they create. Many nations worldwide are now implementing renewable energy resource policies. Some nations are prevailing over others in terms of reducing CO2 emissions and working to discover new technology to promote renewable energy sources. The question is though, why are some of these nations ahead of others? Why is it that some nations have so many more renewable energy policies than others? The factors I looked at that may have some influence on a country's drive to use renewable energy policies. These factors include the nation's GDP, GDP per capita, primary political party in control, number of years since 1990 the party in control has been left-wing, industrialization, type of government, government effectiveness, number of parties, population, total labor force, voice and accountability, political stability and absence of violence/terrorism, regulatory quality, rule of law, and my dependent variable, the number of renewable energy policies each nation has. I look each variable within each nation and determine whether this is correlated with higher numbers of renewable energy policies.

I am looking at the Organisation for Economic Co-operation and Development (OECD) nations which are members of the International Energy Agency (IEA). The only member countries of the OECD that are not members of the IEA are Chile, Iceland, Mexico, and Slovenia; so these nations are not included in my study. There are twenty-eight nations total in my study, all of which are in the OECD and members of the IEA. Some of the data included in an Ernst and Young report concluded that China is the leading country in renewable energy resource investment. Most of this investment is given to China's wind-power development. The wind market in China has surpassed the United States' wind market when four years ago the U.S. led the market. This, however, doesn't mean that China is leading in the implementation of renewable energy policies. My paper will reveal which nation is leading and why.

The leading nation right now in renewable energy policies is Slovakia. Trailing behind are Poland, Italy, and France. I am looking to discover why.

Many other studies that have been done have concentrated on specific countries and their renewable energy sources. They have also focused on what type of policies these countries have implemented and how they work. My study is different in the fact that it concentrates on how many policies each of these nations has and to what variables brought these policies into effect.

Types of Policies

Part of the challenge of looking at renewable energy policies is determining which policies are actually effective. Much of the literature looks at the effectiveness of the renewable energy policies by looking at how much of a country's energy supply is renewable. They also look at how much technological development had been made in the form of renewable energy sources in each nation. Levy (2000), for example, looks at renewable energy through a political

economy lens as a source of power and as a business sector. His paper looks at the overall policy structure of the U.S. and European systems and seeks to determine which policy system is sound in helping to promote renewable energy production. Levy determines that the European policies work more efficiently in promoting renewable energy production because they tend to be better funded, targeted, and more consistent. This causes the policies to be more effective overall. Technological innovations have been made in Europe that have not been made in the United States yet because of these policies. So is it the number of policies that Europe has or is it the efficiencies of these policies?

Menantenue et. al also looked at the effectiveness of particular policies in different nations. They concentrated primarily on Europe, but looked at types of policies that are in place in many different nations. They determined that depending on the type of incentives that the policies provide, for example profitability, determines the type of policy that will be most effective in promoting renewable energy technology. This is a very important piece of information because it may not be the number of policies that matters, but more so the type of policy that is in place. So it is a matter of quality, and not quantity.

Influence of Surrounding Nations

Elin Boasson determined whether nations are influenced by others in setting renewable energy or not. Norway, currently not part of the European Union (EU), has recently started to implement EU renewable energy policies. The EU is a major player in renewable energy technology and so far the nations within the EU are leading overall renewable energy use. This is potentially influential to those nations that are around them, and hopefully to nations worldwide. This article looks at the EU's policies that revolve around renewable energy and look at which of

these policies the nations around them have adopted. One issue that results though is that the policies are rather weak, and in the other nations that have adopted them they tend to be unstable. This information is surprising considering many of these nations are leading in the use of renewable energy even though their policies are relatively weak. It may not just be the type of policies or the power that the EU has in general, but I believe that it is because the EU has so many policies and they expand from one nation to the next.

The Power of Policies

James Stoutenborough discusses renewable energy policies as being the main component of power to set renewable energy use in motion. Stoutenborough mentions that in order for us to all understand the future of our energy supply there must be the support of our political leaders. As long as political leaders are on board, more policies will be made, hence more renewable energy sources will emerge. Stoutenborough focuses on specific types of policies that are more effective than others and determines the type of policies that have already been adopted and why. Menanteau et. al also mention the necessary policy power in their paper. They claim that policies are only necessary to get renewable energy use in place and get new technology discovered. This is because companies are not willing to invest in renewable energy sources and new renewable energy technology unless they are forced to. There is no point in industries spending money to "clean up" if they will not see any profitable results in the end. They may even see it as "profit" to avoid any fees they may incur if they do not follow a policy. It is important to establish the importance of policies being in place in general to promote renewable energy use in order to prove that policies make a difference. Without policies in place renewable energy investment would be overall a lot lower and new renewable energy use technology would be a lot less discovered.

Political Influence

One of my independent variables that I would like to analyze is political influence in renewable energy development. By this, I mean what type of political party is leading the nation, for how long, and what are the beliefs of this party? Nicholas Fowler attempts to answer this on a state-level. Nicholas discovers the affects that the political culture of a state has on that state's likelihood of adopting particular renewable energy policies. I would like to expand this study to an international study, rather than a state-level study. I believe that there will be a relationship between the type of political party in office and the number of renewable energy policies that exist within that nation, but I wonder if it will be a significant relationship. Fowler realizes the importance of developing renewable energy policies, and although his study is done within the 50 United States, it is still informative of how nations as a whole work with renewable energy policies.

Specific Policies in Each Nation

Many of the member countries of the EU are also member countries of IEA, which is the group of nations that am studying for this paper. Because of this, I will need to know a lot about these country's energy policies-the policies that they have now, and policies that they expect in the future. Nilson et. al. looked into these policies of the EU to discover their effectiveness and determine which policies are most helpful in creating competition within renewable energy source markets. This competition is necessary to kick off renewable energy technology, because nobody is going to want to enter the market if they won't make a profit. By this, I mean that the market for creating renewable energy sources needs to be booming and needs to be consistently

profitable. It won't be profitable though if people aren't required to use renewable energy sources. We get these requirements through policies and regulations that the states implement. Levy looks at the different policies in the U.S. and in Europe and determines which ones are in place specifically to facilitate renewable energy innovation. Rooijen (2006) also looks at the policies that are in place to facilitate renewable energy innovation, but in the Netherlands. There are three main examples of renewable energy policies; feed-in tariff, policy targets, and renewable energy portfolio standards. Lin (2007) concentrates specifically on the US, Sweden, Germany, and the Netherlands to look at their different policies that are in place and many of the other articles that I have studied look into the different policies already in place.

Why the Policies are Adopted

There are many different variables that I look at to discover why renewable energy policies are adopted in these nations. I look to find a reason as to why some nations have more renewable energy policies than others. J.L. Lewis (2006) found that markets have a big influence on the adoption of renewable energy policies. Renewable energy sources create a whole new market for nations and can therefore increase economic activity, which is never bad for a nation. Lewis believes that this is the main driver for creating renewable energy policies, in order to drive nations into the renewable energy market. This market is becoming increasingly popular and competitive and nations are noticing this. They need to join before they get left behind and people are less likely to move into this market on their own with the risk of renewable energy use failing.

Wustenhagen (2007) also has his opinions on the primary reason for renewable energy policies being adopted. His findings revolve around "social acceptance" of the policies. By social

acceptance he means finding the approval of all nations, or citizens, to adopt policies and act according to green technology use. Social acceptance can explain how we do things and why we do them in the first place. If we look at nations as a whole, they all look for social acceptance in order to work with one another and the trend of renewable energy use is one of those acceptance variables. The more renewable energy use is being spread, the more likely it is to be socially acceptable and the more likely nations are to adopt policies to implement and regulate renewable energy use. Wustenhagen believes that this social acceptance is why many nations adopt renewable energy policies, because they are becoming more and more popular among nations.

Methodology

After looking over the sources that I have used for my variables I have come up with a definition of renewable energy policies. Renewable energy policies are measures taken to reduce greenhouse gas emissions, improve energy efficiency, and support renewable energy development and deployment. Without renewable energy policies there would not be much advancement made in renewable energy technologies due to market disincentive.

Variables: The dependent variable that I have chosen to use is "the number of renewable energy policies" that each nation has. I tested to determine which independent variables altered how many renewable energy policies a nation has and to decipher the reason that some nations are ahead of others in enacting renewable energy policies. The site that I used to find the number of renewable energy policies that each nation had was the International Energy Agency website. It is comprised of twenty-eight member countries and stays up-to-date on renewable energy policies in these nations. Renewable energy policies are the principle driver of today's renewable

energy use. They are measures taken to reduce greenhouse gas emissions, improve energy efficiency, and support renewable energy development and deployment.

I chose to use fifteen independent variables to test the dependent variable with. The first of these variables is gross domestic product (GDP). I used the CIA World Factbook to find all of the member country's GDP. My initial thought was that nations with higher GDPs would be more likely to have more renewable energy policies due to the fact that they would have more money and be more easily able to support research and development of renewable energy sources. The next variable that I used was GDP per capita. I also got this variable from the CIA World Factbook and initially thought the same thing with this variable as I did with GDP; the higher it was, the more likely nations were to support more renewable energy policies. Which political party is in control right now was another independent variable that I thought would be significant. I hypothesized that if there was a left –side party in control now, it would be more likely that the nations would have more renewable energy policies. Left-side politicians tend to have more aggressive approaches to renewable energy use and would therefore support renewable energy policies. The type of government was another variable that seemed significant to me. I thought that with more representative types of governments there would be more voices heard and it would be more likely for there to be renewable energy policies implemented. Another variable that I tested was the number of prominent political parties that a nation has. I thought that the more prominent political parties that a nation has, the more likely they were to have renewable energy policies. It seems that with two-party systems it is harder to agree on anything and get anything through Congress due to conflicting views, but with more parties expressing their opinion on the matter coalitions are formed and it seems more likely for policies to get passed concerning renewable energy. I thought that Population would influence the

number of renewable energy policies in the same way that GDP and GDP per capita would, with a positive relationship between the two. This was also the same situation with my variable "lforc" which is the labor force in a nation. I thought that there would be a positive relationship between this and the dependent variable. From the WorldBank data I was able to add the independent variable "vacct" which stands for voice and accountability. Voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption were all governance indicators. All of these variables broke down the type of government that each nation has and gave me more of an idea of which factors exactly altered each nation's government and their ability to have policy effectiveness. I thought that all these variables would have a positive relationship with the dependent variable as well because the more control that the government has the more they are able to implement renewable energy policies. Two more variables that I used were the type of party in control now (whether it is a left-side or right-side party) and the number of years since 1990 that a left party was in control. Again, I anticipated that the longer that a left-side party had been in control, the more likely it was that the nation had a high number of renewable energy policies. The last variable that I looked at was industrialization. I believed that the more industrialized a nation was, the less likely they were to pass renewable energy policies.

Findings

The first of the variables that I looked at were GDP and GDP per capita. As you can see from figures 1 and 2 there was not much of a relationship between them and the dependent variable. Although there was a positive relationship between GDP and the dependent variable it

was statistically insignificant with a significance level of .447. The significance level was the same for GDP per capita and the R square was .029. This goes against my hypothesis of the relationship between the two variables.

The next variable that I tested was the population of the nation. There was a slight positive relationship between this and the number of renewable energy policies in the nation, but overall the statistical significance was insignificant at .949. (Look to figure 3).

Labor force proved to be yet another variable that was statistically insignificant with a score of .503. The R square was .017 and you can see a clear positive relationship between the labor force and the dependent variable. This also goes against my hypothesis of a relationship between the two variables. (look to figure 4).

The variable "voice and accountability" literally flatlined in the graph that was produced, implying that there is no effect on the number of renewable energy policies in the nation due to this variable. It was statistically insignificant with a score of .771. (look to figure 5)

Years of left control since 1990 and the number of renewable energy policies in the nation also proved to be statistically insignificant. I found that there was actually a slight decline in the number of renewable energy policies with the higher number of years that the left party had been in control. This was surprising to me considering I thought that left parties were more likely to support renewable energy policies and would therefore implement more renewable energy policies. The significance was at .238. (look to figure 11).

When I looked at the effect of regulatory quality on renewable energy policies I saw that there was a positive relationship with the two variables. This was to be expected even though

there was not a large scale positive relationship because the curve was very slight. The statistical significance was .486. (look to figure 8).

While I did analyze all of my variables they all proved to be insignificant. You can see the relationship between each of them and the dependent variable via the following graphs, but none of them were statistically significant.

Summary and Conclusions

After looking at these findings we see a couple of different conclusions that were initially assumed. The number of years that the left party was in control since 1990 actually had an opposite effect on renewable energy policies. These results were surprising in some ways and not in others. In some ways, it was surprising to find that none of the variables were statistically significant because all of the variables were assumed to have some effect on the number of renewable energy policies that nations had. It was not surprising, however, because the nations that I studied all had around the same numbers for many of the variables. Due to this homogeneity, there wasn't much information that differed between the nations. I think that if I were to do the study again I would look at other nations outside of the OECD and IEA and see their development on renewable energy policies. I believe that these nations would be less developed and would therefore have different numbers than the nations that were used. The relationships between the independent variables used and the dependent variable were all insignificant but we could see either a positive or negative relationship with most of them, which proved part of the hypothesis to be true for most.

Figure 1: GDP

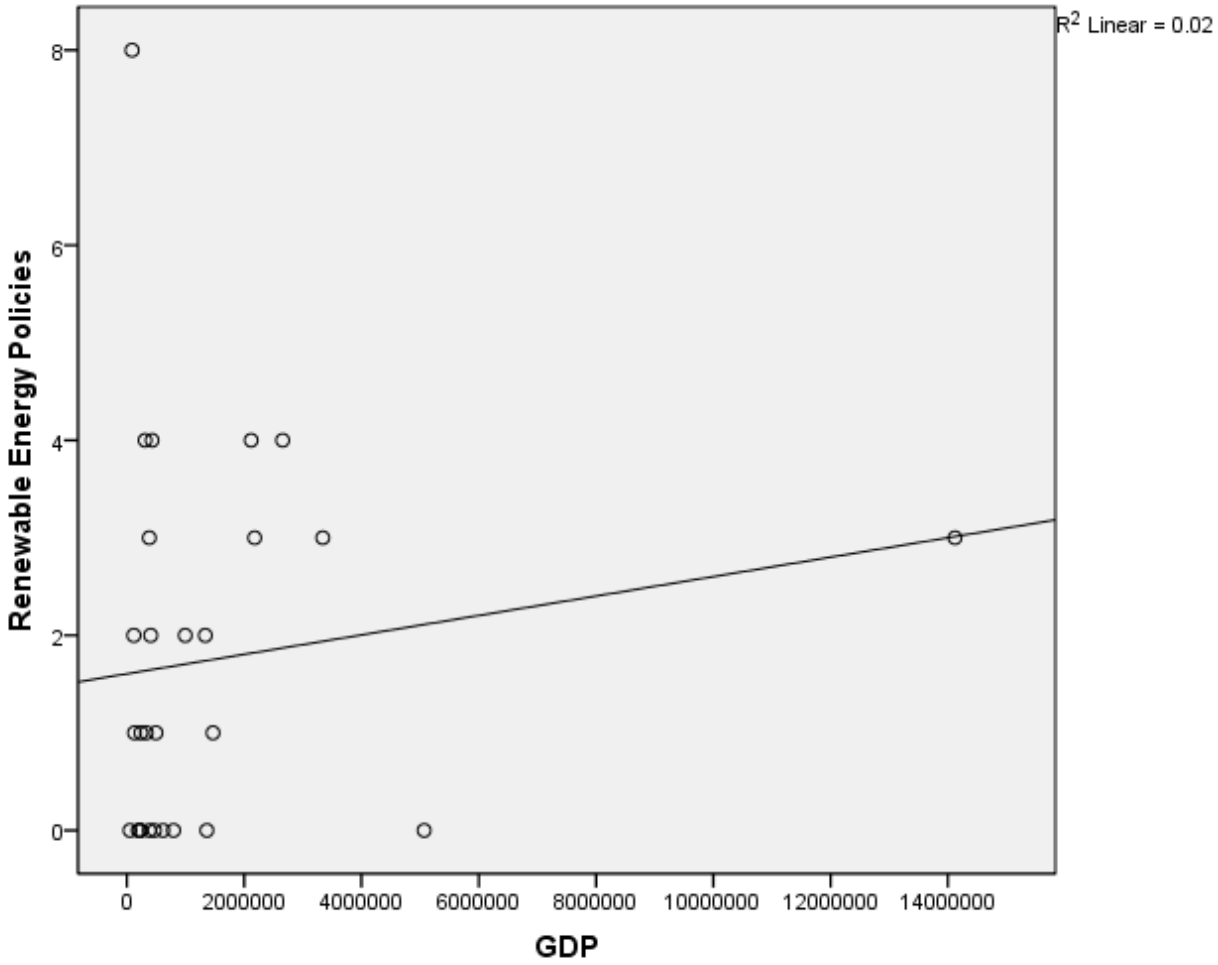


Figure 2: GDP per capita

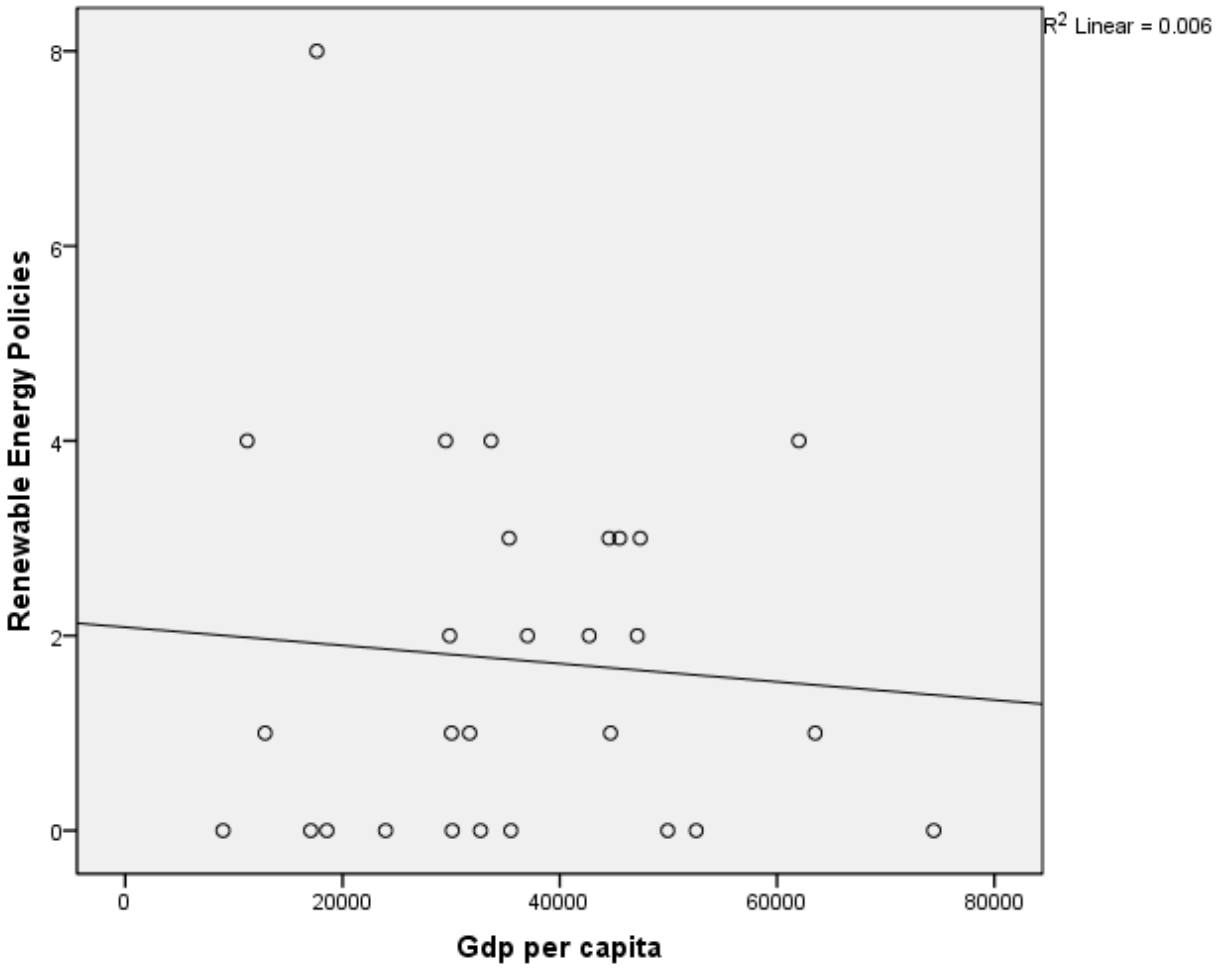


Figure 3: Population

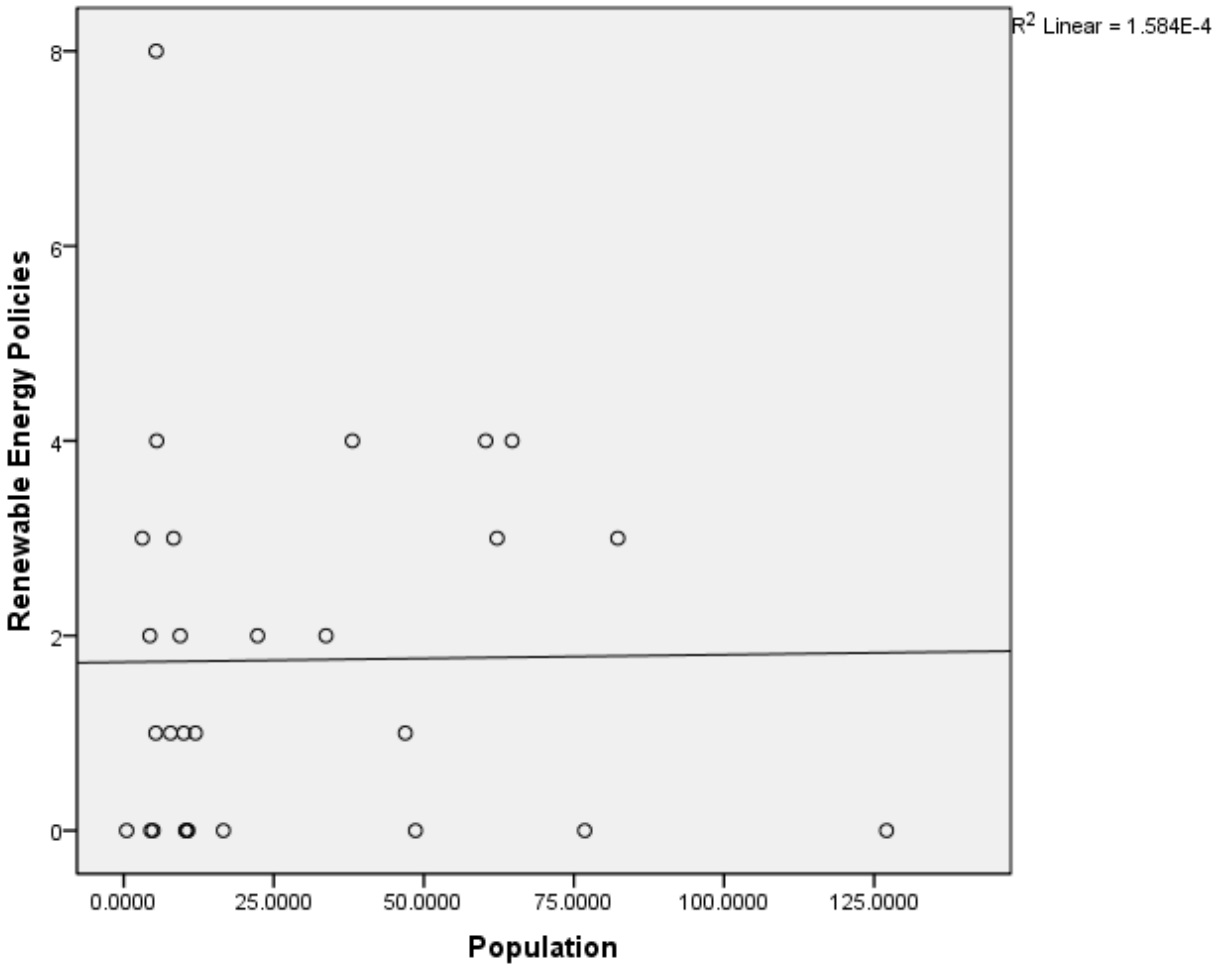


Figure 4: Labor Force

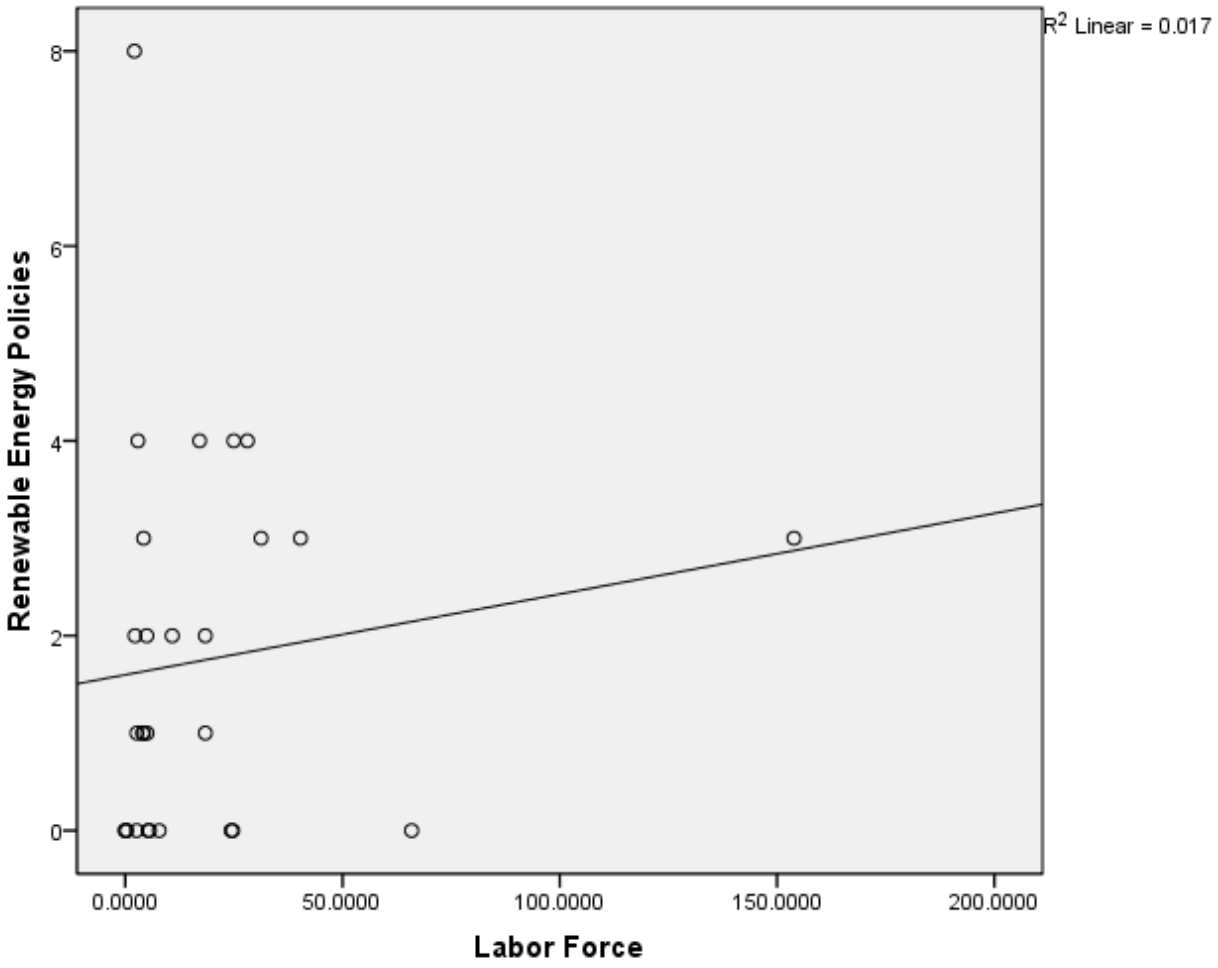


Figure 5: Voice and Accountability

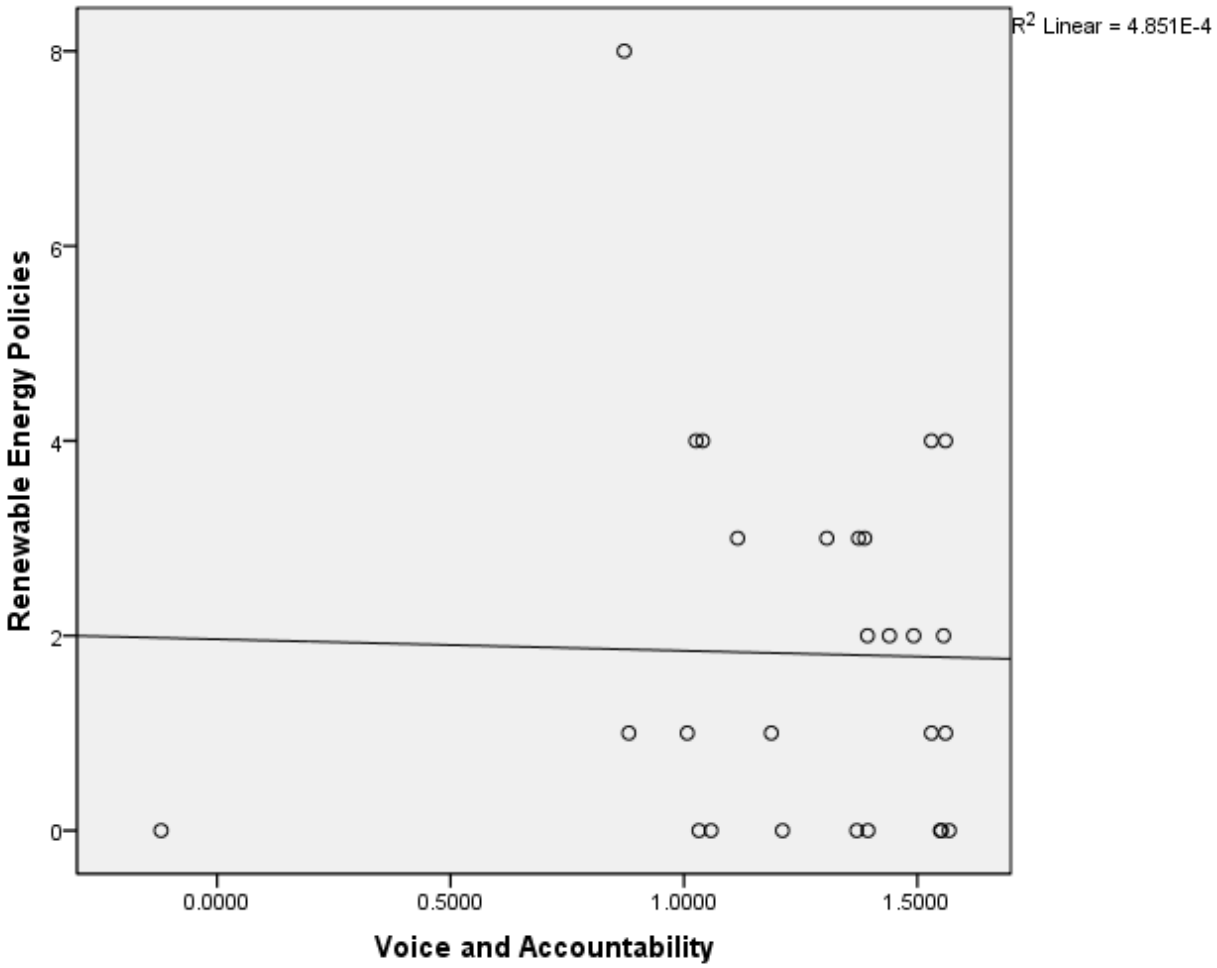


Figure 6: Stability of Government

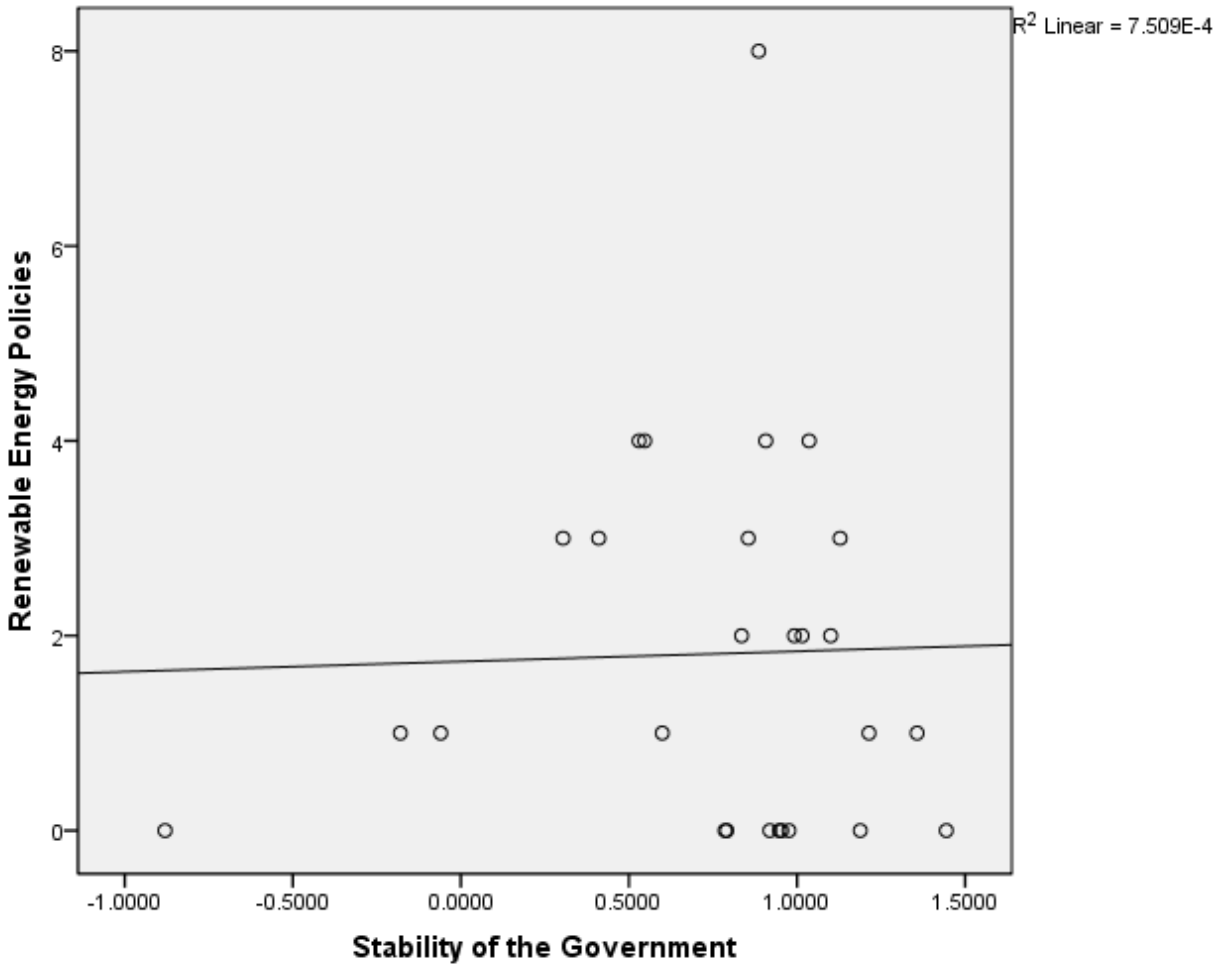


Figure 7: Government Effectiveness

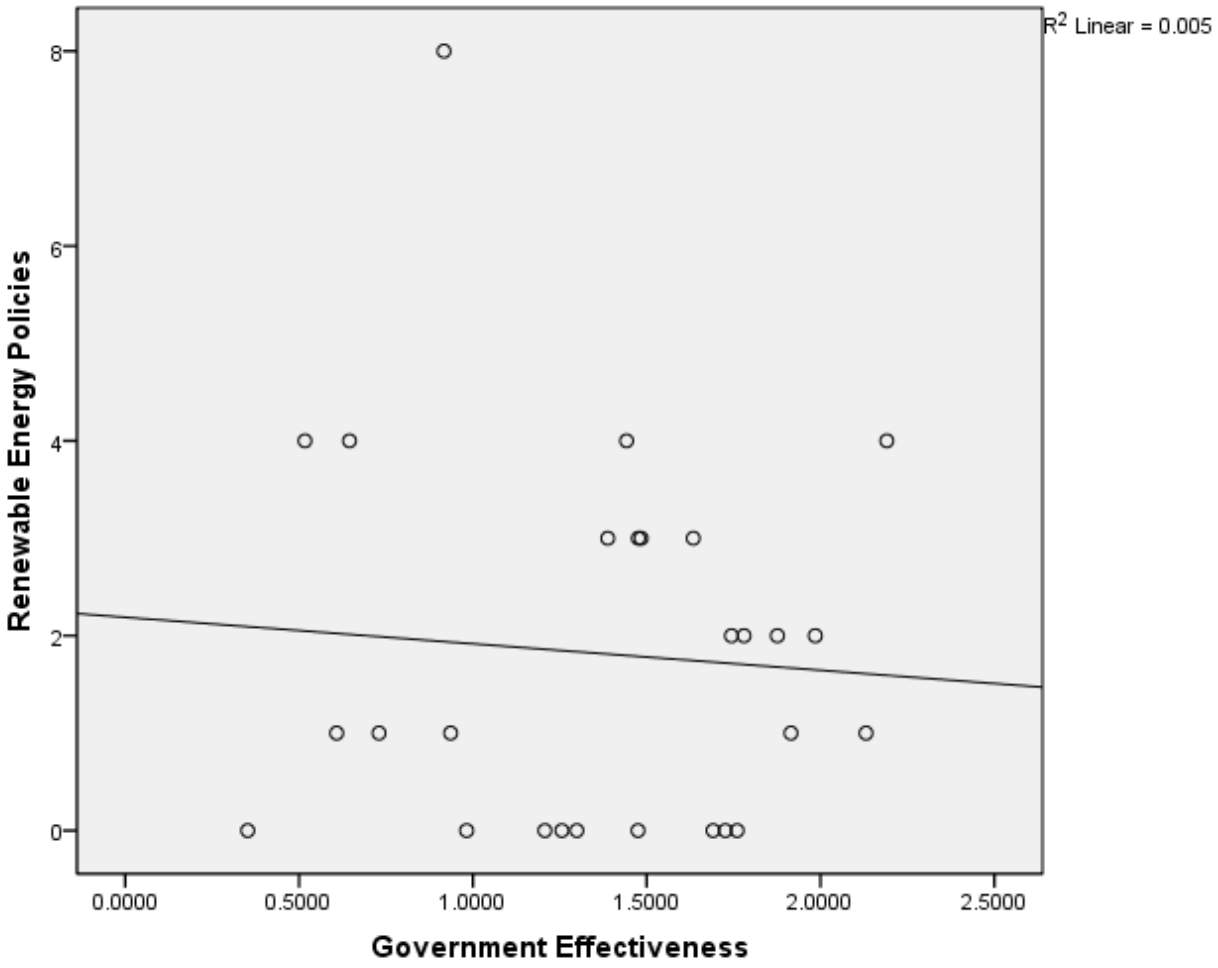


Figure 8: Regulatory Quality

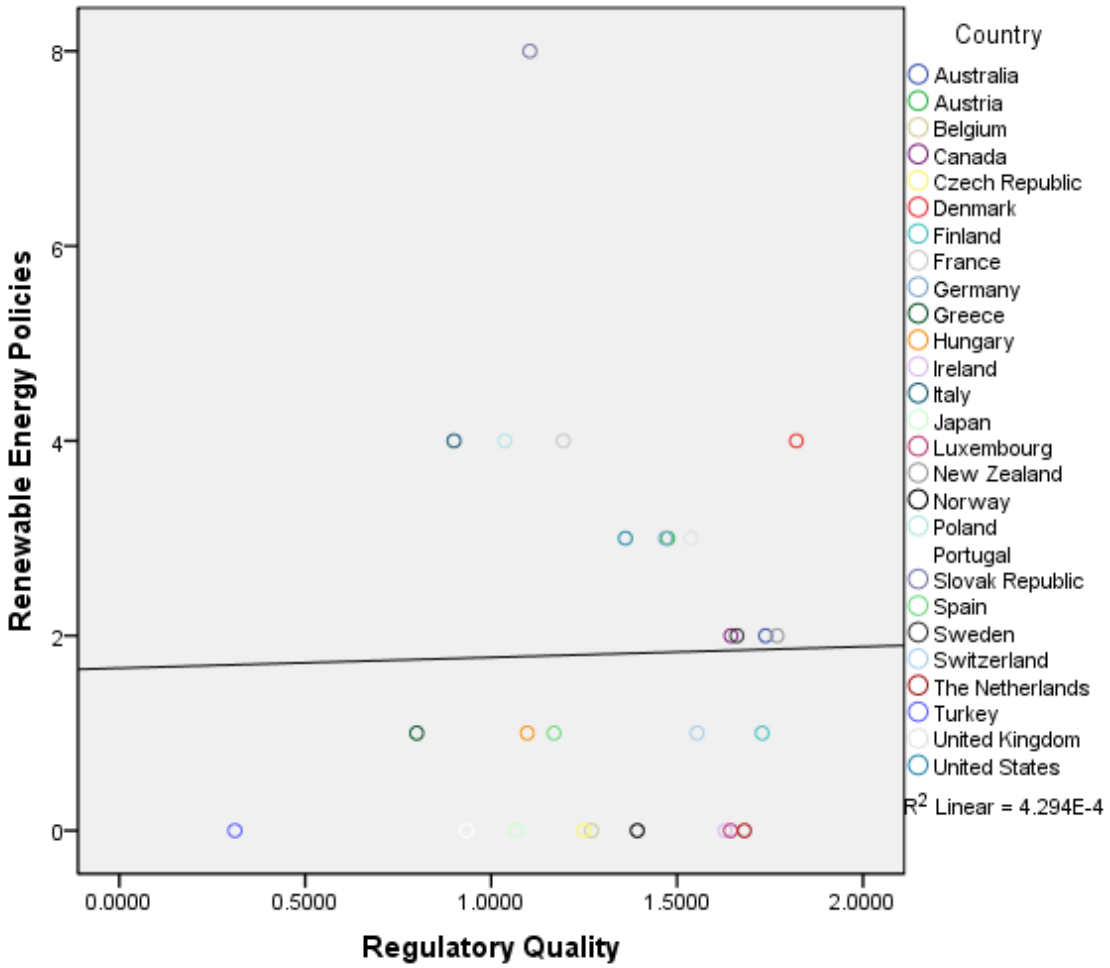


Figure 9: Rule of Law

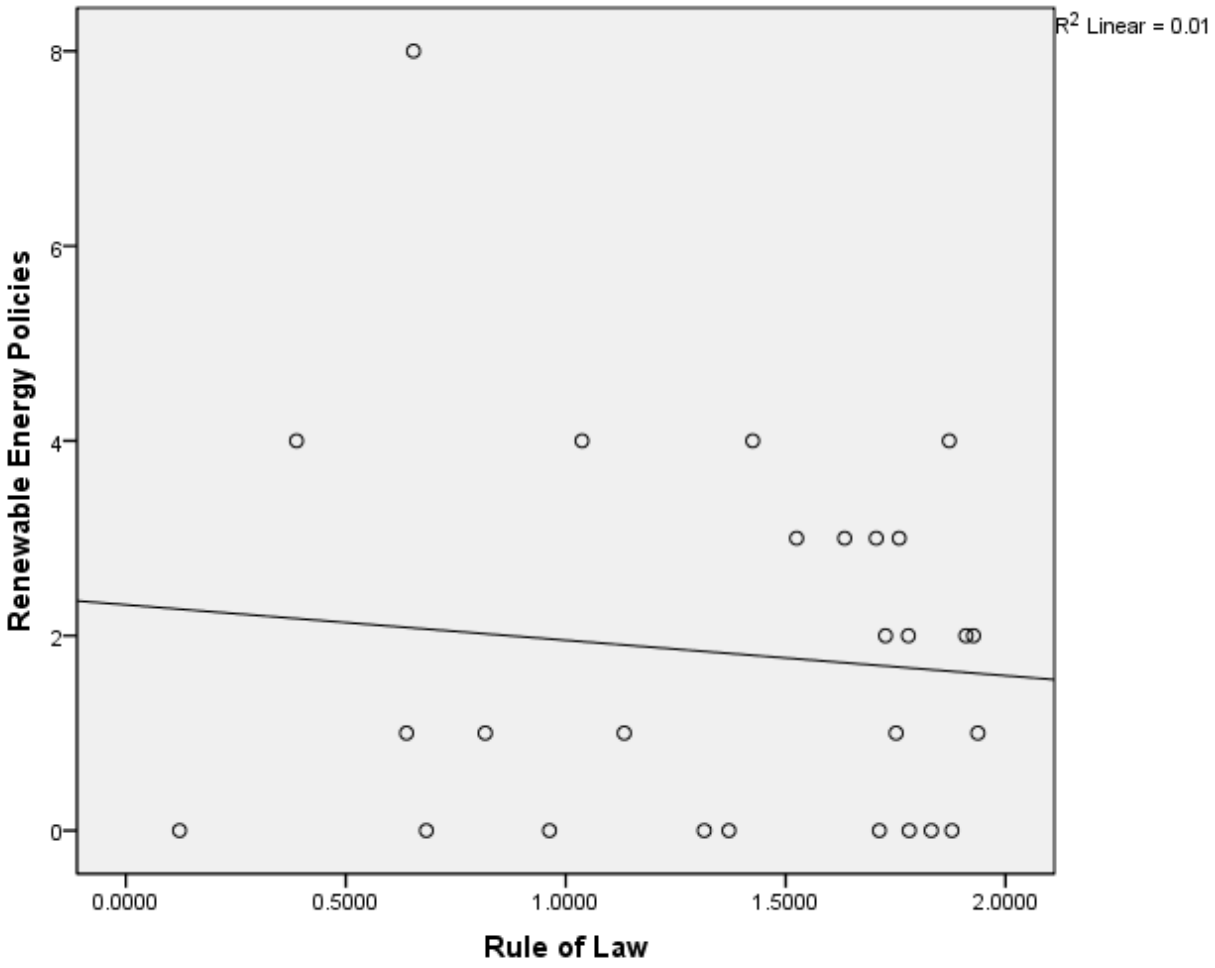
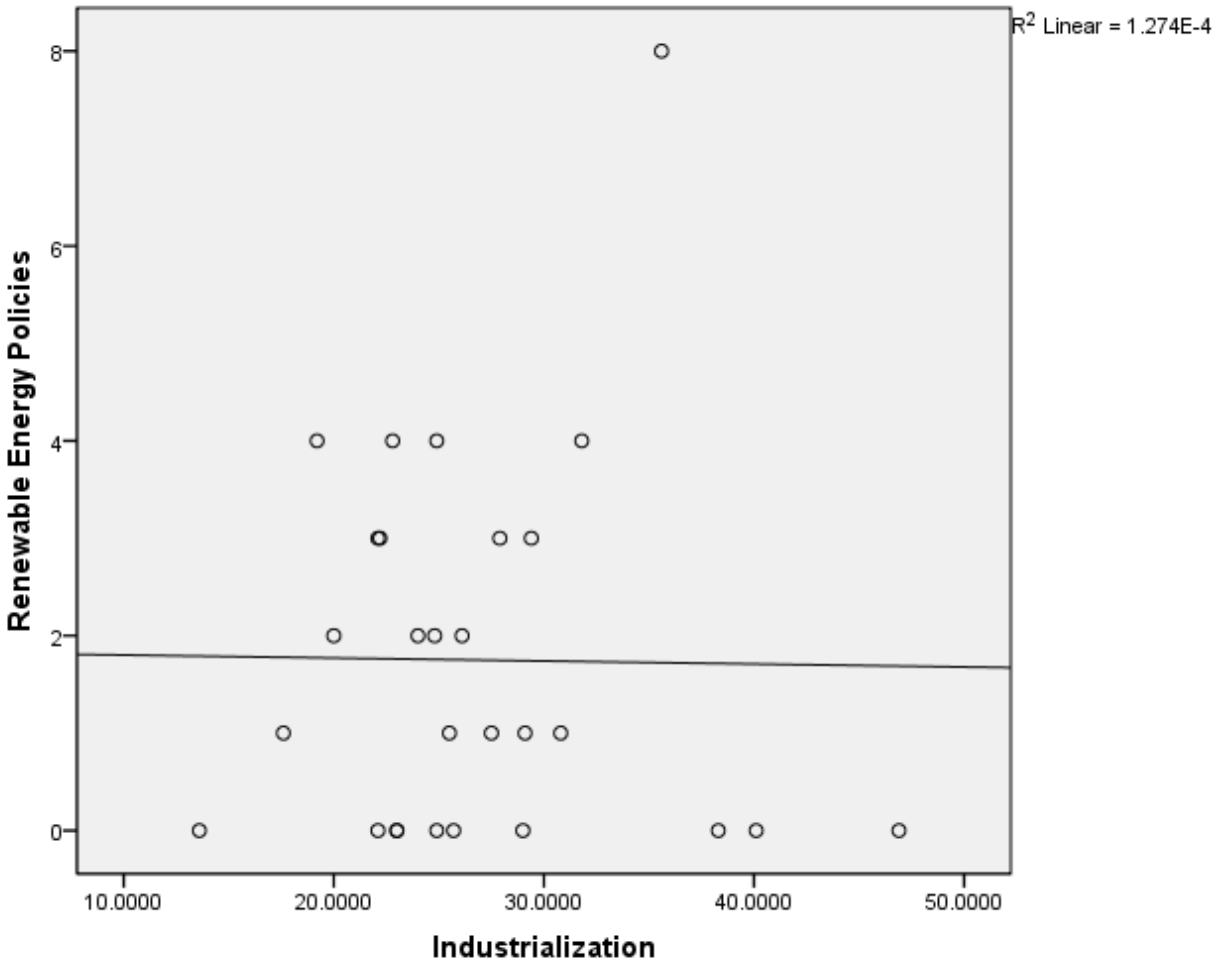


Figure 10: Industrialization


R^2 Linear = 1.274E-4
Renewable Energy Policies
8
6
4
2
0
10.0000
20.0000
30.0000
40.0000
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Industrialization

Figure 11: NYrs

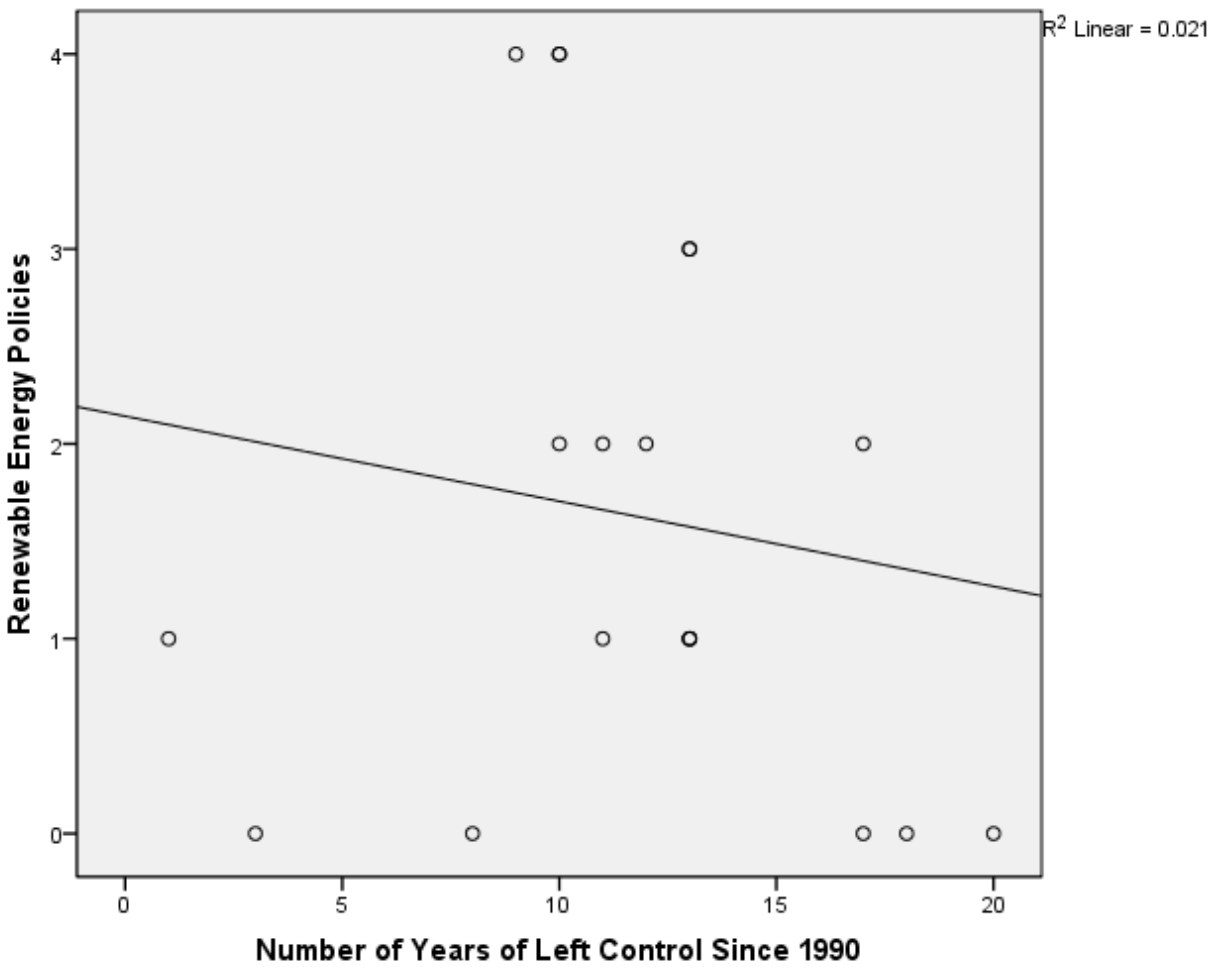


Figure 12: Party Currently in Control

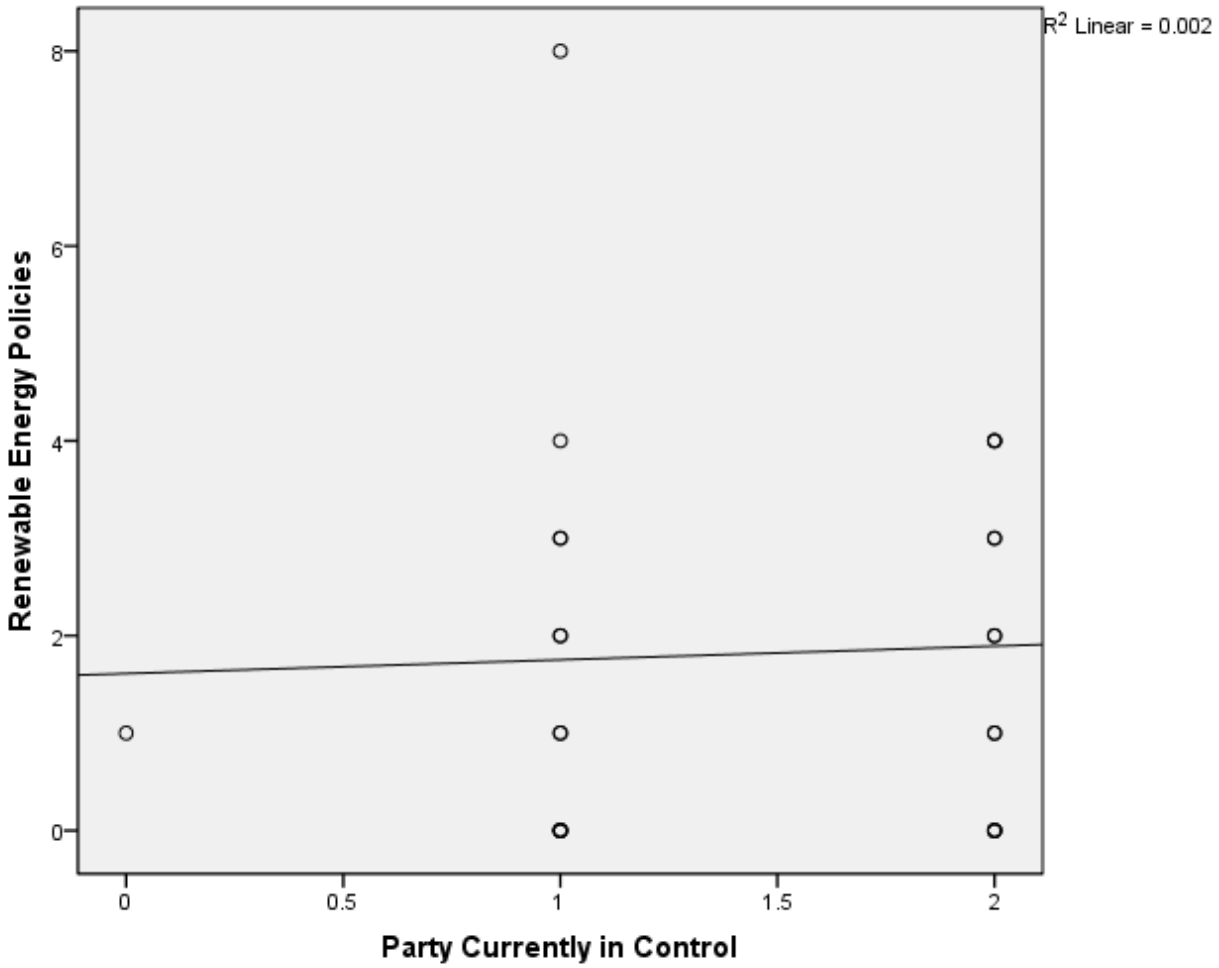
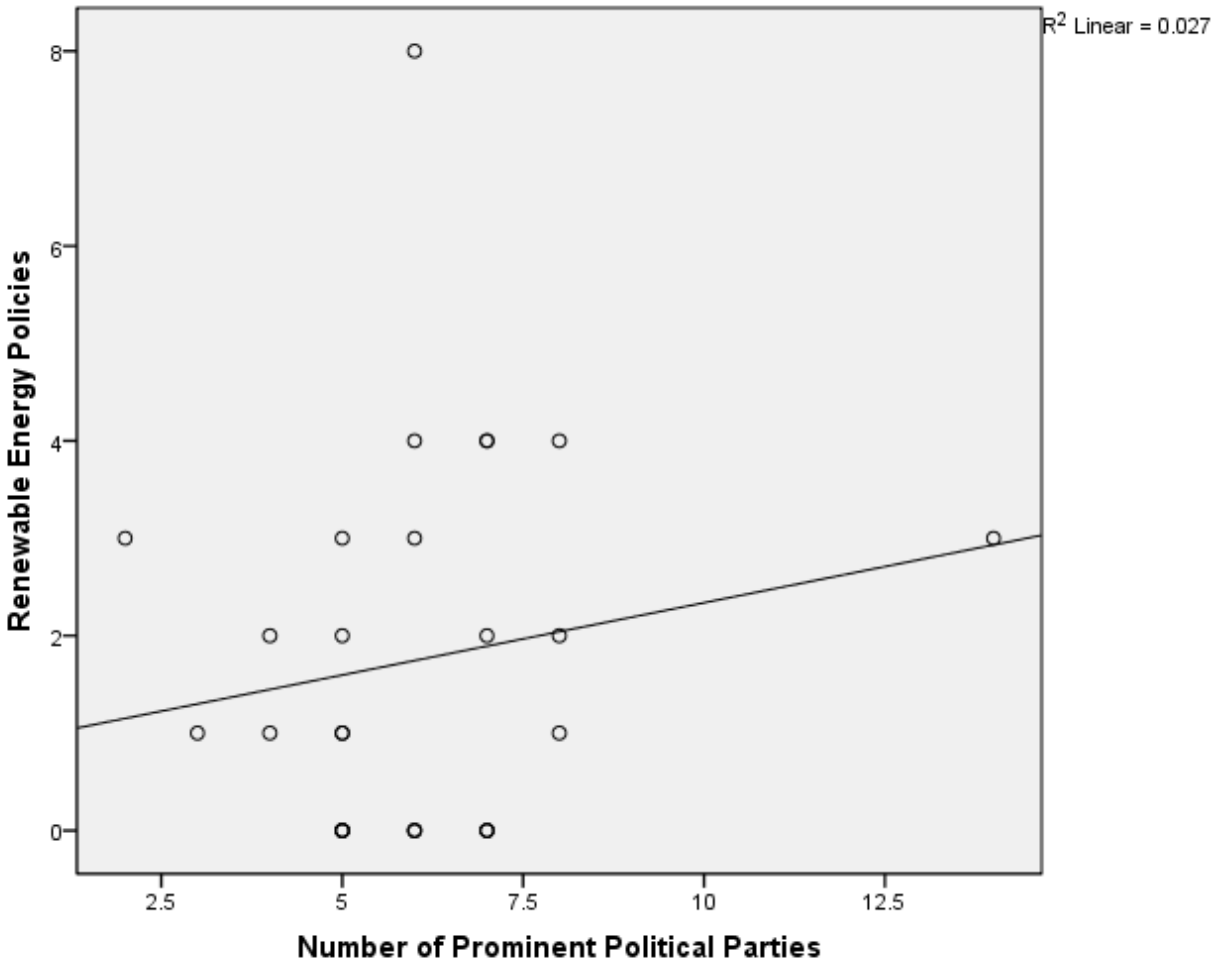


Figure 13: NProminent


R^2 Linear = 0.027
Renewable Energy Policies
8
6
4
2
0
2.5
5
7.5
10
12.5
Number of Prominent Political Parties