Proceedings of the 2nd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/52/20230705

An Empirical Study on Environmental Policies on Unemployment in Selected States in the United States

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Abstract: In the recent years, numerous environmental policies aiming at deterring environmentally hazardous actions have been put in place as a result of the increased concern for environmental quality in the United States. The unemployment rate is impacted by these regulations, which encourage environmental conservation. In addition, given structural unemployment, it is crucial to provide a just transition, providing employees and communities impacted by the move to a more sustainable economy with adaquate support. Policymakers and stakeholders must be aware of how environmental levies, in particular cap and trade, affect unemployment in order to weigh potential trade-offs and create mitigation plans for unfavorable effects. This research paper aims to investigate the relationship between cap and trade policies and unemployment rates. The literature review will encompass both environmental and economic perspectives to support the claims and discussions. Regression analysis and hypothesis testing are applied to set up relationships between cap and trade and unemployment rate. The findings may be used to draw conclusions and have interaction in discussions, dropping light on the complicated relationship among environmental policies and employment dynamics. In the long run, this study aims to provide insights for knowledgeable decision-making in crafting effective and equitable environmental policies that promote sustainable monetary growth while supporting workers and communities via the transition to a greener future.

Keywords: cap and trade, unemployment rate, greenhouse gas emission, structural unemployment

1. Introduction

In recent times, due to the rising concerns about environmental quality in the United States, an increasing number of environmental policies have been implemented to discourage environmentally harmful practices. There is growing support for a national US climate policy that can result in significant reductions in carbon dioxide and other greenhouse gas emissions [1]. The relationship between economic growth and environmental quality has been a source of great controversy for a very long time [2]. While these environmental policies save natural resources, mitigate pollution, and promote environmental protection, they also inevitably influence the unemployment rate. Understanding the impact of environmental policies on employment is crucial, as it enables policymakers and stakeholders to assess potential trade-offs and develop strategies to reduce negative consequences. One pivotal policy avenue that embodies this nexus between environmental concerns

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and economic consequences is the implementation of cap and trade, which may lead to a structural unemployment. Increased structural unemployment may be indicated by an increase in the variance of the 'c' values over time as compared to earlier periods [3]. In this context, the 'c' value represents cap and trade. Consequently, as cap and trade is progressively implemented, it is likely to result in increased structural unemployment. The phenomenon presents a conundrum for policymakers to the extent that structural unemployment is increasing [4]. This highlights the requirement for a proper transition, which ensures that those affected by structural unemployment receive retraining programs, job creation initiatives, and social safety nets. A cap and trade system is a tool used by government to put an absolute limit — a hard cap — on the pollution responsible for global warming [5]. One of the core questions that emerges is whether cap and trade policies, while beneficial for environmental sustainability, inadvertently lead to job losses. This question is grounded in the notion of structural unemployment, where shifts in economic patterns result in a mismatch between available jobs and the skills of the workforce. The concept becomes particularly relevant as cap-and-trade mechanisms can bring about transformations in industries that rely heavily on emission-intensive processes. Therefore, the central research question will focus on understanding the impact that cap and trade have on unemployment.

2. Methodology

This research paper will examine the research question of whether cap and trade has impact on unemployment rate or not. In the regulatory context, Cost-Benefit Analysis can be a helpful tool when assessing different regulatory program implementation strategies [6]. After taking Cost-Benefit Analysis into account, the preliminary claim is that cap and trade increase unemployment rate since company usually bear the most burden of a permit price. Herewith, the hypothesis for this research will be that cap and trade will increase unemployment. To testify the hypothesis, regression analysis with five variables has been conducted. The five variables include unemployment rate, cap and trade, greenhouse gas emissions, Covid-19, and six different US states as one variable. Setting Colorado as the base state, this research only considers other five states including California, New York, Massachusetts, Washington, and Oregon.

The data and statistics of these variables are collected from the U.S. Bureau of Labor Statistics and the U.S. Environmental Protection Agency. This research only considers the years 2017, 2018, 2019, and 2020. Setting unemployment rate as the dependent variable, six separated regression analyses have been run to ensure the relevancy of the results of the regression models. The first regression includes cap and trade as the only independent variable. The second regression includes cap and trade and adds in greenhouse gas emissions as the independent variables. The third regression includes all independent variables without the effect of Covid-19. The fourth regression includes cap and trade and Covid-19 as the independent variables. The fifth model includes cap and trade and Covid-19 and adds in greenhouse gas emissions as the independent variables. The sixth regression includes all independent variables. The results of the regression analysis are then used to conduct hypothesis testing to determine the conclusion for the research hypothesis.

$$\mathrm{Un}_{it} = \alpha_0 + \alpha_1 \mathrm{CT}_{it} + \alpha_2 \mathrm{GHG}_{it} + \alpha_3 \mathrm{States}_{it} + \epsilon_{it} \quad (1)$$

The first three regressions are based on equation 1. The variable Un represents unemployment rate, CT represents cap and trade, GHG represents greenhouse gas emission, and States represents the five states not including the base state Colorado. If the state has implemented cap and trade, the value of CT will be set to 1, if not, the value will be set to 0.

$$\mathrm{Un}_{it} = \beta_0 + \beta_1 \mathrm{Covid}_{it} + \beta_2 \mathrm{CT}_{it} + \beta_3 \mathrm{GHG}_{it} + \beta_4 \mathrm{States}_{it} + \nu_{it} \quad (2)$$

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The last three regressions are based on equation 2 which adds in the new variable Covid-19, represented by the variable Covid. The value of Covid for 2020 is 1, and for the other three years is 0. Adding Covid-19 into the model helps to factor in the affect that Covid-19 has on the unemployment rate while analysing the impact of cap and trade on unemployment rate.

3. Result

In Table 1, the result table for regression 1, 2, and 3 are displayed. The table includes the coefficient and standard error for each independent variables, with the number of standard errors in paratheses. For the last three columns of the table, the adjusted-R2, F-statistics, and observations of model 1 are being displayed.

Table 1: Results for models without factoring in Covid-19.

	(1)	(2)	(3)
Cap and Trade	2.003* (0.979)	2.457** (1.165)	1.658 (1.096)
GHG Emissions		-0.003 (0.004)	-0.184*** (0.034)
California			53.61*** (10.189)
New York			13.061*** (2.802)
Massachusetts			-10.407*** (2.239)
Washington			-5.08*** (1.694)
Oregon			-11.97*** (2.834)
Adj-R2	0.121	0.102	0.612
F-stats	4.177	2.319	6.196
Obs	24	24	24

Notes: *p<0.1 **p<0.05 ***p<0.01. Standard errors in parentheses

In regression 1 and 2, cap and trade and unemployment rate appear to have a fairly strong positive relationship. The coefficient of cap and trade in regression 1 is 2.003, and in regression 2 is 2.475. The p-value for both regressions is less than 10%. This means that as cap and trade has been implemented, unemployment rate will increase correspondingly. The result from regression 2 supports the result from regression 1, indicating that cap and trade can has impact on unemployment rate. Businesses will utilize fewer polluting inputs and pollution-intensive processes when adjusting to green growth regulations. As a result, each sector's labor need will fluctuate, either adding or eliminating jobs [7]. In addition, gases that trap heat in the atmosphere are called greenhouse gases [8]. In this context, cap and trade specifically destroys jobs that are non-green because the permit price increases the cost of production for companies with heavy greenhouse gas emission.

In regression 3, greenhouse gas emission has a coefficient of -0.184 which shows a negative relationship between cap and trade and unemployment. A p-value of less than 1% show a significantly strong relationship between greenhouse gas emission and unemployment rate. This indicates that greenhouse gas emission can significantly affect unemployment rate. Considering the relationship that higher unemployment rate is associated with lower greenhouse emission, and since cap and trade

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aims to lighten the emission of greenhouse gas, implementing a cap and trade policy could potentially lead to job losses due to an increase in the unemployment rate. The following worries have not been refuted by empirical data. Most of the time, carbon taxes and air quality laws have only minor negative employment consequences that are concentrated in energy-intensive and polluting businesses [9]. Furthermore, significant differences become apparent when comparing the five states to the base state, Colorado, as evident from the coefficients. This observation highlights the substantial impact of incorporating cap and trade into the model, which has played a significant role in shaping the outcomes.

In Table 2, the result table for regression 4, 5, and 6 are displayed. The table includes the coefficient and standard error for each independent variables, with the number of standard errors in paratheses. For the last three columns of the table, the adjusted-R2, F-statistics, and observations of model 2 are being displayed.

Table 2: Results for models that factor in Covid-19.

	(4)	(5)	(6)
Cap and Trade	0.522	0.129	-0.995
	(0.329)	(0.573)	(0.590)
GHG Emissions		0.002	-0.040
		(0.002)	(0.023)
Covid-19	5.041***	5.237***	4.952***
	(0.541)	(0.562)	(0.614)
California			14.244**
			(6.678)
New York			5.732***
			(1.548)
Massachusetts			-0.682
			(1.567)
Washington			0.227
			(1.003)
Oregon			-2.096
			(1.762)
Adj-R2	0.820	0.824	0.922
F-stats	53.517	36.788	35.238
Obs	24	24	24

Notes: *p<0.1 **p<0.05 ***p<0.01. Standard errors in parentheses

In regressions 4, 5, and 6, Covid-19 appears to have a significantly strong positive relationship with unemployment rate. The coefficient of Covid-19 in regression 4 is 5.041, in regression 5 is 5.237, and in regression 6 is 4.952. They all have p-values that are less than 1%. The pandemic increased unemployment rates due to widespread lockdowns, business closures, disrupted supply chains, reduced consumer spending, travel restrictions, economic recession, remote work limitations, fear and uncertainty, school closures impacting working parents, and the oil price collapse, collectively causing a sudden and significant loss of jobs across the states. It is obvious that after adding Covid-19 as a variable in the models, regressions 3, 4, and 5 all shows that Covid-19 has a notably strong relationship with unemployment rate. Integrating Covid-19 into the models is important because it has affected the 2020 unemployment data. Massive job losses and a rise in unemployment have resulted from the COVID-19 pandemic, which has upended the American labor market [10].

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4. Conclusion

This research delves into the intricate relationship between cap and trade policies and unemployment rates, offering insights into the potential impacts of environmental regulations on employment dynamics. The goal of this study is to illuminate the multifaceted nature of this relationship and underscore the significance of crafting policies that not only promote environmental sustainability but also safeguard employment. The methodology of this paper is composed by regression analyses and hypothesis testing. Notably, a positive correlation emerged between the implementation of cap and trade policies and higher unemployment rates. This raises pertinent questions for policymakers and stakeholders involved in shaping environmental and labor market policies.

The integration of the Covid-19 variable enriched the analysis by revealing the interplay between pandemic-induced disruptions and the consequences of cap and trade policies on employment. This underscores the need for a comprehensive approach when assessing the dynamics of unemployment within the context of evolving environmental frameworks. The implications of these findings extend beyond statistical inferences. They highlight the necessity of balanced decision-making that considers the potential trade-offs associated with environmental regulations. As industries transition towards greener practices, this study emphasizes the importance of a just transition strategy. Such an approach ensures that communities and workers affected by shifts in employment are provided with the necessary support to navigate the changing landscape.

In essence, this research underscores the significance of informed policy formulation. By comprehending the intricate relationship between cap and trade policies and unemployment rates, policymakers can better anticipate and manage potential consequences. This enables the design of holistic strategies that mitigate adverse impacts while fostering a sustainable economy. While this study delves into the complex relationship between cap and trade policies and unemployment rates, it is important to recognize some restrictions that can affect how thorough and generalizable the results are.

This study explores the intricate link between cap and trade policies and unemployment rates. However, certain limitations need acknowledgment. Firstly, the research focuses on a limited number of U.S. states, possibly constraining the representation of wider regional variations and economic diversity. Expanding the geographical scope could offer a more nuanced perspective. Secondly, the study's timeframe spans from 2017 to 2020, potentially overlooking longer-term trends and variations. Extending the analysis could shed light on the stability of the identified relationships. Furthermore, the study examines the impact of cap and trade policies in isolation, not accounting for potential interactions with other environmental regulations or economic factors. Since environmental policies often intersect, exploring their collective influence on unemployment rates could enhance understanding.

Future research may include a greater variety of variables to provide a more thorough study, which would help to overcome these constraints. A more comprehensive comprehension of the implications of cap and trade laws on unemployment may be obtained by examining sector-specific impacts and expanding the study's time span.

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