

How Does Political Affiliation in a State Affect Its Recycling Rate of Common Containers and Packaging Materials

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Abstract: This paper uses data from polling in US Swing states to evaluate the correlation between a state's affiliation towards the Democratic or republican party and how it affects their CCPM recycling rate. Across the board of top CCPM recycling states, 17 of the states are democratic states, with only one being a republican state (being at number 20). On the flip side, out of the 20 lowest recycling states in terms of CCPM, 14 states are strongly Republican, and only 4 states are Democratic. In the top 20, most states generally have high disposal costs, bottle refund bills, and supporting CCPM legislation; however, in the bottom 20, not a single state has any one of these features (with the exception of Wyoming, having a high disposal cost). Through logistical relationship, we derived a causal relationship between a state turning Republican with a decrease in recycling rate and vice versa. Because the recycling rate is generally dictated by all these factors, it appears that once a state adopts republican affiliations, it tends to place less focus on such factors.

Keywords: CCPM recycling rate, United States Recycling, CCPM supportive legislation, Bottle bill, plastic refund policy

1. Introduction

In today's industrialized world, where millions of purchases are made daily, resulting in an enormous amount of waste materials, it is crucial to prioritize recycling and repurposing in order to maintain the sustainability of economies worldwide. The success of recycling efforts is largely dependent on the incentives and the lawful intervention through enforcement from authorities to promote the repurposing of raw materials [1].

A common challenge when assessing the impact of recycling policies is the inherent diversity among countries in terms of their development, government systems, and economic composition. Making it difficult to pin the difference in recycling rate on the difference in policy; therefore, direct comparisons between countries can often lead to flawed conclusions. However, the United States offers a unique perspective, as every state operates under the same federal government and exhibits relatively smaller differences in overall development and lifestyle.

In this research paper, we seek to address the phenomenon of why democratic states in the United States tend to perform better in terms of recycling than republican states. This is generally universally true and has an extremely strong correlation from data we have found in strength in recycling rate

with the political party leaning of a state. In our data set, the CCPM recycling rate is in the top 20 states, both including cardboard and not only have 3 Republican states. Virginia and South Dakota [2]. With the entirety of the top 10 states in terms of CCPM recycling rate being democratic states/strongholds [2]. Contrasting this with the worst 20 states in terms of recycling the only two solidly democratic states are West Virginia and Nevada, with a lot of republican leaning swing states towards the bottom of the list [2]. Providing conclusive evidence that republican controlled states tend to have a lower recycling rate.

The goal of our investigation is to compare the CCPM (common container and packaging materials) recycling rate and the state government policy and recycling measures they put in place to see if such policy truly matters. However we are utilising a CCPM statistic where Cardboard is not included [2], this is because cardboard has an especially high recycling rate across the board inflating the CCPM recycling rate of certain states which have poor recycling overall. A prime example of this is Pennsylvania which has the highest cardboard recycling rate in the country 77% and if this figure included it would be one of the best recycling states in the country [2]. However, if this is to be taken out of account Pennsylvania becomes a middling state in terms of CCPM recycling. In addition to this, cardboard recycling is not a general priority as cardboard is largely biodegradable) [3]. We chose CCPM recycling rates due to the fact that it has a lower correlation with the nature of the economy and occupation of a state. Overall waste recycling would include industrial waste which is an issue that is not consistent across all states as states with larger manufacturing economies would have much more waste produced than other states regardless of policy.

Subsequently, we will begin analysing the discrepancy in recycling rate between Democrat and republican states and see how political bias tends. A comparison between the states will be performed to private a correlation. After establishing this relationship we will move on to the main investigation of this research paper how switches in political stance within a state affect a state's recycling rate.

The six states we have chosen for this investigation to find the correlation between state policy and recycling rate are: Maine, Massachusetts, Missouri, Pennsylvania, South Carolina, and Mississippi. This is due to the states being similar in demographic background and are thus comparable and thus perfect for a comparison.

2. Theory on conceptual framework

Firstly in our investigation, we seek to establish the correlation of high CCPM recycling rates with effective bills/policy and high disposal costs in a state. The three indicators we will be looking at to evaluate states are Bottle bills, CCPM-supportive legislation, and disposal costs [4]. This is because the government seeks to incentivise recycling as much as possible through policy and make it easier to do so, allowing a state to recycle more of its waste [5]. This will be done by utilizing data from our sources to prove a strong correlation between these two variables. To begin a full breakdown of state policy and current CCPM recycling statistics will be presented to provide a visual summary. This is a direct one-way relationship we are seeking to establish that states with effective policies tend to have higher CCPM recycling rates. The reason we cannot take this as given is that all the past research papers have not investigated how policy affects states overall and just show that policy causes a state to increase recycling. We only seek to prove causation as the regression we will perform will be to prove causation between other variables which is the main focus of our investigation. In addition to this, the datasets we have found are not sufficient to prove causation only correlation. This is because it is not necessarily these policies that drive up recycling rates within these states, it may be that states which have these features tend to invest more in recycling and are more aware of their impact on their environment [6]. Making it so their higher recycling rate is not due to the existence of these policies but instead of their added focus on recycling. Thus, with our data, we only seek to establish that these three variables are indicators/ correlate with states that are better at recycling.

After this, we will establish a correlation between the political stance of being Republican or Democrat and having high CCPM recycling rates. This can be done by ranking the states in recycling rate and showing whether they are Democrat or Republican to show how the general CCPM of the states is based on their political bias. In addition to this, we will show the general difference in policy between republican stronghold states and democratic stronghold states. The link we are attempting to make is a one-way relationship that states under republican ideology tend to place less emphasis on recycling than democratic states. As shown in Figure 1, we have labeled states as republican democrat or swing states [7]. All the states that have a margin of difference larger than 5% we labeled as democratic or republican. Any smaller differences and we labeled them as swing states or gave them either a democratic-leaning or Republican-leaning profile based on their voting in the latest presidential election and the party of the state governor (this is the reason that Arizona a traditionally republican state was placed as a democratic state here due to the 2020 election).

	CCPM Recycling Rate without Curbside	Bottle Bill	CCPM Supportive Legislation	Disposal Costs in Top 25% of US	
1 MAINE	72%	Yes	No	Yes	1. Democrat
2 VERMONT	62%	Yes	Yes	Yes	2. Democrat
3 MASSACHUSETTS	55%	Yes	Yes	Yes	3. Democrat
4 OREGON	55%	Yes	No	Yes	4. Democrat
5 CONNECTICUT	52%	Yes	No	Yes	5. Democrat
6 NEW YORK	51%	Yes	No	Yes	6. Democrat
7 MINNESOTA	49%	No	No	No	7. Democrat
8 MICHIGAN	48%	Yes	No	Yes	8. Democrat
9 NEW JERSEY	46%	No	No	Yes	9. Democrat
10 IOWA	44%	Yes	No	No	10. Swing state
11 CALIFORNIA	44%	Yes	Yes	Yes	11. Democrat
12 WISCONSIN	44%	No	Yes	Yes	12. Swing state
13 MARYLAND	44%	No	No	No	13. Democrat
14 DELAWARE	43%	No	Yes	Yes	14. Democrat
15 WASHINGTON	41%	No	No	Yes	15. Democrat
16 RHODE ISLAND	39%	No	No	Yes	16. Democrat
17 HAWAII	37%	Yes	No	Yes	17. Democrat
18 PENNSYLVANIA	36%	No	No	Yes	18. Democrat
19 NEW HAMPSHIRE	32%	No	No	Yes	19. Democrat
20 SOUTH DAKOTA	32%	No	No	No	20. Republican
30 NEVADA	18%	No	No	No	30. Democrat
31 UTAH	17%	No	No	No	31. Republican
32 GEORGIA	17%	No	No	No	32. Republican
33 ARIZONA	17%	No	No	No	33. Swing state
34 IDAHO	17%	No	No	No	34. Republican
35 COLORADO	16%	No	No	No	35. Democrat
36 MONTANA	15%	No	No	No	36. Republican
37 WYOMING	15%	No	No	Yes	37. Republican
38 ARKANSAS	14%	No	No	No	38. Republican
39 KENTUCKY	14%	No	No	No	39. Republican
40 NEBRASKA	14%	No	No	No	40. Republican
41 NEW MEXICO	13%	No	No	No	41. Democrat
42 TEXAS	13%	No	No	No	42. Republican
43 ALABAMA	11%	No	No	No	43. Republican
44 OKLAHOMA	10%	No	No	No	44. Republican
45 MISSISSIPPI	8%	No	No	No	45. Republican
46 SOUTH CAROLINA	8%	No	No	No	46. Republican
47 TENNESSEE	7%	No	No	No	47. Republican
48 ALASKA	6%	No	No	Yes	48. Republican
49 LOUISIANA	4%	No	No	No	49. Republican
50 WEST VIRGINIA	2%	No	No	No	50. Republican

Blue text is for democratic leaning states red for republican

Figure 1: Recycling overview of states

The final goal of our investigation is to see if causation exists between lower recycling rates and whether a state switched party affiliation. The reason we must do this by analyzing the rate of CCPM change in swing states based on votes in elections is that this is the only true way to prove a causal effect. As for the previous strong correlations between Democratic and Republicans, they do not necessarily causation as it may just be that states that value recycling tend to be democratic states meaning that the one-way causal effect of when states are more Democrat, they tend to

recycle more which we are attempting to prove is not validated. In addition to this, logically, republican states are also capable of recycling just as well as democratic states, as there are no physical limitations. This will be done by analyzing key swing states that have switched control from 2021-2023, as these are the only two CCPM recycling rate data we can find, and performing a regression model to see how much the CCPM recycling rates have changed over time. Through performing this analysis across multiple states we seek to find conclusive evidence of a relationship between these two factors in proving its causation.

3. Method

With voter data from the Harvard database, we are then able to use the regression formula to see whether there is a strong correlation between recycling rate and political affiliation. Apart from that, we can analyze the correlation between the Democratic and Republican parties to see how political lean and standing in a current state can influence state regulations and policies for recycling and recycling incentives or penalties. After this, we will seek to establish a correlation between the two variables of interest in our investigation policies put in place by states and the CCPM recycling rate. In theory, the recycling policies put in place by the local government should increase the rate of CCPM recycling as this will encourage and incentivise greater recycling. Such laws being put in place would also signify a greater level of attention being placed on recycling waste [8].

With our collected data, we are then able to use the regression formula to see whether there is a strong correlation between recycling rate and political affiliation. Apart from that, we can analyze the correlation between the Democratic and Republican parties to see how political lean and standing in a current state can influence state regulations and policies for recycling and recycling incentives or penalties.

4. Results

In the first variable we analyzed we found that having a bottle bill has a strong correlation with higher recycling rates [9]. Democratic states also seem more willing to adopt bottle bills, so far, the only non-Democratic state to adopt a bottle is Iowa being a swing state [10].

Based on the data we found that having CCPM legislation has a correlation with higher recycling rates within a state (as sc, which is a second indicator we included in this Table 1. All of the states which have CCPM supportive legislation are within the top 30 states in terms of CCPM recycling rate although it is not as clear as the effect of bottle bills because many top recycling states do not appear to have such legislation. This means that it is entirely possible to recycle a high amount of plastic waste without such support. However, this legislation is a good indicator of how much focus and priority a state places on the management of plastic waste, meaning that all states that have such legislation perform well in recycling rates.

The third indicator we analyzed disposal rates had a direct correlation with CCPM recycling rates but it is a much more nuanced relationship [11]. This is because states with disposal prices being in the top 25% of the United States, incentivize consumers to recycle waste instead [12]. However, an issue with using this variable to determine the CCPM recycling rate is that states that are undeveloped, underpopulated, and populated extremely sparsely have higher disposal prices. Although disposing of trash in these states may be difficult. Two examples of states that fall under this category include Wyoming and Alaska Wyoming is a reasonably sized state but also is the least populated and Alaska has around 2 people per square mile making having waste-gathering infrastructure very difficult raising the disposal prices [13]. Higher recycling rates are more easily achievable in states with lower populations as the waste generated is orders of magnitude lower than in larger states [12]. With, both of these states are among the bottom 20 recycling states. Contrasting with the fact that out of the ten

best recycling states in terms of CCPM recycling rate 8 of the states have recycling prices within the bottom 25% of the US [2]. In addition to this outside of Alaska and Wyoming all states in the top 25% of disposal prices in the US are among the top 20 states in CCPM recycling rate. This shows that while higher disposal prices are a driver of recycling rate it alone is not enough to cause high amounts of recycling rate. Because even if disposal prices are high, if the recycling prices are much higher, waste will not be recycled at any substantial level [9,14]. This means that disposal cost is a useful variable to take into account with other indicators to predict a state’s CCPM recycling rate.

Based on the top 20 and bottom 20 states list we made the key findings that Democratic states place better. Within the top 20 states, 17 are democratic states 2 are swing states and one is a truly republican state (which happens to be 20th). For the bottom 20 recycling states, 16 states are Republican 3 states are Democratic and one state is a swing state. In addition to this, the only non-democratic state to have a bottle bill is Iowa and the only non-democratic state to have CCPM policy implemented is North Carolina. All this is to show that democratic states tend to have more policies to improve recycling rates and tend to recycle at a higher rate.

Table 1: States CCPM recycling

State name	Recycling rate	How many indicators do they fulfil	Party affiliation	Demographics of state
Maine	72%	Bottle bill: Yes CCPM supportive legislation: No Disposal cost in top 25%: Yes	Democrat	Population: 1.4million Urban percent: 39% GDP per capita: 52860 USD
Massachusetts	55%	Bottle bill: Yes CCPM supportive legislation: Yes Disposal cost in top 25%: Yes	Democrat	Population: 7 million Urban percent: 92% GDP per capita: 87860 USD
California	44%	Bottle bill: Yes CCPM supportive legislation: Yes Disposal cost in top 25%: Yes	Democrat	Population: 39million Urban percent: 95% GDP per capita: 83000 USD
Missouri	30%	Bottle bill: No CCPM supportive legislation: No Disposal cost in top 25%: No	Republican	Population: 6.2 million Urban percent: 70.4% GDP per capita: 55540 usd
Indiana	27%	Bottle bill: No CCPM supportive legislation: No Disposal cost in top 25%: No	Republicans	Population: 6.8 million Urban percent: 72% GDP per capita: 58500 usd
Florida	21%	Bottle bill: No CCPM supportive legislation: No Disposal cost in top 25%: No	Republicans	Population: 22million Urban percent: 91% GDP per capita: 56600 usd
South Carolina	8%	Bottle bill: No CCPM supportive legislation: No Disposal cost in top 25%: No	Republican	Population: 5.3 million Urban percent: 66.3% GDP per capita: 48370 usd
Texas	13%	Bottle bill: No CCPM supportive legislation: No Disposal cost in top 25%: No	Republican	Population: 30.3 million Urban percent: 85% GDP per capita: 66650 usd
Louisiana	4%	Bottle bill: No CCPM supportive legislation: No Disposal cost in top 25%: No	Republican	Population: 4.6million Urban percent: 73.2% GDP per capita: 52080 usd

5. Data

Through Eunomia, we have been able to obtain 2 snapshots of CCPM recycling rates in the United States and this data can be found on their website [2]. Along with the recycling rates, we were also able to obtain data on the electoral map as well as data on the political lean of each state through <https://www.270towin.com/same-since-electoral-maps/>. Despite this, there were no sources that were able to provide accurate information of a changing rate of recycling rates so we only have access to the snapshots of recycling data based on 2023 and 2021.

From the Harvard database, we were able to obtain the political leaning of each state [15]. Through this, we were able to create a scatterplot of each party and their respective area of recycling rate.

In addition to this, we used the records of the most recent state governor elections which are completely public [16]. This is done through using governor history from official state websites on past governors and their party affiliations as this is another political indicator that better fits our timeframe.

6. Conclusion

In our study, we explore the correlation between the political affiliations of the United States and their CCPM recycling rates. Our investigation stems from the observation that Republican-leaning states often exhibit lower rates of CCPM recycling, despite no significant inherent disparities between states. Our findings reveal a correlation between a state's political orientation and its recycling practices. However, due to the current landscape of recycling rates being in general decline, there is proven causation between the two variables.

However, it is important to acknowledge certain limitations in our study. One such limitation is the inherent complexity of CCPM recycling rates. For instance, our analysis reveals a scenario where two states may recycle the same volume of waste, yet the state collecting less waste could display a higher recycling rate, potentially leading to slightly skewed conclusions. Furthermore, our study is constrained by a limited dataset comprising only two snapshots over a relatively short timeframe, which may not holistically capture the ongoing trends accurately. Some areas future studies could pursue are to use of recycling data from a much longer time frame, or analysing counties/ cities as their leadership changes political affiliation.

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Binxi Wu and Xinyu Hu contributed equally to this work and should be considered co-first authors.

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