Undergraduate Research Fellowship Working Paper Series

Title:

"Universal vs Directed Dividends Effect on Inequality: The Case of Alaska"

Author(s):

Arielle Adiri
2023-2024 Undergraduate Research Fellow

2023-2024

Section 1: Introduction

Carbon Dioxide and the greenhouse gas effect prevent the Earth from freezing over. However, as the climate becomes more unpredictable, one widely accepted hypothesis as to why the Earth is experiencing an abnormal and accelerated greenhouse gas effect is the increased carbon pollution from burning fossil fuels. This increase in CO2 may lead to melting icebergs, rising sea levels, and the destruction of animal habitats. The United States government has introduced federal solutions in the past: a carbon cap-and-trade system and subsidies for alternatives like electric cars or solar panels. Resources for the Future has listed every such proposal introduced in Congress in the United States, most of which are carbon fees, or a price per metric ton of carbon dioxide released with prices ranging from $15 to $59 per metric ton, and one proposal for a cap-and-trade system which sets a maximum amount of Carbon Dioxide emissions allowed, forcing large carbon emitters to trade "carbon credits" to be allowed to emit more (Hafstead, 2020). The carbon trading policy, or the cap-and-trade system, that has been implemented in some states, is not enough action to actually produce any change in carbon emissions. Although it does impose a limit on the carbon emissions permitted, in "Cap and Trade is Not Enough: Improving U.S. Climate Policy," researchers in the Carnegie Mellon Department of Engineering and Public Policy Department state, "the effective CO2 price under the various cap-and-trade bills that have been introduced or are being discussed is likely to be so low initially, and to rise so slowly over time, that it will not induce the types of investment that will be needed to achieve a 50-80% reduction in CO2 by mid-century." (Samaras, 2009, p. 3)

Subsidies for electric cars and other similar legislation are slow and expensive solutions that are unlikely to meet stated climate goals: "the President set groundbreaking goals: Reducing U.S. greenhouse gas emissions 50-52% below 2005 levels in 2030. Reaching 100% carbon

pollution-free electricity by 2035. Achieving a net-zero emissions economy by 2050" (*National Climate Task Force* 2024). Subsidy solutions that have been passed by congress in recent history would only make one particular kind of car less expensive, yet nowhere near affordable enough for those in lower income groups.

An alternative solution instead of subsidizing more environmentally friendly options, would be to make producing carbon intensive products more expensive. One aforementioned federal solution to increase cost of emission, that has been introduced but never implemented, is the carbon tax. However, this solution has a major flaw: it increases the substantial income inequality as the poor are disproportionally affected by a tax which leaves the wealthy comparatively unscathed. It is recognized that a carbon tax places an economic burden on low-income households who spend a larger proportion of their wealth on carbon intensive products than high income households, either because high income households can afford carbon alternatives, or because the carbon intensive products have less effect on their income as a whole. A potential carbon pricing program that could reduce carbon emissions and preserve the current income inequality would tax carbon-intensive corporations while simultaneously rebating tax earnings to individuals affected by potential increased prices from carbon-taxed corporations. Carbon pricing that does not address the increased burden on the average worker may not be politically feasible, as many politicians feel they would lose the vote by just implementing a tax without a rebate of any kind. For example, the tax would affect major oil companies who may be able to compensate by raising prices, which the companies may choose to offload cost to consumers. However, the rebate would help to alleviate the perceived increased cost pressure on consumers and continue to focus the brunt of the policy on large, carbon-emitting corporations.

Dr. Ian Parry, Principal Environmental Fiscal Policy Expert of the International Monetary Fund, has proven in previous research the potential efficacy of a carbon tax in being able to act as "an effective tool for meeting domestic emission mitigation commitments," and could "raise a significant amount of revenue" for the federal government (Parry, 2019). The revenue can be allocated anywhere, and even if a rebate is implemented, it can be implemented in such a way that satisfies voters enough, then politicians will be able to use leftover revenue to fund other social welfare programs. Dr. Parry also stresses the quality of a direct carbon tax rather than a cap-and-trade systems, or as he calls them "emissions trading systems" (Parry et al., 2022). Other economists, such as Klenert and Hepburn, in their essay, "Making Carbon Work for Citizens," acknowledge citizens aversion to a new taxing system but makes it clear that "increasing the salience of the benefits derived from a carbon-pricing reform enhances acceptability, so that visible revenue recycling may be advisable" (Klenert and Hepburn, 2018). A direct rebate to consumers will make a carbon tax more acceptable to the population. Dr. Parry goes further in a separate essay discussing the different rebate and welfare programs possible under different carbon tax or emissions trading systems: "[an] approach that has recently gained traction is known as "cap-and-dividend", which involves a cap-and-trade program with full allowance auctions with all the revenue returned in equal lump-sum transfers for all individuals" (Parry et al., 1997). In contrast, this essay will analyze lump-sum transfers to individuals under a flat carbon tax rate.

The purpose of the current study, rather than putting forth a new carbon tax proposal, is to focus on how sending lump sum checks to all households, or some subset of households, can impact inequality, as measured by a Gini coefficient. Given that no carbon tax proposals are beyond the speculative phase in the United States, an example can be drawn from the Permanent

Fund Dividend program in Alaska, where each individual in the state annually receives a lump sum payment from an investment fund the Alaskan government created from the royalties made from oil and mineral extraction within the state. The Fund Dividend Program is a good source of information in its own right, as it can provide a baseline for how a universal basic income could work in the United States. The Permanent Fund Dividend program has been in place since 1982 and on average has paid $1,260 per year to each individual classified as an Alaskan resident.

This essay will examine the effects of a lump sum payment on inequality as shown by a Lorenz curve and Gini coefficients. A Lorenz curve illustrates the distribution of income across a given population and corresponds with a Gini coefficient which provides a number, from zero to one, measuring how unequal the income distribution is, zero representing perfect equality and one representing perfect inequality. In section 2, the essay will examine the Alaskan Permanent Fund Dividend and give various descriptive statistics. In section 3, the essay will describe generally how the Lorenz curve gives the distribution of wealth across a given population. The Lorenz curve corresponds with a Gini coefficient which comes together to provide a measure of the effects of potential lump sums on general income inequality, usually decreasing inequality. Section 4 will examine the Alaskan Fund Dividend from a perspective of changes in a Lorenz curve and Gini coefficient in the state of Alaska, with and without the lump sum payment provided by the Fund Dividend. Under the crude assumption that income would change by the amount of the Dividend, section 4 will compute what the Lorenz curve and Gini coefficient would be absent the oil dividend, then give an estimate of how much inequality can be improved by lump sum payments of varying sizes, universally distributed to every household in a population or directly distributed to households under a certain income threshold. Alaskan inequality measurements will act as a comparison to the United States, generally. Section 5 will

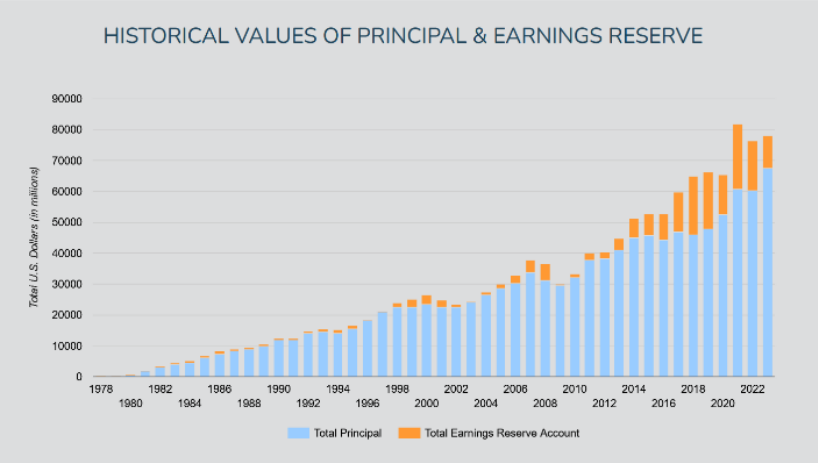
provide concluding remarks and findings, as well as how this essay could further the conversation on making the United States more livable by way of a reduction of Carbon Dioxide in the atmosphere as well as retaining, or even improving, the buying power of people in all income groups.

Section 2: Alaskan Permanent Fund Dividend

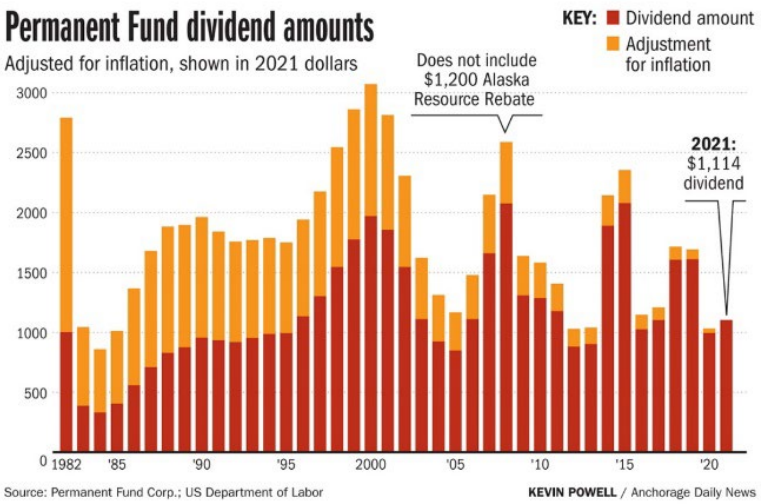
Alaska's Permanent Fund Dividend was first conceived in 1976. The first payments were made four years later in 1980, when each Alaskan resident received $50 for each year they had been living in the state since its conception in 1959. However, this first payment was deemed unconstitutional, as it violated the 14th amendment and made it impossible for new residents to ever make as much from the Dividend as old residents. In 1982, Alaska shifted the payout method, instead of paying out $50 for each year an individual has lived in the state, to any individual can receive a fixed Dividend amount so long as they have residency for at least six months. Since 1982, the Permanent Fund Dividend decided on Dividend amounts by yearly investment earnings on the tax revenue of Alaskan mining royalties (*State of Alaska*, 2024). The Alaskan Government entrusts the investment fund to be managed privately by the Permanent Fund Dividend Corporation so as to preserve the interest of Alaskan individuals:

> Section 15. Alaska Permanent Fund.
>
> At least twenty-five percent of all mineral lease rentals, royalties, royalty sale proceeds, federal mineral revenue sharing payments and bonuses received by the State shall be placed in a permanent fund, the principal of which shall be used only for those income-producing investments specifically designated by law as eligible for permanent fund

investments. All income from the permanent fund shall be deposited in the general fund unless otherwise provided by law (Zobel v. Williams, 1982).



The state pays out dividends called the Permanent Fund Dividend, per capita, rather than per household. It pays out to every individual regardless of factors such as age, employment status, or income level. The state of Alaska's Permanent Fund Dividend is a prime example of a flat rebate per individual, similar to how any potential rebate would work in response to a carbon tax. It is theorized that a flat payment to each individual, or even each household, would effectively reduce the Gini coefficient. This study will adjust the per capita Dividend amount, multiplying it by the average household size in Alaska to get a rough flat household amount. In any case, Alaska's Dividend would reduce the inequality in Alaska, depending on how substantial that payment is.



Alaska's Permanent Fund Dividend would decrease inequality in Alaska, or make the income distribution more equal, this essay will show that a flat rate dividend will decrease the value of the Gini coefficient. It is important to note that the Permanent Fund Dividend is paid out to each individual, regardless of age, while income usually refers to each household. So, when calculated the effect on the Gini coefficient, in reality, some households may receive more than others depending on the number of children and retired persons living there along with the wage earners. In order to be considered a resident, a person must: 1) be considered a resident in the previous year, 2) have the intent of being a resident permanently, 3) have not claimed residency in another state in the past year, and 4) not be convicted of a felony or incarcerated in the last year. There is also a stipulation which states if a resident is absent for more than 180 days of the previous year on an "allowable absence," then they must have spent at least 72 consecutive hours in the state (*State of Alaska*, 2024). With these stipulations, it may be that Alaska's primary goal with the Dividend is not to reduce income inequality, but more likely to increase population.

The state of Alaska has added one-time payments in the past. For example, in 2008 Alaska implemented the Alaska Resource Rebate to the dividend, and similarly in 2022 and 2023, they added Energy Relief Payments to the dividend. The Resource Rebate was added only

one time in 2008 as an additional $1,200 on top of the Permanent Dividend payment of that year, $2,069, assumedly to support Alaskan citizens as the economy downturned.

Section 3: Lorenz curve and Gini coefficient

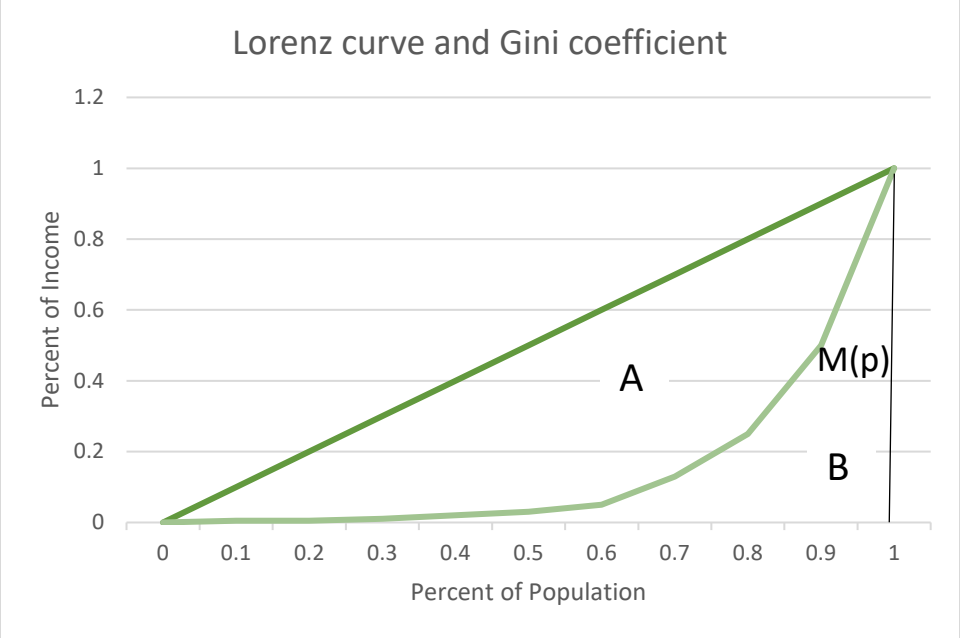
In previous research, it has been found that the Gini coefficient and Lorenz curve are helpful tools in measuring the tax progressivity, or in this case the rebate regressivity, in a population (Mathews, 2014). In the case of this paper, a flat rebate would be regressive in that it pays out proportionally less per marginal increase, or even in the case of a cutoff point, pays out nothing at all to the high earners. Population is first sorted by income, from least to most, where p is the income percentile and m is money and m(p) is the total income of the p^{th} percentile. In solving for a country's Gini coefficient, the Lorenz curve, M(p), must first be calculated: the integral of all income up to p, divided by total income. M(p) is strictly increasing; an increase in p means an increase in M. For example, fifty percent of income earned could be held by as large as ninety percent of the population. Then, to show the effect of implementing a cutoff point in the population, where only those individuals or households below the cutoff would receive an enlarged fixed amount, F represents the fixed amount being paid out to each person or household and c represents the cutoff percentage.

The equation for the Lorenz curve is as follows:

$$m_{\frac{F}{c},c}(p) = \begin{cases} m(p) + \frac{F}{c} & if\ p \leq c \\ m(p) & if\ p > c \end{cases}$$

$$M_{\frac{F}{c},c}(p_0) = \begin{cases} \dfrac{\int_0^{p_0}[m_{\frac{F}{c},c}(p) + \frac{F}{c}]dp}{\int_0^1 m(p)dp + F} & \text{if } p_0 < c \\ \dfrac{\int_0^{p_0} m(p)dp + F}{\int_0^1 m(p)dp + F} & \text{if } p_0 \geq c \end{cases}$$

Once the Lorenz curve is found, a Gini coefficient can be calculated for the population. The Gini coefficient is the difference between the income inequality in a population as observed by a Lorenz curve and perfect equality, or the 45-degree line.



Where the Gini is calculated as $g = \frac{A}{A+B}$, or, since A+B represents the entire area under the 45-degree line, $g = 2A$. In order to prove that a flat rate dividend to every individual or household, or a flat rate up to a cutoff point would indeed decrease the Gini coefficient, the derivative of the Lorenz system of equations with respect to the payout amount can be calculated:

$$\frac{dM_{\frac{F}{c},c}(p_0)}{dF} = \begin{cases} \dfrac{[\int_0^1 m(p)dp + F][\int_0^{p_0} \frac{1}{c} dp] - [\int_0^{p_0} (m(p) + \frac{F}{c})dp]}{[\int_0^1 m(p)dp + F]^2} & \text{if } p_0 < c \\ \dfrac{[\int_0^1 m(p)\delta p + F] - \int_0^{p_0} m(p)\delta p}{[\int_0^1 m(p)dp + F]^2} & \text{if } p_0 > c \end{cases}$$

For both derivatives in the system, both for those in the population below the cutoff and above the cutoff point, the derivative is positive. The derivative non-negativity proves that when distributing a flat rate, the Lorenz curve will increase, or become flatter, and always decrease the Gini coefficient. It follows that increasing F, increasing the flat dividend rate, increases the $M_{\frac{F}{c},c}(p)$, or the Lorenz curve, for all $p \in (0,1)$, in turn decreasing the Gini for the population. The proof demonstrates Lorenz curve dominance, very similar to first order stochastic dominance, adding F always creates a higher, flatter Lorenz curve, which always decreases the Gini coefficient. It also follows that increasing the cutoff point, c, would decrease the Lorenz curve, making it more convex and lower, and in turn increasing the Gini coefficient.

$$\frac{dM_{\frac{F}{c},c}(p_0)}{dc} = \begin{cases} \dfrac{\int_0^{p_0} -\frac{F}{c^2} dp}{\int_0^1 m(p)dp + F} & \text{if } p_0 < c \\ 0 & \text{if } p_0 > c \end{cases}$$

Where the derivative of the top equation, which describes the population below the cutoff, is negative, because as the cutoff point increases, the amount paid out to each individual or household decreases, because more households fall into the percentile that receives. The derivative of the bottom equation, showing the population above the cutoff, is unaffected because they receive no payout, they are neither better nor worse off. It follows that increasing

the cutoff point also demonstrates Lorenz curve dominance: a Lorenz curve with a higher cutoff point spreads the dividend thinner amongst a greater number of people, which means that a Lorenz curve that is flatter can always be created by concentrating the dividend towards those clustered at the bottom of the income distribution.

However, having cutoff points and flat rate dividends together raises an issue of reordering the population. Because the Lorenz curve is organized as both income and population are strictly increasing, then implementing a flat rate dividend to a lower portion of the population over a continuous population would presumably raise the income of those just below the cutoff to more than those who are just above the cutoff. In this essay, the assumption is made of a break in continuity in Lorenz curve, so the population remains in order, and no reorganization is needed. The cutoff point must be chosen from any discontinuity between, in this study, income quintiles. Distributing a flat rate dividend, F, to each individual or household in a population would make the population's income more equal. Distributing an increased flat rate dividend, of an amount $\frac{F}{c}$, to all individuals or households below the cutoff, c, would more cost-effectively make the population's income more equal. However, the function must respect monotonicity which creates an implementation difficulty, which can either be solved by phasing out the dividend as the Lorenz curve, M(p), increases or by reordering the population in some manner which reserves the comparison of before and after dividend payments.

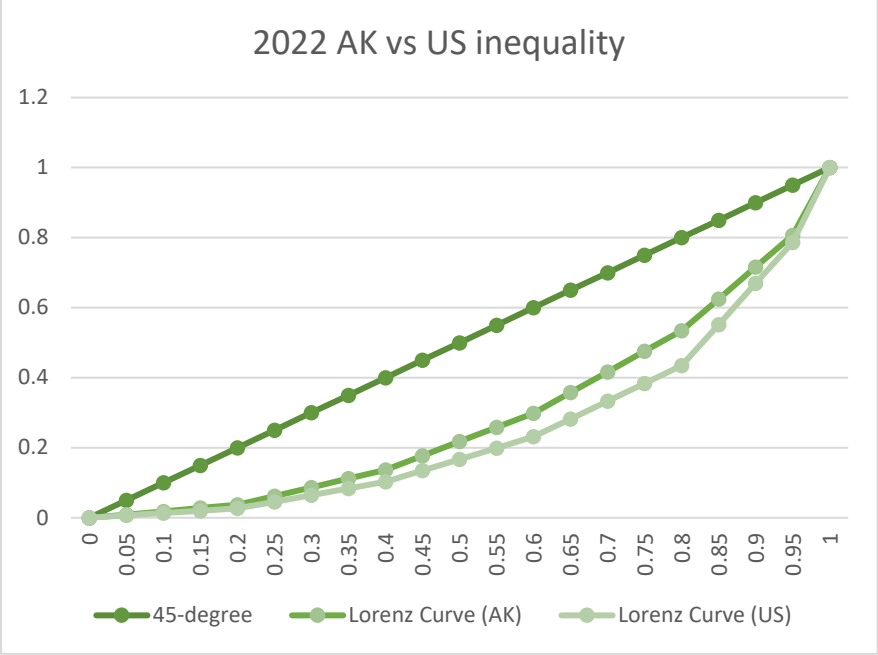
Section 4: Changes in Alaskan Inequality and Comparison with the United States

Subject	Gini coefficient
United States 2022	0.47
Alaska 2022	0.41

Alaska 2022 minus the adjusted dividend amount (base)	0.46
Alaska base plus minimum dividend amount	0.45
Alaska base plus maximum dividend amount (2022 dividend amount)	0.41
Alaska base plus average dividend amount	0.44
Alaska base plus increased average to bottom 40%	0.42

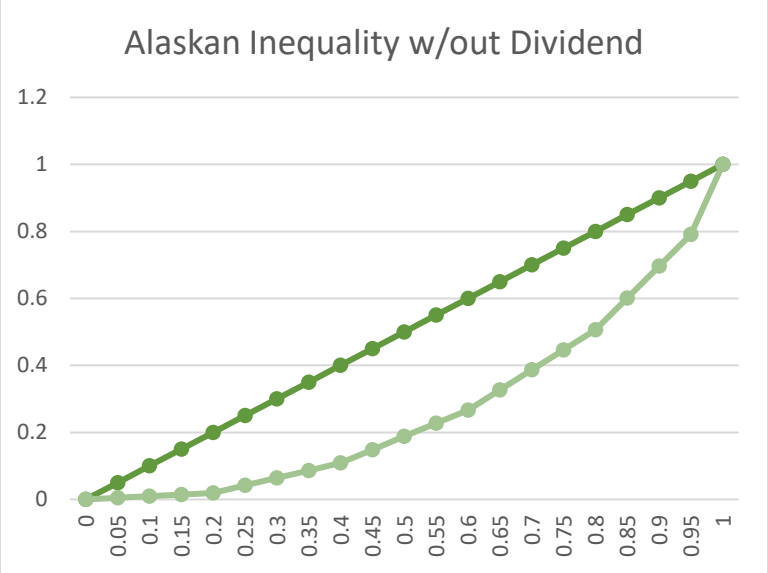
(U.S. Census Bureau, 2022) ("Alaska Median Household Income," 2024)

In 2022, the United States Gini coefficient was 0.47, whereas Alaska's in the same year was 0.41. It seems Alaska is significantly more equal than the whole of the United States. The dark green line shows the 45-degree line, or perfect equality, and the light green line shows the Lorenz curve; the area between the two lines is the Gini coefficient.



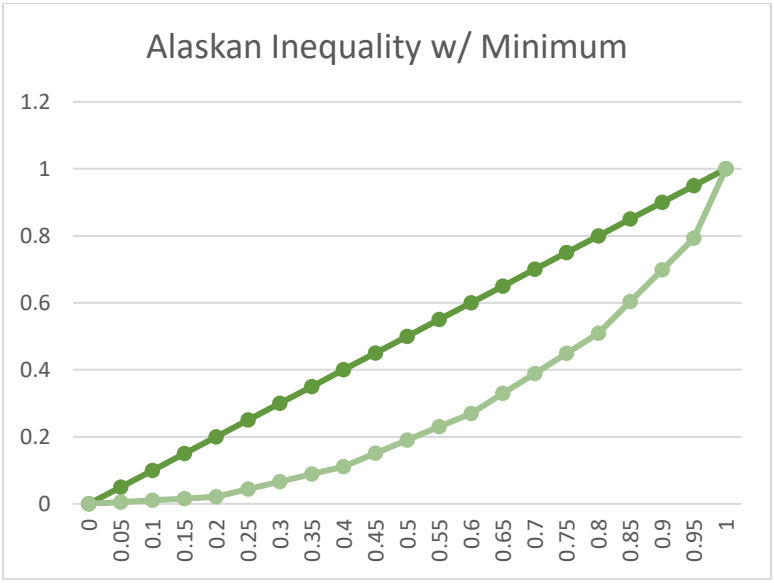
The shown difference could be due to many factors, however, when the Permanent Fund Dividend amount is removed, Alaska's Gini coefficient becomes much closer to that of the United States. In order to find the Gini coefficient in Alaska without the Dividend, since the data found from Neilsberg is Alaskan income as perceived by Federal income taxes, the Fund

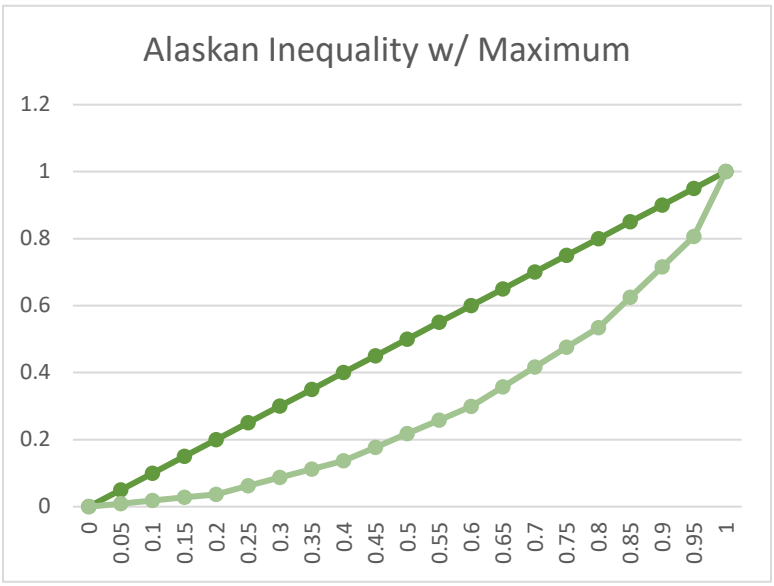
Dividend amount must be subtracted from income. However, a challenge arises because federal income tax is per household, where the Permanent Fund Dividend pays out to each individual, even dependents and retirees. In order to account for this difference, before subtracting the flat dividend rate from each quintile, the amount must first be increased by the rate of average size of household, which in Alaska is 2.67. By multiplying the Dividend amount in 2022: $3,946 by the household size: 2.67, the total amount subtracted from each household's income becomes $10,535.82. In reducing each income quintile by this amount, a simulation is conducted which reduces of the flat rate across the population and demonstrates a noticeable increase in the Gini coefficient, from 0.41 to 0.46, making it more closely resemble that of the United States as a whole, 0.47. The similarity goes to prove that a flat dividend or rebate to every individual in the United States would effectively decrease inequality.



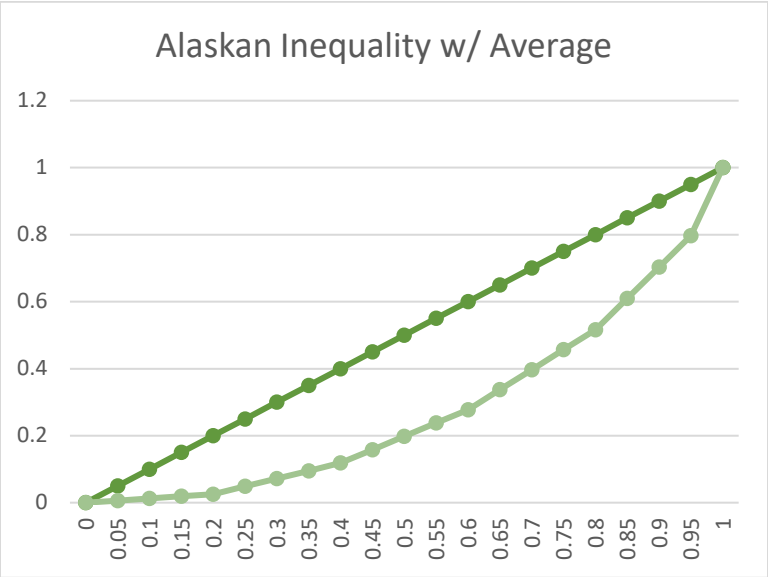
Now that it has been shown that the inequality in Alaska is less than that of the entire United States, most of the differences in both Gini coefficients can be effectively explained by the Permanent Fund Dividend. With the baseline of the Alaskan Inequality without any Dividend payout, observations can be made of the change in the Gini coefficient by adding different flat

rates back to individuals. The minimum amount the Permanent Fund Dividend has paid out in the past has been $331.29 in 1984, the maximum being 2022's $3,946. The Gini coefficient for the maximum has previously been observed as 0.41, however for the minimum Dividend amount the inequality is minimally affected, showing a Gini coefficient of 0.45, recall that without any payout it is 0.46.



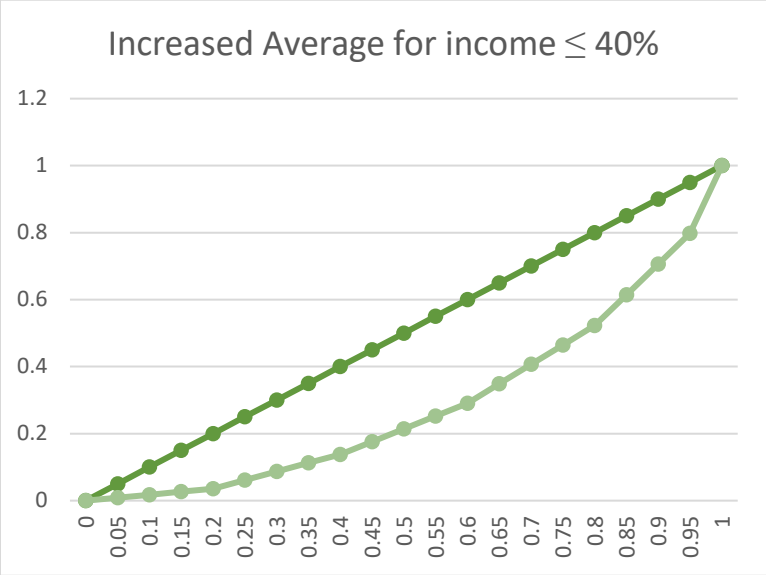


The average Permanent Fund Dividend amount over the entirety of its existence is $1,260.47. Adding this average amount times the average household size to the base Alaskan inequality gives a Gini coefficient of 0.44.



The research shows that because the Permanent Fund Dividend is a flat rate, the greater the amount paid out to every individual in the population will lessen the income inequality. There is no wealth redistribution by way of taxation, or the rebate amount is not at all reliant on funding from taxing other, wealthier, members of society. In addition, at this point in the research, it can be proven that implementing a cutoff point and increasing the flat rate amount and only paying out to below the cutoff could make the income more equally distributed more cost effectively. By using the same amount from the average Permanent Fund Dividend, $1,260.47 per individual, or $3,365.45 per household, and then choosing an arbitrary cutoff point, for the case of this study, the bottom 40% of the population. The fund amount per household who is eligible to receive it would increase to $8,143.66, and would have an increased effect, similar to that of the maximum Dividend amount, in decreasing the Gini coefficient, or in making Alaskan income more equal. The Gini becomes 0.42, as opposed to the 0.44 of the

average payouts without the cutoff, more similar to the 0.41 of maximum payout without cutoff. The Pechman-Okner coefficient, or the percentage decrease in value of the Gini, for the Fund Dividend in 2022 is 10.87%. The minimum amount results in a percentage decrease of 2.17%, the average a decrease of 4.35%, and finally with the cutoff of 40% of the population, a percentage decrease in the Gini of Alaska of 8.70%. Notice the percentage decrease with the cutoff at 40% creates an increase in the percentage decrease amount compared to the 4.35% decrease caused by distributing the average universally. Even though both programs would cost the same amount, implementing a cutoff point doubles the decrease in the Gini coefficient.



The cutoff problem mentioned previously is accounted for in these measurements, as United States and Alaskan income data is provided in quintiles, up until the final 20% which is given as 15% and a final 5%, to account for the sharp increase in income. In order to account for the final 5% while retaining equal portions for the Lorenz curve, each quintile is stretched into four 5% groups with the same value. In order to keep measurements simple, with a lack of data available, an assumption is made that each household in each quintile has an income equal to the mean income found in the data for the portion. For example, every household in the United

States in the bottom 20% of the population makes the same $20,537 in income. In making this crude assumption, as long as the Permanent Fund Dividend amount does not exceed any difference between break points, quintiles, in the data, then there will be no need to reorder the population.

The examples with the various Alaskan Dividend amounts demonstrate Lorenz curve dominance with a universal flat rate payout or a directed flat rate payout to a cutoff percentage of the population. Each increase results in a higher, flatter Lorenz curve, in turn recalculating the Gini coefficient to be smaller, which means a more equal distribution of income. No matter the Permanent Fund Dividend payout that Alaska chooses per year, any payout will decrease the income inequality in the state. Compared to the larger United States, it goes to show that any universal rebate or payout of any kind, whether it be a rebate to offset the increased inequality caused by a carbon tax, or any kind of universal basic income, the rebate or payout on its own will always decrease inequality in a population.

Section 5: Concluding Remarks

This essay makes assumptions which require breaks in continuity so as to not have to reorder the Lorenz curve, should payout to a lower income group push them to earn more than the next highest, the Lorenz curve no longer functions and cannot be compared because the ordering had changed. In future research, it would be ideal to obtain continuous, per capita data to capture more accurate changes in income inequality. If in the future this data can be found, in order to reorder the Lorenz curve there would be some kind of horizontal integration to account for the benefits cliff created. Future research may also address how a carbon tax on high carbon

emitting corporations may affect the income inequality of a population, and how to address those specific affects with the flat rebate option discussed in this essay.

The case of Alaska provides an example within the United States of a more equalized income distribution credited to the Permanent Fund Dividend's flat rate payments. Retrieving funds from private companies mining resources in Alaska, investing the royalties privately, and finally paying out earning from the Fund as an equal amount to every individual in the state provides an excellent example which the United States can strive for when contemplating a carbon tax. The population of the state reaps the benefits of the environment, so anyone who lives there is incentivized to at least acknowledge the importance of healthy mining practices.

The case of Alaska provides an excellent example of Lorenz curve dominance, that a flat rate is, in fact, a regressive rate which would decrease the Gini coefficient so long as the amount is substantial, always making a population more equal. It is important to note that the Gini coefficient only measures inequality and decreasing inequality should not be the main goal of an economy but is something to keep in mind in comparison with other measures, such as GDP and unemployment. It should also be noted that, while indeed measurements of income inequality, like the Gini coefficient and Lorenz curve, are meant to simulate, more so than other macro-economic measures, the quality of life within an economy or state compared to others.

However, any measurement of income inequality is by no means a measure of utility or happiness inequality, as previously proven by Mathews and Schwartz; "the level of utility inequality need not correspond in any way whatsoever with the level of income inequality." (Mathews & Schwartz, 2019) However, it could measure the retention of buying power over an entire population rather than its wealthiest members. Income is also more readily empirically found, and therefore a better measure for the effect of various taxes and rebates on a population,

because they retain a dollar value as a level of comparison. This essay utilizes the Permanent Fund Dividend to simulate how a potential carbon rebate would benefit the United States. A flat rebate system, or universal basic income of a similar nature, may actually be less costly for the federal government, as it decreases the amount of costly bureaucracy of other welfare programs, while still achieving some goals of decreasing income inequality, and in turn increasing buying power of lower-earning United States citizens.

Bibliography

"Alaska Median Household Income: Trends, Analysis, and Key Findings." *Neilsberg*, 11 Jan. 2024, www.neilsberg.com/insights/alaska-median-household-income/#income-by-quintile.

Alaska Permanent Fund Corporation, 29 Sept. 2023, apfc.org/.

Hafstead, Marc. "Carbon Pricing Bill Tracker." *Resources for the Future*, 1 Oct. 2020, www.rff.org/publications/data-tools/carbon-pricing-bill-tracker/.

Klenert, D., & Hepburn, C. (2018, July 31). *Making carbon pricing work for Citizens*. CEPR. https://cepr.org/voxeu/columns/making-carbon-pricing-work-citizens

Mathews, T., & Schwartz, J. A. (2019). Comparisons of utility inequality and income inequality. *Economics Letters*, *178*, 18–20. https://doi.org/10.1016/j.econlet.2019.02.015

Mathews, T. (2014). Historical trends in the degree of Federal Income Tax Progressivity in the United States. *The Social Science Journal*, *51*(1), 90–99. https://doi.org/10.1016/j.soscij.2013.10.011

Parry, I. (2019, December). *Putting a Price on Pollution*. IMF: Finance & Development. https://www.imf.org/Publications/fandd/issues/2019/12/the-case-for-carbon-taxation-and-putting-a-price-on-pollution-parry

Parry, I. W., Williams, R., & Goulder, L. (1997). *When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets*. https://doi.org/10.3386/w5967

Parry, I., Zhunussova, K., & Black, S. (2022, July 22). *How to Design Carbon Pricing Schemes*. CEPR. https://cepr.org/voxeu/columns/how-design-carbon-pricing-schemes

Samaras, C., Apt, J., Azevedo, I. L., Lave, L. B., Morgan, M. G., & Rubin, E. S. (2009, March). *Cap and Trade is Not Enough: Improving U.S. Climate Policy*. A Briefing Note From the Department of Engineering and Public Policy Carnegie Mellon University. https://www.cmu.edu/steinbrenner/images/cap-trade-not-enough.pdf

State of Alaska: Department of Revenue Permanent Fund Dividend, pfd.alaska.gov/. Accessed 29 Feb. 2024.

The United States Government. (2024, March 7). *National Climate Task Force*. The White House. https://www.whitehouse.gov/climate/

U.S. Census Bureau. (2022). Mean Household Income of Quintiles. *American Community Survey, ACS 1-Year Estimates Detailed Tables, Table B19081*. Retrieved February 29, 2024, from https://data.census.gov/table/ACSDT1Y2022.B19081?q=income by quintiles.

"U.S. Census Bureau Quickfacts: Alaska." *United States Census Bureau*, www.census.gov/quickfacts/fact/table/AK/PST045222. Accessed 29 Feb. 2024.

"Zobel v. Williams, 457 U.S. 55 (1982)." *Justia Law*, supreme.justia.com/cases/federal/us/457/55/. Accessed 29 Feb. 2024.