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Econ403 - Final Paper

In 2010 a new policy was put into place to reform school lunch programs called the Healthy, Hunger-Free Kids Act of 2010. The act had 2 major focuses, the first being to provide more access so that more children would be able to qualify and receive meals from school lunch programs. The second part is an overhaul on the nutritional requirements which has not been changed for the past 30 years. An example of the changes are a minimum set servings of fruit, vegetables, and whole grains and a maximum sodium, sugar, and fat content. The act also creates more transparency in the school lunch program by mandating that nutrition facts must be available to the public and auditing school districts to ensure they are following the act. The main goal of the act was to ensure that no child would go hungry and would have healthy nutrition to try and combat the obesity crisis. There were many critics of this act especially considering the restriction of whole milk and the reduction of portion sizes. The effectiveness of the act can be broken down into 2 major areas. The first being did the act reduce the child obesity levels and the second did the act have an improvement on education as a whole. The focus on this paper will be on education as a whole specifically in the state of Missouri and Oregon. There are many different academic papers discussing this policy with the majority of them looking at the policy from a different perspective than this paper.

There appears to be not many papers written on the effect the Healthy, Hunger-Free Kids Act of 2010 had on education in general. The majority of the papers are discussing the effect the act had on the health of students. An example of this is the “Impact Of The Healthy, Hunger-Free Kids Act On Obesity Trends”. (1) This paper discusses the impact the act had on obesity risk on children after the act was passed. The paper found no significant impact for children in general

but did find that the act greatly reduced the risk for children in poverty. The paper recommended keeping the changes that the act implemented. Another paper discussing the effects the act had on the health of children specifically dealing with obesity is “The Healthy, Hunger-Free Kids Act and Children’s Body Mass Index Outcomes”. (2) This paper came to a similar conclusion as the first. Another important part of the act was to try and increase the accessibility of school lunch programs to students. The paper “Impact of the 2010 US Healthy, Hunger-Free Kids Act on School Breakfast and Lunch Participation Rates Between 2008 and 2015” (3) discusses this. The paper tries to see if the act decreased students participation in school lunch programs. The way that they did this was by collecting data from 4 specific schools in New Jersey to see if there were any significant changes created by the act. The paper saw that there was a slight decrease immediately following the act passing but was followed by a small increase after the act was fully set in place. This paper came to the conclusion that the Healthy, Hunger-Free Kids Act of 2010 had no significant impact on participation rates. Another paper discussing the Healthy, Hunger-Free Kids Act of 2010 is “Post–Healthy, Hunger-Free Kids Act Adherence to Select School Nutrition Standards by Region and Poverty Level: The Healthy Communities Study”. (4) This paper discusses how feasible the act was to implement on a national scale. The data is from elementary and middle schools throughout the country. The majority of schools were able to meet the new requirements set by the act. There was a significant difference found between the different regions of the country. The paper comes to the conclusion that the act was successfully implemented and was feasible for different regions and poverty levels. There does not seem to be many if any papers discussing the effect the Healthy, Hunger-Free Kids Act of 2010 had on the academic performance of students. Below will be a description of the thought process behind the regressions.

The question being answered with this regressions is if the Healthy, Hunger-Free Kids Act of 2010 was effective on improving the academics of high school students in Oregon and Missouri. This effectiveness will be judged by whether the student has completed any years of schooling after high school. The reason these 2 states are picked specifically is based on data from a paper discussing which regions were properly following the guidelines of the act in 2013 to 2015. (4) The paper found that the West followed the requirements the most while the Midwest followed them the least. This is not to say that the majority of schools in the Midwest did not follow the guidelines. Just that they had 64% of schools reported meeting the nutrition requirements while the West had 82%. For each state multiple regressions will be run independent of each other. This means that a regression will be run without controls, with each set of controls and all controls combined together. With these regressions the effectiveness of the act can be determined and how it can be improved can be seen in the differences between the regressions. The data will be binned into 2 different groups based on age. The first bin will be people aged 27 to 29 in 2019. The reason for this is these people would be 18 to 20 in 2010. The second bin will be people aged 18 to 20 in 2019. These people would be 9 to 11 years old in 2010. With these 2 age groups a difference in difference regression can be run. The first bin will be used as the control or untreated group. These people should be at the age where they have already graduated from high school while the act has not passed yet. The second group will be the treated group. The reason these people are used instead of a younger group is because of the sudden changes that occurred during the years following 2020. The school system as a whole drastically changed during covid the the lock down that follows. With chosening the data like this hopefully these effects can be managed with the sacrifice that the students in the treated bin

did not receive all their lower level education while this act was in effect. They did receive a significant amount of it under the act with the oldest person in the bin having done 7 years of education under the act. This being the grades of 6th grade to high school. This is the majority of the person's lower level education under the act including middle school and high school which are where the student learns the majority of the skills needed to pursue further education. This is why the IPUMS ACS 2019 data is used for the majority of the data in this paper including all data that is used in the regression. There are a couple of controls that will be added to the regression. The first will be race. Race will be broken into 5 dummy variables. These variables will be white, black, native american, asian, and other. Asian will be created from the categories of Chinese, Japanese, other Asian or Pacific Islander. Other will be created from other races, two major races and three or more major races. The 3 other variables have their own categories and will be created from them. These controls are used to see if there is a statistically significant effect from race on the regression. This regression is equation 2. The second set of controls is sex. This will be done in a similar way to race. 2 dummy variables will be created, one for man and one for woman. This is done to see if there is a statistically significant effect from sex on the regression. The third set of controls is school type. This control will be made up of whether the student attended public or private school. This will be done in the same way that sex was done. This control should have a significant effect on the regression since the majority of students in private schools attend higher education after high school and most likely do not qualify for the act. The last set of controls added comes from total family income. This data will be split into 2 groups. The first being families making $50k or less a year. The other group will be families making more than $50k a year. The reason for this control is to artificially create the people who would have qualified for the act. The issue with this control is it does not give an accurate

representation of the people who actually qualified for the act and for how long they did. It just shows that in the year of 2019 they would have qualified for the bill. The reason that $50k is used is if a family of 4 has an annual income of $47,623 (5) they would qualify for reduced meal prices. This is another weakness of this control since the size of the family determines if the family income is low enough to qualify for aid. With these 5 sets of controls hopefully the effectiveness of the act can be seen and who it affects the most. Below will be a description of the data used in more detail.

For the state of Oregon after the limitations were set for the age and state limits. These limits were living in the state of Oregon during the 2019 census and being between the ages of 18 to 20 or 27 to 29 during the 2019 census. The data was left with 3,054 total observations. There are a total of 1,594 people in the 18 to 20 age bracket. The rest are in the 27 to 29 age bracket which is 1,460 people. This data is also shown with mean and standard deviation in table 1. The data was unbiased based on sex, there were slightly more females than males but the difference is insignificant. The exact breakdown is shown in table 3. This was not the case for the race controls. The majority of the people in the dataset are white. The other races make up about 1/5th of the data. The second highest percentage for a single race was for other. They had about 9.3% of the population of the dataset. In table 2 all the different characteristics are shown for the race control. The school type controls also have a heavy bias as well. The majority of the people in the data set were not enrolled in either a private or public school. About 35% of the population were enrolled in a public school and 8.81 were enrolled in a private school. This is expected since the majority of the population should have finished high school by the age groups picked. It is also expected that the majority of the population that are still enrolled in high school are

doing it at a public school. This data is shown in table 4. The final control used is based on the total family income. The majority of people surveyed earned more than $50,000 in this data set. This does not necessarily mean that the majority of people in the survey did not have access to the school lunch program. The reason for this is this is just a snapshot from one year. In previous years the total family income could have been low enough to qualify for the act. The aid is also given out based on the size of the family. The $50,000 cutoff is based on a family size of 4 people. If the family is larger than they could qualify for the aid with a higher total income then 50,000. In figure 1 a histogram of the total family income is shown. This is done to show the breakdown of each income level and the frequency of which it occurs. The max values are removed from the graph. The reason for this is it was the largest group of people and made the graph skewed to the right. The reason this group is so large is the people in this group most likely earn more than the survey had as the max income level. Below is the data description for Missouri.

The dataset for Missouri was set up the same way as the one for Oregon. The total observation was larger by a significant amount. There were 4,723 total people that passed the age requirements. 2,469 people are in the 18 to 20 age bracket. The remaining people are in the 27 to 29 age bracket, which is 2,254. This data is located in table 6. The race controls bias is similar to Orgeons in that the majority of the people surveyed were white. The second largest group was different for Missouri. This group was African Americans but they made up a similar percentage of the population compared to Oregon's second largest race group. All the characteristics of the race variable are located in table 7. The Missouri dataset was not biased towards sex as well. The dataset had slightly more males than females. This data is located in table 8. The school type

control for Missouri had a similar breakdown to the Oregon dataset. There is a small difference in that slightly more students are enrolled in private schools. The difference is a couple of presents so there should not be a significant difference. The total family income also follows a similar trend between the 2 states. A histogram is also provided for the Missouri dataset. The settings and exclusions are the same as the Oregon one. It is located in figure 2 and 948 people were excluded from the graph. The Missouri histogram has a sharper drop off after around the $100,000 mark. It appears that Oregon has more people that earn over $100,000 to around $8,000,000. Missouri has more people that earn over the max total family income. This is most likely the reason why the means are so close to each other. The 2 states have many similarities but the differences are significant especially in the race and total family income controls. The following section will discuss the results of the different regressions.

There were 12 different regressions run with the results shown in table 11. There were 6 for each state. The equations are shown in the equation section. For each regression different controls are turned on. The controls that are expected to affect the results the most are school type and total family income. The reason for this is most people who go to private schools also attend higher education. The same logic applies to total family income. The higher this total is the more likely the individual will attend higher education. The controls for sex and race will hopefully have minimal effects on the regression. The reason for this is if these controls have a significant effect then the act has racial and sexual bias. This could mean that the act is not being enacted fairly or there were pre-existing bias in the school system towards a specific race or sexuality. These worries were not needed. When the controls for race and sex are activated there is minimal change in results of the interactive term. For the state of Orgen when no controls are

added the results are 0.17. This does not change when the race and sex controls are turned on. The same is seen in Missouri. The results for no controls, race controls and sex controls is around 0.20. All the t-test values are significant at the 1% level for these regressions. The results from the school type and family income were quite interesting. Both of these regressions had an increase in the value of the interactive term. This means that when the school type is removed more people were pursuing higher education. The same effect was seen for the family income controls for Oregon. The increase was not large but was a noticeable change. For Oregon the interactive term increased to 0.20 for the school type controls and 0.18 for family income controls. For Missouri only the school type had a change and was increased to 0.23. These regressions were also significant at the 1% level. The results for all the controls being added are similar to the other results. For Oregon the interactive term is 0.1999 and for Missouri it is 0.2339. These terms are close in value to the highest interactive term seen in the single controls regressions. As with the other interactive terms these values are significantly at the 1% level by a large amount. The trend of all regressions and in both states is a positive increase in the amount of people who are pursuing higher education. This trend is more important than the actual values of the interactive terms. Seeing a positive increase means that the policy is effective at raising the academic level of students and increasing the likelihood of higher education. A reason why the increase is larger in Missouri compared to Oregon even though Missouri was less effective at implementing the policy is that the Missouri education system (Prek to 12th) is ranked higher than Oregons. Missouri is ranked 21 by US News while Oregon is ranked 44. (6) It is expected that more people would pursue higher education when the lower schools are better. There are a couple of limitations to the regressions run. One is the scope of the data and the way the data is collected. Since the data is from the census and limited to one year not many individuals are left

after the data has been processed. The time trends between the 2 age brackets can also be different. For the 27 to 29 age bracket many of them could have chosen not to pursue higher education because of the housing crisis of 2008 and the recession that followed it. The same can be argued for the 2020 covid crisis for the 18 to 20 age bracket. These effects are deemed to be minimal since the economy was recovering by 2010. The 27 to 29 age bracket also could have attended higher education later instead of doing it between the ages of 18 to 20. The covid crisis effect is also minimized since many of the students in the 18 to 20 bracket would not have known about covid while applying and enrolling in higher education. The y term for the regressions is also set in such a way that any amount of higher education is counted. This has the benefit of minimizing these effects as well as counting trade schools and associated degrees. In conclusion the regressions run found that the Healthy, Hunger-Free Kids Act of 2010 did have a positive effect on academic performance.

Tables:

Age Bracket	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
18 to 20	1,594	52.19	52.19	23.298	4.620	18	29
27 to 29	1,460	47.81	100				

Table 1 - Age Bracket Characteristics for Oregon dataset

Race Controls	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
White	2,482	81.27	81.27	1.946	2.164	1	9
African American	60	1.96	83.23				
Native American	44	1.44	84.67				
Asian	184	6.02	90.69				
Other	284	9.30	100				

Table 2 - Race Controls Characteristics for Oregon dataset

Sex Controls	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
Male	1,524	49.90	49.90	1.501	0.501	1	2
Female	1,530	50.10	100				

Table 3 - Sex Controls Characteristics for Oregon dataset

School Type Controls	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
Private	269	8.81	8.81	1.531	0.652	1	3
Public	1,084	35.49	44.3				
Not Enrolled	1,701	55.70	100				

Table 4 - School Type Controls Characteristics for Oregon dataset

Total Family Income Controls	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
Total Family income is Under $50k	649	21.25	21.25	2,080,685	3,965,803	0	9,999,999
Total Family Income is Over $50k	2,405	78.75	100				

Table 5 - Total Family Income Controls Characteristics for Oregon dataset

Age Bracket	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
18 to 20	2,469	52.28	52.28	23.271	4.594	18	29
27 to 29	2,254	47.72	100				

Table 6 - Age Bracket Characteristics for Missouri dataset

Race Controls	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
White	3,976	84.18	84.18	1.4611	1.448	1	9
African American	437	9.25	93.43				
Native American	12	0.25	93.68				
Asian	121	2.56	96.24				
Other	177	3.75	100				

Table 7 - Race Controls Characteristics for Missouri dataset

Sex Controls	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
Male	2,391	50.62	50.62	1.494	0.500	1	2
Female	2,332	49.38	100				

Table 8 - Sex Controls Characteristics for Missouri dataset

School Type Controls	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
Private	535	11.33	11.33	1.536	0.689	1	3
Public	1,461	30.93	42.26				
Not Enrolled	2,727	57.74	100				

Table 9 - School Type Controls Characteristics for Missouri dataset

Total Family Income Controls	Total people	Percent	Cum	Mean	Standard Deviation	Min	Max
Total Family income is Under $50k	1,227	25.98	25.98	2,074,742	3,972,461	0	9,999,999
Total Family Income is Over $50k	3,496	74.02	100				

Table 10 - Total Family Income Controls Characteristics for Missouri dataset

	Oregon		Missouri	
Regression	Interactive Coefficient, β_3	t-Test	Interactive Coefficient, β_3	t-Test
No Controls, Eq1	0.1759	8.72	0.2032	12.09
Race Controls, Eq2	0.1774	8.83	0.2028	12.12
Sex Controls, Eq3	0.1710	8.58	0.2031	12.15
School Type Controls, Eq4	0.2006	10.30	0.2334	14.48
Total Family Income Controls, Eq5	0.1801	8.92	0.2076	12.44
All Controls, Eq6	0.1999	10.36	0.2339	14.69

Table 11 - Interactive Coefficients and t-Tests from Regressions

Figures:

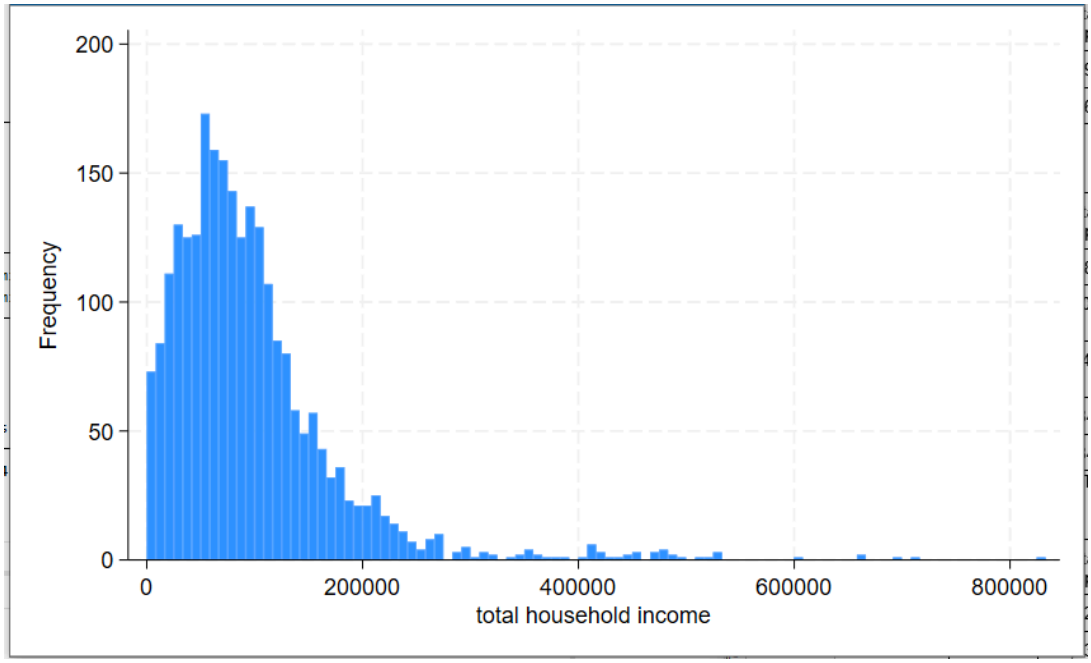

Figure 1 - Total Family Income Controls Frequency for Oregon dataset

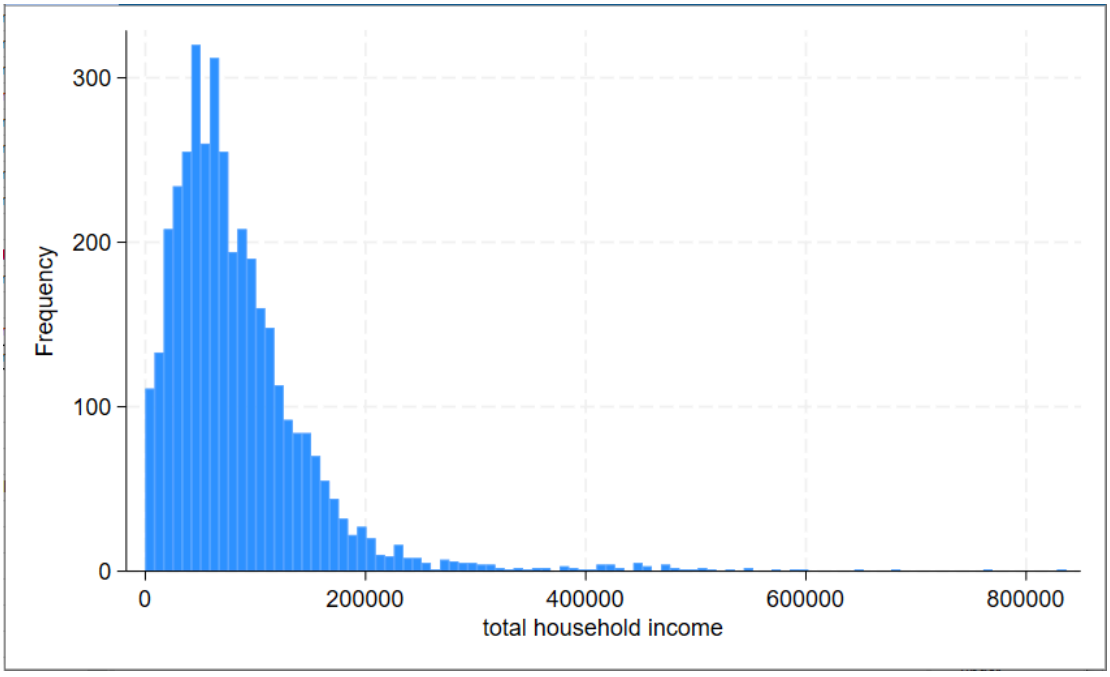

Figure 2 - Total Family Income Controls Frequency for Missouri dataset

Equations:

1. No controls

$$Educ_{high} = \beta_0 + \beta_1 Age + \beta_2 After + \beta_3 (Age * After) + \varepsilon$$

2. Race Controls

$$Educ_{high} = \beta_0 + \beta_1 Age + \beta_2 After + \beta_3 (Age * After) + \beta_4 White + \beta_5 Black + \beta_6 Native + \beta_7 Asian + \beta_8 Other + \varepsilon$$

3. Sex Controls

$$Educ_{high} = \beta_0 + \beta_1 Age + \beta_2 After + \beta_3 (Age * After) + \beta_4 Male + \beta_5 Female + \varepsilon$$

4. School Type Controls

$$Educ_{high} = \beta_0 + \beta_1 Age + \beta_2 After + \beta_3 (Age * After) + \beta_4 Public + \beta_5 Private + \varepsilon$$

5. Over 50,000 Family Income Controls

$$Educ_{high} = \beta_0 + \beta_1 Age + \beta_2 After + \beta_3 (Age * After) + \beta_4 Under + \beta_5 Over + \varepsilon$$

6. All Controls

$$Educ_{high} = \beta_0 + \beta_1 Age + \beta_2 After + \beta_3 (Age * After) + \beta_4 White + \beta_5 Black + \beta_6 Native + \beta_7 Asian + \beta_8 Other + \beta_9 Male + \beta_{10} Female + \beta_{11} Public + \beta_{12} Private + \beta_4 Under + \beta_5 Over + \varepsilon$$

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