An Analysis of the Social Program Prospera: Cash Benefits and Its Effects on Tertiary Grade Progression.

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Abstract

The purpose of this study was to determine if the amount of conditional cash benefits due to education co-responsibilities in a Mexican state of the social program Prospera affect the tertiary grade progression of the beneficiaries' children in that state. Prior research shows that Prospera has had a positive impact in raising the grade progression, lowering dropout rates, and increasing school reentry rates in primary and secondary education among its beneficiaries; however, no emphasis was placed on tertiary education nor on the amount of conditional cash benefits. Mexican states were classified as either a Mexican state with high or low educational cash benefits based upon their beneficiaries' cash benefits. A between-within ANOVA was used to compare the tertiary grade progression of the Mexican states with high educational cash benefits against those with low educational cash benefits across Prospera's first four years of implementation. Initial results showed a difference in the average tertiary grade progression of between the two groups, thus showing that higher educational cash benefits lead to a higher tertiary grade progression. Therefore, the conclusion can be made that Mexican states with higher educational cash benefits have higher investments in human capital through tertiary education; nonetheless, this conclusion is limited by the fact that a basic statistical program was used, which did not check for assumptions of the between-within ANOVA, which in turn could affect the between-within ANOVA results. Future researchers should investigate if the trend seen in this study applies for Prospera's nutritional and health cash benefits.

Keywords: Prospera, tertiary grade progression, educational cash benefits

Introduction

One of the biggest problems Mexico faces and is currently trying to solve is poverty. According to the government agency *Secretaría de Desarrollo Social* (SEDESOL), whose main objective is to lead the social development efforts in the nation, approximately 43.6% of the Mexican population lives in poverty with a subset of 9.4 million individuals having a severe deprivation of basic needs, classifying them into the category of extreme poverty (Secretaría de Desarrollo Social, 2018). In an attempt to combat this dilemma, SEDESOL has implemented the social program Prospera, a conditional cash transfer (CCT) program in which approximately 17.8 million people are enrolled. Prospera is the fourth iteration of a federal program, which has seen various implementations, such as Solidaridad (1988-1997), Progresa (1997-2002), and Oportunidades (2002-2014), due to changes in the administration of the program, but has mostly operated in the same fashion throughout the years with no significant changes.

The basis for any CCT program is to reduce poverty by making the welfare benefit conditional based upon the receiver's actions. As described by the Inter-American Development Bank, an international organization which finances multiple social program in Latin America, Prospera included, for beneficiaries in Prospera to receive cash benefits, they must comply with certain health, nutrition, and education co-responsibilities, such as attending biweekly health and nutrition service appointments and workshops, enrolling children in primary, secondary, and tertiary education, and meeting a certain attendance minimum per month (Inter-American Development Bank, 2016). Prospera's target population consists of households who desperately need the aid; in order to qualify for the program, the household must be below the *Linea de*

Bienestar Mínimo Ajustada, which represents the minimum income required to afford the basic food basket.

Literature Review

Although Prospera is meant to alleviate poverty in Mexico, there is much discussion on whether the program does so effectively. Tamara Diana Wilson, an anthropology professor at the University of Missouri, argues that the Prospera's design limits the impact it can have on its beneficiaries because health and nutritional conditions, such as taking children to health checks and attending nutritional and health appointments, are time-consuming, which is likely to lead to the exclusion of single-parent households from Prospera because of the unableness to complete both the co-responsibilities and money-earning activities (2017). Additionally, Wilson stresses that the free-services promised by Prospera (clinics and schools) are absent in isolated rural communities, thus leading to more exclusion (2017). Wilson's comments illustrate that although Prospera covers million of households, the program is not able to provide for all low-income households in Mexico, leaving various groups and communities in poverty.

In addition to Prospera's undercoverage, there is a possibility that these types of social programs have no effect in reducing poverty in the next generation, but rather lead to an intergenerational transfer of welfare dependency. In a study performed by John J. Antel, a professor of labor economics at the University of Houston, in which mothers' welfare participation was observed and the daughter's welfare behavior was documented seven years later, demonstrated that there was a higher probability for the daughter to be involved in a welfare program if her mother had participated before (1992). This study, therefore, suggests that social programs do not have a significant effect in the long-term; however, it must be noted that

the study was performed only on the recipients of the Temporary Assistance for Needy Families program, which could lead to differences in other social programs such as Prospera.

Although Prospera has detriments, the Mexican national social program seems to be effective in raising the human capital of its beneficiaries. Adam Smith, the father of modern capitalism, in his work *An Inquiry into the Nature and Causes of the Wealth of Nations*, defined human capital as "the acquisition of … talents during… education, study, or apprenticeships, costs a real expense, which is capital in [a] person. Those talents [are] part of his fortune likewise of that society" (1776). In other words, human capital is the skills, knowledge, and habits an individual can attain that allows him to increase his individual productivity and that of his society. Theodore Schultz, American economist and chairman of the University of Chicago Department of Economics, elaborated further on this subject by claiming that these actions and skills that attribute to an individual's human capital can be grouped into five aspects of one's life: health, on-the-job training, study programs, migration, and formal education (1961). A strong emphasis will be placed on formal education in this paper because it is one of the main aspects Prospera looks at to combat poverty.

However, critics of human capital theory, such as Mark Blaug, a British economist whose main work focused on the methodology of economics and its applications, argue that this theory lacks precision in determining an individual's human capital and that investments on human capital can only be used to predict general trends (1976). In other words, an individual's human capital can never be quantified and investments on any of its five aspects can only lead to the conclusion that an individual's human capital has grown. As a result, although it would be impossible to determine the exact growth of human capital of an individual caused by Prospera,

it can be concluded that by using cash benefits as an incentive, Prospera encourages low-income families' children to attend primary, secondary, and tertiary school, which Schultz would consider an investment in human capital (1961).

Claudia Goldin, the Henry Lee Professor of Economics at Harvard University, further corroborates this idea by suggesting that these investments in human capital can foster the economic growth of the individual (2016). Goldin presents evidence of this idea by comparing the income of individuals in the mid-twentieth century, an era in which the United States government heavily invested in education making it a crucial moment for the rise of human capital, who attended secondary school versus those who did not. The conclusion of her results demonstrated that those who attended secondary school, or those who invested in their human capital, often saw higher income than their peers (2016). Additionally, Gary S. Becker, professor of economics in human capital theory and recipient of the Nobel Memorial Prize in Economics Sciences, also highlights the importance of education in human capital theory through his book *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education.* Becker claims that as time progresses, the investments of human capital, produce returns as parts of earnings, which he backs up through a correlational study of college education and its return rates, in which he arrived at the conclusion that these have a positive correlation, such that higher education has a higher return rate (1994). The results of these studies propose the possibility that through Prospera's educational co-responsibilities, which are enrolling children in primary, secondary, and tertiary school and meeting a certain attendance minimum per month, the beneficiaries could potentially afford the basic food basket through an elevated income.

Although there is a lack of research that addresses how Prospera's educational co-responsibilities develop human capital in its beneficiaries, there are multiple studies that evaluate another CCT program, Progresa, a past iteration of the program (1997-2002). Jere R. Behrman, Piyali Sengupta, and Petra Todd, professors of developmental, educational and labor economics, respectively, suggest in their study that the social program Progresa, had a positive effect on its recipients' education (2005). Through the use of a Markov schooling transition model, which can distinguish different kinds of social program impacts by studying the short and long-term dynamics of educational progression through various dimensions, the authors concluded that the educational co-responsibilities of Progresa were associated with better grade progression, lower dropout rates, and higher school reentry rates in primary and secondary education among its beneficiaries. Furthermore, Pierre Dubois, Alain de Janvry and Elisabeth Sadoulet, all economic professors, using a theoretical framework to analyze the dynamic educational decisions and processes, concluded that Progresa was linked to a rise in performance at the primary school level (2012). Nonetheless, Dubois', de Janvry's and Sadoulet's study also demonstrated that Progresa beneficiaries saw a decline in performance at the secondary level, showing a detriment of Progresa. While these statistics are based upon Progresa, because the basis for the federal program has mostly operated in the same fashion throughout its various implementations (Secretaría de Desarrollo Social, 2018), it can be assumed that these effects layover into Prospera. The mostly positive effects of education represent that Progresa, and therefore Prospera, have made successful investments in human capital through education; nonetheless, it must be noted that these evaluations only refer to primary and secondary education, excluding tertiary education.

The lack of studies involving tertiary education and those that directly evaluate the current national Mexican social program Prospera indicate a gap in the field, as no conclusion can be made about the effects tertiary education can have on human capital throughout time. In addition, the aforementioned studies in this paper evaluated Progresa through a national scope, rather than a state-wise approach, which also provides a gap in the literature, as internal patterns of Prospera are not addressed. Furthermore, none of the past studies mentioned how the amount of allocated funds, which differ among the Mexican states due to the differences in poverty rates and population, for the program could potentially affect the results of Prospera, such as the recipients' tertiary grade progression within the state as the years' progress.

The importance of evaluating the tertiary grade progression with respect to Prospera is highlighted by studies of intergenerational transmission of poverty and intergenerational mobility as these demonstrate that while not substantial, investments in human capital through education, such as those in Prospera, in low-income areas can result in reducing poverty in the next generation (Becker et al., 2018), which would accomplish Prospera's goal. Additionally, further studies emphasize that children whose human capital is invested the most tend to be in a higher economic status (Behrman et al., 2017). Such studies iterate the importance of analyzing the impact Prospera has on a state's education as it can demonstrate if more allocated funds to Prospera can result in higher tertiary grade progression of its beneficiaries. As a result, the purpose of this paper is to answer the following question: based on the first four years of its implementation (2014-2017), how does the social program Prospera's amount of cash benefits due to education co-responsibilities in a Mexican state affect the tertiary grade progression of the beneficiaries' children in that state?

Method

Because the inquiry of this research project required the analysis of Prospera across a period of time, a longitudinal study was performed, which Paul D. Leedy and Jeanne E. Ormond, authors of the book *Practical Research: Planning and Design,* define as a study where "a single group of people is followed over the course of months or years, and data related to the characteristic(s) under investigation are collected at various times" (1974).

The 32 Mexican states were divided into two groups (states with high cash benefits against states with lower cash benefits) based upon their confidence intervals of their cash benefits and a between-within analysis of variance (ANOVA) was performed, which, according to statistician William J. Vincent, is a statistical test aimed to study the effect of one independent variable on a dependent variable across repeated measures (1994). This approach was ideal because it was utilized to compare the effects of cash benefits due to educational co-responsibilities through multiple years on tertiary grade progression on two different groups; thus, matching the purpose of the inquiry.

Confidence Intervals: Estimating A State's Cash Benefits

Because the inquiry required the comparison between states' cash benefits and their tertiary grade progression, it was important that an accurate estimation of a state's educational cash benefits be established. Utilizing the funding for Prospera and stratifying the Mexican states into two groups based on each individual state quota was considered; nonetheless, this procedure was dismissed because Prospera alleviates health, nutrition, and education within a state, which could consequently cause for the state funding to be arrayed in a manner that mitigates one aspect of Prospera on an unequal manner. Therefore, it was decided that instead, there should be

an emphasis on the average cash benefit that an average beneficiary in a given state would receive on a bi-monthly period, as this functions as the main incentive for their cooperation in the program.

The federal Mexican law requires that all information about a social program be published for public viewing, which allowed for the access of the list of beneficiaries within each state and their bi-monthly cash benefits directly from the official Prospera website (Secretaría de Desarrollo Social, 2014). Due to some states containing over four-hundred thousand recipients, which would make calculations for a state's average educational cash benefit that an average individual would receive bi-monthly and its standard deviation time-consuming and difficult, one-sample t confidence intervals were performed for each state to estimate the states' average educational cash benefit that an average beneficiary would receive. According to Daren S. Starnes, Josh Tabor, Dan Yates, and David S. Moore, all statisticians, a one-sample t confidence interval is a statistical method that "uses sample data to estimate an unknown population parameter with an indication of how precise the estimate is and of how confident we are the result is correct when we do not have the standard deviation of the population statistic" (2014). For the purpose of this study, the unknown population parameter is a state's average educational cash benefit that an average individual would receive bi-monthly. Additionally, because this process is repeated 32 times (one for each state) and a confidence interval's probability that the given interval contains the true population parameter is independent from all other intervals, a high confidence level is required to have a high enough probability that all confidence intervals contain the true population parameter of their given state. As a result, a 99% confidence level was selected.

Due to the formula of the one-sample t confidence interval (see *Figure 1*), a sample size of 556 beneficiaries was selected to reduce the size of the interval and achieve a high enough sample ($n = 556 \geq 30$) to approximate normality in the population distribution without breaking the requisite that the population is at least 10 times as large as the sample (Starnes et al., 1998) as Mexican state Sonora has a population of 5,560 Prospera beneficiaries.

$$\overline{x} \pm t * \frac{S_x}{\sqrt{n}}$$

Figure 1. Formula of a one-sample t confidence intervals. The figure illustrates the formula to create a one-sample t confidence intervals, where $\overline{x}$ represents the sample mean, *t* is a value dependent of the degrees of freedom (for our sample size of 556, the degrees of freedom are 555, making *t* equal to 2.58), S_x is the standard deviation of the sample, and n is the sample size.

With the given sample data, the one-sample t confidence intervals were calculated. Nonetheless, a limitation of this method is that the intervals give a range of possible values that can represent the true population parameter of each Mexican state instead of a single value. This comparison would have made stratifying the Mexican states complicated because these intervals could have overlapped between each other. As a result, the sample average of each Mexican state was chosen to represent the state's average educational cash benefits that an average individual would receive bi-monthly as it does not prioritize high cash benefits over low cash benefits and vice-versa. Using these values, Mexican states were stratified into two groups: high cash benefits and low cash benefits.

Between-Within ANOVA: Comparing Tertiary Grade Progressions

With the Mexican states stratified into two groups, the tertiary grade progression of each state through Prospera's first four years of implementation (2014-2017) was collected. The federal Mexican government publishes this information in the official Prospera website

(Secretaría de Desarrollo Social, 2017). This allows the conclusions regarding the between-within ANOVA to be specific toward the beneficiaries of each state, facilitating the evaluation of the program.

According to Dr. Erin M. Buchanan, professor at Missouri State University, the results of a between-within ANOVA is partitioned into three effects: the Main Effect Between, the Main Effect Repeated Measures, and Interaction, which, in this case, is the statistical measure of the change of tertiary grade progression due to the difference of high cash benefits and low cash benefits, the statistical measure of the change of tertiary grade progression across the years of implementation, and the combined effect on tertiary grade progression due to the difference of high cash benefits and low cash benefit and the years of implementation, respectively (2016). These effects are represented by *F* values, calculated based upon the variance created by the treatment and the variance caused by random error, which are then compared to their respective *F critical* calculated by the computer based upon the degrees of freedom. If the F value is bigger than the F critical, then we can assume that there is a significant difference between the compared groups caused by the effect being analyzed.

Another important aspect of the between-within ANOVA is that F critical is dependent of the significance level desired, or the probability of accepting that there exists a significant difference between the groups' means when there exists no difference (Vincent, 1994). Because Prospera involves millions of citizens and pesos, the minimization of an error is important; therefore, a significance level of 0.01 was selected, indicating a risk of 1% of concluding that a difference exists between the different groups tertiary grade progression when there is no actual difference. Nonetheless, it is important to note that due to this low significance level, there exists

a higher risk of concluding that there exists no differences between the groups tertiary grade progression, when a difference does exists between the tertiary grade progression of the groups analyzed.

Limitations

The limitation of this approach was that, while it determines if cash benefits due to educational co-responsibilities have a statistical significance on a state's grade progression across time, it does not demonstrate why this trend occurs. This limitation becomes an issue because after the between-within ANOVA is performed, no suggestions of specific changes of Prospera can be implemented because there is no knowledge as to why tertiary grade progression of the beneficiaries is at a certain percentage. As a result, performing a follow-up ethnographic case study with interviews was considered, but due to time constraints and resources, these would only be performed on low-income communities in Nuevo Leon due to proximity, which could lead to false national conclusions. Therefore, this approach was scrapped.

Results

After the random sampling and the confidence intervals were performed on the 32 Mexican states with respect to the average educational cash benefit a beneficiary receives (see *Table A1* in Appendix), there was a considerable difference in the average of cash benefits of the lowest sixteen states and the highest sixteen states, 782.23 and 985.73 pesos, respectively. These figures represent 16.2% and 20.5%, respectively, of the bi-monthly Mexican minimum wage and is equivalent to 3.46% and 4.37%, respectively, of the bi-monthly cost of basic expenses, according to the Consejo Nacional de Evaluación de la Política de Desarollo Social standards, a Mexican government entity that generates information and standards on Mexico's poverty and

social policy (Consejo Nacional de Evaluación de la Política de Desarollo Social, 2017). Although these percentages seem relatively low, it is important to consider beneficiaries have their main income as well as the nutrition and health cash benefits of the program.

Additionally, another considerable difference between the states with high cash benefits due to educational co-responsibilities and states with low cash benefits is the number of citizens who participate as beneficiaries in the social program Prospera. The former has an average of 124,650 beneficiaries in the program compared to 247,708 individuals in states with low cash benefits, almost double in size from the states with high cash benefits due to education co-responsibilities (see *Table A1* in the Appendix for each state's amount of participants). Theoretically, the population sizes' averages should be the same as the amount of cash benefits an individual receives is independent of how many other citizens there might be in a state because the individual must only meet his educational co-responsibilities. Nonetheless, based upon the comparison of the average amount of participants between states with high and low cash benefits due to education co-responsibilities, there could possibly be an association between these two characteristics; however, we lack information about the internal management of Prospera funds and other socioeconomic variables within a specific state to reach further conclusions.

A noticeable nationwide trend was that a large number of beneficiaries that do not participate in obtaining educational cash benefits as can be seen by the mode of every Mexican state being zero (see *Table A1* in Appendix), which may cause the average cash benefit of an average beneficiary of Prospera through educational co-responsibilities to be skewed towards smaller values. This statistic suggests that many of the Prospera participants are not investing on

human capital through education; nonetheless, it must be noted that data regarding the beneficiaries is limited as there was no information if these individuals did not have a family, qualifying them as unable to receive educational cash benefits. Although excluding individuals with zero educational cash benefits was an alternative, such idea was scrapped as it potentially ignores parents with children that do not meet the co-responsibilities to receive educational cash benefits.

Another trend regarding Mexican states and their classification as a state with a high or low amount of educational cash benefits is through geographical distribution. As can be seen in *Figure 2*, the states with a higher average of cash benefits due to educational co-responsibilities are mostly located in the geographic west and center of the country while states with a lower average of cash benefits are mostly northwestern and southern Mexican states. Similarly to the number of participants in a state with high or low cash benefits due to education, we expected to see no apparent geographical trends as the amount of cash benefits one receives is not based upon the location of the state but rather the participant's ability to complete the educational co-responsibilities. Nonetheless, *Figure 2* seems to hint at the fact that location and the amount of cash benefits a state receives are associated; nevertheless, more data about a specific state's management of Prospera funds would be required to establish a connection between these two.

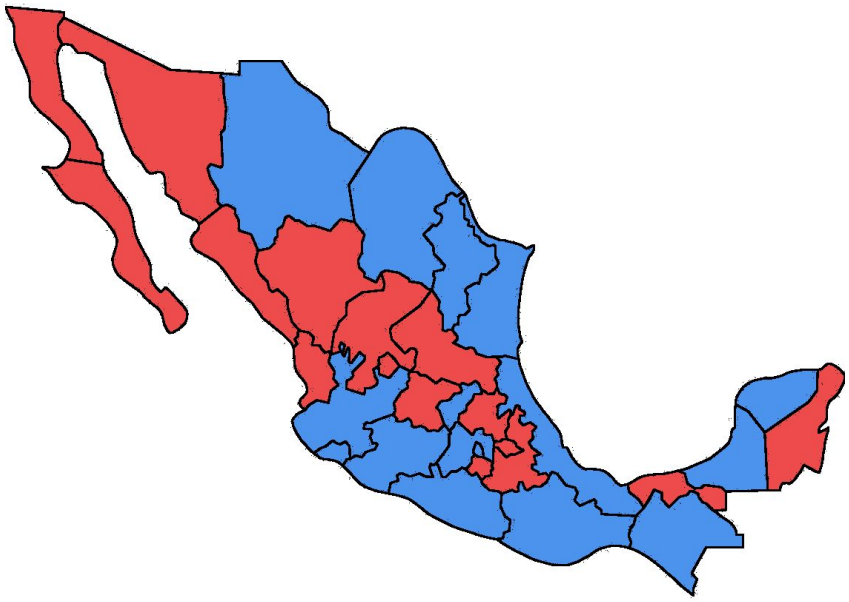

Figure 2. A Map of Mexico Divided by the Average Amount of Cash Benefits a Beneficiary Would Receive Through Education Co-responsibilities. The Mexican states that are colored blue represent are those with lower cash benefits for an average beneficiary due to education co-responsibilities when compared to the red states, which have higher average cash benefits for their beneficiaries through education co-responsibilities.

Discussion

With the Mexican states classified into either high or low cash benefits due to educational co-responsibilities, their classification and their tertiary grade progression were tabulated (see *Table A2* in the Appendix) into Google Spreadsheets to perform the between-within ANOVA. In order to calculate the F values for the three effects, the statistical program in Google Spreadsheets calculated the average tertiary grade progression for the categories of high and low educational cash benefits and year of implementation, and determined the variance and averages of these statistics based upon the categories mentioned (see *Table A3* in the Appendix).

As can be seen from *Table B1*, the only F value that was higher than their respective F critical is the Main Effect Within, or the statistical measure of the change of tertiary grade progression due to the difference of high cash benefits and low cash benefits. As a result, we can

assume that there is a significant difference in the tertiary grade progression of Mexican states with high and low cash benefits due to educational co-responsibilities. This information is further highlighted in *Figure 3*, through the clear difference, or gap, in the tertiary grade progression between these two groups of Mexican states.

Between-Within ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F critical*
Main Effect Within	882.6301125	1	882.6301125	15.84212206	0.000118339 6419	6.850893399
Main Effect Repeated Measures	287.4522094	3	95.81740312	1.719804224	0.166566127 6	3.949099795
Interaction	12.6629125	3	4.220970833	0.075761221 18	0.972945434	3.949099795
Within	6685.696088	120	55.71413406			
Total	7868.441322	127				

Table B1. Between-Within ANOVA Table of Mexican States' Tertiary Grade Progression When Classified By Their Citizen's Average Cash Benefits due to Educational Co-responsibilities. This table provides the statistical summary of the Between-Within ANOVA, reporting the P-value, F critical, and F values of the Main Effect Within. Main Effect Repeated Measures, and Interaction.

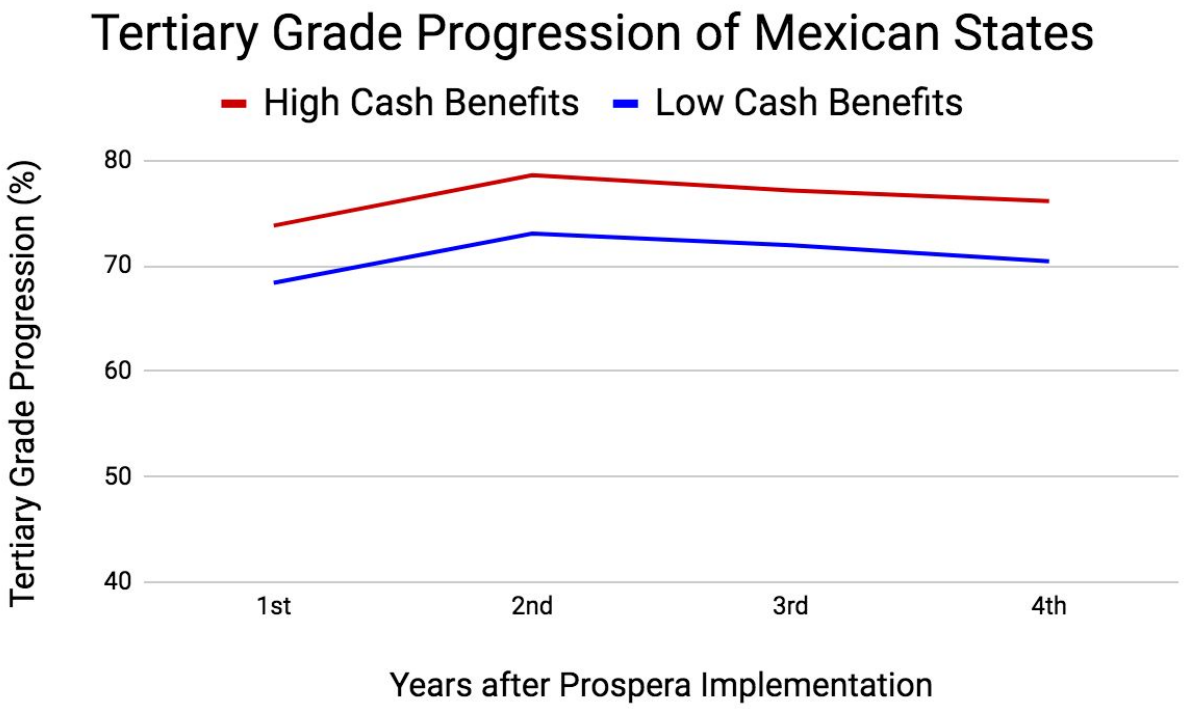

Figure 3. Graph of the Tertiary Grade Progression of Mexican States' Prospera Beneficiaries When Classified by Their Their Citizen's Average Cash Benefits due to Educational Co-responsibilities. This graph highlights that there is a significant difference in the tertiary grade progression between Mexican states with high cash benefits and low cash benefits due to educational co-responsibilities but not through the years of implementation as it remains mostly stagnant.

Mostly, when a significant difference is found in one effect, a post hoc test, such as the Tukey's Honest Significant Test, would be performed. According to Vincent, post hoc tests determine which exact groups have a significant difference in the average of their dependent variable when the F value is larger than the F critical (1994); however, because in the Main Effect Within, there are only two groups, we do not need to perform a post hoc test to determine that the significant difference exists between the tertiary grade progression of Mexican states with high and low cash benefits due to educational co-responsibilities.

The difference between the tertiary grade progression of Mexican states with high and low cash benefits due to educational co-responsibilities seems to suggest a difference in the

investment of human capital in the beneficiaries in Prospera between these states. This suggested difference in the human capital of these states causes with it also multiple differences between these groups due to the implications of human capital. As mentioned by both economists Goldin and Becker, educational investments in human capital lead to higher income and return rates as time progresses, which would show a disparity in the economic growth between the Prospera beneficiaries in states with high cash benefits due to educational co-responsibilities against states with low cash benefits, with the former having an increased growth (2016;1994). The variation of economic growth between these populations, in turn, signifies a greater effectiveness of Prospera's goal of ending poverty in the long-term in states with high educational cash benefits, because the greater percentage of individuals with investments in human capital, which leads to higher income and return rates, are able to grow economically beyond poverty due to the rise in earnings, breaking the cycle of intergenerational poverty (Becker et al., 2018).

Nonetheless, another aspect of the between-within ANOVA, as can be seen in *Table B1* above, is that both the Main Effect Repeated Measures and the Interaction had F values that were lower than their respective F critical values, which means that there isn't a significant difference in both the tertiary grade progression of Prospera beneficiaries through the first years of its implementation and the tertiary grade progression of Prospera beneficiaries of Mexican states when considering their classification of high or low cash benefits due to educational co-responsibilities and the year of implementation. This information is further supported by *Figure 3,* as there isn't a significant change in the tertiary grade progression of each group across the years of implementation and the slope of these graphs across the same time periods are approximately equal. The lack of significant differences between these areas signifies that

although there exists a difference between the tertiary grade progression of Mexican states with high and low cash benefits due to educational co-responsibilities, the tertiary grade progressions of all Mexican states, regardless of their cash benefits due to educational co-responsibilities, seem to lack a significant change over time.

The lack of a significant change in the tertiary grade progression of Prospera beneficiaries across its first four years of implementation suggests that the educational investment in human capital is not changing across time, and therefore, the percentage of individuals who surpass poverty through this route is constant. As a result, there exists a percentage of beneficiaries every year who do not enter tertiary education, which, as explained by Behram et al. can hinder their economic progress and contribute to the cycle of intergenerational transmission of poverty (2017). Nonetheless, an important limitation to consider is that because of the selected 0.01 significance level, the risk of not detecting a significant change in the tertiary grade progression of Prospera beneficiaries in any group comparison when it actually exists is increased. As a result, there exists the probability that, although we concluded that there was a lack of a significant significant difference in both the tertiary grade progression of Prospera beneficiaries through the first years of its implementation and the tertiary grade progression of Prospera beneficiaries of Mexican states when considering their classification of high or low cash benefits due to educational co-responsibilities and the year of implementation, there could be a possibility that this result is incorrect. Furthermore, another limitation of this paper is that, to be able to perform a between-within ANOVA, as described by Dr. Buchanan, homogeneity of variance, an assumption that the variances of all of the groups compared in the between-within ANOVA are approximately equal, and sphericity, an

assumption that the variances of the differences between all the possible pairs of subjects in a single group is approximately equal in all of the groups compared in the between-within ANOVA, must be met (2016); if these are not met, then corrections must be made to the data collected. Nonetheless, because I was not using an advanced statistical program, such as SPSS or R, but rather using the basic statistical program provided by Google Spreadsheets due to resources, I was not able to check for these assumptions nor make any corrections to the data collected. The consequences of not making the corrections, if they are required, is that the between-within ANOVA produces inaccurate results, thus possibly affecting my conclusions. Therefore, it is suggested that for future researchers that would like to replicate this research that they use advanced statistical programs to reduce possible errors.

For future directions, as mentioned as a limitation of the method, there isn't sufficient evidence to conclude as to why some individuals enter tertiary education at a higher rate than others. As a result, the reason why this trend occurs could be explored through interviews with beneficiaries that chose not to enter into tertiary education, questioning them about the reasons or limitations they faced that lead them to opt out of education. Another area of potential research is based upon the fact this paper was specified only in educational investments of human capital through tertiary education to reach economic growth and as a result, surpass poverty, while in reality, there are other ways to accomplish the same goal. Within the paper, no emphasis was placed in primary and secondary education, which can have an impactful role in the economic growth in the individual, as proposed by Goldin in her study analyzing the relationship between income and secondary education (2016), as well as affecting the tertiary grade progression of a Mexican state, influencing other stages of educational investment in human capital. In addition,

as mentioned by Theodore Schultz, human capital encompasses the individual productivity of a person through formal education, health, on-the-job training, study programs, and migration (1961). Prospera also has nutritional and health co-responsibilities, which through check-ups and workshops, also increase the human capital of the individual and thus his economic growth. A study using the same methodology could address if the amount of conditional cash benefits due to health and nutritional co-responsibilities in a Mexican leads to higher investments in human capital of the beneficiaries in that state. These possible, future studies are crucial to further our understanding of Prospera and thus adjust Prospera accordingly to allow more low-income households to surpass poverty.

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Appendix

Table A1

Statistics Regarding the 32 Mexican State Random Sampling: Cash Benefits through Educational Co-responsibilities

Name of Mexican State	Average	Standard Deviation	Population in Prospera	Mode	Confidence Intervals
Chiapas	697.19	1055.85	696379	0	[581.66,812.72]
Oaxaca	728.96	1039.43	460281	0	[615.22,842.69]
Chihuahua	732.91	1203.59	112655	0	[601.21,864.60]
Coahuila	737.68	1248.35	60550	0	[601.09,874.26]
Guerrero	754.85	1088.22	444620	0	[635.78,873.91]
Veracruz	760.61	1052.35	608372	0	[645.46,875.75]
Michoacan	783.35	1042.87	305576	0	[669.24,897.45]
Yucatan	786.19	1097.43	138456	0	[666.11,906.26]
Jalisco	790.55	1071.33	162490	0	[673.32,907.77]
Ciudad de Mexico	803.33	1209.1	26225	0	[671.03,935.62]
Campeche	807.26	1134.42	64099	0	[683.13,931.38]
Estado de Mexico	810.76	1201.46	579003	0	[679.30,942.21]
Colima	821.68	998.55	21431	0	[712.42,930.93]
Nuevo Leon	825.54	1084.72	74762	0	[706.85,944.22]
Tamaulipas	836.81	1236.68	123684	0	[701.49,972.12]
Queretaro	837.98	1157.83	84758	0	[711.29,964.66]
Zacatecas	919.26	1105.63	100041	0	[798.28,1040.23]
Baja California Sur	921.41	1164	20008	0	[794.04,1048.77]
Puebla	936.59	1162.69	493680	0	[809.37,1063.80]
Guanajuato	938.83	1140	256760	0	[814.09,1063.56]
Hidalgo	944.85	1153.88	206625	0	[818.59,1071.10]
Morelos	951.08	1161.53	85272	0	[823.98,1078.17]
Tabasco	959.6	1177.54	38095	0	[830.75,1088.44]
Nayarit	966.08	1186.52	128155	0	[836.25,1095.90]
Quintana Roo	966.92	1180.06	62685	0	[837.80,1096.03]
Sinaloa	1007	1265.87	148253	0	[868.49,1145.50]

Sonora	1007.58	1284.97	5560	0	[866.98,1148.17]
Baja California	1007.99	1270.95	46942	0	[868.92,1147.05]
Tlaxcala	1012.87	1167.85	70099	0	[885.08,1140.65]
Durango	1021.55	1911.65	102187	0	[812.38,1230.71]
San Luis Potosí	1086.42	2188.27	197827	0	[846.98,1325.85]
Aguascalientes	1123.57	1312.62	32213	0	[979.94,1267.19]

Table A2

Mexican States Classification of Cash Benefits and Tertiary Grade Progression Through Prospera's First Four Years of Implementation (2014-2017)

		Tertiary Grade Progression in a given year			
Name of Mexican State	Classification of Cash Benefits	1st	2nd	3rd	4th
Aguascalientes	High	76.91	79.95	76.94	76.19
San Luis Potosí	High	74.02	74.96	72.93	72.08
Durango	High	67.3	70.43	70.61	71.38
Tlaxcala	High	78.44	81.2	78.31	76.81
Baja California	High	74.48	79.34	77.84	71.77
Sonora	High	72.87	80.4	76.76	78.39
Sinaloa	High	80.19	85.27	82.34	85.52
Quintana Roo	High	75.22	78.32	79.34	78.99
Nayarit	High	80.53	78.34	79.75	77.34
Tabasco	High	84.91	88.34	87.11	85.71
Morelos	High	78.72	81.06	79.52	77.98
Hidalgo	High	73.98	76.11	76.09	76.66
Guanajuato	High	54.9	65.96	65.03	64.09
Puebla	High	78.68	81.69	78.67	75.83
Baja California Sur	High	57.16	82	81.41	78.97
Zacatecas	High	72.71	74.14	71.7	70.4
Queretaro	Low	61.72	67.31	65.63	61.55
Tamaulipas	Low	75.38	79.88	80.09	80.01
Nuevo Leon	Low	63.82	68.2	68.3	63.93
Colima	Low	73.83	76.03	76.77	78.94
Estado de Mexico	Low	66.7	75.05	74.46	74.22
Campeche	Low	76.72	79.12	78.47	80.13
Ciudad de Mexico	Low	63.34	58.12	48.62	42.66
Jalisco	Low	55.1	54.92	55.03	56.34
Yucatan	Low	73.72	77.7	80.28	79.74
Michoacan	Low	69.7	72.47	71.93	68.73

Veracruz	Low	76.76	80.25	78.74	74.71
Guerrero	Low	71.02	76.44	74.31	75.92
Coahuila	Low	73.54	82.84	78.96	82.23
Chihuahua	Low	75.33	77.04	73.77	68.82
Oaxaca	Low	66.28	67.35	66.6	66.63
Chiapas	Low	71.32	77.01	71.07	73.27

Table A3

Breakdown of Statistical Summaries of Tertiary Grade Progression With Regards to Classification of Cash Benefits and Year of Implementation

SUMMARY	1st	2nd	3rd	4th	Total
High					
Count	16	16	16	16	64
Sum	1181.02	1257.51	1234.35	1218.11	4890.99
Average	73.81375	78.594375	77.146875	76.131875	76.42171875
Variance	64.64925167	29.65943958	26.93912958	29.51958958	38.97809382
Low					
Count	16	16	16	16	64
Sum	1114.28	1169.73	1143.03	1127.83	4554.87
Average	69.6425	73.108125	71.439375	70.489375	71.16984375
Variance	39.19472667	63.30792292	81.39221958	111.0507929	71.90779839
Total					
Count	32	32	32	32	
Sum	2295.3	2427.24	2377.38	2345.94	
Average	71.728125	75.85125	74.293125	73.310625	
Variance	54.73723508	52.75167581	60.82498992	76.23413508	