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Poverty Rates and Spending on Public Education at the K-12 Level: Is There a Correlation?

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Abstract

Many academics and policymakers argue that increases in spending on public education will reduce poverty. The goal of this paper is to evaluate whether increases in current spending on public education at the K-12 level lowers poverty rates in the United States. Using public education expenditure data from government and census Web sites describing cities throughout the U.S., empirical analysis shows a significant negative relationship between spending on public education and the poverty rate. This implies that increases in public education expenditures would lead to decreases in future poverty rates.

Introduction

Poverty indicates a failed country and world as a whole. Organizations such as One.org and UNICEF are devoted to eliminating poverty. Nearly 3.4 billion people worldwide live under or at an inconceivably low poverty threshold of $2 per day. The United States' poverty threshold is not as low as $2; however, it is difficult to believe that a family of five can survive today on $23,613 a year. To break that down, each individual in that five-person household must live day-to-day on $12.93 or less. With steady inflation, one can imagine how difficult it would be to not only get by day-to-day, but also attempt to accumulate wealth to move out of poverty and move higher up on the socioeconomic ladder.

Furthermore, the U.S. Web site for census data shows that poverty rates have steadily risen for the past six years. Thus, we can see that poverty is a problem that will continue to hinder the world's potential if we do not do something to stop it now. Therefore, many economists and policy makers would like to determine the root causes of poverty to determine appropriate polices to lower this failure rate.

This paper specifically looks at poverty in United States and attempts to uncover the impact of K-12 public education spending on the poverty rate. If a negative correlation occurs between expenditures on public education and poverty rate, this might suggest that increasing our spending on public education per child may lead to a reduction in the country's rate of poverty. To preview the results, the regression model shows that a 10% increase in spending on public education at the K-12 level will decrease poverty rates by a little more than 3.5%.

This paper proceeds with the second section discussing previous research done on similar topics. The third section reviews this paper's econometric model. The fourth section analyzes the data and its basic statistics. The fifth section studies the regression model and its findings.

Literature Review

One particular study by Jha, B. Biswal and U.D. Biswal (2001) discusses the same topic and how the increase in public expenditures on education affects

poverty in India. They claim that government implemented strategies to increase public expenditures in three key areas, one of them being education, is stated to have "benefited the low-income people," and decreased poverty over time, meaning the actual returns from the increase in education expenditures would be intergenerational (2001, p. 5). However, Jha concluded that India should make its investment in higher education, as opposed to primary education, to help eradicate poverty (2001, p. 20). The reasoning is that the returns from higher or secondary education would be quicker. For example, an individual who attended a vocational school would be able to pursue a job right after completing his or her schooling and immediately become a productive member of the workforce.

An additional study, by Jung and Thorbecke for the International Monetary Fund (IMF), discusses the impact of education expenditures on poverty in Tanzania and Zambia. The authors argue that each country needs to evaluate its own situation and find which sectors are growing and then begin investing in educational programs that will benefit those specific growing sectors (Jung, 2001, p. 24). By doing so, the authors' claim is that increases to economic growth and decreases to the poverty rate are achievable. However, the increases in public education expenditures cannot be frivolous; Jung and Thorbecke argue that to achieve the most success, policy makers should target these increases in education at underprivileged areas. Basically, Jung and Thorbecke suggest that a country should analyze its labor demands and make investments into an educational system that produces the type of labor force to meet those labor demands; doing so will allow for more economic growth. Moreover, to optimize the amount of economic growth, countries should target educational systems in more underprivileged areas. In turn, the increase in economic growth will allow for higher human capital, increasing the value and demand for more educated laborers. This will ultimately lead to poverty alleviation. Thus, the Jung and Thorbecke study supports the classic hypothesis—that the correlation between poverty and education expenditures is negative. Even though this study looked specifically at two developing African countries, the study could be applied to any country or city and would receive similar results.

Model

Our goal is to determine the effect of spending on public education on poverty in the United States. Using a standard econometric model, the independent variables are tested to determine their effects on the dependent variable. Therefore, the poverty rate is the dependent variable while the public education expenditures (current and lagged) are the independent variables in our model. We also control for other factors that could affect poverty such as the dropout rate, unemployment rate, median family income, and teen pregnancy. Furthermore, because the dependent variable and two of the explanatory variables are ratios, the logs of the other four variables were used to make it easier to read the coefficients as percentage changes. This semi-log model also gave a slightly higher R^2 than the corresponding linear model. The econometric model is specified as follows:

$$povrate = \beta_0 - \beta_1(lnexkid) - \beta_2(lnexkid)_{t-1} + \beta_3(droprate) + \beta_4(unemprate) - \beta_5(lnmedfinc) + \beta_6(lntbirths) + u$$

Where:

β_n	=	is the coefficient value that will be found after running the regression
povrate	=	rate or percentage of poverty
lnexkid	=	log of total expenditures per child on public education (current and lagged)
droprate	=	total dropout rate for grades 7-12
unemprate	=	the unemployment rate
lnmedfinc	=	log of median family income
lntbirths	=	log of total live births to mothers ages 10-19
u_t	=	error term

Family income (lnmedfinc) and expenditures per child on public education (lnexkid) are expected to be negatively correlated with poverty rate—the hypothesis is that an increase in education expenditures per child would cause a decrease in the poverty rate. This is important because the focus is on the issue of poverty, something the world as a whole would like to reduce or ideally eradicate. The model most importantly incorporates the lag effect, so we can see if this will lead to a decrease or eradication of poverty over time by investing more in the education system.

Data

First, three cities from each state were chosen, in addition to the District of Columbia. Selection of cities from each state required a metropolitan city, suburban city, and rural or urban city as the sample data. This method for choosing the sample was a better method for getting a wider range of data. Moreover, even though this causes the model to have a nonrandom sample biased, this method of data collection ensured that the skewing of the data in one direction to represent one type of city or population did not occur. The goal of the data is to represent the U.S. population in its entirety—not only rich or poor areas. Thus, by collecting the data based on one city of each type, rural/urban, suburban and metropolitan, from each state, we get data that is not skewed to represent any social class.

In addition, each chosen city was broken down to the county level so that school districts could be determined for data of educational variables. If more than one school district was available for the county or area in question, then the school district with the largest enrollment was chosen.

The variables containing educational data or data regarding dropout rates, expenditures per child, and students per teacher were collected from The National Center for Education Statistics, http://nces.ed.gov. Because we are assuming that spending on public education, expenditures per child, has a delayed effect on poverty rates, collection of data for a lagged variable was necessary. Thus, data for expenditures per child for the year 1999–2000 was also collected. Collection of all other data occurred for the year 2000–2001. The other variables included poverty rates, unemployment rates, live births to mothers between the ages of 10–19, and median

family income, which were gathered at the county level through other census Web sites. I also gathered data for the unemployment rate from the Bureau of Labor Statistics Web site, ftp://ftp.bls.gov, while the data for median family income and poverty rates came from the Small Area Income and Poverty Estimates section of the United States Census Web site, http://www.census.gov/hhes/www/saipe/county.html. Lastly, I collected the data for teen pregnancy from the Interactive Atlas from the Center for Disease Control and Prevention, http://apps.nccd.cdc.gov.

Eight cities were not used because of missing data; therefore, the sample size was reduced to 143. New cities were not chosen to replace the cities with missing data due to a time constraint. A summary of the data for the given variables is displayed in Table 1 (this is before logging was done on the variables):

Table 1
Basic Statistical Information From the Data

	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
povrate	11.671%	4.334%	4.3%	28.3%
droprate	4.1%	3.44%	.1%	27.5%
exkid00	$7,497.8	$2,106.9	$4,093	$17,182
exkid99	$6,976	$1,853.6	$4,040	$15,109
unemprate	3.99%	1.416%	2%	8.8%
medfinc	$41,541	$8,791.1	$24,089	$74,652
tbirths	64.5/1000	10.079/1000	35.1/1000	93.8/1000

Moreover, because the cities were divided into population area type, we are able to look at the frequencies of the population area types within the data, which were encoded so that 0 ≡ suburban area; 1 ≡ metropolitan area; 2 ≡ rural area; and 3 ≡ urban area. Urban area was included as a substitute for rural area because certain states did not have rural areas, or data was unavailable for those areas. Urban areas were substituted due to similar economic conditions, which were based on median family income. Examples of urban areas would be Macon, GA; Fort Wayne, IN; and Timmonsville, SC. The observations were broken down so that there were 51 suburbs, 49 metropolitan cities, 39 rural areas, and 4 urban areas.

Also derived were correlation coefficients for the variables. The only real significant correlations that occurred were that unemployment rates and median family income were highly correlated with poverty rates. Surprisingly, there was not a great deal of correlation between any of the independent variables themselves with the exception of exkid00 and exkid99. The two expenditure variables are correlated because education expenditures in the current year are dependent upon expenditures from the previous year.

Regression Analysis

The estimation of the regression model required the use of the Ordinary Least Squares (OLS) method. The directions of correlation between the independent and

the dependent variable are as expected; however, the correlation between exkid00 and poverty is opposite of what was hypothesized. It appears as though an increase in current expenditures is associated with an increase in poverty rates. This is the opposite of what we would first assume; however, this is understandable because an increase in per child expenditures for education is also a decrease in spending for other socially beneficial programs helping to eradicate poverty, which leads to an increase in poverty rates. The results are in Table 2:

Table 2
Regression Numbers

Dependent Variable: povrate	
Independent Variable	Estimated Coefficient (t-stat)
constant	131.52 7.563
lnexkid00	2.6296 3.396
lnexkid99	-0.37426 -1.627
droprate	0.18754 4.303
unemprate	0.62411 2.933
lnmedfinc	-15.043 -10.26
lntbirths	3.9505 3.332
No. of Observations Degrees of Freedom R-Squared	143 136 0.7779

The table presents the final regression results after removing statistically insignificant variables and correcting for any heteroskedasticity. We can see from the equation that droprate, unemprate and lntbirths are all positively correlated with poverty rates, as we would expect them to be. Each coefficient says that a 10% increase in these variables will respectively cause a 1.9%, a 6.2% and a 4% change in poverty rates. These percent changes in poverty rates may not seem like significant changes, but if interpreted in real numbers for actual human beings, these seemingly insignificant percentages become significant in the actual number of individuals impoverished.

Conclusion

Our regression results agreed with our hypothesis, which states that an increase in spending on public education at the K–12 level will reduce poverty rates. However, there are some weaknesses with the data, and they need addressing in order to create a more robust model.

One of the main weaknesses is that the delay in the lag variable is only for one year. This may be a reason why the lag variable does not appear to be extremely statistically significant. If the delay between the lag variable data and current year data could have a difference of at least 10 years, the results might show an increased level of significance. A delay of only one year for the lag variable does not allow for the benefits or effects from the increase in education expenditures to take their full effects.

Moreover, spending on education is an investment in human capital. Thus, the returns on this investment will not be seen immediately or even after a few years. The returns from this investment will not be evident until after these children move on into adulthood and into the workforce.

However, the problem with the education expenditure data is that the data does not go back more than a few years. Thus, the possibility of testing a 10-, 15-, or even 20-year lag is not feasible as of yet. I hope that in the following years, data will be available, and a minimum 10-year delay in the lag variable will be possible. Nevertheless, we should not disregard the results of this model and view this paper as insignificant. My hope is that this paper sparks some discussion on public education expenditure reform. In addition, I hope that society begins to view the value of education and understand that education is an investment in all of our futures. Therefore, when budget cuts occur and affects the education sector, we should be worried about how this will affect our children and us.

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A Cross-sectional Analysis of Research and Development Expenditures

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Abstract

Long-term economic growth is sustained by research and development activities conducted by private firms, and therefore, understanding how firms make R&D choices is important. In this study, Compustat data is used to econometrically analyze firm choices about research and development (R&D). Examined are both the total amount of money firms spend on R&D activities and the portion of sales revenue firms spend on R&D. Our interpretations are as follows. The model predicts that larger firms, determined by sales revenue and number of people employed, spend more money on R&D activities. In addition, firms whose operations include more business segments commit fewer revenues to innovation, while firms that operate in more geographic areas typically spend more on R&D. Finally, if a firm owns more intangible assets, such as franchise rights and patents or copyrights, it will likely spend more on R&D.

Introduction

It is widely recognized that innovation is one of the most important factors that drive long-term economic growth (Schumpeter, 1994). One common way to measure the amount of innovation in an economy is by looking at the amount of money private firms report as research and development (R&D) expenditures. This study used cross-sectional data from 2005 to examine the characteristics of firms that conduct R&D. To identify the key characteristics of firms, we developed two least-squared regression models that examine different factors that could influence R&D choices.

The first model studied inter-firm variation of R&D expenditure in attempt to better identify the characteristics that indicate which types of firms fund the most innovation. The second model worked to explain the variation in normalized research and development expenditures. We calculated normalized research and development expenditures by dividing the amount of money each firm spent on R&D in 2005 by the sales revenue the firm earned in the same year. Thus, normalized R&D expenditure was thought of as the fraction of revenue a firm spent on R&D. This approach had the advantage of controlling for firm size, and allowed us to more carefully examine what types of firms conduct R&D.

First, however, we provide a brief survey of some recent research on R&D. Second, we describe the data analyzed in the study. Third, we develop two different models to explain R&D decisions. Finally, in the conclusion, we examine some of the most interesting results of our analysis and make policy recommendations.

Literature Review

Schumpeter suggested that entrepreneurship and innovation are the keys to economic growth over the long run (1994). However, while there is extensive literature