# Getting the U.S.A.+ for Education

AN ANALYSIS OF HOW U.S. FEDERAL FUNDING IS – AND SHOULD BE – ALLOCATED FOR EDUCATIONAL PURPOSES

BACKGROUND

WV's 2009 STATISTICS

Per Capita Income
$31,400 (Rank: #49 of 50)

Population with
Post-Secondary Degree
29% (Rank: #50 of 50)

Per Capita
Educational Funding
$620.70 (Rank: #5 of 50)

Meet Norm Dist, a 13-year-old boy who is growing up in West Virginia. West Virginia has the lowest personal income and education levels in the U.S.A., but recently it has received significant educational funding from the federal government.

He read about Stan Dev in the newspaper – a 22-year-old from Modeville whose passion for baseball and calculus earned him a scholarship to play and study at Val University. This motivated Norm to do well in high school so he can follow in Stan's footsteps.

With the help of a scholarship like Stan, Norm hopes to be the first in his family to go to college. More students like Stan and Norm need educational funding so that they can stay off the streets and lead a brighter future.

RESEARCH QUESTIONS

STEP 1: How can the government use the insight gained from available data to make appropriate funding decisions?

STEP 2: Why should the Department of Education get more funding from the federal government?

STEP 3: How best should the Department of Education allocate their funds?

HYPOTHESIS

Increases in federal funding towards education will...

Improve educational attainment, which will...

Improve the well-being of less privileged neighborhoods, and...

Ultimately improve U.S. national and state prosperity.

KPI's

- Dollar ($) amount of funding
- Post-secondary educational attainment
- Personal income

This hypothesis is **confirmed** by the analysis performed.

CONCLUSIONS

1. Descriptive analytics show that **states with higher education funding tend to have higher education attainment and higher per capita income.**

2. Using regression analysis, it is evident that there is a **statistically significant relationship** between educational funding, educational attainment, and per capita income.

3. This relationship is **corroborated by similar findings from external research** on studies conducted by reputable third-parties.

4. Predictive analytics show that **educational funding dollars have a higher impact on states with lower educational attainment** than states with higher educational attainment.

5. We suggest **investing more federal funding towards states with low educational attainment** to optimize the impact on education attainment per funding dollar spent.

DATA SOURCES

- Catalog of Federal Domestic Assistance (CFDA) grants from the FFIS (Federal Funds Information for States) Grants Database, provided by Manhattan College.
- Socio-economic dataset provided by Manhattan College.
- Educational attainment dataset extracted from IPUMS USA with U.S. Census Data

REFERENCES

1. Holland, Dawn, Iana Liadze, Cinzia Rienzo, and David Wilkinson. "The relationship between graduates and economic growth across countries."Department for Business Innovation and Skills. N.p., 2013. Web.
2. Klein, Alyson. "No Child Left Behind Overview: Definitions, Requirements, Criticisms, and More." Education Week. Education Week, 10 Apr. 2017. Web.
3. "Every Student Succeeds Act (ESSA)." U.S. Department of Education. U.S. Department of Education, n.d. Web.

ANALYSIS & RECOMMENDATIONS

Step 1: ANALYSIS OF CURRENT SITUATION

How can the government use the insight gained from available data to make appropriate funding decisions?

Historical data for federal funding, educational attainment, and personal income were analyzed using descriptive analytics.

1 Federal Funds by Category
2005 to 2009

Agriculture/Food
Housing
Education
Healthcare

U.S. federal funding for Education is 2nd highest, after Healthcare.

2 Total Educational Funding by State
Average from 2005 to 2009
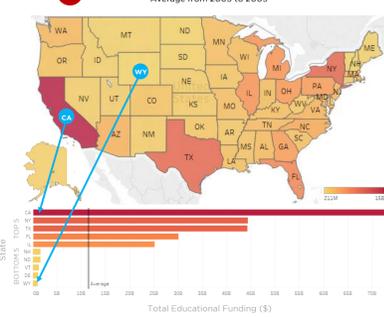
California, the state with the highest population, had the highest total educational funding throughout the years 2005 to 2009, whereas Wyoming, the state with the lowest population, had the lowest funding.

3 Educational Funding Per Capita by State
Average from 2005 to 2009
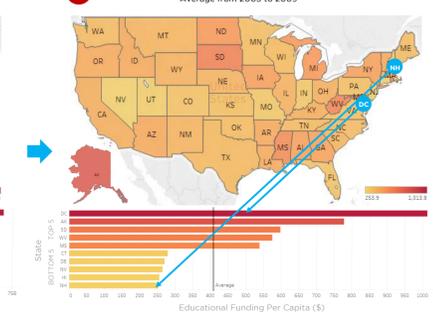
District of Columbia had the highest educational funding per capita throughout 2005 to 2009, whereas New Hampshire had the lowest educational funding per capita.

4 Educational Attainment by State
2005 to 2009
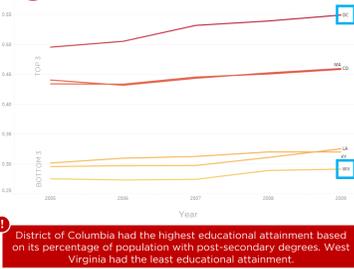
District of Columbia had the highest educational attainment based on its percentage of population with post-secondary degrees. West Virginia had the least educational attainment.

5 Personal Income Per Capita by State
Average from 2005 to 2009
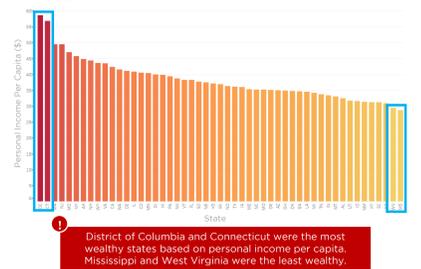
District of Columbia and Connecticut were the most wealthy states based on personal income per capita. Mississippi and West Virginia were the least wealthy.

KEY TAKEAWAYS & RECOMMENDATIONS Funding is related to education and income levels.

More educational funding should be allocated towards states with lower levels of educational attainment and per capita income.

States with higher educational funding tend to result in higher educational attainment.

States with higher attainment also tend to have higher per capita income levels.

Step 2: ANALYSIS OF FUNDING BENEFITS

Why should the Department of Education get more funding from the federal government?

Regression analyses were performed to determine whether educational funding has a statistically significant effect on educational attainment and personal income.

Trends among specific states were also studied in order to gain more insight to this effect.

1 Fit Plot for Educational Attainment Change
2005 to 2009

Observations	51
Parameters	2
Error DF	49
MSE	0.0042
R-Square	0.1001
Adj R-Square	0.0817
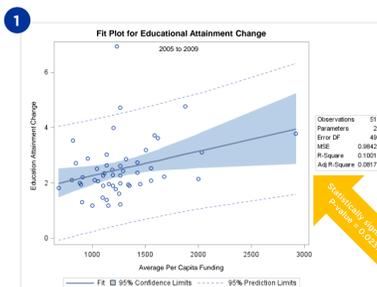
There is a slight positive relationship between a state's average per capita funding during 2005-2009 and its increase in educational attainment percentage in that same period.

The full impact of per capita education funding on education attainment may have been weakened by the ineffective spending of education resources caused by the No Child Left Behind Act during the 2001-2015 period (See: Examples of Criticized Educational Funding).

2 Fit Plot for Per Capita Income
2005 to 2009

Observations	765
Parameters	2
Error DF	487
MSE	
R-Square	0.4435
Adj R-Square	0.4427

There is a positive relationship between a state's educational attainment percentage and per capita income for the same year.
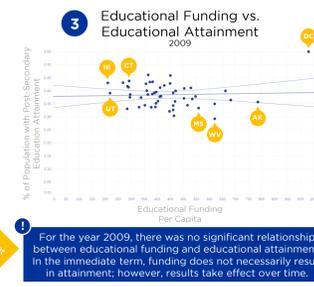
This is further supported by the UK's international study in 2013 that proves a positive relationship between education and GDP growth across 15 developed countries (See: Examples of Successful Educational Funding).

3 Educational Funding vs. Educational Attainment 2009

For the year 2009, there was no significant relationship between educational funding and educational attainment. In the immediate term, funding does not necessarily result in attainment; however, results take effect over time.

4 Educational Attainment vs. Personal Income 2009
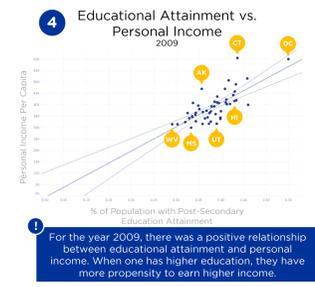
For the year 2009, there was a positive relationship between educational attainment and personal income. When one has higher attainment, they have more propensity to earn higher income.
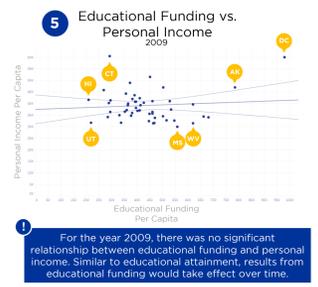
5 Educational Funding vs. Personal Income 2009

For the year 2009, there was no significant relationship between educational funding and personal income. Similar to educational attainment, results from educational funding would take effect over time.

KEY TAKEAWAYS & RECOMMENDATIONS The relationship between funding, education, and income is statistically significant.

Invest more in educational funding to encourage higher educational attainment and result in higher per capita income, but ensure that such spending is efficient and effective.

The Department of Education should also investigate each of the highlighted states for reasons why they fall in each category – adopt good practices and correct ineffective practices.

High Funding & Med-High Attainment & High Income	High Funding & Low Attainment & Low Income	Low Funding & High Attainment & High Income	Low Funding & Med Attainment & Low Income
	WV MS	CT HI	UT

Step 3: BUDGET OPTIMIZATION

How best should the Department of Education allocate their funds?

The states were first split into two equal groups based on educational attainment, with members of each group assigned a dummy variable of 1 or 0. A regression was run to assess the impact of each group on educational attainment change from 2005 to 2009.

To incorporate more details and further improve the predictive power of the model, the states were then split into three equal groups based on educational attainment, and three new variables (Immigration Status, Gender, and Age) were added. The same regression was run to assess the impact of each group on educational attainment change from 2005 to 2009.

1 Two Education Levels

Dependent Variable: EAChange

| Number of Observations Read | 51 |
| Number of Observations Used | 51 |

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	8.95916	4.47958	4.82	0.0124
Error	48	44.62875	0.92977		
Corrected Total	50	53.56790			

Root MSE	0.96424	R-Square	0.1672
Dependent Mean	2.50508	Adj R-Sq	0.1325
Coeff Var	38.49152		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1.65340	0.50089	3.30	0.0018
Average_PCF	1	0.00008556	0.00036578	2.42	0.0193
educationlevel	1	-0.53126	0.27011	-1.97	0.0550
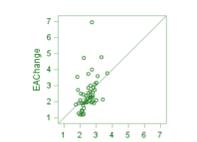
Since the top 50% of states for educational attainment hold an Education Level 1, the negative correlation between education level on educational attainment change proves that it is more difficult for states with high educational attainment to increase its percentage compared to states with lower educational attainment.

2 Three Education Levels + Additional Variables

Dependent Variable: EAChange

| Number of Observations Read | 51 |
| Number of Observations Used | 51 |

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	16.80965	2.63498	3.07	0.0135
Error	44	37.77805	0.65859		
Corrected Total	50	53.58790			

Root MSE	0.92660	R-Square	0.2960
Dependent Mean	2.50508	Adj R-Sq	0.1989
Coeff Var	36.98894		

mededucationlevel = Intercept - loweducationlevel - higheducationlevel

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-16.49431	8.92729	-1.85	0.0714
native_percent	1	0.03341	0.03081	1.08	0.2841
male_percent	1	0.24672	0.16001	1.55	0.1272
average_age	1	0.07277	0.08822	0.82	0.4139
Average_PCF	1	0.00006444	0.00036897	2.34	0.0237
loweducationlevel	B	0.18888	0.36874	0.51	0.6110
higheducationlevel	B	-0.34223	0.33067	-1.03	0.3063
mededucationlevel	B	0	.	.	.
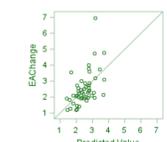
After updating with three additional variables and one additional education level, the explanatory power of the model has increased. All states are assigned to three equal groups according to their educational attainment percentage – High, Medium, and Low. Using the Medium education level as a base case, we confirm the findings of the previous analysis, and find that as the education level increases, its impact on educational attainment change scales exponentially (i.e. From Low to Medium: -0.189% vs. From Medium to High: -0.342%)

LEGEND

'EAChange' = Educational Attainment % Change
'Average_PCF' = Average Per Capita Funding
'EducationLevel' = 1 if the state is in the top half for educational attainment, 0 otherwise

LEGEND

'Native_Percent' = Percentage of population that are non-immigrants
'Male_Percent' = Percentage of population that are male
'Average_Age' = Average age of the population
'LowEducationLevel' = 1 if the state is in the bottom 1/3 for educational attainment, 0 otherwise
'HighEducationLevel' = 1 if the state is in the top 1/3 for educational attainment, 0 otherwise
'MedEducationLevel' = 1 if the state is neither in the high or low education level group, 0 otherwise

KEY TAKEAWAYS & RECOMMENDATIONS Provide more funding to states with low education levels, instead of funding states that are already highly educated.

The Department of Education should transfer federal funding from states of higher educational attainment to states of lower educational attainment, so as to maximize the utilization of every dollar spent. This is because states which already have high educational attainments rates will have a harder time increasing their rates due to decreasing marginal utility.

Decrease funding to states with high Educational Attainment + Increase funding to states with Low Educational Attainment = Higher benefit to the U.S.A. as a whole

Supporting Research

Examples of Successful Educational Funding

In 2013, the UK released a study that found a strong positive relationship between education and GDP growth. The empirical evidence across the 15 developed countries noted that an increase in human capital with tertiary education resulted in an increase in GDP. A 1% increase in the share of the workforce with a university degree increases the level of long run productivity by 0.2-0.5% due to the accumulation of graduate skills in the labor force. However, it is important to note that investment in higher education is more profitable in developed countries (i.e. UK, US) than developing counties (i.e. Philippines). This is because in a developed countries like the US or the UK, the economy's infrastructure is able to efficiently absorb the new graduates into the workforce. (1)

Examples of Criticized Educational Funding

The No Child Left Behind Act (NCLB) of 2001 focused on improving the nation's academic progress, specifically for disadvantaged and high-need students. By school year 2013-2014, states were expected to bring all students to a proficient level on reading and math tests, but ultimately failed to achieve this goal.

Criticisms of NCLB were:
- Strict annual performance benchmarks narrowed the curriculum due to the heavy focus on math and reading and increased the reliance on standardized tests
- No updates were made to the law after implementation
- Students at low-performing schools were not capitalizing on the mechanisms to improve academic performance (2)

The Every Student Succeeds Act (ESS) is the successor of NCLB and addresses some of the issues with ineffective education funding:
- Flexibility is given to states by allowing them to adopt comprehensive state-developed plans designed to improve academic performance, enhance the quality of instruction and increase equity
- Federal action to improve underperforming schools with low graduation rates
- Transparent communication is provided to educators, students, and families through annual statewide assessments to measure student progress towards the academic standards (3)

Tools Used

SAS   +tableau