

Does the US Need an Educational Reform for Economic Growth?

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Abstract

The paper empirically investigates the effect of education on economic growth of local regions with standard growth regression models using a set of cross-sectional data for sub-state counties of 50 US states. The findings suggest the existence of income convergence among US counties, a strong growth-enhancing effect of human capital accumulation measured by schooling years, a negative effect of the unemployment rate and a positive effect of the net migration rate on the growth rate. In contrast, government expenditure on education appears to have a negative association with growth, suggesting the ineffectiveness of US education policies. Furthermore, the result indicates possible failures of secondary education in the US regions.

Keywords: Convergence, Education, Human Capital, Migration, Regional Growth, Unemployment

1. Introduction

President Obama has been persistently calling for sweeping changes in education throughout his first and second administrations, and insisting to improve the performance of early childhood education and higher education. For the education reform, his administration has secured additional budgets and planned to implement new programs to influence educational policy at the state level as well as the local level. Understanding the impact of education on economic growth and social cohesion is a matter of main concern for governments and economists. The current study contributes to this debate by analyzing the effect of schooling on economic growth and convergence.

The main objective of this empirical study is to analyze the role of education in the process of growth and convergence in order to provide valid implications for US educational policies. We focus on investigating the importance of human capital development in the process of economic growth particularly for local economies in the whole US. Therefore, we will begin by raising some typical research questions from the point of view of local economies.

The first question to consider is whether there is actually any income convergence between rich regions and poor regions over time for the US^{2, 19}. Among many others, Barro and Sala-i-Martin provide evidence of income convergence among US states in the process of growth^{1, 3}. However, the overall attention of regional growth studies for the US has been paid to relatively large-scaled region units such as states or economic regions. Therefore the paper will try to put more attention to the small economic unit, that is, local counties in the US and test whether theories of income convergence is valid in the growth process of the US counties. To do this, we employ local county data for more than 3000 counties across 50 states of the US.

Secondly, what are the main determinants of economic growth? Therefore, another objective of the paper is to empirically investigate the determinants of regional economic growth for the US counties, with a special attention to education and schooling. It would be natural to expect a positive impact of education on growth as reported in the previous literature. However, it is not clear whether higher levels of education significantly contribute to regional economic growth at the local county level and

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more importantly which level of education is the main engine of economic growth. In this regard, it would be reasonable to address a question. Which level of schooling has been the main driving force of economic growth? To answer the question, we will split the rate of education attainment into three levels. Our investigation shows a negative effect of some particular levels of schooling on growth.

The structure of the rest of the paper is as follows. The following section briefly surveys the related literature and raises the research questions. Then, the third section will introduce the US county data used for the empirical analysis and explain two simple growth regression models, followed by the report of estimation results in the fourth section. Finally, we will summarize the results and suggest policy implications.

2. Regional Growth and Convergence

This section briefly reviews the growth literature related to the issues that the paper addresses, such as income convergence, the impact of unemployment on growth and the growth effect of education.

Numerous growth studies have suggested convergence or divergence among countries or regions in the path of economic growth^{15, 18, 19}. Empirical studies report evidence of income convergence between countries, between EU states, and between US states^{1-3, 16}. Some other studies show non-convergence particularly between EU regions^{6, 8}. However, to the best of my knowledge, there is just a few studies that investigate growth and income convergence for all counties in the US¹³. The main contribution of the study is to fill this gap in the literature and extend the study of Kim¹³.

Next, regarding the educational issues, the rate of human capital accumulation would determine the rate of economic growth in steady state in Lucas' AK-type growth model with constant returns to education over her entire lifetime or in the period of transition to the steady state in the Solow model with human capital^{5, 15}. The stock of human capital also is the main driving force of economic growth because human capital helps innovate or imitate advanced technologies¹⁸. Most empirical findings of the previous studies support the theoretical prediction of positive effects of education on growth and productivity^{3, 5, 9, 13}.

Another strand of the growth literature is the debate on the role of labour-market conditions such as unemployment and migration. On the one hand, the literature shows theoretical ambiguities for the causal links running from unemployment to growth^{4, 11}. However, empirical evidence for the latter seems to support the theories that predict an adverse effect of unemployment on growth¹¹. On the other hand, the literature also reports ambiguous results on the impact of migration on growth although the conventional theories of migration expect to have a negative effect of immigration on growth for the receiving economies^{3, 10, 14}. However, in the case of migration within a country such as the US, the stock of human capital of immigrants tends to be higher than that of natives⁷. In this sense, the current study should expect to observe a positive effect on growth of immigration between local counties in the US.

3. Data and Estimation Methods

In this section, we briefly describe the EU regional data and estimation methods used for the analysis. A set of cross-sectional data is constructed for local counties in 50 states of the US for the period of 1982-2006 from Regional Economic Information System, U.S. Bureau of Economic Analysis (REIS, BEA) and County and City Data Book 1988, U.S. Bureau of the Census (CCDB88, BOC). The focus of the analysis is on the effect of education variables on regional growth at the county level. The main variables of interest obtained from the data set include real per capita income (hereafter, income), education attainment, education expenditure, unemployment and net migration. It should be noted that the lack of appropriate price indices for individual counties may cause potential measurement errors in both the growth rates and the levels of real per capita GDP for the US counties.

The estimation strategy is to apply two typical regression models for unbalanced panel data although we use cross-section data for US counties. This is because the total number of observations in the sample is at most 3062 counties which belong to 50 US states. These individual counties are represented by one observation for each variable. Since the present analysis follows the standard estimation approaches for panel data analysis, it would not be necessary to go through typical estimation equations in detail¹². As the benchmark regression method, we apply the Pooled Ordinary Least Square regression (POLS) model. The POLS model runs growth regressions

for local counties by assuming a common intercept for all counties in the US.

As an alternative estimation method, we employ the Fixed-effects (FE) model. It is more likely that counties within different states have their own state-specific characteristics rather than sharing one common effect across the US. In other words, county variables are likely to be correlated with the state-specific effects. In this case, it would be appropriate to use the FE model or the Least Squares Dummy Variables (LSDV) model. We use heteroskedasticity robust estimators.

The dependent variable is the log averaged annual growth rate of real per capita GRDP from 1982 to 2006 for each of the sample counties. Explanatory variables and relevant hypotheses to test are as follow. First, we include county real per capita income in order to test convergence of county income, hypothesised to be negative. Secondly, the rate of individuals at least having completed secondary education to total population of 25 year old or more is used as a proxy variable for the stock of human capital, and its sign is expected to be positive. We also use government expenditure on education as a policy variable, measured by the ratio of educational expenditure to county GRDP and expected to be either positive or negative.

4. Empirical Findings

This section reports the results of regional growth regressions for US counties. The main objective of the analysis is to investigate the effect of educational factors on economic growth and income convergence at the local county level. Table 1 presents results of both the cross-regional POLS growth regressions and the fixed effects regressions with dummies for 50 US states. The results contained in Table 1 are mainly focused on the convergence among US counties and the effect of education on growth.

4.1 Convergence between US Counties

As expected, estimated coefficients of initial county income turn out to be negative and significant for all regressions. In particular, negative coefficients on the first row in Table 1 indicate the existence of conditional convergence among US counties. The estimated coefficient on initial income, -0.0115 , appears to be statistically significant in regression POLS1. This coefficient is estimated -0.0085 without adding any control variable (not reported here), which suggest unconditional convergence as well.

Table 1. Regional growth regressions: education

Regressors	Pooled OLS			Fixed Effects Models		
	POLS1	POLS2	POLS3	FE1	FE2	FE3
Log (Per Capita Income) 1982	-0.0115^{**} (-15.4)	-0.0146^{**} (-15.2)	-0.0164^{**} (-17.5)	-0.0095^{**} (-11.2)	-0.0152^{**} (-14.4)	-0.0165^{**} (-16.4)
Unemploy Rate 1986	-0.0337^{**} (-11.7)	-0.0300^{**} (-10.4)	-0.0272^{**} (-9.3)	-0.0302^{**} (-8.2)	-0.0166^{**} (-4.8)	-0.0153^{**} (-4.4)
Net Migratn Rate 1980	0.0412^{**} (5.0)	0.0470^{**} (5.5)	0.0439^{**} (5.3)	0.0399^{**} (4.5)	0.0307^{**} (3.7)	0.0281^{**} (3.38)
Schooling Yrs>11 1980		0.0085^{**} (6.5)	0.0106^{**} (8.2)		0.0224^{**} (12.0)	0.0234^{**} (13.2)
Gov Educ Expend 1982			-0.0333^{**} (-4.9)			-0.0155^{**} (-2.1)
Constant	0.1286^{**} (17.8)	0.1531^{**} (17.4)	0.1712^{**} (19.7)	Yes	Yes	Yes
State Dummies						
Adjusted R ²	0.144	0.160	0.176	0.299	0.345	0.355
D.W.	1.62	1.60	1.59	1.99	2.00	2.004
Included Obs.	2947	2947	2939	2947	2947	2939

Note : *t*-values appear within parentheses below the coefficients and are obtained with White heteroskedasticity-consistent standard errors & covariance whenever necessary. ^{**}Significant at 5% and ^{*} at 10%.

We still obtain negative and significant coefficients for initial income when state-specific dummies are added as in columns FE1-FE3. This result indicates that there would be counties' income convergence within states. The performance of model specifications is likely to be better in fixed-effects models than POLS models in all cases according to Akaike information criterion tests. Such estimation results for US county economies support the β -convergence theory that poor countries might catch up with rich countries in terms of real per capita income.

4.2 Labour-Market Conditions

Before moving onto the effect of education, let me briefly report regression results for labor-market factors such as the rate of unemployment and the rate of net migration, which are displayed on the second and third rows, respectively. On the one hand, the county rate of unemployment appears to have a negative association with the rate of per capita income growth, which is statistically significant in all regressions.

On the other hand, the estimated coefficient on the net migration rate presents positive signs in all regressions, suggesting that inflows of labor forces into counties are more likely to be skilled and thus contribute to economic growth. In general, determinants of migration are known to be wages, the unemployment rate, job prospects and growth prospects among others. Therefore, the inflow of labor forces from one region to another region means that regions with positive net migration are economically superior to other regions. In this sense, relatively highly educated workers are more likely to have migrated and contributed to economic growth⁷.

4.3 Educational Attainments and Expenditure

More importantly, we added two education related variables, such as the county rate of educational attainments and the county rate of Government Educational Expenditure in GDP. The regression results for these educational variables are displayed on the fourth and fifth rows of Table 1, respectively.

The stock of human capital, measured by the proportion of individuals who have attended schools for 12 years or more in the population, appears to have a positive association with the growth rate for given level of initial income. Positive coefficients for education attainment all

are statistically significant. In general, this positive effect of education attainment on growth is consistent with both theoretical predictions and empirical findings of previous growth studies discussed earlier. Here, it would be reasonable to raise the question whether this growth-enhancing effect of schooling would hold at various schooling levels. Thus, we will analyse the composition of the effect of schooling in detail later.

In contrast, government expenditure on education presents opposite results. Estimated coefficients on this variable both are negative and significant in columns POLS3 and FE3. Although it is weaker than the positive effect of schooling, this educational policy variable tends to have a meaningful adverse effect on growth. The results suggest that US education policies have at least partly failed to enhance long-term economic growth of county economies. Another contrasting result between these two educational variables is that, once controlling for state specific effects, the absolute size of the coefficient on educational spending brings about a dramatic decrease by a half (0.0333 to 0.0155) while that on educational attainments comes with a twofold increase. The results indicate that unknown state-specific factors may have a great influence on these two educational factors at the county level but in opposite ways.

4.4 Composition of the Effect of Schooling

We divide the variable of education attainment into three levels in order to investigate the growth-enhance effect of schooling in detail. These three rates include the proportion of individuals who have attended school for not more than 12 years, and those who have attended school for at least 12 years but not more than 16 years, and those who have attended for at least 16 years or more in the population. The regression results for these schooling variables are displayed on the fourth, fifth and sixth rows, respectively in Table 2.

Having a closer look at the effect of deepening human capital accumulation on the rate of real income growth, we found surprising results that relatively high human capital (schooling years ≥ 16 years) plays a very crucial role for long-term economic growth of US counties. On the contrary, we obtained more interesting results for the relatively low level of schooling years that has a negative effect on the growth rate. Workers without high school graduation appear to have hindered economic development for the US counties. However, the estimation results for the middle level of schooling turns out to be ambiguous.

Table 2. Regional growth regressions: schooling

Regressors	Pooled OLS			Fixed Effects Model		
	POLS1	POLS2	POLS3	FE1	FE2	FE3
Log (Per Capita Income) 1982	-0.0146** (-15.2)	-0.0108** (-11.3)	-0.0170** (-23.3)	-0.0152** (-14.4)	-0.0098** (-9.1)	-0.0145** (-17.5)
Unemploy Rate 1986	-0.0300** (-10.4)	-0.0344** (-11.9)	-0.0256** (-9.4)	-0.0166** (-4.8)	-0.0295** (-8.1)	-0.0162** (-4.8)
Net Migratn Rate 1980	0.0470** (5.5)	0.0388** (4.5)	0.0343** (4.4)	0.0307** (3.7)	0.0390** (4.4)	0.0369** (4.6)
School Yrs < 12 1980	-0.0085** (-6.5)			-0.0224** (-12.0)		
School12=<Y<16 1980		-0.0029* (-1.7)			0.0024 (0.84)	
School Yrs >=16 1980			0.0439** (13.7)			0.0440** (13.3)
Constant or State Dummies	0.1616** (16.8)	0.1235** (14.2)	0.1758** (25.4)	Yes	Yes	Yes
Adjusted R ²	0.160	0.145	0.244	0.345	0.299	0.383
D.W.	1.60	1.62	1.63	2.00	1.99	2.00
Included Obs.	2947	2947	2947	2947	2947	2947

Note : *t*-values appear within parentheses below the coefficients and are obtained with White heteroskedasticity-consistent standard errors & covariance whenever necessary. ** Significant at 5% and * at 10%.

The estimation results can be interpreted as follows. As the US industrial structure tends to shift into a knowledge-based economy, demand for labor forces with high skills and knowledge has rapidly increased all over the US economy. Meanwhile, the deepening knowledge-based economy has made general and elementary education less useful for economic growth and rather made a rapid increase in demand for highly educated workers. Therefore, counties with higher educational institution are more advantageous for regional economic growth.

5. Concluding Remarks

The paper provided empirical evidence of β -convergence among local counties both between states and within states of the US and a growth-enhancing effect of educational attainments and a negative association with educational expenditure at the local county level. The finding suggests that government expenditure on education is likely to be inefficiently spent and thus prevent county economies from economic growth in the US. A further investigation for schooling suggested that the greater share of workers with university graduation or post-graduate education is

the major element of the positive effect of education on growth for the US counties.

Based on our empirical findings, educational policies have at least partly failed to enhance regional growth in the US. In particular, these findings suggest that the US might immediately need to reform the system for secondary education as well as occupational college education and also improve the effectiveness of its general spending on education. The US educational policies should be revised to provide incentives to produce more workers with high knowledge and skills and the education system needs to be reformed to improve the effectiveness of schooling, particularly at the secondary education and possibly the post-secondary college level as well. Although we could not have data for educational spending broken down into various schooling levels, the results may contain a clear message to US policy makers. For the sake of economic growth of county economies, the US government at all levels should not only put more resources into higher education that includes both undergraduate and post-graduate education, but also improve the effectiveness of educational spending particularly at the low level of schooling.

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