INTERSTATE DIFFERENCES IN EDUCATION AND INCOME DISTRIBUTION Joe Won Lee, Howard University and Institute for Policy Analyses

Introduction

During the last decade and a half the national economy has achieved a continuous growth despite its frequent ups and downs. However, the growth and improvement have not been even among different parts of the nation.

This paper attempts to analyze the redistributional patterns of the growth and improvement in income and education between the different parts (states) in the Union. The analyses are based on the 1960 and 1970 censuses of population and the 1976 Survey of Income and Education (SIE). Although I am well aware that SIE data are not strictly comparable with the two decennial census data, I have tried to incorporate the data in the analysis in order to put the findings in a current perspective.

The second objective of this paper is to analyse the relationship between parents' educational attainments, income levels, and pupils' (school-age children, 5-17 years) educational achievements. This analysis is based on the cross-sectional regression analysis taking the state data as observation units.

Educational Attainment Trend Among The States A frequent measure of educational attainments of the population in an area has been represented by the median number of "school years completed." During the 1960's the general level of education for the U.S. adult population rose by 1.2 years in terms of their school years completed from 10.6 years in 1960 to 11.8 years in 1970.

It is interesting to note that the initially lower areas, especially the Southeast and the Southwest, made relatively faster increases in their educational attainments. The states in the Mountain and Far West regions enjoyed their highest (i.e., 11.7 years of school completed in 1960), but their rate of improvement was not as fast as the low attainment states. However, these Western states in general still enjoy their highest position.

Texas and North Dakota made an extremely rapid improvement; i.e., 1.9 and 1.8 years improvement, respectively. However, it must be noted that these two states started at the lowest level in their respective regions. In other words, these two states made the fastest improvement in the nation during the period, but they were still at the relativelylow side within their respective regions.

The forces which are responsible for interstate differences in educational attainments seem to be both internal and external. On one hand, there is a political force in each state to push its educational performance to the regional average (this force may be termed interstate competition.) The second important force is operating at the federal level, which attempts to equalize education attainments across the country.

The change between 1970 and 1976 showed a somewhat different trend in the interstate differences in the adults' education attainment levels. That is to say, the indication is that during the more recent period, (i.e., 1970-76 period) the interstate differences widened slightly. This assertion can be demonstrated in terms of coefficient of variation, as follows:

Coefficient of Variation (Standard deviation/mean) 1960 1970 1976 8.3% 4.8% 11.8%

This recent trend seems attributable to the shift in interstate migration patterns, i.e., significant out-migration away from the nation's large metropolitan areas, especially toward good climate states.

Relative strength in terms of the trend in adults' educational attainments is shown for many states in the Plains, Mountain and Far West regions; especially, Minnesota, Iowa, Nebraska, Montana, Wyoming, Utah, Colorado, Washington, Oregon, California, Nevada and Alaska. The Southeast region generally has not changed its relative position yet. A noticeable improvement in the 1970-76 period has been witnessed by Arizona.

The observed relative strength among states seems due to industrial structure, high rate of economic growth and demographic composition of respective states.

Income or Earnings Trend Among the States

An average person earned \$2,668 and \$3,436 in 1959 and 1969, respectively. However, interstate differences were enormous. In 1959, an average person in Mississippi earned only \$1,204, while an average person in New Jersey earned \$3,641, which amounts to three times the average of the Mississippians.

By 1969 the interstate differences in earnings have diminished in <u>relative</u> sense. The average Mississippian worker earned \$2,614 in 1969, while the counterpart in Alaska earned \$5,351 in the same year. In the <u>relative</u> sense the Alaskan's earning was approximately twice that of the Mississippian. However, in absolute dollar terms the differences between the lowest and the highest states widened. That is, the differences were \$2,437 and \$2,737, in 1959 and 1969, respectively.

At this moment we have not obtained comparable data (median earnings by persons) from the 1976 SIE tabulation. However, I have chosen a proxy from the SIE tabulation in order to examine the general trend in the interstate differences in income and/or earnings. The SIE tabulation provides for each state median family income for persons 25 years or older. In 1975 an average family in Arkansas had income of \$9,649, while the counterpart in Alaska had \$23,206 in the same year. This abnormally high median family income in Alaska is due to the boom attributable to the pipe line construction. Let us take the next highest state, which is Hawaii whose median family income was \$18,614 in 1975. The Hawaiian median family income is twice that of Arkansas.

As can be seen in Table I, the interstate differences in income and/or earnings levels are being diminished over time. However, there is some persistent force at work, which keeps the income levels high in Middle Atlantic, Great Lakes and Far West regions. These three regions are highly industrialized regions. Connecticut and Massachusets in New England also belong to these highly industrialized areas. The relatively cheap labor and werk labor unions have helped

the southern states to expand their productive capacity more rapidly than the rest of the country. However, the industrial mix in these less industrialized states are not favorable in the sense that their industrial structure is heavily concentrated in those industries which are not expanding rapidly at the national level (such as textile industries.) On the other hand, the aforementioned highly industrialized states have to pay relatively high wages. Therefore, these states are at a disadvantage in competition with the southern, less industrialized states. However, the northern industrialized states have favorable industrial structure in the sense that these states contain those industries whose capacity is expanding more rapidly at the national level (such as service-oriented industries.)

As mentioned above, despite the persistent forces, the general trend which narrows the income gaps between states has been reinforced by deliberate public policies as well as the more or less natural economic forces stemming from the expanding markets in the presently less industrialized states. The narrowing trend of the interstate income gaps (in relative sense) can be demonstrated in terms of the coefficients of variation (standard deviation divided by the national mean income level for each of the observed years), as follows:

1	,,			
19	60	1970		1976
22	.0%	17.2%	-	16.3%
ational	Attainmonte	and	Theomo	TOTTO

Educational Attainments and Income Levels It may be assumed that the higher the educational attainments in an area the higher the earnings level would be. This hypothesis has been tested utilizing the 1960, 1970, and 1976 data. The following three equations show the relationship:

Y ₆₀	=	-2381.1	+	474.9E ₆₀			(1)
¥70	=	-3744.8	+	651.8E70	•	•	(2)
v · · ·	_	1720 0		107 20-			(2)

 $Y_{76} = 1730.8 + 187.3E_{76} \dots (3)$ where Y₆₀ and Y₇₀ represent median earnings in 1960 and 1970 respectively. Y76 stands for median family income, as reported in SIE. E60 and E70 stand for median number of school years completed; E76 stands for percentage of population who have completed high school education as of 1976. R squares were .50, .31 and .40 for 1960, 1970 and 1976, respectively. Although they are not very high, the relationships are significant at 95 percent confidence level. The results seem to indicate that income level (or earnings) of individuals are only partially determined by their educational attainments (in terms of number of years spent for formal education.) Beside the formal education, there seem to be a host of factors influencing the earnings level of workers. These might include the individual's ability to succeed, his training on the job, amount of wealth accumulated or inherited or both, industrial characteristics, and quality of the education in different states. It must be noted that this regression model is based on state observation not individual person's observations. If we take a sample of individuals' educational attainments and their earnings as observation units, the correlation between the two indicators may be much higher than the aforementioned results.

Pupils' Educational Achievements

There are many ways of measuring pupils' educational achievements. In this analysis, however, I have taken two measures of pupils' achievement levels by state. One is their enrollment rates. In other words, the enrollment rate for each state has been derived by those children, aged 5-17 inclusive, who are enrolled divided by total number of the school-age children in each state. The second measure may be termed "deficient rate." This rate has been computed by identifying the modal grade for each age of children. For example, a 7 year old child is normally supposed to be in the second grade. If he or she is enrolled in that grade, he or she is given zero percent credit. If enrolled in the 3rd grade, the child is given one point (100 percent) positive credit. If the child is enrolled in the first grade, he is given negative one point (minus 100 percent) credit. In this way, I computed a "weighted" average "deficient rate" by age and by sex. And, finally, I derived an overall "weighted" average deficient rate (weighted by number of children in each age cohort.) 1

At the national level, the enrollment rate rose from 92.0 percent in 1960 to 93.3 percent in 1970. And it rose to 95.4 percent by 1976, when the SIE survey was taken. In the following the mean (unweighted average) enrollment rate, standard deviation, coefficient of variation (standard deviation/mean), minimum rate and maximum rate are presented.

Pupils' Enrollment Rates (all in percent)

· •	1960	1970	1976
Mean	92.0	93.3	95.4
Standard Deviation	1.6	1.8	1.2
Coefficient of Variation	17.7	19.6	12.7
Minimum	87.5	87.5	92.2
Maximum	95.1	96.2	97.4

A noticeable improvement has been made during the 1970-76 period. And the interstate differences have been narrowed significantly during the recent period, while the interstate differences widened generally in the 1960's.

Another noticeable observation is that not only the interstate (or interregional) gaps have been narrowed in terms of enrollment rate of school age children, the improvement of the southern states (both in Southeast and Southwest) has been especially pronounced. In the south, especially the states of Virginia and South Carolina have achieved the most pronounced improvement in their enrollment rates. South Carolina was 5 percent below the national average in 1960, but by 1976 South Carolina reached the national average. Virginia's enrollment rate in 1960 was 3.3 percent below the national norm, but she exceeded the national average by one percentage point in 1976. Thus, although all states competed for excellence in their education attainments, their relative successes varied, depending upon a host of factors, such as respective states' priority ordering, relative economic performance, which in turn has been affected not only by states' own efforts but also federal policies.

A similar observation can be made in terms of

interstate differences in grade "deficiency rates". The following table presents an overall picture relative to the grade "deficiency rates". As the table indicates, the interstate differences are gradually narrowing over time.

Defici	Deficiency Rates (%)					
	1960	1970	1976			
Mean	-49.7	-51.5	-65.6			
Standard Deviation	13.5	8.8	8.4			
Coefficient of Variation	27.2	19.6	12.8			
Minimum	-91.0	-73.0	-80.0			
Maximum	-28.0	-32.0	-47.0			

The table indicates that children's grades in which they are actually enrolled are approximately one half year below the grades in which they are supposed to be enrolled. It must be pointed out that the slightly higher "deficiency rate" for 1976 is somewhat exaggerated, because the available SIE tabulation did not include those children who are enrolled above their modal grade level. Moreover, the SIE was conducted during the months of April, May, and June 1976, while the decennial census data are recorded as of April. If this factor is taken into account, -65.6 percent for 1976 will be reduced to 57.4 percent. Thus, if the aforementioned two factors are combined, it is probable that the true mean deficiency rate for 1976 would be about the same level as those for 1960 and 1970. Parents' Education and Childrens' Education

I have attempted to quantify the effect of parents' educational attainments on childrens' education, by means of cross-sectional regression, utilizing state data for 1960, 1970 and 1976. Here the dependent variable represents childrens' enrollment rates and the explanatory variable is the median number of school years completed by the population 14 years and over in each state. The results of the regression analysis using children's grade "deficiency rate" as the dependent variable, have been quite parallel to the results shown here.

ENR60 = 79.027 + 1.216ED60 . . . (4) (37.0) (6.1) $R^2 = 0.42$ ENR70 = 61.385 + 2.707ED70 . . . (5) (21.5) (11.2) $R^2 = 0.71$ ENR76 = 91.445 + 0.062ED76 . . . (6) (18.7) (3.0) $R^2 = 0.15$

The independent variable for 1976 (ED76) is percentage of population (25 years and over) who completed high school education. Therefore, the 1976 result cannot be compared with the two previous years.

An interesting result is that the relation between childrens' enrollment rates and adults' educational attainment levels has become stronger in the 1960's (1970 census) than in the 1950's (1960 census). This may be attributable to the relatively prosperous economic conditions during 1960's. That decade witnessed a rapid growth of college enrollment, which endorsed indirectly the utility of education.

Figure I shows a scatter diagram of the 1970 data. As can be seen in the diagram, if the abnormal value of Alabama had been eliminated, a semi-logarithmic specification should have improved the relationship substantially.



My next attempt was to see the effect of parents' educational attainments on enrollment rates for children of different ages. In Figure II the horizontal axis represents children's age from 5 to 17. The vertical axis represents the R square value resulting from the regression relating the enrollment rate of children of a particular age (e.g., 5 years old) with adults' educational attainments (the median number of school years completed).

The figure suggests that parents with high educational attainment levels seem to be more successful in keeping more children in school. The lines (2) and (4) suggest this assertion.

One more interesting observation can be made. When parents' income is included as an explanatory variable, in addition to their educational attainment levels, the income effect is extremely significant for 5 and 6 year old children. But the income effect on the older children is negligible as lines (1) and (3) suggest in Figure II. Conclusions

Interstate differences in all aspects of income and education as examined above, have been



narrowing substantially during the past 15 years; especially pronounced improvement has been achieved during the 1970's.

Interstate differences in income level have been explained at least partially, by the interstate differences in educational attainment levels. As noted earlier, interstate differences in income and/or earnings are attributable to many factors, in addition to the differences in educational attainments of working people. However, the most important point is that the income elasticity with respect to the educational attainments is much greater than unity -- 1.89 and 1.95 for 1960 and 1970, respectively. This indicates that one percent improvement in education (in terms of educational period) will bring about approximately two percent increase in income and/or earnings.

As Figure II indicates, influences of parents' educational level has been significant on childrens' enrollment rates during the 1960-70 period. The influences are stronger in both ends -- youngest children, i.e., 5 and 6 years old, and the children who are completing their high school education. The "U" shape, which is applicable both to the 1960 and 1970 data, seems to reflect the normal human nature. Parents try to put and keep their children in schools when their children reach the school age. And when their children approach the end of high school education, parents with higher income and educational attainment also try harder to make their children complete the high school education, possibly looking forward to their entrance into college.

In addition to parents' education, their income level also exerts a significant influence on both ends of school-age childrens' enrollment rates, since the parents have the means to do so.

The higher correlations for 1970 than 1960 seem to be attributable to two factors. First, the 1960's "new frontier" and "great society" concepts encouraged people to recognize the high return to investment in human capital. Secondly, the prosperity prevailing in the 1960's seems to have reinforced the momentum.

The more rapidly narrowing gap (observed during the 1970-76 period) in the interstate differences in income and education signifies the time lag involved in the long process of policy pronouncement, legislative enactment and administrative implementation in our political process.

FOOTNOTES

¹The term "deficient rate" has a somewhat misleading connotation. However, as expected, the percentage credit for each state, by age and sex has turned out to be <u>negative</u> percentage. This is mainly due to the registration rule in each

TABLE I School Enrollment Rate, Deficiency Rate, Median School Years Completed and Median Earnings, by State, 1960, 1970 and 1976

	1960			1970				1976		
	1	2	3	4	1	2	3	4	I II III IV	
Maine	92.1	.60	10.7	2.3	93.1	.61	12.0	3.5	95.8 64.9 .79 11.6	
New Hampshire	91.5	.44	10.7	2.7	92.4	.46	12.1	4.1	94.6 68.7 .66 14.0	
Vermont	92.3	. 46	10.7	2.3	92.7	. 44	12.1	3.7	95.6 67.2 .57 11.9	
Massachusetts	92.1	. 32	11.3	3.0	95.1	. 41	12.2	4.4	97.4 69.8 .58 15.4	
Rhode Island	91 0	42	10 1	2.7	94 6	49	11 5	3.9	95.7 58.5 .54 14.3	
Connecticut	93 7	36	10.8	3 6	96.2	.42	12 1	51	97.4 67.7 .60 16.3	
New York	93.7		10.0	3 1	90.2	38	12 0	4 9	96.8.63.4 .54 14.8	
New Jorsey	93.3	37	10.6	3 6	-95 3		12.0	5.0	96.5.63.4 .62 16.6	
New Delsey Donneylyania	92.0	30	10.0	3.0	97.5		11 8	J. 0 1 3	96 1 60 5 53 13.9	
Dolawaro	91 1	. 30	10.4	3.0	94.0		12 1	4.5	92 2 66 9 58 16.0	
Maryland	01 2	20	10.9	2.2	01 1	.45	12.1	5.0	96 7 67 4 54 17 5	
District of Columbia	91.3	. 39	10.5	3.J 2.J	24.4 02 E	.44	12.1	5.0	96 1 62 7 65 13 4	
District of Columbia	91.0	. 54	11.0	3.3	93.5	- 60	12.1	<u> </u>	05 7 64 0 71 14 9	
	92.5	.48	10.8	3.3	94.5	.56	12.0	4.5	95.7 64.9 .71 14.8	
Indiana	91.7	.4/	10.7	3.1	93.6	.60	12.0	4.4	94.6 63.8 .80 14.3	
Illinois	92.4	. 35	10.6	3.5	94.6	.41	12.0	4.9	96.2 63.0 .56 15.7	
Michigan	94.4	.40	10.8	3.4	95.1	.45	12.0	4.9	96.9 65.5 .61 15.4	
Wisconsin	93.7	.42	10.6	2.9	95.5	.48	12.1	4.0	97.4 67.4 .66 14.6	
Virginia	88.9	.70	10.1	2.4	92.1	.68	11.5	4.0	96.5 61.8 .// 14.5	
West Virginia	90.0	.52	9.1	2.3	87.5	.58	10.7	3.3	93.4 49.5 .72 11.6	
Kentucky	88.6	.60	8.9	2.0	90.2	.49	10.3	3.3	92.8 49.5 .63 11.0	
Tennessee	89.7	.58	9.2	1.9	90.4	.55	10.7	3.4	94.8 51.2 .65 11.1	
North Carolina	90.0	.66	9.5	1.9	90.8	.60	10.9	3.4	93.0 51.9 .71 11.8	
South C a rolina	87.5	.74	9.2	1.8	90.2	.66	10.7	3.4	95.6 53.3 .72 12.2	
Georgia	90.8	.61	9.5	1.9	90.6	.51	11.0	3.6	94.4 55.4 .62 12.2	
Florida	91.5	.50	10.7	2.4	92.8	.45	12.0	3.6	97.0 62.6 .52 11.7	
Alabama	90.3	.70	9.5	1.8	90.6	.64	10.7	3.2	93.1 53.2 .73 11.5	
Mississippi	91.0	.91	9.1	1.2	89.9	.63	10.6	2.6	94.9 49.1 .58 9.8	
Louisiana	91.3	.60	9.3	2.0	91.4	.55	10.9	3.3	95.5 53.9 .58 12.5	
Arkansas	90.7	.62	9.2	1.5	90.5	.63	10.6	2.8	93.8 53.2 .74 9.6	
Minnesota	93.8	.33	10.9	2.6	95.4	.49	12.1	3.8	96.8 69.3 .74 14.1	
Iowa	94.4	.47	11.2	2.5	94.1	.58	12.1	3.6	96.0 69.4 .77 14.0	
Missouri	91.3	.42	10.1	2.5	93.5	.57	11.6	3.7	95.2 61.2 .66 12.6	
North Dakota	92.8	.36	10.0	2.2	93.5	.47	11.8	3.1	94.0 62.0 .68 13.5	
South Dakota	93.0	. 46	10.5	2.0	94.1	.51	12.0	2.9	95.8 64.1 .69 11.7	
Nebraska	94.4	.45	11.5	2.5	94.7	.53	12.2	3.5	95.2 70.9 .68 13.8	
Kansas	92.8	.35	11.5	2.6	94.4	.44	12.2	3.6	95.5 69.7 .72 13.4	
Oklahoma	91.9	.50	10.6	2.2	93.1	.51	11.9	3.3	95.7 61.7 .67 12.0	
Texas	89.8	.76	9.5	2.4	91.7	.73	11.4	3.7	95.2 61.6 .81 12.6	
Arizona	90.8	. 56	10.9	2.8	92.6	.47	12.1	4.0	96.1 70.7 .56 13.6	
New Mexico	91.0	.61	10.9	2.8	92.7	.50	12.0	3.6	95.4 63.3 .62 12.0	
Montana	92.5	.52	11.3	2.7	93.7	.57	12.2	3.5	95.3 69.7 .72 13.3	
Idaho	93.1	.54	11.3	2.5	92.7	. 56	12.1	3.3	94.6 68.9 .76 13.0	
Wyoming	92.5	.58	11.8	3.0	93.7	.61	12.2	3.7	94.7 72.6 .80 14.6	
litah	92.6	. 47	12.1	3.0	95.4	.49	12.3	3.6	95.9 78.7 .67 14.8	
Colorado	92.8	44	11 9	29	94 9	52	123	3.9	95,776,775,14,8	
				2		• 52	12.5			
Washington	93.5	.52	11.8	3.1	95.0	. 56	12.3	4.3	95.1 74.7 .72 14.5	
Oregon	93.8	.44	11.5	2.9	94.4	.49	12.2	3.8	95.3 73.5 .63 13.5	
California	94.2	. 31	11.9	3.5	95.2	.40	12.3	4.7	96.7 72.4 .57 14.7	
Nevada	94.0	.44	12.0	3.6	93.6	.40	12.3	5.2	95.5 74.3 .61 14.7	
Alaska	90.3	.73	12.0	3.3	93.5	.63	12.3	5.4	94.4 78.7 .71 23.2	
Hawaii	95.1	.31	11.2	3,1	94 6	. 32	12 3	4.8	97.0 68.6 47 18.6	
Mean	91.9	.50	10.6	2.7	93.2	. 52	11 7	3.0	95.4.64.4 66 13.8	
S.D.	1.6	.14	0.9	0.6	1 8	.09	0 6	0.7	1.2 7.6 08 23	
C.V.	1 8	. 279	8 7	225	2 0	209	4 9	179	1 3 11 8 129 16 3	
Min.	87 5	.2/3	80	1 2	87 5	20.9	10.3	2 6	-02 2 AQ] A7 0 6	
Max	97.5	• 20 01	121	3 6	01.5	. 32	10.3	2.0 5 /	54.4 45.1 .4/ 5.0 07 / 70 7 00 33 3	
		• 91	420 ±	5.0	50.2	. / 5	12.3	J. 12	J/17 10.1 .00 23.2	

Enrollment Rate (%)
 Grade "Deficiency Rate" (year)
 Median No. of School Years Completed

(4) Median Earnings (thousand \$)

(I) Enrollment Rate (%)

(II) Percent of Population (25+) comp.High Sch

- (III)Grade "Deficiency Rate" (year)
- (IV) Median Family Income

state, which provides that unless a child has reached a certain biological age, he can not be enrolled.

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