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Neighborhood Effects and the Acquisition of Human Capital

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Abstract

The purpose of my research is to challenge the notion that the AFQT test strictly measures innate ability by testing a set of hypotheses that suggest that differences in AFQT test scores can be at least partially attributed to differing neighborhood effects. I hypothesize that neighborhood effects, such as crime and unemployment rates, school quality, and socioeconomic standards, do have an effect on the acquisition of human capital, including intelligence. Therefore, if the negative effects of these factors are disproportionately felt by minorities, their presence could account for racial disparities in AFQT test scores.

Neighborhood Effects and the Acquisition of Human Capital

By Amber Munday

I. INTRODUCTION

The social science world was stunned in 1994 by the release of a very controversial book, The Bell Curve. Written by Richard Herrnstein and Charles Murray, The Bell Curve uses data from the National Longitudinal Survey of Youth (NLSY) to draw a variety of conclusions that are at least politically incorrect and at worst an outright attack on the battle for racial equality. One of the most inflammatory of Herrnstein and Murray's findings is that white people are inherently smarter than non-whites. This conclusion is based on individual scores from the Armed Forces Qualification Test (AFQT), a standardized test that was administered to everyone in the NLSY database. Herrnstein and Murray argue that these test scores are a measure of innate ability.

The purpose of my research is to challenge the notion that the AFQT test strictly measures innate ability by testing a set of hypotheses that suggest that differences in AFQT test scores can be at least partially attributed to differing neighborhood effects. I hypothesize that neighborhood effects, such as crime and unemployment rates, school quality, and socioeconomic standards, do have an effect on the acquisition of human capital, including intelligence. Therefore, if the negative effects of these factors are disproportionately felt by minorities, their presence could account for racial disparities in AFQT test scores.

This research is very important due to the dangers involved with labeling a superior racial group in society. Many sociologists argue the existence of a self-fulfilling prophecy, that is, if a group is labeled as inferior and they in turn accept this label, their success will be greatly limited, which in turn supports the initial claim of their inferiority. Any contributions to this vicious cycle need to be challenged.

II. LITERATURE REVIEW

A variety of research has attempted to estimate the acquisition of intelligence as a production function wherein intelligence is the output and the characteristics of the individual's school are the inputs. While this does provide a useful framework for thinking about the overall process, it has not been hugely successful in predicting the specific inputs that account for an individual's attainment level. It has been suggested, however, that the failure of the school production function to accurately predict intelligence can be attributed to the fact that it cannot measure the effects of the informal, out of the classroom, education that occurs at home and within peer groups (Mancebon and Bandres 1999).

Researchers Robert Havemen and Barbara Wolfe expand on the production function idea by including measures that may capture the effects of informal education. They argue that the acquisition of intelligence is based on three categories of inputs: government inputs, family inputs, and individual inputs. According to Havemen and Wolfe, government inputs include school spending and neighborhood conditions. Family inputs would be income level, family size, and attitudes toward education. Finally, individual inputs would include the decision to finish high school or to participate in extracurricular activities (1995).

Starting from Havemen and Wolfe's framework, a variety of other research exists that suggests specific factors that fit into the three-part production function model. Research certainly suggests that children from low-income families are less likely to be successful in schools (Downes 1999). This, of course, supports Havemen and Wolfe's idea that a measure of family inputs is necessary when predicting intellectual achievement.

Research also suggests that a measure of neighborhood violence will be a significant predictor of overall intellectual achievement. Researcher Jeffrey Grogger found that neighborhood levels of violence show a significant, negative impact on a child's

Table 1: Mean and Standard Deviation by Race

Symbol	Definition	Mean-white	Mean-black	St. Dev-white	St. Dev-black	Expected
AFQT	Armed Forces Qualifying Test (Dependent Variable)	51.538	23.187	27.757	20.934	
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Family Inputs						
MOMGRD	mother's highest grade	11.646	10.822	2.571	2.609	Positive
DADGRD	father's highest grade	11.823	10.249	3.501	3.47	Positive
SIBLINGS	number of siblings	3.279	4.742	2.171	3.027	Negative
FAMINC	total family income	20024.854	13922.608	15657.906	12059.823	Positive
BOTHPARE	dummy variable for growing up in the home of two parents	0.753	0.503	0.431	0.5	Positive
Government Inputs						
UNEMPRT	unemployment rate in individual's neighborhood	3.239	3.122	0.977	0.897	Negative
URBAN	dummy variable for living in urban area	0.727	0.823	0.446	0.382	Negative
NCENTRAL	dummy variable for region	0.304	0.181	0.46	0.385	Unclear
SOUTH	dummy variable for region	0.319	0.569	0.466	0.495	Unclear
WEST	dummy variable for region	0.173	0.078	0.378	0.268	Unclear
Individual Inputs						
HIGHESTG	individual's highest grade	11.759	11.425	1.862	1.645	Positive
MARIJ24	dummy variable for using marijuana before age 24	0.977	0.952	0.149	0.214	Negative
COC24	dummy variable for using cocaine before age 24	0.83	0.635	0.375	0.482	Negative
FEMALE	dummy variable for female	0.495	0.492	0.5	0.5	Unclear
YRBORN	year born	60.204	60.516	2.261	2.21	Positive

level of educational attainment (1997). This result also leads to the implication that other neighborhood factors, such as the level of unemployment, will be important in predicting educational attainment.

III. EMPIRICAL MODEL

For the empirical testing of intellectual achievement, I build on Havemen and Wolfe's model of the three-part education production function. In order to draw conclusions that are comparable to the results of The Bell Curve, I use the same measure of intellectual achievement used in that study, which is the AFQT test score. I also use the same database, the National Longitudinal Survey of Youth (NLSY). The National Longitudinal Survey of Youth is a cohort study that began in 1979 by surveying over 155,000 respondents who were between the ages 14-21 on December 31, 1979 (Bureau of Labor Statistics). In 1981, respondents completed the AFQT test and thus all other data that I use in this study is based on the environment of the respondent in 1981. OLS regression analysis is used to show that AFQT test scores are a function of parental, government, and individual inputs. For a complete description of variables, including their means and standard deviations by race, refer to Table One.

I measure family inputs through a variety of variables including income, family size, and the highest grade completed by each parent. Furthermore, I include a measure of family structure, specifically whether or not the individual grew up living with both of his or her parents. Total family income and the highest grade completed by each parent should serve as proxies to socioeconomic status. Family size and structure, on the other hand, theoretically can be used to draw conclusions about the amount of time devoted by parents to the child. Larger families, or families with only one parent, would intuitively devote less time to each child.

I measure government inputs through both micro and macro level factors. On the micro level, I include a measure of the local unemployment rate. A high unemployment rate suggests a lack of professional opportunities and thus a disincentive toward intellectual achievement. The model also includes a dummy variable for living in an urban area; the hypothesis being that urban areas are more likely to suffer the negative effects of violence and overcrowding that would dampen intellectual attainment. Research also suggests that school size and teacher salaries would be valuable proxies for micro-level government inputs, however due to data problems these variables are not included. Finally, I look for significant effects on intellectual attainment from different geographic locations, specifically the northeast, north central, south, and west. Any significant effects stemming from differences in geographic location point to differences in the macro-level structure of those regions. While no conclusions could be drawn simply by finding a significant effect on attainment stemming from geographical location, a surprising effect could certainly point out an area for further research.

The final input of Havemen and Wolfe's three-part education production function is individual inputs. I proxy an individual's contributions to their intellectual attainment based on their highest grade completed and their decisions on whether or not to use marijuana and/or cocaine. I also include a control for individual age and sex. Numerous additional measures could also be used including grade point average and/or participation in extracurricular activities. Caution must be taken, however, in interpreting the results of these inputs as it is impossible to determine if the completion of higher grades yields higher intelligence or whether people of higher intelligence complete higher grades. Further, causation cannot be fully determined in the choice to use illegal drugs. One may become less intelligent after using drugs or one may use drugs because they are less intelligent.

The production function for intellectual attainment as outlined in this study is:

AFQT score=f(parental inputs, government inputs, individual inputs)

I theorize that the racial differences in AFQT score that researchers Herrnstein and Murray report in The Bell Curve are in fact not due to some innate intellectual superiority of the white race, but rather that these differences can be explained by the differences in the government inputs into the neighborhoods of whites and blacks, when family and individual level inputs are controlled for. In order to test for these differential neighborhood effects, I will estimate the

Table 2: OLS Regression Results

Variable	Coefficient	Coefficient	Significance	Significance	Expected Sign
	White Regression	Black Regression	White Regression	Black Regression	White/Black
Family Inputs					
MOMGRD	1.307	2.44	.001**	.000**	yes/yes
DADGRD	1.569	1.141	.000**	.022**	yes/yes
SIBLINGS	-.48	0.966	.214	.071*	yes/no
FAMINC	8.52E-05	9.75-05	049*	.373	yes/yes
BOTHPARE	-2.055	-1.426	.265	.619	no/no
Government Inputs					
UNEMPRT	-.368	-1.975	.646	.236	yes/yes
URBAN	.292	-12.815	.879	.010*	no/yes
NCENTRAL	-2.154	-1.364	.294	.74	na
SOUTH	-2.023	-12.638	.351	.001**	na
WEST	-3.937	-13.42	.068*	.013**	na
Individual Inputs					
HIGHESTG	7.353	7.806	.000***	.000**	yes/yes
MARIJ24	-9.981	6.807	.383	.397	yes/no
COC24	3.543	3.087	.072*	.317	no/no
FEMALE	-4.494	1.848	.002**	.515	na
YRBORN	.757	0.683	.085*	.361	na

***denotes significance at the .05 level**
****denotes significance at the .10 level**
Adjusted R^2: White Regression .395 Black Regression .474 Sample Size: White Regression 744 Black Regression 196

above-described three-part education production function separately for white and black respondents. I will then substitute the mean values of the black variables into the white structural equation and look for a prediction of intellectual attainment that is above the actual black average AFQT score. I hypothesize that a differential will exist and that it exists because blacks have, on average, much poorer neighborhood characteristics and different returns on their attainment inputs. Finally, I will repeat this substitution process by placing white averages into the black structural equation and looking for a predicted AFQT score that is

below the actual mean white score. If, as I hypothesize, blacks have poorer returns on their attainment inputs, then the black structural equation should pull down the white scores.

IV. RESULTS

Table Two gives the detailed results of both of the multivariate regressions. The regression was run twice, once using a sample of only white respondents and a second time using a sample of only black respondents. The racially stratified regressions did not yield the same results. Note that different variables were statistically significant in the two regressions and that three variables yielded opposite signs. Further, the adjusted R^2 for the black regression was higher, thus the black regression was able to explain a higher degree of the variation in the AFQT test scores of the black respondents than the white regression was able to explain for the white AFQT test scores.

The results of both regressions support the research of Havemen and Wolfe. Clearly, their argument that intellectual attainment cannot be estimated as solely dependent on the features of an individual's school is supported by the fact that my results show several significant variables unrelated to individual school factors. The significance of the parental input variables and also of the region that one lives in support the fact that informal, out of school inputs, must be considered.

The most consistent finding between the two regressions is the fact that parental inputs are important in an individual's intellectual attainment. For both the white and black regressions the highest grade completed by the individual's parents was statistically significant and showed the expected positive sign. Contrary to prediction, the coefficient for the dummy variable regarding whether an individual grew up living with both parents produced a negative sign in both regressions. This result is counterintuitive; however, the variable was not statistically significant in either model.

Among the variables that were used to measure an individual's input into their intellectual attainment there was only one consistent, significant result between the black and white regressions. This significant variable is the highest grade completed by the individual. Not surprisingly this variable produced a positive result in both models. It is important to note however, that this result, though expected, is very important in combating the results of The Bell Curve. Recall that Herrnstein and Murray argue that the AFQT test measures innate ability and thus would not be a function of one's education.

The variables that were designed to proxy government inputs into the intellectual attainment production function, namely the unemployment rate, the dummy variable for residing in an urban area, and the dummies for geographic location, are the key variables for this research since I am trying to demonstrate that government inputs have differing effects on the AFQT scores of whites and blacks. The measure of the unemployment rate in an individual's neighborhood yielded insignificant results for both the black and white regressions. This measure did however have a negative sign as predicted. Furthermore, both the black and white regressions suggest that living in the northeast, which was the omitted region, is positively correlated with higher intellectual attainment as the other three regional dummy variables yielded negative signs.

It is interesting to note that the negative effect of living in either the south or the west is most significant for blacks. West is the only one of the regional variables significant in the white equation. Clearly the intellectual attainment of blacks is more sensitive to the area in which they live, which suggests that government, or other macro-level factors, affect blacks more strongly than whites. Thus blacks would be more positively affected by living in an area with positive neighborhood effects than would whites. Conversely, the detrimental effects of living among negative neighborhood conditions would have a greater magnitude on the intellectual attainment of blacks vis a vis whites.

As the above results show, the most important variable for explaining the racial differential in AFQT scores is the dummy variable concerning whether or not one lives in an urban area. Recall that a value of one indicated living in an urban area and thus a positive coefficient on this variable indicates a positive effect on intellectual attainment and alternatively a negative coefficient depicts a negative effect for living in an urban area. The white regression yielded a positive, yet statistically insignificant, coefficient for the urban variable. The black regression, however, yielded a

negative and significant result. In fact, the magnitude of this coefficient (-12.815) is one of the largest for any variable in either of the regressions. This suggests that blacks who live in an urban area are at a huge disadvantage when it comes to intellectual attainment. This variable also lends the greatest support to the hypothesis that racial differences in AFQT scores could be explained by differences in neighborhoods since it is clear that the effects of living in an urban area are greatly different for blacks than for whites.

The results of the urban variable were predicted by the research of Jeffrey Grogger. Grogger's research explicitly demonstrates that neighborhood levels of violence affect children's educational attainment. While a measure of local violence is not included in the model, it is clear that urban areas have higher crime rates, and this may be one explanation for the negative effects for blacks that live in urban areas.

The final analysis that I conducted was to use the white structural equation to predict an AFQT score based on the black averages of the independent variables. If the black and the white structural equation were equivalent, then the white structural equation should have predicted, based on black averages, an AFQT score equal to the average black AFQT score. This, however, was not the case. The white structural equation predicted an AFQT score of 36.181. This score is over 56% higher than the actual mean black AFQT test score (23.187).

This exercise of using the white structural equation to predict a black AFQT score based on the mean black variables is useful in that it allows one to see how the inputs of blacks would be rewarded if they had the same attainment structure as whites--that is, if all things were constant except race, how would black AFQT scores change. When black scores are predicted with the white equation, which is in essence the white achievement structure, the gap between the mean white and the mean black AFQT score closes by 46%. The other 54% of the difference between the mean scores of blacks and whites must be based on the differences in the returns to the specific inputs. Recall that when viewing the regression equation as a production function the coefficient on a specific variable can be seen as the marginal product for investing in that variable. Therefore, it is the differences in the coefficients between the two equations that account for the rest of the variation. Surely, the huge disparity between the coefficient of the urban variable for the white equation (.292) and for the black equation (-12.815) accounts for much of this difference.

Finally, if a white AFQT score is predicted by substituting white averages into the black structural equation, the resulting score is 36.833. This score is 28.9% lower than the actual white mean AFQT score. The fact that the white score is worsened when the white characteristics are subject to the black achievement structure supports the claim that blacks have lower returns on their investments into their human capital.

V. CONCLUSIONS

The purpose of this research was to challenge the controversial findings of The Bell Curve, which suggests that whites are intellectually superior to minorities. I theorized that the racial differences in intelligence, as proxied by AFQT score in both The Bell Curve and in this research, could be explained by differences in the average neighborhood conditions of blacks and whites. The theoretical framework described in the research of Havemen and Wolfe was modified and then used to estimate intellectual attainment as the output of a three-part production function, where the three categories of inputs are family inputs, government inputs, and individual inputs.

The results of this research are quite consistent with the previous research on intellectual attainment. This study, like the work of Mancebon and Bandres, demonstrates that intellectual attainment cannot be thought of as dependent solely on formal education and that out of the classroom experiences serve as important influences on a child's development. Clearly these findings also support Havemen and Wolfe's research in that statistically significant variables were found from within each of the input categories.

Finally, this research provides merit to the claim that differential neighborhood effects account for some of the differences in AFQT scores of blacks and whites. The most significant of the independent variables is undoubtedly the urban variable. It shows a very different effect of living in an urban area for

blacks and whites. The large negative effect of an urban residence for blacks suggests that blacks live in different neighborhoods within urban areas than whites. This is consistent with current census information. Thus, these different neighborhoods seem to have very different effects on intellectual attainment. The importance of this finding is compounded by the fact that this research suggests that blacks are more profoundly effected by their neighborhood conditions than are whites. This is seen in the significance of the regional variables in the black regression only.

Perhaps the most telling result of this research comes not from the actual regression equations, but from the black and white predicted AFQT scores found from the use of each race's mean variables and the other race's structural equation. The black AFQT score predicted by the white equation yielded a result over 56% higher than the actual mean black score, while the white AFQT score predicted by the black equation was 28.9% lower than the mean white score. This certainly points out some inherent differences in the model for blacks and whites. This could be a very important finding if future research could determine the underlying causes of this difference.

One of the major shortcomings of this research is the failure to include any controls for school quality in the model. While previous research disagrees as to the magnitude of the effects, obviously intellectual attainment cannot be analyzed independent of school quality. Future research should include controls for school size and funding as well as other quality measures.

The policy implications of this research are clear. The fact that living in an urban area is so detrimental to black intellectual attainment surely demonstrates that current policies aimed at urban renewal and equalizing the funding for inner city school programs are not doing enough to offer disadvantaged children of the inner city a fair chance at intellectual success. Further research should explore alternative ways of promoting growth and economic opportunities for the inner city.

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