Does College Education Pay?
Evidence From The NLSY-79 Data

Diamando Afxentiou, Ph.D., New York Institute of Technology, USA
Paul Kutasovic, Ph.D., New York Institute of Technology, USA

ABSTRACT

This study examines if the college wage premium favoring college graduates still exists. The NLSY-79 data is employed. The sample includes individuals who received their high school degree and college degree in 1980 and 1981. These individuals were followed until the year 2004. A cross sectional regression model was estimated for the years 1982, 1994, and 2004 and found that education, occupation, and gender were the primary determinants of wages. The income gap between college educated workers and high school educated workers has widen over time. Most interestingly, it is the stagnation of high school educated workers that accounts for the gap.

Keywords: Wage gap, wage determinants, NLSY-79 data, Chow test, regression analysis.

INTRODUCTION

*D*ata from the Department of Labor and the Census shows that there has been essentially no growth in real wages since the early 1980s and that a significant shift toward growing income inequality has occurred in the US economy[1]. This has prompted policymakers to ask the question of what can be done to reverse these trends and enhance workers' income.

The conventional argument is that raising the educational level of the workforce would achieve this result since an investment in human capital would produce a return to the individual in the form of higher earnings (Mincer 1974, Becker 1962). Historically, the data shows a significant gap in the incomes of college and non-college educated workers. Research confirms that college graduates earn more than high school graduates (Afxentiou 2008, Blau and Kahn 1997, Isaacs, Sawhill and Haskins, 2007). The decision to acquire more education has been found to be influenced by a number of factors including: family background (Altonji and Dunn 1996, Ashefelter and Zimmerman 1997, Agnarson and Carlin 2002, Card 1995b, Regan, Oaxaca and Burghrdt 2007), socioeconomic differences (Lang and Ruud 1986), college proximity (Card 1995a, Kling 2001), and compulsory schooling laws (Angrist and Krueger 1991).

From a policy perspective, raising the educational level of the workforce would raise the level of income and increase wage growth over time. Furthermore, it has been argued that a more educated workforce has greater economic mobility and opportunities to move up the income ladder. The question is, has the income gap favoring college educated individuals increased in recent years and are there now other factors impacting wage growth?

The objective of this study is to:

(1) Investigate if the income gap favoring college educated individuals has changed in the period 1982 to 2004, and

(2) Examine factors impacting wage growth while controlling for education.

Most previous research on the labor market has used the Panel Study of Income Dynamics (PSID) data. In contrast, this study employs NLSY-79 longitudinal data which provides a rich source of data to study the labor market in connection with wage growth. A cross-sectional econometric model explaining wage growth is developed and estimated for the years 1982, 1994, and 2004.

A Chow test is used to test if wage growth has changed over time. The key determinants of wage growth includes: education, gender, race, family income, occupation, and one year lagged regional unemployment rate.

The paper is organized as follows: section II is the background, section III discusses the data and the sample, sections IV and V present the comparative and regression analysis respectively, and the paper ends with the conclusions and recommendations in section VI.

BACKGROUND

The stagnation in wages in the U.S. since the 1980s and the widening of the wage gap among high school and college graduates are attributed to both, market and non-market conditions.

Market factors are those that cause changes in the demand and the supply for labor. On the demand side, a combination of globalization and advancement in technological innovations has reduced the demand for low skills jobs. Globalization impacts demand by increasing imports which eliminates domestic jobs in import competing industries. The effect of imports on the wages of less-educated Americans was estimated and until the mid-1990s found to have a modest effect (Krugman, 2007). However, a more recent study by Gordon and Dew-Becker (2007) found that the share of nominal imports in GDP increased from 5.4 percent in 1970 to 16.2 percent in 2005 and this increase has contributed to the decline in the relative wages of unskilled workers. Technological innovations reduce demand by replacing workers with capital and allowing for outsourcing to occur. The impact of technological innovations is stronger on the wages of workers with routine middle-skill jobs that can be replaced by machines or outsourcing (Autor, Katz, and Kearney, 2008).

On the supply side, a slowdown in the growth of college workers (Katz and Murphy, 1992; Card and Lemieux, 2001) contributed to the widening of the wage gap between high school and college graduates.

Non-market conditions influencing workers wages are the de-unionization of the labor force and the reduction in the real minimum wage. The percentage of U.S. employees in unions declined rapidly from 27 percent in 1979 to 19 percent in 1986, and then more slowly to 14 percent in 2005 (Gordon and Dew-Becker, 2007). Unionized workers share a wage premium. The wage premium varies by occupation and industry, but overall it is estimated to be around 15 percent (Blau, Ferber, Winkler 2002).

The reduction in demand caused by globalization and technological innovations along with erosion in labor market institutions has lowered the growth in wages, especially the wages of low-skill workers. Some researchers view the widening of the wage gap between high school and college graduates as one-time "episodic" event explained by the declining real value of the minimum wage (Card and DiNardo, 2002) and changes in the labor force composition. Changes in the labor force composition are due to changes in the distribution of education or experience of the labor force (Lemieux, 2006a).

Not only have wages remained stagnant in recent years, but income inequality has widened. Between 1979 and 2004 the real income of the bottom one-fifth of Americans rose by 9 percent and the top one-fifth by 69 percent (Sawhill and Morton, 2007). Over the same period, the CEO pay increased from 35 times to nearly 262 times the average worker's pay (Sawhill and Morton, 2007). A recent study on economic mobility, by the Brookings Institution and the Pew Charitable Trusts (2007), concludes that obtaining a college degree improves economic mobility, the ability to climb the income ladder. The study shows that 74 percent of adult children with college degree had incomes greater than their parents and adult children of parents in all five quintiles are much more likely to make it to the top two quintiles if they achieve a college degree.

DATA

The NLSY-79 data is employed from 1979 to 2004. The NLSY-79 data consists of a nationally representative sample of 12,686 individuals aged 14 – 21 in 1979 when they were first interviewed. The survey was contacted annually until 1994 and biennial thereafter. The sample includes individuals who received their high school degree and college degree in 1980 and 1981 and were followed until 2004, the year of most currently available data. In order to keep the educational level constant through the test period, the data is verified for each individual to ensure that their level of education didn't change during this period. The sample included a total of 977

individuals; 891 had a high school diploma and 86 had a college degree (Table 1). The sample had 504 males and 473 females. High school graduates had a mean family income in 1979 of $16,515 while the college graduates had a mean family income of $23,725.

Table1: Data Statistics

	High School (12)	College (16)	Total
Men	467	37	504
Women	424	49	473
Total	891	86	977

COMPARATIVE ANALYSIS

A two-Sample t-Test assuming unequal variance was performed on mean wages of high school and college graduates (Table 2). The difference in wages was significant at the 99% level for every year with the exception of 1992 which was significant at the 95% level of significance.

Table 2: Test of Difference in Wages

	Mean Wages ($)		
Year	High School	College	t-test
1981	3,662	8,090	-6.742*
1982	5,412	14,163	-7.660*
1984	7,100	18,283	-9.398*
1986	9,684	20,903	-7.679*
1988	12,048	23,509	-6.141*
1990	14,243	30,127	-4.883*
1992	20,221	34,350	-1.875**
1994	17,403	36,754	-5.814*
1996	19,619	41,379	-5.050*
1998	21,695	49,115	-5.444*
2000	25,588	53,085	-4.864*
2002	27,900	59,441	-4.510*
2004	27,491	64,410	-4.783*
* Significant at 99% level **Significant at 95% level			

Wages were adjusted for inflation to obtain the real difference between the wages earned by college and high school educated workers measured in constant 1981 prices (Table 3). The data shows that the wage advantage, in real terms, for college educated individuals is growing over time rather than narrowing. The results are plotted in Graph 1.

Table 3: Wages Adjusted for Inflation

	Real Wages ($) Constant 1981 prices		
Year	High School	College	Difference
1981	3,662	8,090	4,428
1982	5,147	13,469	8,322
1984	6,297	16,215	9,918
1986	8,200	17,701	9,500
1988	9,362	18,268	8,906
1990	9,964	21,077	11,112
1992	13,319	22,625	9,306
1994	10,871	22,960	12,088
1996	11,576	24,415	12,839
1998	12,356	27,973	15,617
2000	13,734	28,493	14,759
2002	14,341	30,555	16,213
2004	13,449	31,512	18,062

Graph 1
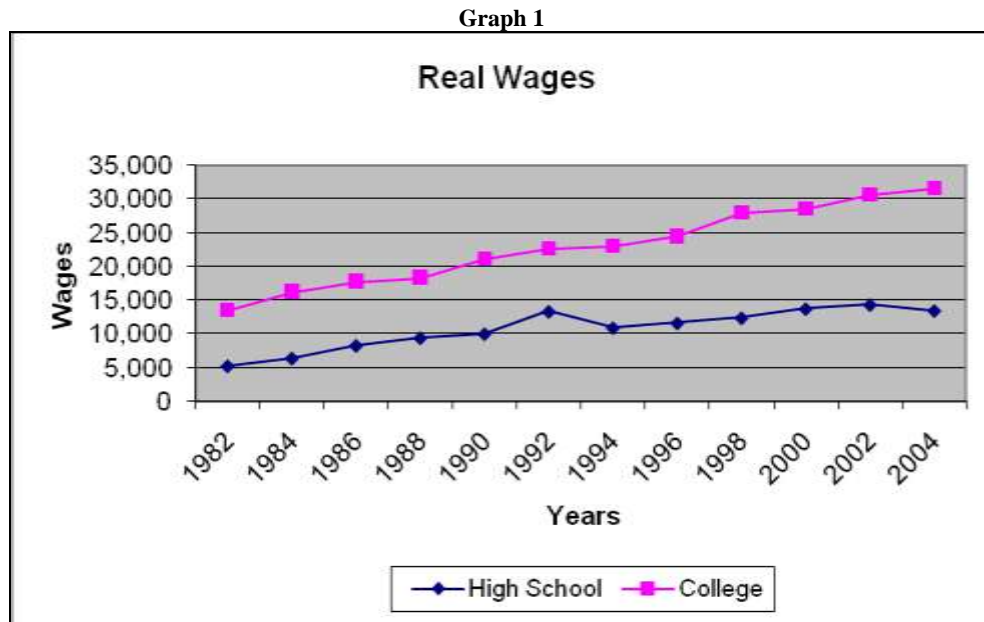
Over the entire period, college educated workers earned more than high school educated workers both in nominal and real terms. Most important, the wage premium favoring college educated workers changed over time. Table 4 shows the growth in real and nominal wages for the period before and after 1992.

Table 4: Annual Growth Rate in Nominal and Real Wages

	High School		College	
Period	**Nominal Wages**	**Real Wages**	**Nominal Wages**	**Real Wages**
1981-1992	16.8%	12.4%	14.1%	9.8%
1992-2004	2.5%	0.0%	5.3%	2.8%

Between 1981 and 1992, wages for both high school and college educated graduates increased in both real and nominal terms with college educated workers earning substantially more. Wages rose quickly for both groups as the workers gained experience from their low starting salaries. While college educated workers earned more, the premium was essentially constant over this time period.

However, this was no longer the case in the years following 1992. As expected, the rate of growth in wages slowed for both groups over the period from 1992 to 2004. But real wages earned by high school graduates peaked in 1992 and showed essentially no growth through 2004. In contrast, real wages for college educated workers continued to increase at a modest rate (2.8%) through 2004, resulting in a growing wage gap favoring college educated workers.
The results suggest that it is stagnation in wages for high school educated workers that accounts for the growing wage gap.

REGRESSION ANALYSIS

A model explaining wage growth was estimated using cross sectional data for three years: 1982, 1994, 2004. The specification of the wage equation is similar to those reported in past studies.

The dependent variable is the annual wage recorded for each individual in the NLSY-79 database. The log of wages was used for the regression analysis. The independent variables are gender, race, education, family income

in 1979, occupation, and regional unemployment rate lagged by one year. Education is a dummy variable equals to one for individuals holding college degree and zero for individuals holding high school or GED degrees. Race is divided into three categories, white, black, and other races. Occupation consists of five categories. The first category is construction, repairs, production, setter, operators and tenders, transportation and material moving workers (production). Category two is managerial, technical, and professional occupations, (managerial). Category three is office and administrative support occupations (clerical), category four is sales and related occupations (sales), the fifth category includes the remaining occupations specifically, service occupations which is the biggest category, farming, forestry, fishing and military occupations. Summary statistics for these variables is presented in Table 5. Since the sample size changes in different years due to different missing values, the values of some variables change as well.

Table 5: Descriptive Statistics

	1982	1994	2004
Variable	**Mean/Proportion**	**Mean/Proportion**	**Mean/Proportion**
Wages	$7,370	$20,030	$34,825
Family Income 79	$18,341	$17,337	$17,153
Gender			
Male	52%	52%	52%
Female	48%	48%	48%
Race			
White	62%	59%	58%
Black	26%	30%	30%
Other	12%	11%	11%
Highest Grade Completed			
High School	89%	90%	90%
College	11%	10%	10%
Regional Unemployment	7.6%	6.8%	5.9%
Occupation			
Construction	38%	38%	34%
Managerial	11%	16%	20%
Clerical	19%	18%	15%
Sales	8%	10%	7%
Other	25%	19%	24%

The regression results for each of the three years are shown in Table 6. The regression equations are statistically significant according to the F test. Gender and education have a strong positive effect on wages in all three regressions. Family income is significant in 1982 and 1994 but not statistically significant in 2004. Family background has an influence on wages when worker are young. As they get older, their family income has no significant influence on their wages. Occupations had a significant effect on wages in all years with the exception of Sales in 1982 which was statistically insignificant. Race and lagged regional unemployment rate, were statistically insignificant in all three years.

Table 6: Regression Results

Variable	1982 Regression (t-test)	1994 Regression (t-test)	2004 Regression (t-test)
Family Income 79	8.7E-06 (2.42)	6.5E-06 (2.17)	3.0E-06 (1.03)
Unemployment Rate	0.003 (0.04)	0.063 (1.21)	0.126 (1.11)
Race			
White	0.245 (1.39)	0.055 (0.35)	0.140 (0.90)
Black	0.098 (0.53)	-0.135 (-0.83)	0.077 (0.47)
Other			
Gender			
Male	0.203 (2.07)	0.463 (5.56)	0.576 (7.36)
Female			
Highest Grade Completed			
College	0.940 (4.49)	0.583 (3.66)	0.482 (2.85)
High School			
Occupations			
Production	0.591 (5.04)	0.466 (4.32)	0.395 (3.99)
Managerial	0.649 (3.41)	0.709 (5.50)	0.757 (6.62)
Clerical	0.723 (5.32)	0.564 (4.70)	0.423 (3.64)
Sales	0.176 (0.96)	0.397 (2.78)	0.334 (2.11)
Other			
Intercept	7.489 (14.12)	8.45 (20.53)	8.58 (12.00)
N	584	580	505
R^2	0.18	0.21	0.24
F	12.16	15.44	15.26

A Chow test was performed for the 1982 and 1994 regressions, 1982 and 2004 regressions, and 1994 and 2004 regressions. The results were consistent in all three tests, rejecting the hypothesis that the regression coefficients remained the same (equality of structural equations) over time[2].

CONCLUSIONS AND RECOMMENDATIONS

This paper developed a cross sectional model that examined the determinants of wages. Using the NLSY-79 data, a log earning model was estimated and found that education, occupation, and gender were the primary determinants of wages. College educated workers were found to have a significant income premium over those with only a high school degree.

For the period 1981 to 1992, the income premium was essentially unchanged and consistent with the one-time "episodic" explanation as proposed by Card and DiNardo, (2002) and Lemieux (2006a). However, after 1992, the wage gap favoring college educated workers has widened significantly. Since 1992, college educated workers have experienced steady increases in real wages while workers with a high school degree have seen their real incomes stagnate. Since 1992, workers with only a high school degree are falling further behind those with more education. The policy implication of this study is clear. To raise income growth and reduce inequality, government

and business must make efforts to increase the educational attainment of the work force, especially the number of college graduates.

END NOTES

1.   See Bureau of Labor Statistics, Employment, Hours, and Earnings from the Current Employment Statistics survey (National) at http://data.bls.gov/PDQ/servlet/SurveyOutputServelet and US Census Bureau, Historical Income Tables – Households (Table H-3) at http://www.census.gov/hhes/www/income/histinc/h03AR.html.

2.   Chow test (Fomby, Hill, Johnson, 1984, p 198):
$$F(k, N_1 + N_2 - 2k) = \{(SSE_R - SSE_{UR})/k\}/\{SSE_{UR}/(N_1 + N_2 - 2k)\}$$
Where k is the number of variables and
        N is the number of observations

(1) 1982-1994
$$F(11, 1142) = \{(616-417)/11\}/\{417/(584+580-22)\} = 49$$

(2) 1982-2004
$$F(11,1067) = \{(616-310)/11\}/\{310/(584+505-22)\} = 96$$

(3) 1994-2004
$$F(11,1063) = \{(417-310)/11\}/\{310/(580+505-22)\} = 33$$

AUTHORS INFORMATION

Diamando Afxentiou, Ph.D. received her MA degree from The New School for Social Research and her Ph.D. degree from West Virginia University. She joined the faculty of New York Institute of Technology in 1990 and is currently an Associate Professor and an Associate Dean in the School of Management. Her research interest is in the area of labor economics and public policy.

Paul R. Kutasovic, Ph.D. received his MA and Ph.D. degrees from Rutgers University. He joined the faculty of New York Institute of Technology in 1988 and is currently a Professor and the Chair of the Economics Department. His research interest is in the area of financial markets, regional economics and economic indicators.

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