

Family Background, Academic Ability, and College Decisions in the 20th Century U.S.

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Abstract

We harmonize the results of a number of historical studies to document changes in the patterns of who attends college over the course of the 20th century. We find that family income was twice as important in determining who went to college at the start of the century as compared to the end, while academic ability was half as important. The importance of income declined and of academic ability rose until roughly 1960, at which point the two are equally important. We construct and calibrate a model to understand what forces can explain the magnitude and timing of these changes, including changes in the skill premium, the financial environment, and the non-pecuniary benefits of college.

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1 Introduction

Determinants of college attendance have evolved markedly over the last century in the United States. As a stark example, first consider [Updegraff \(1936\)](#) who surveyed Pennsylvania high school students born around 1915, documenting each student’s academic ability and their family’s socioeconomic status. Among those students with the lowest academic ability (bottom one-third), yet from families in the highest socioeconomic category (roughly the top 15%), nearly two-thirds attended college. By contrast, among those students in the highest category of academic ability (top 15%) but from the lowest socioeconomic category (bottom one-third), only about 10% attended college. The modern equivalent of this picture is quite different, as overall college access has increased and merit has become a more important factor for college admissions and financial aid. To demonstrate this point, we replicate the same calculation as above using data from the NLSY79 (cohorts born around 1960). Defining ability and socioeconomic groups exactly as in [Updegraff \(1936\)](#), we observe that only 43% of the low-ability, high socioeconomic status group attend college, yet 71% of the high-ability, low socioeconomic status group attend college. Underlying these statistics are several fundamental questions. Who deserves to go to college? Do those deserving have access? What has changed over the last century such that the characteristics of college students has changed so much? The answers to these questions have strong implications for how colleges are financed, for the development and expansion of student loan programs, and for the way that colleges themselves choose to conduct admissions.

To document the changing pattern of who goes to school throughout the 20th century, we follow in the footsteps of [Belley and Lochner \(2007\)](#) and [Lochner and Monge-Naranjo \(2011\)](#), who compute college-going as a function of family income and test score quartiles between the NLSY79 and the NLSY97, roughly the 1960 and 1980 birth cohorts. We add to this by integrating similar published results that we have uncovered from studies conducted by educational researchers, psychologist, and economists, starting with the 1915 birth cohort mentioned above. As in [Lochner and Monge-Naranjo \(2011\)](#), the published results give college attendance as a function of some measure of academic ability (test score, class rank) and family background (family income, an index of socioeconomic status). We replicate the results following the original study design, variables used, and formatting in the NLSY79 and the NLSY97. By doing so, we produce a long time series on the importance of academic ability and family background relative to the 1960–1980 era that controls for many of the details of how the underlying studies were performed.

We have two main empirical results based on analysis of these historical studies. First, we

find that family income was roughly twice as important in determining who attended college in the earliest cohorts as compared to the latest, while academic ability was roughly half as important. Second, we find that the relative importance of these two factors converged relatively quickly and was essentially complete by the 1950 birth cohort, with fluctuations but no clear trend afterwards. We also look at alternate sources that present college attendance solely as a function of family background or solely as a function of academic aptitude and find similar patterns reflecting a declining importance for family income and a rising importance of academic aptitude.

We construct a model of college choice in which high school graduates differ in their academic ability and asset endowment (a proxy for family background). Key features of the model which are time-varying include college costs, financial constraints, the college wage premium, and the non-pecuniary benefits of college. We calibrate the model to match the historical data discussed above, and use the model to understand which of these time-varying forces (and over what time periods) are important in determining who goes to college. The main results are pending.

Our paper is related to two key literatures. The first is an active literature on college financing and college attendance today. A number of papers documented that family income played little role in college attendance after controlling for individual characteristics such as ability in the NLSY79 ([Cameron and Tracy, 1998](#); [Cameron and Heckman, 1999](#); [Carneiro and Heckman, 2002](#)). [Keane and Wolpin \(2001\)](#) and [Cameron and Taber \(2004\)](#) also argue that borrowing constraints played little role in student's decisions. However, [Belley and Lochner \(2007\)](#) and [Lochner and Monge-Naranjo \(2011\)](#) show that the importance of family background has subsequently risen and attribute it to the failure of student loan programs to keep up with rising tuition. [Ionescu \(2009\)](#) models college details and the current Federal Student Loan Program in great detail and finds that it plays little role. Relative to this literature, our main contribution is to put this debate into historical context by modeling and understanding college enrollment decisions from an era where the federal government played little role in helping finance college for students.

The second literature seeks to understand the rise in educational attainment and college attainment in particular. [Restuccia and Vandenbroucke \(2013\)](#) model it as an optimal response to the rise in the skill premium. [Goldin and Katz \(2008\)](#) concur, but add a number of institutional factors that may have played a role in the relatively rapid expansion of education in the U.S. [Donovan and Herrington \(2014\)](#) emphasize the decline in real college costs relative to income for cohorts born prior to 1950 and the rising college wage

premium realized by cohorts born after 1950. Relative to these papers we differ mostly in focusing on issues of who attends college rather than the average rise in attendance. Perhaps the most closely related papers along this dimension are [Taubman and Wales \(1972\)](#) and [Hendricks and Schoellman \(2014\)](#), who study the increasing importance of academic ability in determining who attends to college. We add to this literature by incorporating the joint effect of family background, which allows us to isolate other potentially important factors like financing and borrowing constraints.

The paper proceeds as follows. Section 2 presents the data sources, our harmonization procedure, and then the key new facts on college attendance patterns. Section 3 gives the model of college attendance. Section 4 contains our calibration procedure and Section 5 the results. Section 6 concludes.

2 Data

The central empirical claim of our paper is that the importance of family background in determining who attends college has declined throughout the twentieth century, while the importance of academic ability has risen. The evidence for this claim is derived from studies performed throughout the 20th century, primarily from the Great Depression onward. The original underlying studies were conducted by researchers in a variety of fields, including psychology, economics, and education. The design, sample, and presentation of results are different for each study. Nonetheless, it may be helpful to consider a hypothetical typical study that utilizes the most common elements. An online appendix gives a description of the details of the underlying studies used here.

In a typical study, a researcher will work with a State’s Department of Education to administer a questionnaire and an examination to a sample or possibly the universe of the state’s high school seniors in the spring, shortly before graduation. The results of the examination, which may be an aptitude or an achievement examination, are used to rank students in terms of academic ability, although in some cases class ranks or grades are used instead. The questionnaire included questions about family background, often including parental education, occupation, and estimates of family income. Finally, the researchers would either inquire directly about the student’s plans for college, or follow up to learn about actual college-going behavior a year later.

The original microdata from most of these studies no longer exist, particularly the ones conducted before 1960. Instead, we rely on the published results, which we have collected

from journal articles, dissertations, books, technical volumes, and government reports. It is common for these studies to report college-going for students who have different ranges of academic ability, family background characteristics, or both. For example, they might report the fraction of students who score in the top ten percent that plan to go to college. We have collected as many such studies as we can find and use them below.

The raw results reported in these studies are consistent with the claims made in the paper about the changing relative importance of academic ability and family background. However, it is natural to be concerned about the comparability of the results reported in different studies. The approach we adopt here is to utilize the NLSY to act as a “bridge” to improve the comparability of the studies. The idea is that the NLSY79 and the NLSY97 provide detailed microdata on family income, socioeconomic status, test score, high school performance, and college-going. Hence, it is possible to re-create the exact tabulations published in earlier papers using the NLSY data. Our reported results compare the importance of academic background and family income for explaining college attendance, *relative* to what the researcher would have found if he or she implemented the same design for the modern cohorts in the NLSY. We now explain how we do this and what we find.

2.1 College Attendance as a Function of Family Background and Academic Ability

The main source of data is historical sources that cross-tabulated college attendance as a function of academic ability and family background. The former is measured either using test score from an achievement or aptitude test (such as the AFQT); the latter is measured using family income or an index of socioeconomic status. In this sense, these earlier studies report figures comparable to those used by [Lochner and Monge-Naranjo \(2011\)](#) to document the growing relative importance of family income for college-going between the NLSY79 and the NLSY97.

The underlying studies differ in several dimensions. First, as is the case throughout this section, they were conducted by different researchers in different geographic regions of the country, using different sample selection criteria, and so on. Details on the relevant metadata are provided in Table 1. Second, the studies differed in how they collected information on each of the key variables. For academic ability studies used either class rank or test score on a standardized test, with varying tests over the years. For family background studies used family income or socioeconomic status, calculated different ways.

Finally, to document college-going studies either asked high school seniors about their plans to attend college (typically in the spring), or they followed up with students, their family, or their high schools in order to ascertain the actual behavior of students. Again, Table 1 contains details on each of these dimensions.

We re-construct these as closely as possible in both the NLSY79 and the NLSY97. An example may help. [Goetsch \(1940\)](#) reports college-going as a function of family income for students who score on the top fifteen percent of a standardized test. She provides tabulations for eight family income categories, containing 24, 8, 16, 22, 20, 7, and 3 percent of the relevant population. Within the NLSY, we restrict our attention who scored in the top fifteen percent on a standardized test, namely the AFQT. We then sort the remaining children on family income and form them into bins that contain the same 24, 8, 16, ... percent of the income distribution.

The result is raw data $C(A, F)$ on college-going as a function of academic ability A and family background F , and simulated functions $\hat{C}(A, F)$ from the NLSY. To help summarize the results of each study we construct two summary statistics by regressing C and $\hat{C}$ on A and F . Intuitively, β_A measures the importance of academic ability after controlling for family income and β_F measures the importance of family income after controlling for academic ability. We report $\frac{\beta_A}{\beta_A}$ and $\frac{\beta_F}{\beta_F}$ for each study. Intuitively, these ratios are the importance of academic ability and family background in the original study, relative to the recent cohorts of the NLSY.

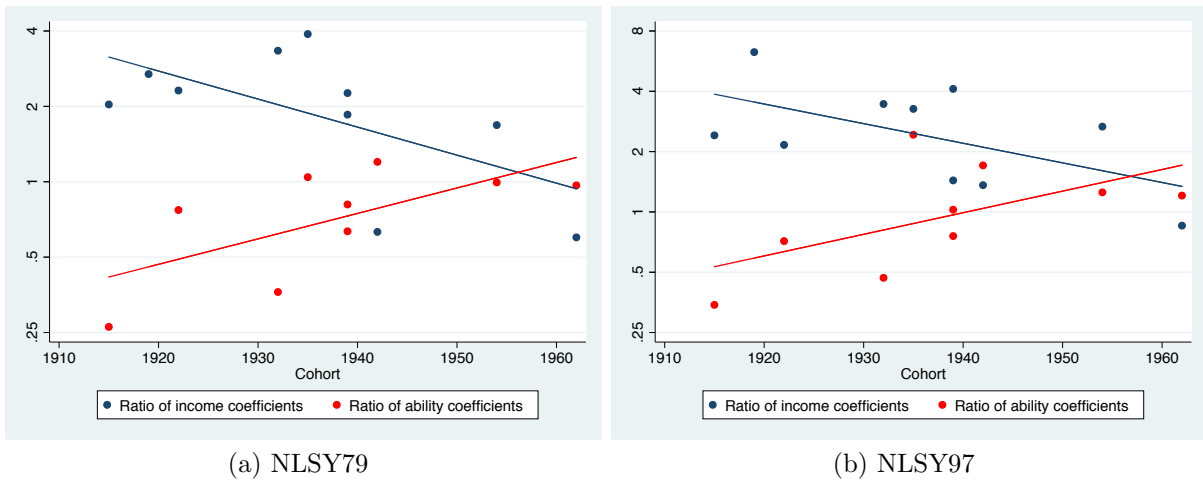


Figure 1: Changing Importance of Academic Ability and Income for College Attendance

Figure 1 show the results plotted as a function of the birth cohort. Figure 1a shows the results from replicating the original study in the NLSY79; Figure 1b shows the results from using instead the NLSY97, for robustness. Both figures tell a similar story. For the earliest cohorts, income was roughly 2–4 times as important as in the NLSY79, while academic ability was roughly half as important. The importance of income fell throughout the period, whereas the importance of academic ability rose. A simple regression on the data suggests that they reached the level of the NLSY79 around the 1950 cohort, although the small number of data points makes this statement somewhat imprecise.

An alternative way to express the same results is to report the importance of income relative to ability within each study, $\frac{\beta_F}{\beta_A}$. This statistic is still meaningful because we have expressed both family background and academic ability in percentiles throughout, so the scale of the variables are comparable. Figure 2 presents the results. Whereas income was clearly more important than ability in the early part of the century, the reverse is true today. A simple trend line suggests that the change has been dramatic, with income going from twice to one-fourth as important as ability.

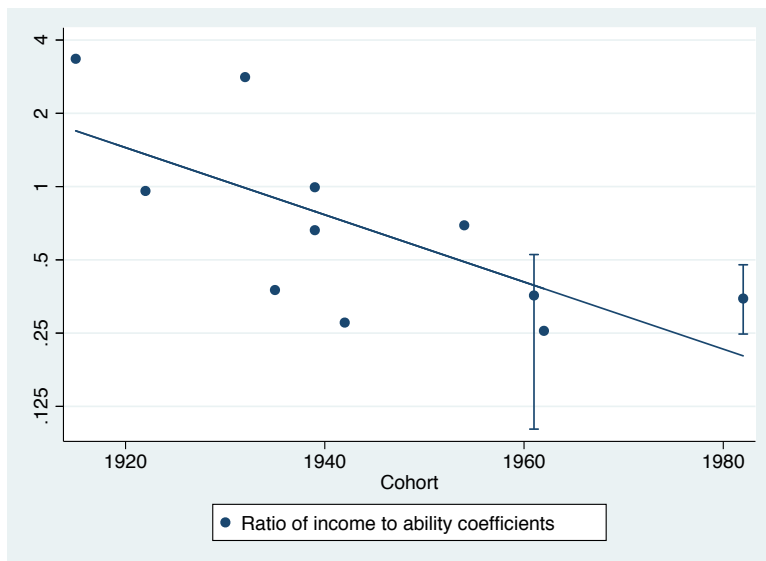


Figure 2: Declining Relative Importance of Family Income for College Attendance

In principle these types of cross-study comparisons can be biased by the fact that this way of reporting the data does not control for differences in sample selection, study design, variables used, and so on. To demonstrate that this is not the case, we construct $\frac{\hat{\beta}_F}{\hat{\beta}_A}$ in the NLSY79 and the NLSY97 using each possible study design. Doing so yields nine results for

each NLSY, which we represent as a dot (for the median point estimate) and bars (for the minimum to the maximum). The highest estimate from any sample design on either NLSY is slightly above one-half, far lower than the historical studies. Thus, we conclude again that income has declined in importance and ability risen as determinants of who attends college.

2.2 College Attendance as a Function of Academic Ability

[Hendricks and Schoellman \(2014\)](#) previously harmonized and compared the academic ability (measured by standardized test score) of college-bound and non-college-bound high school seniors for various cohorts over the twentieth century. The work is similar to that of the previous subsection in that it involves harmonizing results from a number of different studies, including many of those used here. Figure 3 reproduces their main result, which is that ability has become much more important in determining who attends college. For cohorts born around 1900, college-bound seniors scored roughly ten percentage points higher on standardized tests than non-college-bound seniors; by the 1980 birth cohort, that gap had grown to roughly thirty percentage points.

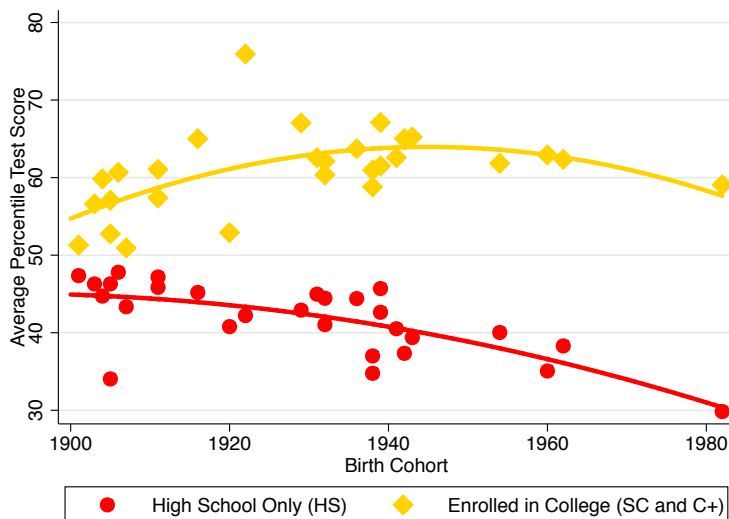


Figure 3: Rising Importance of Ability for College Attendance

2.3 College Attendance as a Function of Family Background

A second set of historical studies documented college-going behavior as a function of family background unconditional on students' academic ability. As above, we replicate their methodologies using NLSY79 and NLSY97 data to compare how family background has changed over time as a determinant of college attendance. For each study that reports college-going as a function of family background ($C(F)$), we compute the same function with NLSY data ($\hat{C}(F)$). Regressing C and $\hat{C}$ on F yields coefficients β_F (from the original study) and $\hat{\beta}$ (from the NLSY replication). Figure 4 plots the coefficient ratios $\frac{\hat{\beta}}{\beta_F}$ for the original studies relative to their modern counterparts in the NLSY79 and NLSY97. The evidence again supports the claim that family background has been steadily declining in importance for college attendance decisions. It is worth noting that slopes depicted in Figure 4 are not as severe as those shown in Figure 1, due in part to the omission of controls for student ability, which was increasing in importance over time.

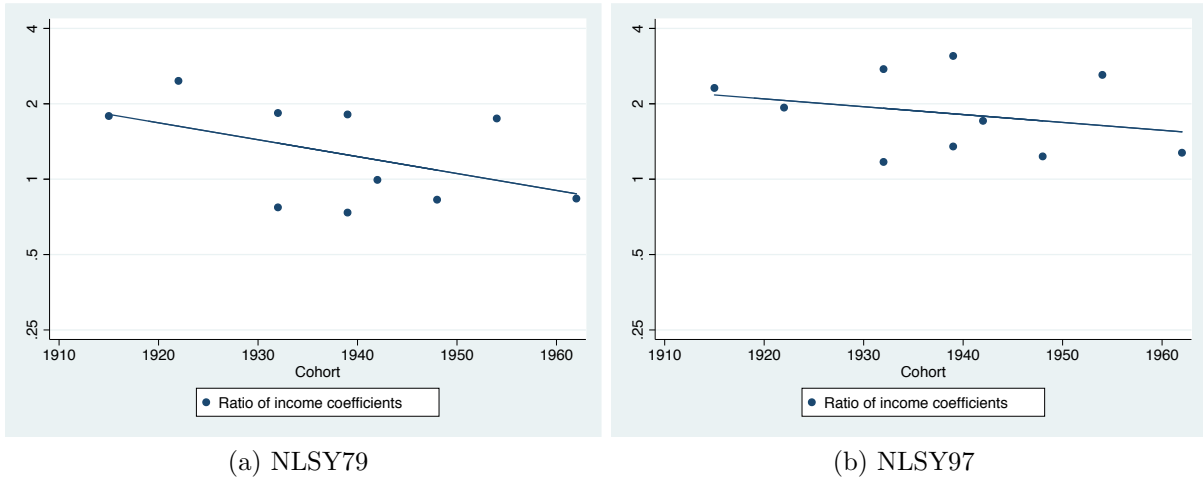


Figure 4: Declining Importance of Income for College Attendance

3 Model

To be written.

4 Calibration

To be written.

5 Results

To be written.

6 Conclusion

To be written.

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A Details on Original Studies

Table 1: Details on the Family Background-Academic Ability Studies

Source	Location	Breadth	Cohort	Type	Academic Ability	Family Background.
Updegraff (1936)	Pennsylvania	Large Sample	1915	Follow-Up (1 year)	Test Score (not specified)	Socioeconomic Status
Goetsch (1940)	Milwaukee	Entire City	1919	Follow-Up (1 year)	Test Score (Henmon-Nelson)	Family Income, State Tax Records
Sibley (1948)	New York	State	1922	Follow-Up (1 year)	Class Rank	Family Income, State Tax Records
White (1952)	Northeast Ohio	Sample	1932	Follow-Up (1 year)	Test Score (not specified)	Social Class
State University of New York (1955)	New York	Sample	1935	Prospective	Test Score (not specified)	Family Income, State Tax Records
Sewell and Shah (1967)	Wisconsin	Sample	1939	Follow-Up (several years)	Test Score (Henmon-Nelson)	Socioeconomic Status
Stroup and Andrew (1959)	Arkansas	Large Sample	1939	Follow-Up (1 year)	Test Score (ACE)	Family Income, Survey
Flanagan et al. (1964)	National	Sample	1942	Follow-Up (1 year)	Test Score (Composite)	Family Income, Survey
Eckland and Henderson (1981)	National	Sample	1954	Follow-Up (4 years)	Test Score (Composite)	Socioeconomic Status
Gardner (1987)	National	Sample	1962	Follow-Up (2 year)	Test Score (Composite)	Family Income, Survey

Table 2: Details on the Underlying Family Background Studies

Source	Location	Breadth	Cohort	Type
Updegraff (1936)	Pennsylvania	Large Sample	1915	Follow-Up (1 year)
Sibley (1948)	New York	Sample	1922	Follow-Up (1 year)
White (1952)	Northeast Ohio	Sample	1932	Follow-Up (1 year)
Berdie (1954)	Minnesota	Statewide	1932	Follow-Up (1 year)
Stroup and Andrew (1959)	Arkansas	Large Sample	1939	Follow-Up (1 Year)
Lansing et al. (1960)	National	Sample	1935	Follow-Up (multiple years)
Nam and Cowhig (1962)	National	Sample	1941	Follow-Up (1 Year)
Flanagan et al. (1964)	National	Sample	1942	Follow-Up (1 Year)
Sewell and Shah (1967)	Wisconsin	Statewide	1939	Follow-Up (multiple years)
Tillery (1973)	Four States	Large Sample	1948	Follow-Up (1 year)
Eckland and Henderson (1981)	National	Sample	1954	Follow-Up (4 years)
Gardner (1987)	National	Sample	1962	Follow-Up (2 year)