The Changing Roles of Family Income and Academic Ability for US College Attendance

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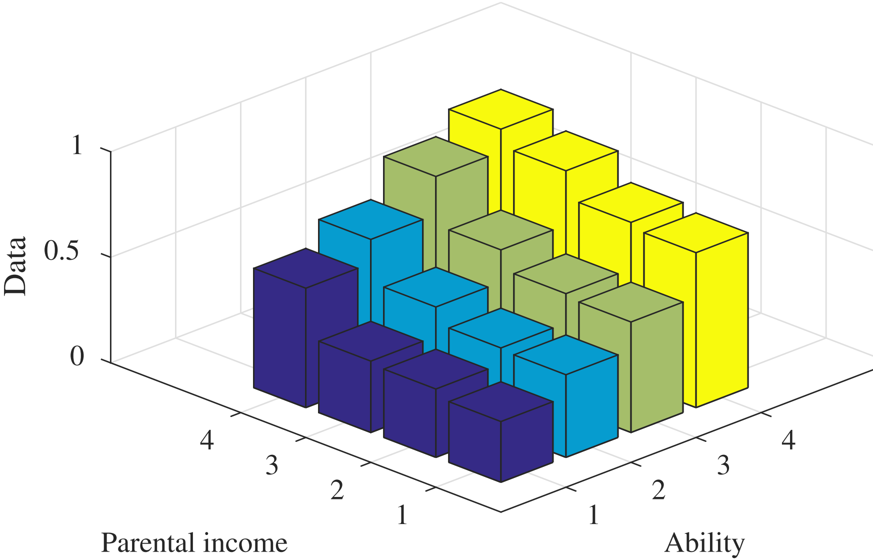
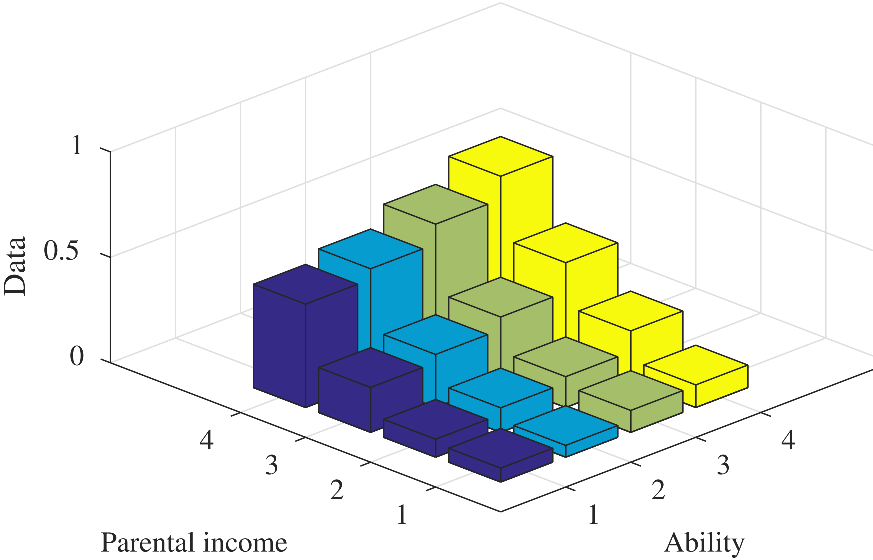
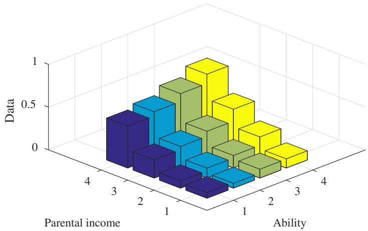
College Entry Rates: NLSY79



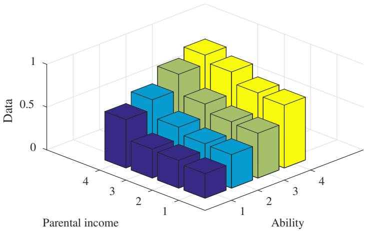
College Entry Rates: 1933



Reversal in College Entry Rates



Updegraff (1933)



NLSY79

Before about 1950: **family background** was the main determinant of college entry.

After about 1960: **student ability** was the main determinant.

Contributions

Empirical:

- Document the reversal
- Compile roughly 40 historical data sources on college-going behavior
- 1919--1979

Model:

- "national integration" of the market for colleges (Hoxby)
- decline in search costs generates the reversal

Data

Data Sources

Collect studies and datasets that cover **college attendance** by **student ability** and/or **family background**

Sources span 1919 to 1979 HS graduating cohorts.

Modern era (1960--date)

- Access to original microdata
- Project Talent, NLSY79, NLSY97

Pre-modern era (1919--1960)

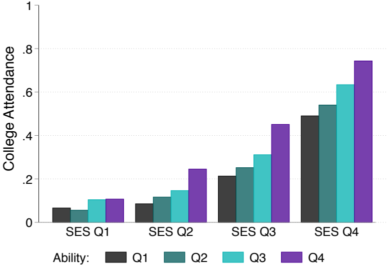
- No original microdata, rely on published summaries
- More than two dozen such studies by researchers in many fields.

Documenting the Reversal

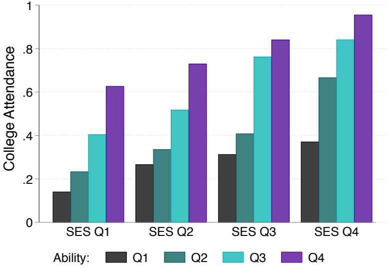
Our strategy:

- focus on 3 main studies:
  - Updegraff (1933)
  - Project Talent (1960)
  - NLSY79 (1979)
- show that the reversal is essentially complete by 1960
- show that the 3 studies represent a broader trend
- address comparability concerns

The Reversal: 1933 vs 1960

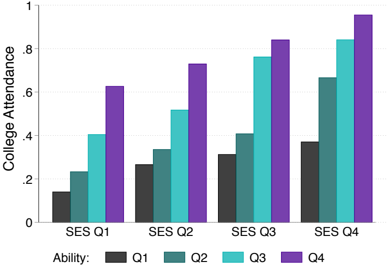


Updegraff (1933)

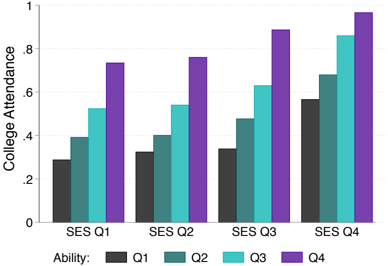


Project Talent (1960)

1960 vs 1979



Project Talent (1960)



NLSY79 (1979)

Historical studies

Argue that the 3 main studies represent a broader trend.

Collect college enrollment by ability and/or income from 30 historical studies.

Document increasing role of ability and declining role of income over time (until about 1960)

Details

Model

Model

National integration of college market (Hoxby, 2009)

1930s: market was **local**

- Idiosyncratic admissions based on local networks.
- Little differentiation in colleges. Single applications is the norm.

1960s: market was **national**

- Standardized admissions with information dissemination.
- Growing differentiation among colleges. Multiple applications is the norm.

Our approach: model with college **search costs**.

- abstract from changes in college financing (took place after 1960)

Model Overview

Framework: islands model of college choice

Each island is inhabited by

- 1 college
- measure 1 of HS grads

Colleges choose admissions criteria to maximize objective

Students choose whether to work, attend local college, or search

Colleges

College i is endowed with

- endowment $\bar{q}_i$,
- capacity E

College **quality** depends on average student ability: $q_{it} = \bar{q}_i + \bar{a}_{it}$

- quality determines how much students learn

Colleges

College i chooses an **admission cutoff** $\underline{a}_{it}$ to solve

$$\max P(q_{it}, e_{it}) = q_{it} e_{it} \quad \text{s.t.} \quad e_{it} \leq E \tag{1}$$

Higher cutoff:

- Weakly lowers enrollment e_{it}
- Weakly increases quality

No pricing decisions (for now).

Students

New high school graduates endowed with

- location i
- $(a,p) \sim F$

Choose among three options

- Work as **HSG**, value $V_{HS} = 0$
- Attend **local** college: $V(a,p,i,t)$
- **Search** nationally for college: $W(a,p,i,t)$

$$\max\{V_{HS}(t) + \bar{\eta}\eta_{HS}, V(a,p,i,t) + \bar{\eta}\eta_V, W(a,p,i,t) + \bar{\eta}\eta_W\}$$

Attending Local College

Students can attend local college if $a \geq \underline{a}_{it}$

If so:

- Live off family resources p for four years
- Generate human capital $h(a, q_{it}) = a^{q_{it}}$.
- Work and earn h after graduation
- Enjoy flow value $V_c(t)$.

Implies the value function:

$$V(a,p,i,t) = \log(p) + \alpha \log\left[h(a,q_{it})\right] + V_c(t) \tag{2}$$

Searching Nationally

Students can pay cost $\xi(t)$ to search among all colleges

- $\xi(t)$ lowers consumption in college
- Allows students to attend best college they can be admitted to.

Implies the value function:

$$W(a,p,i,t) = \mathbb{E}\left\{\max_{j:\underline{a}_{jt}\leq a} V(a,p-\xi(t),j,t) + \bar{\zeta}\zeta_j\right\}$$

Equilibrium

Equilibrium: $\underline{a}_{it}$ **and decision rule** $d(a,p,i,t)$ **such that:**

1. Colleges maximize prestige, subject to capacity constraint.
2. Students maximize utility, subject to admissions criteria.
3. Enrollment is consistent with student attendance decisions.

Generally, equilibrium is not unique.

- Strategic complementarities induced by peer effects.

Algorithm

We focus on the equilibrium produced by the following algorithm:

1. Guess college qualities q_{it}
2. Calculate student values (local and search).
3. Assign students to colleges. Working from the highest ability down:
   3.1 Assign student to most preferred remaining college or work.
   3.2 Reduce college capacity as needed.
4. Compare implied q_{it} to guess. Iterate if necessary.

Calibration

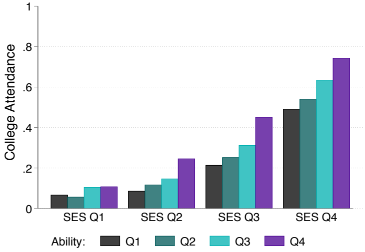
Choose 11 parameters

- $F(a,p)$ is Gaussian copula on $[a_0, a_0+1] \times [p_0, p_0+1]$, correlation ρ.
- College capacity E
- Weight on post-college consumption α.
- Preference shocks: scale $\bar{\zeta}, \bar{\eta}$.
- **Time-varying**: college value $V_c(t)$ and search cost $\xi(t)$.

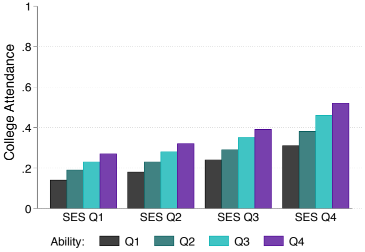
Data moments: for 1933, 1979

- College entry rates: $C(a,p)$
- Search: fraction with multiple applications
- 34 moments ▸ Details

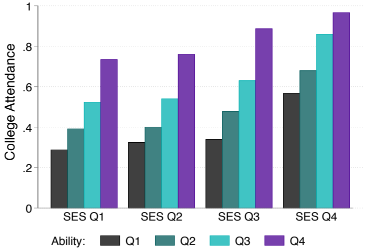
Model Fit



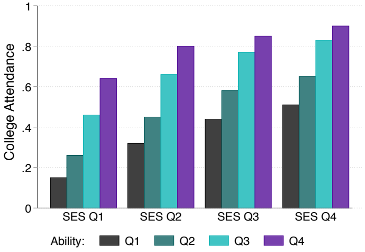
1933 Data



1933 Model

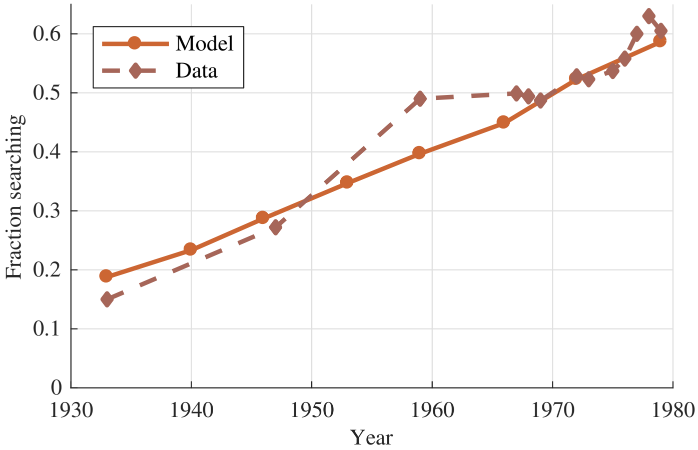


1979 Data



1979 Model

Fraction of Students Searching



Searching means: applying to multiple colleges

Model Mechanics

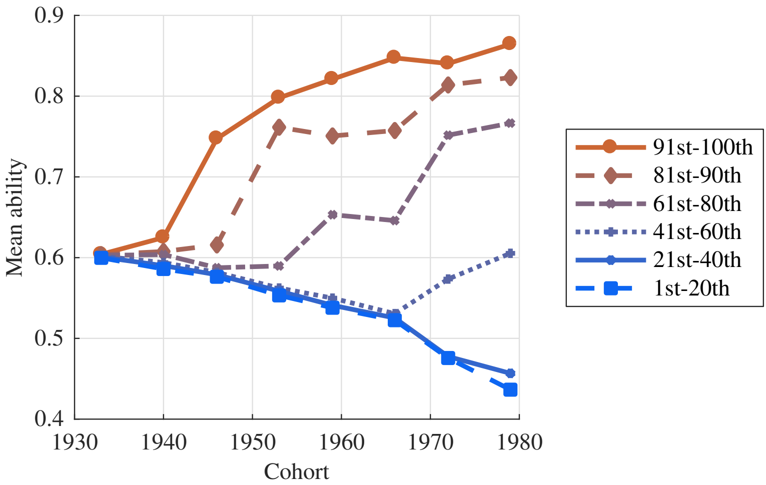
1933:

- high search cost $\Longrightarrow$ most students stay local
- very little quality variation across colleges
- little incentive to search

1979:

- more students search
- college quality matters most for high ability students
- high ability most likely to search and attend high quality colleges

College Selectivity



Consistent with Hoxby (2009)

Results Summary

Model generates change in sorting patterns with two driving forces

- Quantitatively significant reversal

Key mechanism: search $\rightarrow$ sorting $\rightarrow$ available college options

- Increase in search consistent with the data
- “Fanning out" of colleges by student ability from Hoxby (2009)
    - Hoxby: Spread increases from 40 to 70pp, 1962–today
    - Our model: spread increases from 0 to 40pp, 1933–1979

Conclusion

Empirical: **Reversal** in college attendance patterns around 1950s

Model: decline in **search costs** can account for

- "national integration" of the market for colleges (more search)
- increasing stratification of college qualities
- the reversal

Supplementary Evidence: Historical Studies

Argue that the 3 main studies are not outliers

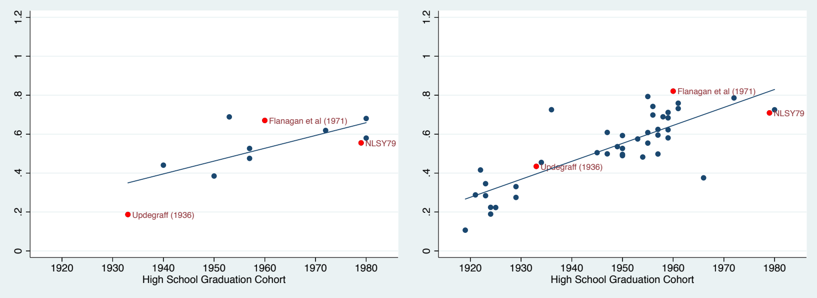
Obtain college entry rates from about 30 historical studies

- $C(a)$; $C(p)$; or $C(a,p)$
- a and p are midpoints of percentile ranges

Regress C on a, p, or both

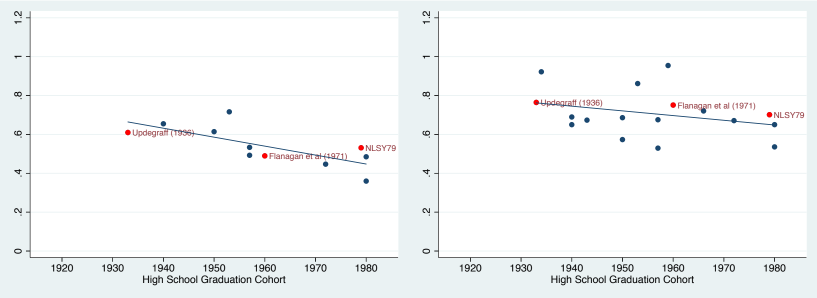
- Report β_a, β_p
- Study time series

Academic Ability: β_a



Bivariates studies $C(a,p)$ Univariate studies $C(a)$

Family Background: β_p



Bivariates studies $C(a,p)$ Univariate studies $C(p)$

NLSY79 Replication of Univariate Studies

Academic ability (β_a) Family income (β_p)

Calibrated Parameters

	Description	Value
Endowments		
a_0	Ability scale factor	1.6
p_0	Transfer scale factor	1.43
ρ	Endowment correlation	0.464
δ	Dispersion of college endowments	0.0211
Colleges		
α	Weight on post college payoffs	2.42
E	College capacity	1.18
Preferences		
$V_c(t)$	Relative value of college	(-2.46, -1.61)
$\underline{\xi}(t)$	Search cost	(1.91, 1.45)
$\bar{\zeta}$	Scale of taste shocks at college entry	0.673
$\bar{\eta}$	Scale of taste shocks when searching	0.37