

Majoring in STEM?

An Inquiry into the Major Choice of Native and Immigrant Students

Ning Jia

University of Notre Dame

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Motivation

- STEM education as a top national priority
 - One million more college graduates with STEM degrees than what are expected at the current rate over the next decade
 - Supply shortage of skilled STEM workers
 - Long-term prosperity
- “Reaffirming and strengthening America’s role as the world’s engine of scientific discovery and technological innovation is essential to meeting the challenges of this century.”

President Obama, Educate to Innovate, 2009

Motivation

- Immigrants in the STEM workforce
 - NSF: 24 percent of college educated STEM workers were foreign born, twice their share in the working population
 - Innovation and invention
Hunt and Loisel (2010), Kerr and Lincoln (2010)
 - Labor market outcomes
Bojas(2009), Peri (2009)
- Immigrants in the STEM pipeline in college?

Research Question

- Immigrants in the STEM pipeline in college
 - Are immigrant students more likely to enter and persist in STEM majors than native students?
 - What are the factors contributing to their higher college STEM attainment?
- Ultimate goal
 - Inform policy-making

Literature on College Major Choice

- Academic ability
 - Turner and Bowen (1999), Smyth and McArdle (2004), Crisp et al. (2009)
- Preferences
 - Smart et al. (2000), Porter and Umbach (2006), Hilmer and Hilmer (2012)
- Expected earnings
 - Cannings et al. (2002), Beffy et al. (2012)

Data and Sample

- **Beginning Postsecondary Students Longitudinal Study 2004/09**
 - NCES, educational experiences of a nationally representative sample of students who first started college during the 2003-04 academic year, follow-up surveys at the end of the third and sixth year after entering college
 - Large sample size
 - Diversity: 11.8% foreign born, 12.4% foreign-born parents
 - Detailed student information: demographic characteristics, family backgrounds, academic achievement etc.

Data and Sample

- Define Immigrant Status
 - Native students
 - Second generation students: foreign-born parent(s)
 - First generation students: foreign-born
 - Non-recent / 1.5 generation:
Came before kindergarten, attended US K-12 school
 - Recent / 1st generation:
Came after kindergarten, attended foreign K-12 school
 - International / 0.5 generation:
Came after high school

Data and Sample

- Define STEM Majors (NCES)

STEM	Non-STEM
Biological and biomedical sciences	Social sciences
Computer/Information science/support	History; Psychology; Public administration/ social service etc.
Engineering	Humanities
Mathematics and statistics	Architecture; Visual and performing arts; Communication/ journalism; English; Foreign language etc.
Physical sciences	Education
Engineering technologies/related fields	Business
	Health professions
	Legal professions

Data and Sample

- STEM Entry

- Ever majored in STEM fields

- Based on major in 2003-04, 2006, 2009

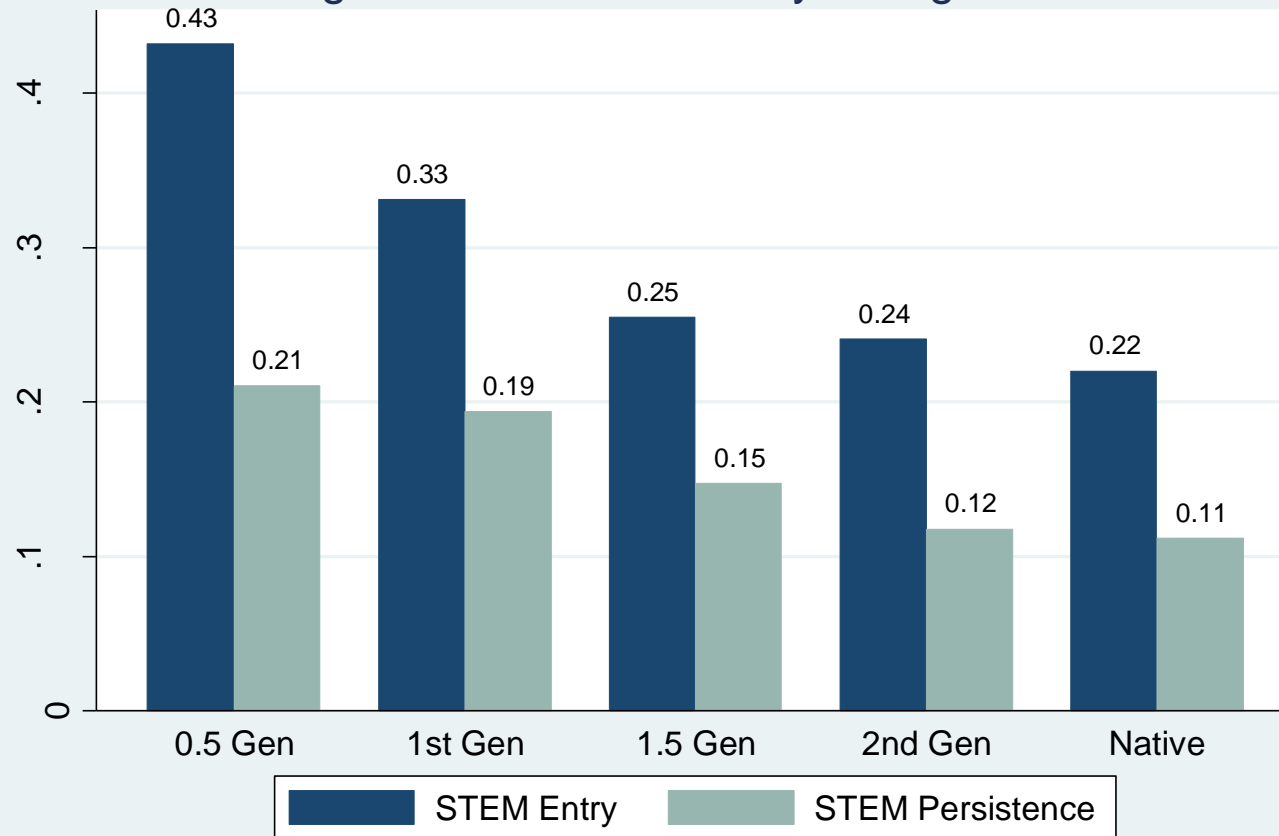
- STEM Persistence

- Remained in STEM fields

- Still Enrolled as STEM major in 2009

- Not enrolled but attained a STEM degree

College STEM Attainment by Immigrant Status



Estimation

$$\text{STEM}_i = \beta_0 + \beta_1 \text{IM}_i + \epsilon_i$$

i: individual student i

– STEM

- STEM entry
- STEM persistence

– IM

- Immigrant status dummies
- Native students as the comparison group

– β_1

- Raw immigrant/native college STEM gap

Results

Table1 Immigrant/ Native College STEM Attainment Gap

	STEM Entry	STEM Persistence
<i>0.5 Gen</i>	.2121*** (.0699)	.0991*** (.0399)
<i>1st Gen</i>	.1109*** (.0266)	.0822*** (.0212)
<i>1.5 Gen</i>	.0348 (.0283)	.0358* (.0215)
<i>2nd Gen</i>	.0206 (.0157)	.0062 (.0109)
N	11720	11720

Notes: Regressions are weighted. Standard errors are in parentheses. Number of observations is rounded to the nearest 10 to comply with the NCES restricted use data license.

Estimation

$$\text{STEM}_i = \beta_0 + \beta_1 \text{IM}_i + \beta_2 X_i + \epsilon_i$$

- Socioeconomic status (SES)
 - Age, race, gender, family income, parents' education
- Preferences
 - Claimed important goals
- Academic preparation
 - Years of math in high school, years of science in high school, highest level of math, SAT math test scores

Results - SES

	Age	Male	Black	Asian	Income percentile	College educated
<i>0.5 Gen</i>	19.35	0.66	0.27	0.33	44.17	0.62
<i>1st Gen</i>	18.61	0.48	0.11	0.27	35.19	0.61
<i>1.5 Gen</i>	18.63	0.46	0.08	0.23	44.80	0.65
<i>2nd Gen</i>	18.44	0.42	0.10	0.18	45.30	0.60
<i>Natives</i>	18.62	0.44	0.12	0.00	53.20	0.72

Notes: Means are weighted.

Results - SES

Table 2 Immigrant/ Native College STEM Attainment Gap

	STEM Entry		STEM Persistence	
<i>0.5 Gen</i>	.2121*** (.0699)	.1791*** (.0680)	.0991*** (.0399)	.0872*** (.0383)
<i>1st Gen</i>	.1109*** (.0266)	.1102*** (.0267)	.0822*** (.0212)	.0864*** (.0214)
<i>1.5 Gen</i>	.0348 (.0283)	.0335 (.0289)	.0358* (.0215)	.0365 (.0223)
<i>2nd Gen</i>	.0206 (.0157)	.0292* (.0161)	.0062 (.0109)	.0141 (.0111)
SES		Y		Y
N	11720	11720	11720	11720

Notes: Regressions are weighted. Standard errors are in parentheses. Number of observations is rounded to the nearest 10 to comply with the NCES restricted use data license.

Results - Preferences

Is the following aspect important?

- Being financially well-off; Having steady work; Being recognized as an expert in the field; Being a community leader; Influencing the political structure; Having leisure time; Having children; Living close to parents and relatives etc.
- Preference dummy variables

Results - Preferences

Table 3 Immigrant/ Native College STEM Attainment Gap

	STEM Entry		STEM Persistence	
<i>0.5 Gen</i>	.1791*** (.0680)	.1739*** (.0659)	.0872*** (.0383)	.0842** (.0390)
<i>1st Gen</i>	.1102*** (.0267)	.1085*** (.0264)	.0864*** (.0214)	.0846* (.0213)
<i>1.5 Gen</i>	.0335 (.0289)	.0334 (.0289)	.0365 (.0223)	.0363 (.0222)
<i>2nd Gen</i>	.0292* (.0161)	.0297* (.0162)	.0141 (.0111)	.0146 (.0111)
SES	Y	Y	Y	Y
Preferences		Y		Y
N	11720	11720	11720	11720

Notes: Regressions are weighted. Standard errors are in parentheses. Number of observations is rounded to the nearest 10 to comply with the NCES restricted use data license.

Results - Academic Preparation

	Years of Math	Years of Science	Advanced Math	SAT Math
<i>0.5 Gen</i>	3.52	3.48	0.65	516.15
<i>1st Gen</i>	3.48	3.17	0.49	494.89
<i>1.5 Gen</i>	3.57	3.25	0.47	491.49
<i>2nd Gen</i>	3.44	3.15	0.44	494.45
<i>Natives</i>	3.44	3.26	0.44	495.07

Notes: Means are weighted. Advanced math courses include pre-calculus and above.

Results - Academic Preparation

Table 4 Immigrant/ Native College STEM Attainment Gap

	STEM Entry		STEM Persistence	
<i>0.5 Gen</i>	.1739*** (.0659)	.1158* (.0651)	.0842** (.0390)	.0369 (.0370)
<i>1st Gen</i>	.1085*** (.0264)	.0834*** (.0256)	.0846* (.0213)	.0629*** (.0207)
<i>1.5 Gen</i>	.0334 (.0289)	.0217 (.0276)	.0363 (.0222)	.0266 (.0208)
<i>2nd Gen</i>	.0297* (.0162)	.0196 (.0158)	.0146 (.0111)	.0050 (.0107)
SES	Y	Y	Y	Y
Preferences	Y	Y	Y	Y
Academics		Y		Y
N	11720	11720	11720	11720

Notes: Regressions are weighted. Standard errors are in parentheses.

Number of observations is rounded to the nearest 10 to comply with the

NCES restricted use data license.

Conclusion and Future Work

- Compared to native students, recent immigrant students are more likely to enter and persist in STEM fields
- Better math academic preparation is the most important factor driving their higher college STEM attainment
- High school math reform
 - A Nation at Risk 1983
 - No Child Left Behind 2001

Conclusion and Future Work

Unexplained gap

- Labor market
 - Construct immigrant/native wage gap using ACS data
- Culture
 - A high amount of prestige on STEM education and STEM occupations

Thank you!