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# Do Double Majors Face Less Risk? An Analysis of Human Capital Diversification

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## Introduction

### Motivation

- Literature shows mixed results for mean returns to double majors (see Del Rossi & Hersch, 2008, 2016)
- Minimal attention paid to diversification of human capital (see Light & Schreiner, 2019)
- Research question:** does the undergraduate double major provide an option value, or protection against earnings shocks

### Objectives

- Estimate degree to which double major reduces earnings shock
- Show that academic distance between degrees increases protection of double majors
- Measure skills and occupational differences between single and double majors

### Endogeneity Concerns

- Individuals choose major – our selection criteria reduces the chance our results are affected by labor market conditions at time of choice
- Individuals choose double major – we leverage exogenous variation in income across states, majors, and time
- Innate ability – we control for parental education and university quality (Carnegie classification)

Figure 1: Plausibly exogenous residual variation across states, years and time

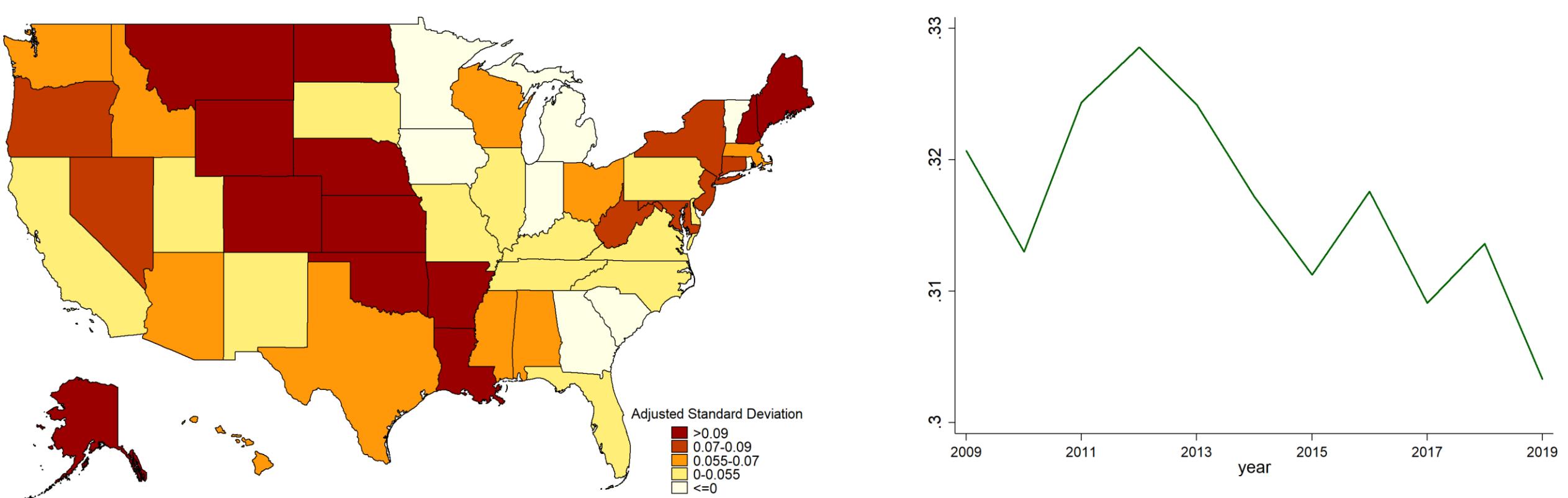


Table 1: Estimated protection of double majors against year-state-major shocks

	(1)	(2)	(3)	(4)
Year-state-major shock: first major	0.522*** (0.014)	1.000*** (0.004)	1.017*** (0.014)	0.059*** (0.013)
Year-state-major shock: second major	0.390*** (0.014)		0.012 (0.013)	0.969*** (0.014)
Year-state-major shock: higher major	0.019 (0.023)		-0.028 (0.018)	-0.028 (0.018)
Year-state-major shock: first major*double major		-0.941*** (0.014)	-0.958*** (0.014)	
Year-state-major shock: second major* double major		0.012 (0.013)		-0.958*** (0.014)
Year-state-major shock: higher major* double major		-0.028 (0.018)		
First major earning	0.523*** (0.029)	0.523*** (0.029)	0.523*** (0.029)	0.523*** (0.029)
Second major earning	0.294*** (0.030)	0.302*** (0.029)	0.302*** (0.029)	0.302*** (0.029)
Higher paying major earning	0.212*** (0.050)	0.202*** (0.049)	0.202*** (0.049)	0.202*** (0.049)
Double major	0.006** (0.003)	0.010*** (0.003)	0.010*** (0.003)	0.010*** (0.003)
Occupation F.E.	yes	yes	yes	yes
Observations	1,423,860	1,423,860	1,423,860	1,423,860
R-squared	0.347	0.350	0.350	0.350

## Data: ACS

- 2009-2019, 1% sample of US population
- Sample selection: keep respondents who...
  - Earned a bachelor's degree
  - Are employed
  - Are between 30 and 65 years or old
  - Work at least 40 weeks and 35 hours a week.
  - Earn >\$2,000 a year
  - Were born in a US State
- Total sample: = 1,423,860
- Respondents list first and second majors, and corresponding field

## Data: NSCG

- 2003, 2010, 2013, 2015, 2017 waves
- Sample Selection: Same as ACS and...
- Parental education
- University Carnegie classification

## Data: O\*NET

- Skills (developed capacities that facilitate learning or the more rapid acquisition of knowledge)
- Knowledge - organized sets of principles and facts applied in general domains

## Empirical Approach

Two-stage regression method

- estimate field-specific log-earnings from single majors, use residuals as earnings shocks
- estimate effect of double majors and wage shocks on log-earnings

Stage 2:

$$y_{it} = \beta_0 + \beta_1 s_{1st,it} + \beta_2 s_{2nd,it} + \beta_3 s_{max,it} + \beta_4 DM_i + \beta_5 DM_i s_{1st,it} + \beta_6 DM_i s_{2nd,it} + \beta_7 DM_i s_{max,it} + W_i \Gamma + X_{it} \Upsilon + \lambda_o + \varphi_s + \theta_i + \omega_{it}$$

$y_{it}$  - log earnings

$s_{1st}, s_{2nd}, s_{max}$  - shocks from first major, second major, and max of the three

$DM$  - double major indicator

$W_i$  - is set of variables that includes estimated log earnings for first, second, and max of both majors – coefficients for variables sum to 1

$X_i$  - set of controls: race, gender, ethnicity, marital status, potential experience and its square, hours worked per week

$\lambda_o, \varphi_s, \theta_i$  - fixed effects for occupation, birth state fixed effect, and year fixed effect

**Coefficients of interest:**  $\beta_5, \beta_6, \beta_7$  - degree to which double major offsets or magnifies shock

Table 2: Double majors tend rank high in skills and knowledge relative to single-majors

	Panel A: Number of high skills/35 O*NET skills					
	Above median		Above top 75%		Above top 90%	
	Double major	0.015*** (0.004)	0.010*** (0.003)	0.002*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
Global double major	0.019*** (0.005)		0.013*** (0.004)		0.003*** (0.001)	
Local double major	0.007* (0.004)		0.003 (0.002)		-0.000 (0.001)	
First major F.E.	yes	yes	yes	yes	yes	yes
Second major F.E.	yes	yes	yes	yes	yes	yes
Observations	1,429,573	1,429,573	1,429,573	1,429,573	1,429,573	1,429,573
R-squared	0.134	0.134	0.149	0.149	0.102	0.102
Panel B: Number of high knowledge categories/32 O*NET knowledge categories						
	Above median		Above top 75%		Above top 90%	
	Double major	0.006** (0.003)	0.006*** (0.002)	0.002 (0.001)	0.003* (0.002)	0.003* (0.002)
	Global double major	0.009*** (0.002)	0.008*** (0.002)	0.003* (0.002)	0.003* (0.002)	0.003* (0.002)
Local double major	0.002 (0.005)		0.001 (0.002)		-0.000 (0.001)	
First major F.E.	yes	yes	yes	yes	yes	yes
Second major F.E.	yes	yes	yes	yes	yes	yes
Observations	1,429,573	1,429,573	1,429,573	1,429,573	1,429,573	1,429,573
R-squared	0.075	0.075	0.110	0.110	0.096	0.096

Table 3: Double majors tend to hold a broader variety of jobs relative to single majors

	(1)	(2)	(3)	(4)	(5)	(6)
1st major-job correlation	-0.007*** (0.001)		-0.006*** (0.001)		-0.006*** (0.001)	
2nd major-job correlation		-0.011*** (0.002)		-0.008*** (0.001)		-0.009*** (0.002)
Average major-job correlation						
Double major	-0.007*** (0.001)		-0.006*** (0.001)		-0.006*** (0.001)	
Global double major		-0.011*** (0.002)		-0.008*** (0.001)		-0.009*** (0.002)
Local double major		0.003 (0.002)		-0.000 (0.002)		0.001 (0.004)
First major F.E.	yes	yes	yes	yes	yes	yes
Second major F.E.	yes	yes	yes	yes	yes	yes
Observations	1,429,573	1,429,573	1,429,573	1,429,573	1,429,573	1,429,573
R-squared	0.500	0.500	0.504	0.504	0.501	0.501

## Conclusions

- Results tend to support protection, not option, effect – reduce effects of shocks, both positive and negative
- Regressions with proxies for ability – parental education and university quality – show no effect on results
- Evidence that double majors rank high in skills and knowledge
- Evidence that double majors tend to hold a wider variety of jobs

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