Effects of Entry Economic Conditions on the Career of Economics Ph.D.

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Introduction

There is no unemployment among Ph.D.s in economics – John Siegfried

- Strong demand for economics Ph.D. over the decade (BLS 2021)
- Pandemic left scars on the current economics profession worldwide (INOMICS)
- A depressed labor market may bear lasting scars: *lost generation*
- Less work has been done on whether the careers of economists is affected by the business cycles
- I build a theoretical model to examine the potential mechanisms and test the predictions empirically

Features of the Market for Ph.D.s in Economics

- Economist market is an ideal setting to study the impacts of entry conditions
  1. well-defined job market
     - most jobs are posted on JOE Listings (Job Openings for Economists)
     - recruiting process mostly occurs around ASSA conference every year
  2. entry-year unemployment rate is comparatively very low
  3. different workplace environment
     - academics
     - private sectors
     - research institute / government
  4. productivity is measurable through publishing research activity

- Detailed employment histories and a range of ranking measures are available

Motivation and Research Question

- Workers graduating into a recession would likely match to lower-level starting jobs than their luckier counterparts (Devereux 2002)
  - first job placement is important in explaining the long-term losses (Kwon et al 2010, Oreopoulos et al. 2012)
  - how long the effects remain depends on the ease of switching jobs (Van den Berge 2018, Cockx and Ghirelli 2016)

- Develop the theoretical model to explain what drives the persistent outcomes for economics PhD
  - academic publications are valued both in academia and practice (Swanson 2004, Mittal et al 2008)

- Test the model's predictions using detailed information on career paths and productivity measures scraped from the web

Preview on Research Findings

1. Demand for economists is pro-cyclical
2. Entering a recession is bad for the placements
   - indicate an initial mismatch
3. It is bad for research productivity
4. These effects would have been mediated through mobility
   - economists rarely switch occupations in response to economic conditions
   - determinant of these switching costs is development of task-specific human capital

Road Map

1. Literature Review
2. Data
3. Conceptual Framework
4. Empirical Results
5. Conclusion

Contribution I : Persistent Effects of Entry Condition

- Many papers analyze the effect of entry conditions on the labor market outcomes over time (Kahn 2010, Oreopoulos et al. 2012, Schwandt and von Wachter 2019, Yu et al. 2014, Maclean, 2015, Ball 2021)
  - expand into health, marriage, divorce, fertility, crimes
  - effects vary by education, major, race, institutional settings (Altonji et al. 2014, Beiler 2017, Choi et al. 2020, Liu et al.)
- Oyer (2006) examined economists' academic placements and publications for 7 elite schools, but my research is different from:
  1. 32 Ph.D. granting programs in U.S. having more general cohort characteristics
  2. nearly complete employment histories: possible to trace non-academic careers
  3. the private and international demand for economists grew exponentially
  4. examine the potential mechanisms underlying persistent career effects

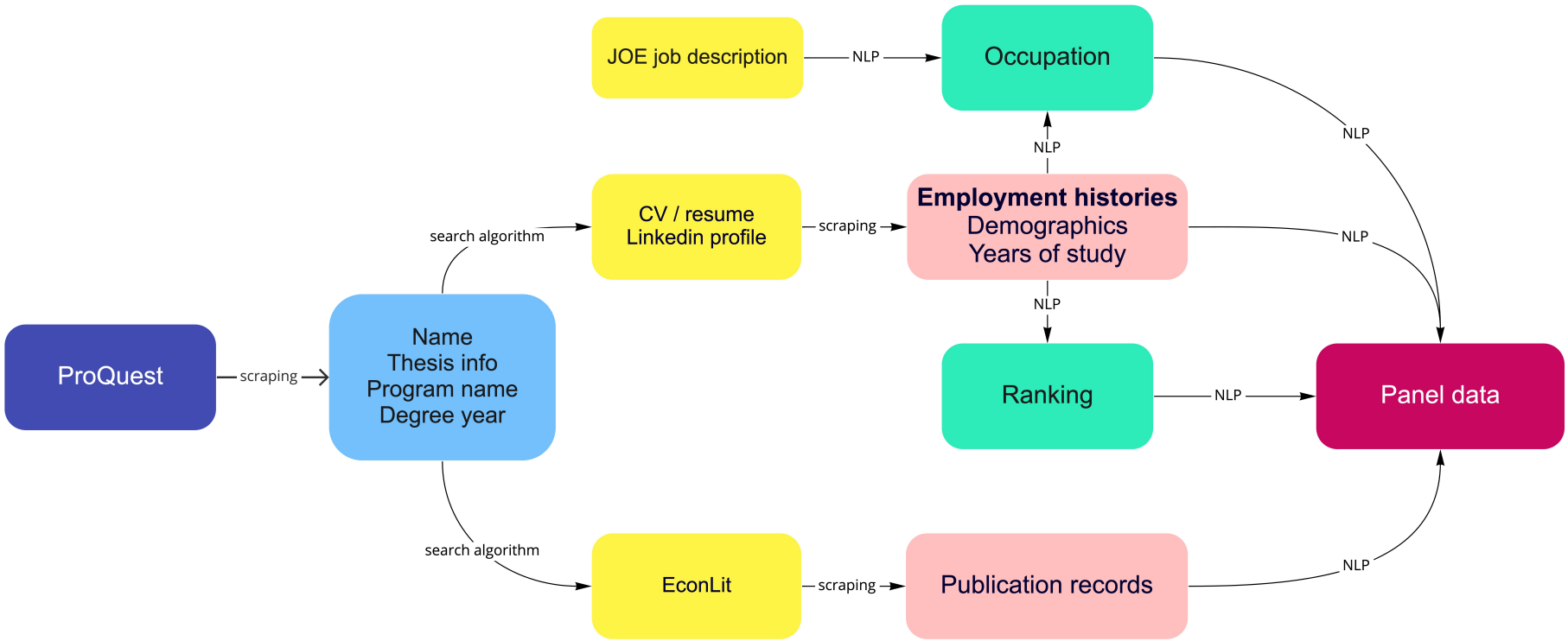
Contribution II : Occupation Choice and Human capital development

- The study of exogenous shocks can help shed additional light on the determinants of career developments
- Job mobility plays a crucial role in recovering from the early damages (Van den Berge 2018, Cockx and Ghirelli 2016)
- Initial investment in skills specific to occupation keeps a person on a certain career trajectory (Gibbons and Waldman 2004, 2006)
- This paper provides more supporting evidence for the model of task-specific human capital
  - persistent effects are driven by the very first exposure to unemployment rates

Data Description

- ProQuest Dissertations & Theses Global
  - collect the doctoral dissertations by institutions, year of publications, economics (related) classification, subject codes
  - $\sim$ 4,600 graduates from top 32 programs in U.S. between 2004–2012
- Scrape CVs on the web or Linkedin experience profile
  - collect employment history until 2020
  - demographic information
  - could not find about 600 individual careers
- Publication information from EconLit
- List of job postings from JOE
  - hiring institution, position, JEL classifications, job descriptions
- Construct the matching algorithm to compile all data

Data Preparation Workflow



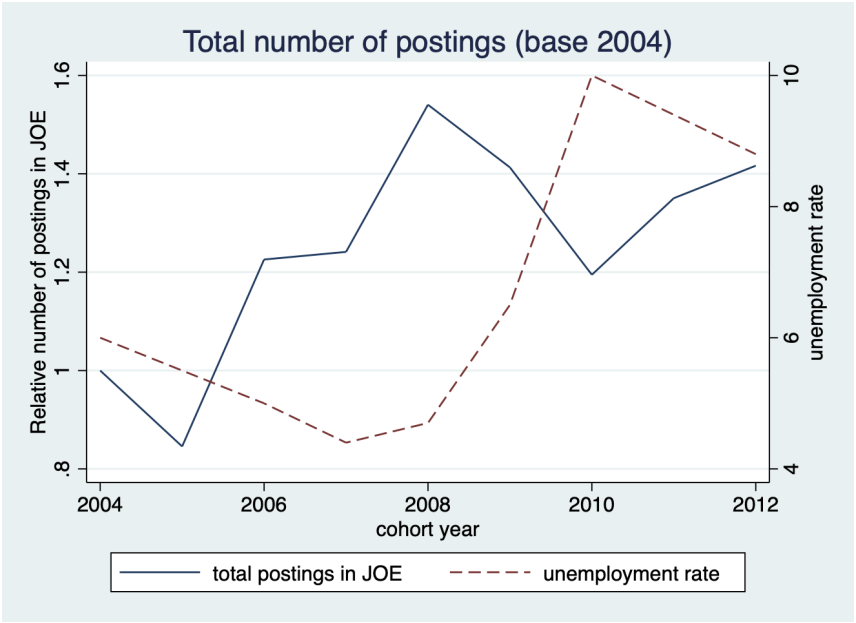
Fetching and Parsing problems

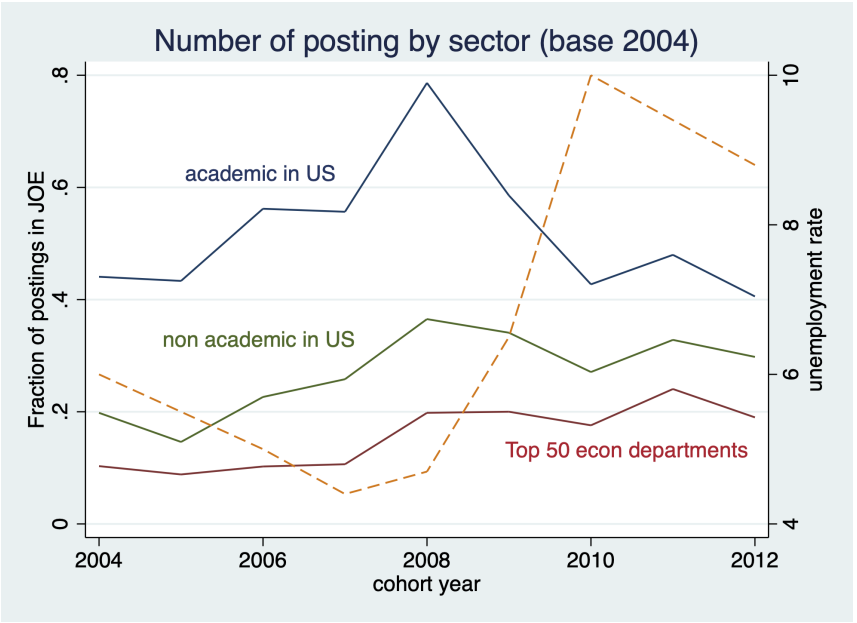
- ProQuest does not have *major* classification
  - parse the cover letter and search *economics*
  - use advisor information
  - compare the list with the placement outcomes
- CV / resume: using the google search API
  - identify html markup tags: individual websites are usually based on markup language
  - identify university domains
  - Linkedin profile search
- Naming match
  - lemmatize first and middle names using Oxford Dictionary of First Names
  - use work histories, graduation date, institution
- JOE job description: topic modeling (Wordnet Lemmatizer)

Descriptive Statistics

	Overall (1)	tier 1 (2)	tier 2 (3)	tier 3 (4)
Demographics				
female	0.287	0.251	0.324	0.309
	(0.452)	(0.433)	(0.468)	(0.462)
US bachelor	0.426	0.471	0.398	0.376
	(0.494)	(0.499)	(0.489)	(0.484)
Research Productivity				
number of publications by 9 years	1.414	1.970	1.020	0.880
	(2.325)	(2.748)	(1.948)	(1.562)
Initial placements				
tenure-track in R1 university	0.232	0.301	0.184	0.165
	(0.422)	(0.459)	(0.388)	(0.371)
private sector	0.240	0.226	0.261	0.241
	(0.427)	(0.418)	(0.439)	(0.427)
number of schools	32	10	10	12
number of individuals	3,979	1,795	1,197	987

Cyclical Demand for Economics PhD





- Total postings decreased by 22 percent between 2008–2010
  - largest drop: the full-time tenure track academic positions in U.S. ($\sim$ 45 %)

Theoretical Framework

- How do economists accumulate human capital?
- Theory of human capital accumulation provides the foundation of career development
  - human capital accumulation is largely determined during the first decade of one's career in high-skill occupations (Rosen 1990, O'Flaherty and Siow 1995)
  - Gibbons and Waldman (2006) suggests task-specific human capital approach to explain persistent wage effects of initial conditions
- The idea is based on that a worker develops skills according to the tasks
- Job mobility would raise questions on the transferability of skills
  - more costly for whose skills are not transferable across jobs
  - critical at research universities in which early switching tends to be discouraged

Model Setup

- Based on the model from Gibbons and Waldman (2004 and 2006)
  - simplify the accumulation speed and the effect of schooling
  - follow the definition of occupation
    - define occupation as the collection of firms having the same task
    - add the explicit task weights on each occupation
  - add the dynamics of task-specific human capital jointly determined by innately ability and labor market experience
  - the output is determined by match qualities of human capital, ability, and firm with a worker
  - incorporate entry economic conditions into the model
    - predict the worker's mobility

Model

- Worker i at firm f in o at t produces cumulative task j specific output Y^j_{ifot}:

$$\log Y^j_{ifot} = \gamma_o \overbrace{\left[\sum_j \beta^j_o \left(\underbrace{H^j_{it}}_{\beta^j_{o'}, \text{Exp}_{io't}} \right)\right]}^{\text{Task}_{iot}} + \overbrace{\sum_j \beta^j_o \alpha^j_i}^{\text{m}_{io}} + \mu_{if} \quad (1)$$

$$\text{where} \sum_j \beta^j_o = 1 \text{ for all } o = 1, ..., O$$

- γ_o is the occupation-specific return to human capital
- β^j_o is the share of time a worker spends on average in the task j in o
- H^j_{it} is the human capital accumulated in task j until time period t
  - $\text{Exp}_{io't}$ denotes the previous tenure in occupation o' to simplify exposition
- α^j_i: initial endowment for the task j
- μ_{if} denotes the idiosyncratic match quality between i and f

Model - continue

$$\log Y^j_{ifot} = \gamma_o \text{Task}_{iot} + \overbrace{\sum_j \beta^j_o \alpha^j_i}^{m_{io}} + \mu_{if} \quad \text{where} \sum_j \beta^j_o = 1 \quad \text{for all } o = 1, ..., O \quad (2)$$

- Hence, the output is determined by the match qualities
  1. between the tasks and the accumulated human capital
     - task tenure
  2. between the tasks and the innate ability
  3. between the firm f and individual i

Characteristics of task tenure

- To make an exposition simpler, examine two-task model $J = \{R, T\}$

$$\text{Task}_{iot} = \gamma_o \left\{ \beta_o^R H_{it}^R + \left(1 - \beta_o^R\right) H_{it}^T \right\}$$

- o' and o denote source and target occupation, respectively

Proposition

For $\beta_{o'}^R > 0.5$, task-tenure is valued more if moves to $\beta_o^R > \beta_{o'}^R$
For $\beta_{o'}^R < 0.5$, task-tenure is valued more if moves to $\beta_o^R < \beta_{o'}^R$
For $\beta_{o'}^R = 0.5$, task-tenure does not change regardless of moving

- If o is more specialized than o', the one's task tenure would be valued more
  - e.g. if one worked at teaching college, her task-tenure would be valued less when moving to research-heavy university
- if o' is very general, switching does not have any merit for task tenure

Occupational switching

- Improvement on match-up qualities and returns to task tenure would make a shift more likely, but there is a loss from the task tenure according to the proposition when move

$$(m_{io} - m_{io'}) + (\mu_{if} - \mu_{if'}) + (\gamma_o - \gamma_{o'})\,\text{Task}_{io't} > \gamma_o \underbrace{\left[\left(\beta^R_{o'} - \beta^R_o\right)\left(H^R_{it} - H^T_{it}\right)\right]}_{\text{potential loss}} + \underbrace{x_{o't}}_{\text{switching cost}} \tag{3}$$

- Potential loss is governed by two factors
  - how similar the tasks between occupation o and o', $|\beta^R_o - \beta^R_{o'}|$
    - if the source occupation is very general, there would be no loss
  - how much human capital accumulated from the previous occupations

Discussion: Overview of the model's contributions

- If economists' human capital is not task-specific, the markets would be similar to the high skilled industry
  - the workers would mitigate the initial mismatch by switching, and hence the effects would not be permanent

- If workers' human capital is task specific, there are two more cases
  - the economist's tasks are specialized (distances are significant)
    - they would less likely switch because they might risk losing the human capital
    - the initial effects would remain
  - the economist's tasks are general (distances are small)
    - economists would more easily switch the occupation, and hence the initial placement effects are less likely to be permanent

Division of Occupation by Tasks

- Literature use occupational and industry codes from the census
  - change in occupation means the skills required for new occupations would be substantially different from those used in the old
  - need to build another index because of the small range of occupations economists would work at
- Define occupations by analyzing job descriptions and other sources
  - R1 university defined by Carnegie Classifications
  - All other universities in US (National Center for Education Statistics)
  - Research organization or governmental agencies in US (e.g. World Bank)
  - Foreign institute
  - Private institute

Job description Analysis

- Analyze the text in the job descriptions from JOE and CSWEP letters
- TF analysis in job postings ads (Wordnet Lemmatizer)
  - Tenured track positions: **research, economics, teach**, curriculum
  - Research org: **research, economics**, teach
  - Private: research, economics, communicate, work, policy, experience, analysis, skills, quantitative, management
- Word **research** and **teach** dominates in Academic positions
- Diverse range of words are captured in private sector positions
  - communication related words are rarely captured in academic positions
- Possibly, different skills are required for the private sectors

Empirical Strategy I

- The regression model is not directly derived from the model
- Estimate the short- and long-term effects of initial labor market conditions
  - for individual i, cohort c, department d, fields of study f

$$y_{icdf} = \beta \text{ec}_c + \gamma X_i + \lambda_d + \theta_f + \epsilon_{icdf} \tag{4}$$

    where ec_c indicates the economic conditions at graduation for c
  - λ_d, θ_f are fixed effects for department and fields of study, respectively
  - X_i includes US bachelor and gender indicators

- Investigate y_{icdf}:
  1. Placement outcomes
     - whether one would be landed at R1 university as a full-time professor
     - ranking of the placements
  2. Job mobility
     - whether an individual has ever switched from the initial placements

Table 2: Effect of entry condition on the initial placements in R1

	(1)	(2)	(3)	(4)
unemployment	-0.0214***	-0.0286**	-0.0172**	-0.0317***
	(0.00483)	(0.0106)	(0.00654)	(0.00612)
female	0.00616	0.00570	0.00586	0.00618
	(0.0160)	(0.0149)	(0.0149)	(0.0161)
US bachelor degree	0.0589***	0.0657***	0.0588***	0.0587***
	(0.0109)	(0.0118)	(0.0109)	(0.00877)
tier 2 (rank 11–23)		-0.114***		
		(0.0145)		
tier 3 (rank 24–45)		-0.128***		
		(0.0193)		
unemployment× tier 2		0.0168		
		(0.0151)		
unemployment× tier 3		0.00897		
		(0.0180)		
unemployment× female			-0.0144	
			(0.0148)	
unemployment× US bachelor degree				0.0234***
				(0.00664)
mean(dependent variable)	0.2339	0.2339	0.2339	0.2339
Observations	3916	3916	3916	3916
R^2	0.063	0.040	0.063	0.064

Standard errors in parentheses and are clustered by cohort level.

Department and fields of study fixed effects are included in the estimation except column (2)

* $p < 0.10$, ** $p < .05$, *** $p < .01$

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Table 3: Effect of entry condition on initial-placement ranking for those who placed in R1

	(1)	(2)	(3)	(4)
unemployment	12.30**	12.63*	12.45*	24.51**
	(4.590)	(5.725)	(5.463)	(8.556)
female	0.458	0.273	0.418	1.622
	(11.54)	(9.472)	(11.47)	(11.26)
US bachelor degree	14.77	15.27	14.79	13.95
	(10.79)	(11.84)	(10.71)	(8.691)
tier 2 (rank 11–23)		42.13***		
		(7.503)		
tier 3 (rank 24–45)		68.10***		
		(11.02)		
unemployment× tier 2		-4.003		
		(6.936)		
unemployment× tier 3		-3.320		
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unemployment× female			-0.531	
			(8.717)	
unemployment× US bachelor degree				-22.36**
				(9.337)
mean(dependent variable)	137.80	137.80	137.80	137.80
Observations	1183	1183	1183	1183
R^2	0.125	0.081	0.125	0.129

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Table 4: The Effect of Entry Conditions on the Job Mobility

	Occupational switching			Firm switching		
	(1)	(2)	(3)	(4)	(5)	(6)
	$\leq$ 3 years	$\leq$ 6 years	$\leq$ 9 years	$\leq$ 3 years	$\leq$ 6 years	$\leq$ 9 years
unemployment	-0.00238	0.00166	-0.00216	0.0151***	0.0121	0.00694
	(0.00595)	(0.00842)	(0.00939)	(0.00398)	(0.00949)	(0.00774)
female	0.00586	0.0250	0.0108	0.0182*	0.00573	-0.00568
	(0.00675)	(0.0170)	(0.0176)	(0.00795)	(0.0161)	(0.0140)
US bachelor degree	0.000261	-0.00796	-0.0153	0.0345*	0.0243	0.00933
	(0.00747)	(0.0106)	(0.0128)	(0.0186)	(0.0154)	(0.0164)
mean(dependent variable)	0.1751	0.3133	0.4180	0.3199	0.5413	0.6912
Observations	3916	3916	3916	3916	3916	3916
R^2	0.019	0.021	0.015	0.023	0.017	0.014

Standard errors in parentheses and are clustered by cohort level.

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Empirical Strategy II

- Analyze the effect of entry conditions on the economists' productivity
- Approximate the productivity using the cumulative number of publications
  - for individual i, cohort c, department d, fields of study f, at year t

$$y_{icdft} = \beta \text{ec}_c + \gamma X_i + \lambda_d + \theta_f + \tau_{exp} + \epsilon_{icdft} \tag{5}$$

    where ec_c indicates the economic conditions at graduation for c
  - λ_d, θ_f are fixed effects for department and fields of study, respectively
  - τ_{exp} capture the labor-market experience fixed effects
  - X_i includes US bachelor and gender indicators
- Investigate y_{icdft}:
  - Cumulative number of articles
    - top 50, top 20 and top 5

Table 5: Effect of entry condition on number of publications in Top 50 economics journals

	Full sample				Restricted to initial placement in R1			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
unemployment	-0.0213***	-0.0807***	-0.0452***	-0.0136	-0.0628**	-0.0886***	-0.110***	-0.0273
	(0.00795)	(0.0244)	(0.0119)	(0.00915)	(0.0252)	(0.0306)	(0.0307)	(0.0291)
female	-0.288***	-0.278***	-0.286***	-0.288***	-0.576***	-0.558***	-0.555***	-0.571***
	(0.0240)	(0.0239)	(0.0226)	(0.0240)	(0.0563)	(0.0526)	(0.0583)	(0.0572)
US bachelor degree	0.00424	0.0594***	0.00448	0.00435	-0.00749	0.0821	-0.0165	-0.0127
	(0.0119)	(0.0123)	(0.0120)	(0.0116)	(0.0638)	(0.0506)	(0.0640)	(0.0619)
tier 2 (rank 11–23)		-0.609***				-0.902***		
		(0.0485)				(0.0838)		
tier 3 (rank 24–45)		-0.685***				-0.860***		
		(0.0537)				(0.0774)		
unemployment× tier 2		0.104***				0.149**		
		(0.0363)				(0.0671)		
unemployment× tier 3		0.104**				-0.0215		
		(0.0435)				(0.0646)		
unemployment× female			0.0817***				0.167**	
			(0.0216)				(0.0706)	
unemployment× US bachelor degree				-0.0175				-0.0645
				(0.0111)				(0.0431)
mean(dependent variable)	0.9225	0.9225	0.9225	0.9225	1.9321	1.9321	1.9321	1.9321
Observations	50311	50311	50311	50311	11963	11963	11963	11963
R^2	0.169	0.149	0.169	0.169	0.324	0.298	0.325	0.324

The dependent variable is the cumulative number publications in the top 50 economics journals.

Department and fields of study fixed effects are included in the estimation except column (2) and (6).

Standard errors in parentheses and are clustered by cohort level and current year t.

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Table 6: Transition Probability between Occupations

	occupation 9 years after graduation				
Initial occupation	R1 university	all other US university	research org in US	foreign institute	private institute
panel a. all samples					
R1 university	74.08	5.08	6.37	8.21	6.26
all other US university	10	73.04	4.13	4.57	8.26
research org in US	11.67	3.24	67.91	4.86	12.32
foreign institute	6.31	2.87	3.78	77.87	9.17
private institute	6.17	2.54	6.89	7.01	77.39
panel b. cohorts from 07 and 08 (good cohorts)					
R1 university	74.78	3.04	6.96	9.57	5.65
all other US university	8.73	77.78	1.59	3.97	7.94
research org in US	10.34	2.59	69.83	5.17	12.07
foreign institute	7.36	1.84	0.61	77.91	12.27
private institute	5.94	1.83	9.13	7.31	75.8
panel c. cohorts from 10 and 11 (bad cohorts)					
R1 university	74.21	4.74	6.32	5.79	8.95
all other US university	8.89	76.67	5.57	1.11	7.78
research org in US	11.8	2.25	64.04	6.18	15.73
foreign institute	8.48	3.57	3.57	76.34	8.04
private institute	4.68	2.92	10.53	5.85	76.02

Each row calculates the transition probabilities from the initial occupation to the occupation working at 9 years after graduation.

Robustness Check

- In the analysis above, assume that the macroeconomic conditions at graduation represent an exogenous labor demand shock
  - the average quality of graduates who enters the market is not systematically associated with the economic conditions
- 5 years of study is arguably the norm of the economics Ph.D. programs
  - start year of PhD is partially observable
- Examine the effect of the entry economic conditions on one's decision to delay graduation
  - individuals tier 1 programs would have an option to delay
  - revisit the previous findings using individuals from other than tier 1 programs

Table 7: Effect of entry condition on delaying graduation

	(1)	(2)	(3)	(4)
unemployment	0.0247	0.0485*	0.0243	0.0213
	(0.0136)	(0.0240)	(0.0167)	(0.0159)
female	0.0202	0.00958	0.0202	0.0202
	(0.0149)	(0.0155)	(0.0151)	(0.0148)
US bachelor degree	-0.0218	-0.0255	-0.0218	-0.0220
	(0.0356)	(0.0357)	(0.0355)	(0.0355)
tier 2 (rank 11–23)		0.0102		
		(0.0282)		
tier 3 (rank 24–45)		-0.0172		
		(0.0397)		
unemployment× tier 2		-0.0276		
		(0.0166)		
unemployment× tier 3		-0.0592		
		(0.0447)		
unemployment× female			0.00143	
			(0.0165)	
unemployment× US bachelor degree				0.00804
				(0.0295)
mean(dependent variable)	0.4909	0.4048	0.4909	0.4909
Observations	2371	2371	2371	2371
R^2	0.069	0.027	0.069	0.069

The dependent variable is whether one studied longer than 5 years.

Department and fields of study fixed effects are included in the estimation except column (2).

Standard errors in parentheses and are clustered by cohort level.

* $p < 0.10$, ** $p < .05$, *** $p < .01$

Conclusion

- Assuming that those missing individuals are less likely successful, I believe my findings would provide the minimum effects of the entry conditions on the economics Ph.D.'s career and productivity
- To conclude, the transition from education to the labor market in a recession would threaten the economists' careers
- Their occupational outlook would not be more promising than surrounding cohorts, and the productivity loss is expected on average

Current work

- Li, Liu, Moon, Weiss: Algorithmic Classification of Dementia Status
  - Dementia ascertainment is time-consuming and costly, making it difficult to implement in large, representative cohort studies
  - Moon (2022) proposes a measure as a proxy of cognitive ability based on the response patterns of popular surveys
    - Participating in a survey requires mental effort
    - Incomplete answers are frequently observed in open-ended questions
  - The Langa-Weir Classifications (LW) would be one of the existing algorithms to predict dementia or significant cognitive impairment
  - Using the Health and Retirement Study (HRS), examine whether Moon proxy would algorithmically identifies dementia

Thank You