1 INTRODUCTION

According to the U.S. Bureau of Labor Statistics, there has been strong demand for economists over the decade. Organizations across many industries use economic analysis and quantitative research skills to study and forecast business, sales, and other market trends. That makes the employment of economists projected to grow more than 10 percent each year. However, less work has been done on whether the occupational outlook for the economists is affected by the business cycles. Especially, given that young workers are particularly vulnerable to unfavorable economic conditions at entry (Elsby 2016), the project address the following questions. How do the newly mint academic economists who graduated from the recessionary periods catch up to their peers who started in good times? Or does the difference in the initial career starting period make a permanent difference in their careers and performance? If the latter, what are the mechanisms driving the losses for their jobs?

Understanding the mechanisms leading to persistent effects of entry conditions on labor market outcomes is fundamental in designing policies to help young workers. However, literature is heavily based on graduates from secondary education, although many labor markets, for example law firm associates or surgical residents requiring advanced degrees, have different institutional settings and barriers to entry. The labor market for economists has some unique features. Job seekers must have a Ph.D. degree in economics (or related). Most jobs are posted on the American Economic Association, and recruiting mostly happens between October and March of the following years. Like lawyers, economists usually work under up-or-out policies, in which workers who miss a set of promotion opportunities are hardly make it after, and hence economists may have low job mobility. For academic economists, it would be a more serious concern due to higher tenure-related mobility costs at the early stage of their careers.

One of the critical mechanisms for assessing the impact of graduating in a recession is to evaluate job mobility since catching up between firms would occur through job mobility. Young workers search for a good match, and they experience promotion or wage rise through switching a job, and therefore it is an essential part of a worker's early career (Topel and Ward 1992). During a recession, the number of jobs declines, as well as the quality of the job (**liu2016good**; Altonji, Kahn, and Speer 2016). For the studies on college graduates, workers are more likely to switch firms and occupations, and when they switch, they gain more than their counterparts who started in a boom (**van2018bad**; **cockx2016scars**). Another building block for studying the mechanisms is how human capital is valued across the firms and occupations (**becker1994human**; **jacob1993schooling**). The literature distinguishes between general-purpose skills and specific skills. The former is valued almost equally by all firms or sectors, such as

education or labor market experience. The latter denotes the skills which are valued differently by what industry or firms one work at or what tasks one is assigned to (Altonji and Shakotko 1987; Kambourov and Manovskii 2009; Gibbons and Waldman 2006). In other words, the more one's skills are general, the more one could switch a job.

In this paper, I develop a theoretical model of human capital development to understand the job mobility of economists based on Gibbons and Waldman (2006). My model incorporates occupation-specific task assignments, task-specific human capital, and matching quality between a worker and the tasks in the presence of the entry economic conditions that determine the quality of the initial placements. Given the switching cost and development of human capital according to the tasks, the model predicts that one would not switch a job in which the tasks are not similar to the previous tasks. It gives in part the grounds of why the economics Ph.D.s would be sensitive to economic conditions in the long run since the initial economic conditions would make the worker develop undesirable human capital. Therefore, if economists develop task-specific human capital, the recessionary cohorts would develop undesirable task-specific capital continuously, and the output gap would grow further and further. I test the model's predictions using detailed information on career paths and productivity measures for economists available on the web and find that the predictions are matched.

The motivation for my model's framework originates from the popular explanation on the permanent effects of bad economic conditions on the labor market outcome. It is based on a matching model (Jovanovic 1979). The recessionary cohorts would take longer periods of time to find a job match compared to the surrounding cohorts. Spending time in bad matches would lead to wage losses and would result in wrong investment in human capital. Therefore, the disparities in human capital are the important channel through which the effects of graduating in a bad economy will remain. However, it is not clear what types of human capital economists would develop. My model provides the testable hypothesis on whether the economists human capital is task-specific or not.

In the second half of the paper, I examine the model's predictions using about 4,000 economics Ph.D. graduated between 2004 and 2012. I collect the graduates from 32 economics Ph.D. programs in the U.S. with the job postings data during the period and find the following results. First, the demand for economists is pro-cyclical. The overall demand moves in the opposite direction from macroeconomic conditions, and the fluctuations are primarily driven by the job openings in academic tenure-track positions in the US. Second, the entry economic conditions would affect the initial placement outcomes. The recessionary cohorts are less likely placed in tenure-track academic positions. It is the undesirable outcome assuming that economics Ph.D.

are research oriented. Third, the recessionary cohorts are less likely working at the academia in the long-run, and the effects are manifested through the initial placement. I further find that entry economic conditions would affect cohorts' productivity. In particular, graduates from recessionary cohorts publish fewer journal articles even after the initial placements are controlled. Then, I test the model's prediction empirically. I distinguish the labor market experience between the occupations and find the contribution to the output is different by occupation experience. Secondly, I find that economists rarely switch the occupation even if the entry economic conditions were not favorable. It implies that the economists develop task-specific human capital, and the occupations are quite specialized, and hence the effect of the entry economic conditions would be permanent.

The contributions of the paper are three-holds. Firstly, I provide a fresh perspective on economist's human capital formation by analyzing the consequence of the entry economic conditions and job mobility. Second, to my knowledge, this is the first study that empirically demonstrates the connection between the task-specific human capital and worker's mobility and how it affects a range of outcomes. Finally, nevertheless, I develop the idea based on the market for economists and their careers, the applications of the model and its predications are open to the markets in which labor is the most essential input.

1.1 Relation to the Literature IN REVISION NOW

The investigation of the extent to which the initial economic conditions affect not only the placement outcomes of the new economists but also their long-term careers contribute to four distinct literatures.

The first related body of work analyzes the effects of bad starting conditions at graduation on persistent labor market outcomes. While immediate effects of entering the labor market in a downturn are expected, many worry that young workers will suffer long-lasting adverse effects. If true, this type of hysteresis could point to a lost generation of young workers who will be stuck in mismatches and low-paying jobs. One set of papers studies that people who enter the labor market during a recession indeed receive lower wages even years after the recession period (Brunner and Kuhn 2013; Kahn 2010; Oreopoulos, Wachter, and Heisz 2012). Microeconomic data such as CPS does not record the year when the respondent complete the education and enter the labor market, and therefore literature employs Mincerian proxy[1] for the year of labor entry. The findings imply that hysteresis might be a genuine concern, although more recent works find that the effects would vary by the level of education and college major on the wages and unemployment spell (Altonji, Kahn, and Speer 2016; Cockx and

1. The sum of the year of birth, plus six and plus the years of reported education.

Ghirelli 2016; Hershbein 2012; Liu, Salvanes, and Sørensen 2016). Another set of papers within this body of work studies that the young workers in Europe or Japan, more inflexible labor market compared to the U.S., suffer more from finding a job compared to U.S. workers (Cockx and Ghirelli 2016; Genda, Kondo, and Ohta 2010).

This paper expands this literature by considering the effects beyond college education with detailed data. While some papers have explored differences between high and low educated workers (Cockx and Ghirelli 2016, Genda et al. 2010, Speer 2016) there is as far as I'm aware no study that examines the differential effects for Ph.D. graduates. Oyer (2006) studies the impact of completing an MBA or an economics Ph.D. during a recession, focusing on graduates from seven departments in the U.S. However, research beyond elite universities is especially thin, and the long-term outcomes of the graduates who start their careers in the non-academic sectors are rarely known.

While the above literature has concentrated on establishing a link between initial entry conditions and future outcomes, the primary focus of this paper is on examining the channel through which these persistent losses occur. One of the channels through which the economic conditions affect graduates' career outcomes is the match quality. Job matching is a process that is always present over the course of a business cycle. Many research finds that job match quality is adversely affected during recessions (Bowlus 1995, Cole and Rogerson 1999, Kahn 2010). Liu et al (2016) show that cyclical skill mismatch between college graduate and employer is an important mechanism behind persistent career loss in Norway. To advance the literature, in this paper I examine whether the previous finding is similarly observed in the market for economics Ph.D. It is natural to ask then whether and how differences across field of study interact with the business cycle.

Given the bad economy would aggravate the mismatch, the following related body of work analyzes how job mobility promotes/demotes catching up. Job mobility plays a crucial role in recovering from the damages for those who start in a recession (Van den Berge 2018, Cockx and Ghirelli 2016). While switching sectors solves the initial mismatch for the highly educated, it raises questions to the economists' market, especially at research-intensive institutions where tenure decisions are made at a fixed point in time.

I approach the question with a model of task-specific human capital motivated by Gibbons and Waldman (2004). Most papers consider the role of the first firm in explaining the initial and persistent losses (Liu et al. 2016, Oreopoulos et al. 2012). The effect of the initial placement is particularly important for economists. An essential feature of many high-skill occupations is that human capital accumulation is primarily determined during the first decade of one's career. Lawyers, academic workers, and executives tend to work under an up-or-front policy in which switching a job is

costly (Rosen 1990). The problem would be critical at research universities, in which tenure decisions are determined within 5-7 years. The task-specific human capital model could provide an explanation for cohort effects since workers are forced to develop their human capital according to the tasks assigned. If it were true, the recession likely has a permanent impact on those who end up at lower-ranked schools or private sectors in which the main tasks are different from research universities. To my knowledge, there is no empirical paper applying these theories to the economist markets under the Great Recession.

Section 2 discusses the empirical strategy and provides the identifying assumptions. Section 3 presents the description of data and relevant measures. Section 4 lays out the model of task-specific human capital to explain the stylized facts of economists' markets. Section 5 discusses the results, and section 6 provides a supplementary analysis. Section 7 concludes.

2 The Model

2.1 Theoretical Framework

In this section, I propose a model to explain the mobility of economists. I build the model based on the concept of task-specific human capital proposed by Gibbons and Waldman (2004 and 2006).

I define an occupation o as the collection of firms having the same tasks. Switching firms or occupations for individuals is defined as having different firms or occupations in year t compared to year $t-1$. All firms are contained within occupations, so individuals can only switch occupations if they also switch a firm. A firm f assigns the combinations of tasks $\{1,\ldots,J\}$ to a worker. If a worker i is hired by firm f in o at t, then the worker i produces the task-specific output Y^j_{ifot} as:

$$\log Y^j_{ifot} = \sum_j \beta^j_o a^j_{iot} + \mu_{if} \quad \text{where} \quad \sum_j \beta^j_o = 1 \quad \text{for all } o = 1, ..., O \tag{1}$$

where a^j_{iot} is i's productivity for task j for o at t, and μ_{if} represents the match quality between worker i and firm f. Each occupation combines the tasks in different ways, so β^j_o denotes the share of time a worker spends on average for task j in o. In addition to the relationship between i and o, the unobserved match component may affect the output as well. For example, individuals with the same level of productivity hired in occupation o would produce different output since some of them formed better employer matches. μ_{if} characterize a firm-match component to take account it.

The worker's productivity a^j_{iot} on task j is determined by the initial endowment

of the task α_i^j and the human capital specific to the task accumulated through labor market experience:

$$a_{iot}^j = \alpha_i^j + \gamma_o H_{it}^j \tag{2}$$

where γ_o is the occupation-specific return to human capital. Task-specific human capital H_{it}^j is developed through occupation experience until time t and how much valued by the previous occupation o':

$$H_{it}^j = \lambda_{o'}^j \text{Exp}_{io't} \tag{3}$$

where $\text{Exp}_{io't}$ denotes the previous tenure in occupation o' to simplify exposition[2]. Plugging (2) and (3) into (1) yields

$$\log Y_{ifot}^j = \gamma_o \overbrace{\left[\sum_j \beta_o^j \left(\underbrace{H_{it}^j}_{\lambda_{o'}^j \text{Exp}_{io't}} \right)\right]}^{\text{Task}_{iot}} + \underbrace{\overbrace{\sum_j \beta_o^j \alpha_i^j}^{m_{io}} + \mu_{if}}_{\text{Match quality}} \tag{4}$$

$$\text{where} \sum_j \beta_o^j = 1 \quad \text{for all } o = 1, ..., O$$

Note that Task_{iot} is a measure of task-specific human capital valued by occupation o. m_{io} is the match quality between i and occupation o. I assume the match quality with a firm μ_{if} is random and does not develop by time.

The specification captures critical features of how a worker's production function in which the human capitals are the primary inputs. It assesses the relationship between outputs, occupations, firms, and task-specific human capital an individual developed. Task_{iot} consists of observable measures of task-specific human capital and how the occupation o values them. Match qualities are unobservable measures reflecting how much the task assignments are matched to i and the relationship between f and i.

2.2 Incorporating entry economic conditions

When a worker enters the market for the first time, there are no human capitals accumulated. I impose two more assumptions to reflect the effect of economic conditions at entry. Among the set of tasks J, denote $j = 1$ as economics-related research.

Assumption 1

$$\alpha_i \equiv \left(\alpha_i^1, ..., \alpha_i^J\right) \equiv m(X_i) + e_{it}, \textit{ where } \alpha_i^1 \geqq \max_{j \neq 1} \alpha_i^j$$

2. $H_{it}^j = \sum_s^{t-1} \lambda_{os}^j$ where $\sum_{j=1}^J \lambda_{os}^j = 1$ for all o, s.

The assumption 1 implies that most workers are research oriented. It is necessary to reflect the pro-cyclical demand for economists on the output.

Theorem 1

$$\textit{If } u_t < u_t', \textit{ then } \mathop{\mathbb{E}}_{i}\left[m_{io} \mid u_t, \sum_j H_{it}^j = 0\right] > \mathop{\mathbb{E}}_{i}\left[m_{io} \mid u_t', \sum_j H_{it}^j = 0\right]$$

It implies that mismatch between a worker and occupation would arise when the initial economic condition is unfavorable[3]. Note that m_{io} would be higher if one's abilities are well matched to the task assignments. In a recession, one would be matched to the occupation in which research tasks are less emphasized, and hence the expected value of the match quality would be lower than the good times.

2.3 MOBILITY

If i does not switch the occupation, the following corollary is derived:

Corollary 1

$$\textit{If } u_t < u_t' \textit{ and } i \textit{ did not switch } o, \textit{ then } \mathop{\mathbb{E}}_{i}\left[Y_{ifot}^1 \mid u_t, X_i\right] > \mathop{\mathbb{E}}_{i}\left[Y_{ifot}^1 \mid u_t', X_i\right] \quad \textit{for all } t$$

Note that Y_{ifot}^1 is research-task related output. In sum, the gap is driven by the two factors. First, if the economic conditions at entry were bad, the match-up quality between a worker and an occupation would decline, and hence the initial output gap would arise. From (3), a worker develops the task-specific human capitals according to the occupation experience. If one did not switch the occupation, the worker is forced to develop the undesirable human capital, and therefore the output gap would be enlarged.

Consider how the task-specific human capital would be valued if a worker would switch occupations. Note again that if human capital is task-specific, one's human capital could be appreciated more if one would switch to the occupations where similar tasks are assigned. To make an exposition simpler, I examine two-task[4] model $J = \{R, T\}$. As noted above o' and o indicate the source and target occupations, respectively. From the specification (4), I derive the following proposition:

3. The theorem is consistent with Bowlus (1995).
4. For example, research and teaching, or research and all other tasks.

Proposition 1

$$\begin{aligned}
&\textit{For } \lambda^R_{o'} > 0.5, \textit{ task-tenure is valued more if moves to } \beta^R_o > \lambda^R_{o'} \\
&\textit{For } \lambda^R_{o'} < 0.5, \textit{ task-tenure is valued more if moves to } \beta^R_o < \lambda^R_{o'} \\
&\textit{For } \lambda^R_{o'} = 0.5, \textit{ task-tenure does not change regardless of moving}
\end{aligned}$$

How the task tenure is valued depends on the degree of specialization in the source occupation. Note that $\lambda^R_{o'} = 1$ implies the occupation o' is fully specialized in research and that $\lambda^R_{o'} = 0$ implies the occupation o' is fully specialized in teaching. $\lambda^R_{o'} = 0.5$ suggests that the occupation o' is not specialized in both ways. In other words, $\lambda^R_{o'} = 0.5$ means the occupation o' would not distinguish between the two skills. The proposition indicates that if the target occupation is more specialized than the source occupation, the one's task-tenure would be valued more. If the source occupation is very general (close to 0.5), the task-tenure is valued equally by any target occupation, and hence switching does not have any merits.

2.4 Maximization problem of switching occupation

Now consider a worker's maximization problem. In each period, a worker needs to decide to switch the occupation or not. To make an exposition simpler, consider a two period problem. Suppose an individual i started the career at a firm f' within an occupation o'. In the next period, suppose a firm f within o offers i to move. However, switching the occupation is costly so that it would generate a switching cost $x_{o't}$. Hence a worker faces

$$\max_{o',o} [Y_{if'o't}, Y_{ifot} - x_{o't}] \tag{5}$$

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 1 together with the switching cost $x_{o't}$

$$\begin{aligned}
(m_{io} - m_{io'}) + (\mu_{if} - \mu_{if'}) + (\gamma_o - \gamma_{o'}) \, \text{Task}_{io't} \\
> \gamma_o \underbrace{\left[(\beta_{o'} - \beta_o) \left(H^R_{it} - H^T_{it} \right) \right]}_{\text{potential loss}} + \underbrace{x_{o't}}_{\text{switching cost}}
\end{aligned} \tag{6}$$

Potential loss is governed by the two factors. First, $\beta_{o'} - \beta_o$ represents how similar the tasks between the source and target occupations. If they are similar, then it would be small. Secondly, how much the task-specific human capital is accumulated would affect the size of the loss.

2.5 Brief Overview of the Model's Contributions

The specification (6) provides the testable implications on the characteristic of human capital for the economists. If economists' human capital is not task-specific, the markets would be similar to the high skilled industry. If the initial mismatch happened at entry, the workers would solve it by switching, and hence the effect of entry conditions would be away soon. But if the economist's human capital is task-specific, there are two more cases. Firstly, if the economist's tasks are specialized (distance between the occupations are significant), then they would less likely switch because they might risk losing the human capital developed at the current occupation. If the initial matching is undesirable, the switching will happen early in their careers because of the potential loss of task-specific human capital and switching costs. Therefore, the initial placement effects would be long-lasting. Secondly, if the economists' human capital is task-specific but the industry is not specialized (distance between the occupation is small), then economists would more easily switch the occupation, and hence the initial placement effects are less likely permanent.

3 Data and sample selection

The data set contains information on Ph.D. students from 32 universities in the United States who achieved the degree from 2004 to 2012. Graduate students are identified from their dissertations posted in the ProQuest database. The number of economics-related dissertations during the period is 6,587, and I keep the individuals whose dissertation chair is in the economics department[5]. Information about each employment history is either taken from the most recent CV or the Linkedin experience section. Given that one would obtain the degree years after graduation, I correct the graduation year following their CV. From the dissertations' title, classification, identifier, and subject in ProQuest, I extract data on the field of research[6]. I construct a yearly panel to examine the career of each graduate student. I collect the publication records through EconLit. In sum, I observe name, degree award date, Ph.D. institution, bachelor institution, career history, gender[7], fields of study, and publication records for each graduate. To explore the demand for an economist, I use the number of listings in Job Openings for Economists (JOE) during the years.

I obtain the cumulative number of publications by compiling a list of journal article publications of each economist listed in the EconLit. The journals are limited to top 50

5. The list of departments are economics, business, agricultural economics, health economics, political science, politics, sociology, mathematics, and statistics. Those who had an economics chair are landed at economics departments for the initial placements.

6. See Appendix **??** for details.

7. If gender is not observable, I approximate it based on the first name. See Appendex **??** for details.

listed in *IDEAS/RePEc Simple Impact Factors for Journals*[8] for my primary analysis.

In the section 2, I define the occupation as the collection of firms having the same tasks. Change in occupation means then the skills required for new occupations would be substantially different from those used in the old occupations. Literature use occupational and industry codes from the census, but I need to build another index because of the small range of occupations economists would work at. I define the occupations in the following ways: R1 university, all other university in U.S., research organization in U.S., foreign institute, and private sector. The first occupation, R1 university, consists of 108 universities in the U.S. labeled as *Doctoral Universities: Very High Research Activity* in the Carnegie Classification of Institutions of Higher Education. The second occupation, all other university in the U.S., is the collection of all other universities in the U.S. The third occupation, research organization in the U.S., is the list of research organizations in the U.S. listed in 2004 rankings of economics research institutions available at *econphd.net* and U.S. governmental agencies. The fourth occupation, foreign institutes, consist of international schools, research organization, and governmental agencies. The last occupation, private sector, is the collection of all other remaining.

The main difference between the first two occupations is teaching loads. According to the 2004 National Study of Post secondary Faculty, faculties in non-doctoral granting universities spend more time teaching than doctoral universities (Table 13). The occupation of research organization in the U.S. does not require teaching, and the research goal would not be the same as the universities. The occupation of foreign institutes would be different from the U.S. counterparts. Each country has different institutional settings, and most international universities have other promotion policies than the U.S. (Smeets et al. 2006). The occupation private sectors is different from other occupation based on the job descriptions. I collect all job descriptions in the JOE and examine what words are frequently used in in each occupation. There are a few words found in private sectors mostly: writing, consult, management, communication and finance. All these words are observed in every description, but the share of the counts are substantially larger in private occupations.

I use two other sources of data to further categorize institutions and create three measures of the quality of a given job. The first data is based on Oyer (2006). I define *rank* as the rank between 1 and 321 universities, and as 50 plus twice the rank from 1 to 112 for other organizations. The second measure is to follow *the Journal of Economic Literature (JEL) classifications*. JEL classifies the jobs into 5 groups. The first group is for tenure track academic positions in U.S, and the second group is part-time academic positions in U.S. The third and fourth groups are similar to the former groups but international universities. The last two groups are for all jobs other than academics.

The descriptive statistics for the sample is presented in Table **??**. Compared to Table

8. See the list of journals on https://ideas.repec.org/top/top.journals.simple.html

1 in Oyer (2007), the sample compositions have evolved. As opposed to the late 1990s, the sample cohorts have become increasingly foreign and more female. The different compositions raise the questions whether any findings below vary systematically by gender and nationality. Additionally, I divide the sample by department ranks of Ph.D. awarding institutions according to *econphd.net* rankings above. In column (2), I subsample the individuals graduated from 1–10 departments. Column (3) consists of the graduates from 11–23, and column (4) is taken from 24–45 departments. Graduates from higher ranked departments are more likely male, achieved bachelor degrees in US, published more academic papers, get placed in academics jobs. Summary statistics for graduates' fields of study are given in Appendix **??**.

The demand for economists are complied from the listings on JOE each year. All members of the American Economic Association have a professional obligation to list their job openings in JOE[9]. Jobs are posted every month except January and July. JOE consists of six sections. Odd number sections are full-time positions, and even number sections are part-time or temporary positions. Section 1 and 2 are academic openings in the United States, and section 3 and 4 are academic openings located other than the US. Section 5 and 6 are non-academic positions. Figure 1 graphs JOE as a proxy for a demand that the job market candidate would face. Each panel includes the U.S. unemployment rate as of October in a previous year for another demand proxy, since the candidate starts the job search at least one year before graduation. The left panel shows the total number of postings by an academic year[10]. Over the years, the unemployment rate started to rise in 2008, peaked in 2010, and moved down after, and the JOE listings generally moved in the opposite direction. The right panel dissects the patterns of JOE by job categories for full-time positions. *academic in US* is the fraction of the total postings into full-time academic postings in US. *top 50* is the fraction of the total postings into full-time academic postings in top 50 universities in U.S. non academic in US is the fraction of the total postings into full-time non-academic postings in US. All proxies follow the unemployment rate in opposite ways with different degrees. The full-time academic postings in US have the largest share and fluctuate considerably, but the demand from the elite schools seem relatively intact.

4 EMPIRICAL STRATEGY

In this section I describe the estimation strategy to identify the short run and long run effects of the macroeconomic conditions on initial placements and on a range of other outcomes.

9. Minutes for the Annual Meeting, December 29, 1974, American Economic Review, Proceedings, May 1975, p. 443.
10. Duplicated entries are counted separately.

4.1 Estimation the short-term and long-term effects of initial labor market conditions

I approximate entry conditions on the labor market using the unemployment rate as of October at the one year before graduation. I begin by estimating the effect on the initial placement of the unemployment rate, and then examine the analysis by subgroups and for other long run outcomes. The outcome variable for a graduate i of graduating cohort c from department d with fields of study f at year t is determined by the following linear model:

$$y_{icdft} = \beta ec_c + \gamma X_i + \lambda_d + \theta_f + \tau_{exp,o} + \epsilon_{icdft} \tag{7}$$

in which λ_d, θ_f and μ_t are fixed effects for department and fields of study, respectively. I further include occupation experience fixed effects $\tau_{exp,o}$. I will investigate the effect of the entry conditions on the number of cumulative top 50 publications, ranking of the workplace, and mobility decisions. ec_c is an economic condition a cohort c face at their labor market entry. X_i includes an indicator for receiving bachelor degrees in the U.S. and gender. Department fixed effects λ_d capture time invariant department characteristics which lead to permanent shifts of career paths for the department's graduates. Fields of study fixed effects are necessary since job prospects and the following career would be dependent on what the new graduates majored in. I employ year fixed effects since I can observe one's the job entry year and outcomes at every year. As the main regressor ec_c varies by cohort, standard errors are clustered by cohort.

To analyze the effect on the initial placements, I focus on the observation at graduating year. Since there is no time variation, I estimate the following specification:

$$y_{icdf} = \beta ec_c + \gamma X_i + \lambda_d + \theta_f + \epsilon_{icdf} \tag{8}$$

I examine the various types of y related to the placements, for example whether an individual was landed at R1 university or rankings of the placements.

The specification (7) raises the question of the heterogeneous effect of entry conditions. The effects of a recession would be heterogeneous by gender since men and women face different circumstances when making decisions related to work, family, and household finances. The effects would be heterogenous by nationality since foreign graduate students would have a different perspective on careers and work under the unique institutional policies. Also, the effects would be heterogeneous by department rank and fields of majors. I examine these effects employing a range of interaction terms with ec_c.

The last point of interest in heterogeneity is whether the effects of the entry conditions on the outcomes would vary by years of experience. Following Kahn (2010) and

Oreopoulos et al. (2012), I regress the outcome on the entry economic conditions for cohort c and the same control in (7) and department and field of study fixed effects:

$$y_{icdft} = \sum_{e} \beta_e ec_c \cdot E_{i,exp} + \gamma X_i + \lambda_d + \theta_f + \tau_{exp} + \epsilon_{icdft} \tag{9}$$

where e denotes the year of experience after graduation. I do not include year fixed effects, since any individual from the same cohort c with e years of experience is in the same year t.

4.2 ENDOGENEITY

Several identifying assumptions are necessary. First, the effects of β would be unbiased as long as the average quality of economists entering the market is not systematically related to the state of the economy. That is, the specification (7) treats the time of labor market entry as exogenous. However, the job market candidates might extend their years of study in order to avoid bad conditions at entry or enter early to benefit from favorable market conditions. The norm of the years of education for economic Ph.D. is five, and some might prolong their years into six or seven due to the market conditions. I find partial evidence that graduates do seem to adjust their graduation. They are more likely to delay graduation if economic conditions at graduation are bad, and the composition of the graduation cohort would be different in bad economic conditions. Then, the omitted variable bias is a real concern related with entry condition and initial placements. I conduct a range of robustness checks in section **??**.

The last concern for the specification (7) is endogenous migration before and after graduation in the majority of the literature. People might migrate into the regions in response to a local labor market conditions around the time of labor market entry. However, this is a less concern for economists, since the job matching mostly takes place at the Allied Social Science Associations (ASSA), a three-day meeting each January in one place.

The primary analysis is based on one's dissertation information or resume. Unlike CPS or other microdata, my data report the year when an individual completed the education and started the academic or professional career. Literature tends to employ Mincerian specification to proxy potential experience, but I use actual experience since they are observable. Note that if the graduation date is endogenous because of the labor market conditions, then so is actual experience. I instrument the actual experience with a experience since 5-year in section **??**. However, the effect of experience would be trivial in my setting because the initial labor market condition is a strong predictor for one's career.

5 Estimation Results

5.1 Prediction 1: Initial Placements

I first test whether the entry economic conditions predict the initial placement outcomes. I use the specification (8) to explore these connections in more detail in Table 3. The dependent variable is whether the person held a tenure track position in R1 university. According to Assumption 1, most graduates are research-oriented, the ideal landing occupation would be a research university, and hence the model predicts the negative effects of the entry economic conditions onto the placement outcome. I test further whether the gender and the bachelor's degrees would have an important contribution to the outcome. There is a growing concern about the discrimination of females and nationality, so I think the result would explain a little here [CITES].

The negative coefficient on unemployment indicates that on average the graduates are less likely to get hired by R1 university when the macroeconomic conditions at graduation are relatively bad, and the relationship is significant. The -0.0212 coefficient on unemployment in the first column implies that when unemployment grows by 1 percent, the graduates would be 2 percent less likely hold an assistant professorship in R1 university than it otherwise would have. This result echoes Oyer (2006), who analyze the graduates from seven economics departments. The coefficient on female is positive but statistically insignificant while obtaining a bachelor's degree in the U.S. is associated with a greater likelihood of working in R1 university.

The result in column (1) raises the questions on whether the entry effect would have a heterogeneous impact within the sample. It is common knowledge that positions in academia are preferred to the students in the programs in economics, and that the preference would be stronger in top programs. It raises the question of whether the rank of the Ph.D. institution would have a differential effect of the entry economic conditions onto the placement outcomes. In column (2), instead of department fixed effects, I add two indicators for whether one graduates from 11-23 ranked or 24-45 ranked departments. I interact the two indicators with unemployment to examine the heterogeneous effect. The coefficients on rank 2 and rank 3 are negative and statistically significant, implying that the graduates from rank 1 would have a premium on the academic positions. However, the coefficients on the interaction terms are positive but insignificant. Note that placement at R1 university is very tough for students in rank 2 and rank 3 programs. If it happened, they would be the best students in the program. The joint F-test on the two (either $\beta_u + \beta_1 = 0$ or $\beta_u + \beta_2 = 0$) show that the unemployment would not have a different impact on the placement outcome for rank 2 and rank 3. In other words, the entry economic conditions would be a less concern for the best students in rank 2 and rank 3.

While I do not find the effect of being female on the placement outcomes and the differential effect of unemployment onto females in column (3), whether one achieved the bachelor's degree in the U.S. has an essential contribution to the placement. The coefficient on usa and the interaction term is positive and statistically significant. The joint F-test implies that those who graduated from U.S. college would be less likely get hired by R1 university when entry economic conditions got worse. It is not surprising given that graduates in U.S. colleges would prefer academic jobs in the U.S. and they have a low entry bar compared to foreign college graduates.

I now focus on research-related careers and test for the effect of entry economic conditions on the ranking of the first job in Table 4. The sample includes those who started their career in tenure-track academic positions either in the U.S. or other countries. I further limited the samples only to the ranked schools in *econphd.net rankings 2004*. The dependent variable is the ranking of the placement, which is a proxy for the quality of the placement. Column (1) shows that when unemployment grows by 1 percent, the ranking of the placements will increase by about five on average. In other words, the entry economic conditions would affect the quality of the placement. All the coefficients and specifications in Table 4 are similar in Table 3.

The previous results further raise the question of whether the entry conditions on the placement outcome differ by one's the field of study. I divide the samples into Micro and Macro using the JEL classification of the dissertation. For macro, I include G (Finance), E (Macroeconomics and Monetary Economics) and F (International Economics). For micro, I include J (Labor), I (Health and Education), D (Microeconomics), K (Law and Economics), L (Industrial Organization), R (Urban), O (Agriculture) and H (Public Economics). In panel a of Table 5, I perform the same regression as in Table 3 on the Macro and Micro subsamples. I find the significant coefficients as in Table **??** from the Micro sub-samples. Note that the dependent variable is whether one is hired in R1 university. It might imply that the demand for macroeconomists in academic is not binding. This is in part because financial sectors and international organizations demand macro more than micro. In panel b, I do the same regressions onto the further sub-sample based on the JEL classification instead of aggregating them. Though the sample size is tiny, I find the significant coefficient on the unemployment from the micro-related fields more.

5.2 Prediction 2: Long-run Placements

I now test whether the entry economic conditions predict the long-run outcomes. I use the specification (7) to examine a range of outcomes in the following subsections. As an extension of the previous findings, I first investigate whether one works at the tenure-track position in R1 university each year after graduation. Column 1 in Table

6 presents that the entry economic conditions have a negative and statistically significant effect, but relatively small in magnitude compared to the effect on the initial placement.

None of the inspections to this point has uncovered the grounds for these recessionary cohort effects. From the model and Table 3, I find that unemployment has a significant impact on the initial placements. The model further predicts that the effect will remain persistently if economists develop task-specific human capital. In other words, economists would be less likely to switch a job from the initial placement, and therefore the negative effect on entry would be permanent. Column (2) and (3) in part supports the prediction. I add a binary variable for whether one is placed in R1 university in the estimation as a control in column (2), and include initial occupation fixed effects in column (3). In both cases, the coefficient on unemployment is insignificant, and the regression model explains better the variability of the outcome. One might raise the question of whether the entry condition would serve as a signal of ability, and its importance as a signal declines over time as more information of true ability is revealed. To test whether the effect of unemployment is getting weaker with time, I perform the regression based on the specification (9) in Appendix Table 11. I could not find any gradual effect of unemployment. Instead, unemployment would have adverse effects until four years later with similar magnitude, and the significance goes away after. It might explain the relocation effect for the first four years. All the effects turn out to be insignificant after controlling for the initial placement as in column (3).

5.3 Prediction 3: Publications

I now turn to analyze the effect of entry economic conditions on the research productivity. The main measures of research output for academic economists are their publications. In fact, tenure in the economics department is heavily dependent on publication records in highly ranked journals (Heckman and Moktan 2020). I use the specification (7) to explore how the entry conditions would affect the economists' productivity. The dependent variable in the subsection is the cumulative number of articles published in the top 50 economics journals over time.

The publication records would be a good proxy for research-heavy economists' productivity. Private-sector economists and full-time professors in liberal art colleges would not have any incentive on the publications, so the sample in the estimation only includes the individuals who published at least one journal article after graduation. The negative coefficient on unemployment in column (1) indicates that, on average, the individuals are less likely to publish the articles when entry economic conditions get worse, and the estimate is significant at a 1 percent level as in Oyer (2006). The negative coefficient on female is not surprising since literature finds that

female workers would underachieve in academic careers in which long-term human-capital investment is required (Finkel et al. 1994). I see no significance on whether one achieves bachelor's degrees in the U.S.

In column (2), I control for the labor market experience. The coefficient on experience is positive and statistically significant at any level. It is not surprising given that the labor market experience is an essential input in the model. In fact, the model specifies the human capital by tasks so that I count labor market years of experience separately by occupation over time. exp 1, exp 2, exp 3, exp 4 and exp 5 correspond to R1 university, all other universities in the U.S., research organizations in the U.S., foreign institutes and private sector, respectively.

The magnitude of the coefficient in column (4) would explain the importance of publications in each occupation. Experience in R1 university largely contributes to the publications, and private sector experience would have a minor contribution. The estimate on exp 2 is smaller than exp 3 and exp 4 because the occupation consists of non-doctoral universities mostly in which publications in the top journals are not a priority. The coefficient on occupation specific experience in column (4) supports the hypothesis that economists develop task-specific human capital, otherwise the magnitude of coefficients would be similar.

The insignificant estimate on unemployment in columns (2)–(5) would supply the intuition of the role of the entry economic conditions. The main contribution of the article is determined by what time of human capital one would develop, and the human capital formation is determined by the entry economic conditions. Therefore, the bad entry conditions would have left permanent effects on the economists' careers, as the model predicts in section 2.

5.4 Validating the Model

The mechanism in the model driving the effect of the entry economic conditions onto the outcomes is the job mobility of individuals. I assume the economists develop task-specific human capital, and the model predicts that one would be unwilling to switch an occupation over time. If one did switch, the target occupation would have similar tasks compared to the source occupation. Otherwise, one would switch the occupation to mitigate the entry economic conditions. In Table 8, I examine whether individuals switch a job. The estimation is based on the specification (8). For column (1), the dependent variable is whether one ever switches the occupation within two years after graduation. Columns (2)–(4) summarize the result within the four, six, and eight years after graduation. Columns (5)–(8) summarize the result for the firm switching. The insignificant estimates on unemployment in columns (1)–(4) support the model's predictions in which one would not likely switch an occupation based on entry economic

conditions. The estimates in column (5)–(8) follow the model in (eq:eq10) as well. It predicts that if one switched, it would happen at the early stage and the tasks should be the similar. The entry economic conditions would likely make individuals switch a firm within four years after graduation. The significance of the estimates tends to go away over time. Since I find no evidence of occupation switching early, the target firm would be under the same occupations. Since all firms within the same occupation have the same tasks, those who switched a firm within the occupation develop the same task-specific human capital as before. Hence, if one graduated around the dire economic conditions, the effect would remain a long time.

6 Robustness Check

In the analysis above, I assumed that the macroeconomic conditions at the time of graduation represent an exogenous labor demand shock. That is, I assume the average quality of graduates who enters the market is not systematically associated with the economic conditions. Note that five years of study is arguably the norm of the economics Ph.D. programs. My data allow me to examine whether graduates adjust their timing of graduation to labor market conditions partially. I observe the duration of the study for 60 percent of the sample (see Figure 4). Based on the specification (8), I examine the effect of the entry economic conditions on one's decision to delay graduation. The dependent variable is an indicator for studying longer than five years. The estimates in columns (1), (3) and (4) present that the entry conditions would not affect the timing of graduation overall. However, in column (2), the coefficient on unemployment is positive and significant, and the joint F-test for rank2 and rank 3 with unemployment implies that the entry conditions would only affect the students in rank 1 programs. It makes sense because extra years of study are costly for the programs, and therefore only selected programs could afford it to their students.

If the individuals in rank 1 would have options to delay graduations, the quality of graduates in rank 1 program would be associated with the entry conditions. To test the assumption, I re run the regressions using the samples without the individuals from rank 1 programs. In columns (1)-(3), the dependent variable is whether the initial placement is at R1 university as in Table 3, and the dependent variable in column (4)-(5) is the cumulative number of publications in the top 50 economics journals as in Table 7. The magnitudes of the coefficients are changed slightly, but the result is not much different from the original regressions. The analysis would not be complete. One of the reasons is that those who recorded the start year of educations on their C.V. could be more successful. It makes it hard to predict the direction of the bias in Table 9 and 10. Furthermore, the current norm of the duration becomes six years, and the

change probably starts in this period.

7 Conclusion

Table 1: Descriptive statistics of Graduates by Department Rankings

	Overall	rank 1–10	rank 11– 23	rank 24–45
	(1)	(2)	(3)	(4)
Main independent variables				
female	0.2875	0.2512	0.3236	0.3097
	(0.4526)	(0.4338)	(0.4680)	(0.4626)
US bachelor	0.4259	0.4718	0.3978	0.3765
	(0.4945)	(0.4993)	(0.4896)	(0.4847)
Main outcome variables				
number of publications by 3 years	0.3191	0.4350	0.2402	0.2044
	(0.7351)	(0.8665)	(0.6215)	(0.5482)
number of publications by 6 years	0.8475	1.1771	0.6221	0.5222
	(1.5029)	(1.7648)	(1.2855)	(1.0385)
number of publications by 9 years	1.3592	1.9008	0.9827	0.8333
	(2.2899)	(2.7014)	(1.9366)	(1.5374)
Initial placements				
Tenure-track in R1 university	0.2325	0.3019	0.1843	0.1649
	(0.4225)	(0.4592)	(0.3879)	(0.3713)
Private Sector	0.2413	0.2267	0.2627	0.2419
	(0.4279)	(0.4188)	(0.4402)	(0.4284)
Number of Schools	32	10	10	12
ONumber of individuals	3,982	1,795	1,199	988

I collect the job market candidates from 32 universities in the US and group them into three categories by department rankings. The ranks are quoted from *econphd.net rankings 2004*. Column (2), (3) and (4) summarize those who graduated from 1–10, 11–23, 24–45 departments in the US, respectively. I count the number of cumulative publications from the top 50 economics journals for the primary analysis. Job mobility reports the probability of switching a job from the initial placement. Standard errors are in parentheses.

Table 2: Descriptive statistics on Job mobility

	(1) Overall		(2) Full time	
	occupation switch	job switch	occupation switch	job switch
2	0.059	0.101	0.038	0.067
3	0.051	0.103	0.042	0.085
4	0.047	0.092	0.043	0.086
5	0.039	0.081	0.039	0.081
6	0.042	0.079	0.042	0.080
7	0.026	0.066	0.027	0.070
8	0.036	0.067	0.038	0.071

The table reports the probability of switching occupations and firms at each year since graduation. Occupation consists of R1 university, all other universities in the U.S., research organization (or government) in the U.S., international institutes, and private sectors. Column (2) summarize the probability of job mobility for those who had a full-time job at graduation.

Table 3: The effect of economic conditions at graduation on the initial placement in R1 universities

	(1)	(2)	(3)	(4)
unemployment (β_u)	-0.0214***	-0.0285**	-0.0177**	-0.0313***
	(0.00468)	(0.0104)	(0.00655)	(0.00582)
female	0.00654	0.00569	0.00624	0.00651
	(0.0155)	(0.0145)	(0.0146)	(0.0156)
usa	0.0594***	0.0661***	0.0594***	0.0593***
	(0.0108)	(0.0114)	(0.0108)	(0.00867)
rank 2		-0.113***		
		(0.0143)		
rank 3		-0.127***		
		(0.0191)		
unemployment× rank 2 (β_1)		0.0162		
		(0.0150)		
unemployment× rank 3 (β_2)		0.00955		
		(0.0179)		
unemployment× female (β_1)			-0.0129	
			(0.0148)	
unemployment× usa (β_1)				0.0227***
				(0.00627)
P-val from F-test				
$\beta_u + \beta_1 = 0$		0.3005	0.0272	0.1538
$\beta_u + \beta_2 = 0$		0.1105		
N	3946	3946	3946	3946
R^2	0.061	0.040	0.061	0.062

Standard errors in parentheses and are clustered by cohort level.

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

Estimates are based on Eq. (8), and department and fields of study fixed effects are included in the estimation except column (2). Only fields of study fixed effect is included in column (2). *rank 2* and *rank 3* are binary variable indicating whether one graduated from 11–23 ranked departments and 24–45 ranked departments, respectively.

Table 4: The effect of economic conditions at graduation on the ranking of the initial placement

	(1)	(2)	(3)	(4)
unemployment (β_u)	-3.713	-1.578	-6.915	1.525
	(4.901)	(4.601)	(5.794)	(3.778)
female	1.802	-0.316	3.004	1.963
	(5.686)	(5.753)	(3.988)	(5.792)
usa	13.55**	7.669	13.48**	12.44**
	(4.977)	(7.184)	(5.012)	(4.255)
rank 2		114.6***		
		(9.667)		
rank 3		146.3***		
		(6.076)		
unemployment× rank 2 (β_1)		-11.35		
		(9.875)		
unemployment× rank 3 (β_2)		2.744		
		(6.769)		
unemployment × female (β_1)			10.67**	
			(3.746)	
unemployment× usa (β_1)				-9.582
				(5.835)
P-val from F-test				
$\beta_u + \beta_1 = 0$		0.1146	0.2433	0.2696
$\beta_u + \beta_2 = 0$		0.8830		
N	1304	1304	1304	1304
R^2	0.246	0.170	0.247	0.247

Standard errors in parentheses and are clustered by cohort level.

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

The dependent variable is the ranking of the placement. The department ranks are quoted from *econphd.net rankings 2004*. The sample includes those who started their career from tenure track academic position in U.S. If school is not ranked in *econphd.net rankings 2004*, I rank it as 400. Estimates are based on Eq. (8), and department and fields of study fixed effects are included in the estimation except column (2). Only fields of study fixed effect is included in column (2). *rank 2* and *rank 3* are binary variable indicating whether one graduated from 11–23 ranked departments and 24–45 ranked departments, respectively.

Table 5: The effect of initial labor market conditions on the initial placement by Fields of Study

panel a. aggregated the fields of study into Macro and Micro		
	(1)	(2)
	Macro	Micro
unemployment	-0.0200	-0.0322***
	(0.0124)	(0.00501)
female	0.00766	0.0229
	(0.0209)	(0.0172)
usa	0.0360	0.0674***
	(0.0276)	(0.0181)
N	1493	1872
R^2	0.068	0.061

panel b. Separate estimate by JEL classifications												
	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	JEL G	JEL J	JEL D	JEL I	JEL E	JEL C	JEL F	JEL M	JEL Q	JEL O	JEL H	JEL L
	Finance	Labor	Micro	Health	Macro	Quant	International	Business	Agri	Dev	Public	IO
unemployment	-0.00534	-0.0110*	-0.0464**	-0.0227	-0.0200	0.0102	-0.0958**	-0.00108	-0.0308	-0.0165	0.00349	-0.0520
	(0.0153)	(0.00514)	(0.0144)	(0.0125)	(0.0217)	(0.0349)	(0.0308)	(0.0190)	(0.0386)	(0.0309)	(0.0538)	(0.0304)
female	-0.00163	0.0189	-0.00827	0.0718	0.00385	0.0658	0.0481	-0.188	-0.153*	0.0740	-0.112	0.0251
	(0.0331)	(0.0350)	(0.0554)	(0.0414)	(0.0861)	(0.0933)	(0.0681)	(0.102)	(0.0771)	(0.102)	(0.0868)	(0.108)
usa	0.0453	0.0673***	-0.0246	0.147**	-0.00840	0.0159	-0.00288	0.106*	0.0598	0.0535	0.238	0.0913
	(0.0341)	(0.0196)	(0.0612)	(0.0539)	(0.0566)	(0.0558)	(0.0472)	(0.0499)	(0.0867)	(0.0884)	(0.135)	(0.108)
N	1028	771	366	303	259	217	205	181	130	123	106	100
R^2	0.074	0.080	0.119	0.138	0.136	0.183	0.192	0.180	0.337	0.199	0.273	0.350

Standard errors in parentheses and are clustered by cohort level.

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

Estimates are based on Eq. (8), and department fixed effect is also included in the estimation. The column (1) and (2) summarize macro and micro related fields. For macro, I include G (Finance), E (Macroeconomics and Monetary Economics) and F (International Economics). For micro, I include J (Labor), I (Health and Education), D (Microeconomics), K (Law and Economics), L (Industrial Organization), R (Urban), O (Agriculture) and H (Public Economics).

Table 6: The effect of economic conditions at graduation on the later placement in R1

	(1)	(2)	(3)
unemployment	-0.0108*	0.00285	-0.00139
	(0.00497)	(0.00444)	(0.00171)
female	-0.00723	-0.0122	-0.0172***
	(0.0124)	(0.00694)	(0.00479)
usa	0.108***	0.0702***	0.0353**
	(0.0121)	(0.0110)	(0.0107)
R1 university		0.683***	
		(0.0178)	
N	50338	50338	50338
R^2	0.065	0.452	0.607

Standard errors in parentheses and are clustered by cohort level.

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

Estimates are based on Eq. (7), and the dependent variable is whether one works at the tenure-track position in R1 at time t. Department, fields of study, and labor market experience fixed effects are included in all estimations. Column (3) further include the initial occupation fixed effects. R1 university is an indicator for whether one's initial placement is R1 university or not.

Table 7: The effect of economic conditions at graduation on the number of publications in Top 50 economics journals

	(1)	(2)	(3)	(4)	(5)
unemployment	-0.360***	-0.0502	-0.0479	-0.0608	-0.0443
	(0.0965)	(0.0526)	(0.0509)	(0.0459)	(0.0450)
female	-0.231**	-0.251**	-0.251**	-0.304***	-0.304***
	(0.0837)	(0.0762)	(0.0763)	(0.0771)	(0.0773)
usa	0.0184	0.0575	0.0573	-0.0590	-0.0685
	(0.0824)	(0.0917)	(0.0919)	(0.0710)	(0.0718)
exp		0.344***			
		(0.00924)			
exp 1				0.477***	
				(0.0182)	
exp 2				0.217***	
				(0.0149)	
exp 3				0.287***	
				(0.0203)	
exp 4				0.289***	
				(0.0149)	
exp 5				0.122***	
				(0.0189)	
N	22711	22711	22711	22711	22711
R^2	0.075	0.358	0.360	0.436	0.444

Standard errors in parentheses and are clustered by cohort level

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

Estimates are based on Eq. (7), and the dependent variable in the subsection is the cumulative number of articles in the top 50 economics journals over time. Department and fields of study fixed effects are included in the estimations. Column (3) further includes experience fixed effects, and column (5) includes occupation experience fixed effects. The sample includes those who publish at least one article in top 50 economics journals. experience is the years of labor market experience after graduation. exp 1, exp 2, exp 3, exp 4 and exp 5 count separately the years of labor market experience on the occupations.

Table 8: The effect of economic conditions at graduation on the Job mobility

	Occupation switching				Firm switching			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2 years	4 years	6 years	8 years	2 years	4 years	6 years	8 years
unemployment	-0.00226	0.00312	0.00145	-0.00189	0.0152***	0.0138*	0.00728	0.00681
	(0.00597)	(0.00771)	(0.00853)	(0.00943)	(0.00402)	(0.00743)	(0.00791)	(0.00770)
female	0.00563	0.000349	0.0176	0.0104	0.0179*	0.00352	0.00134	-0.00552
	(0.00687)	(0.0123)	(0.0186)	(0.0182)	(0.00820)	(0.0171)	(0.0154)	(0.0140)
usa	0.000500	-0.00411	-0.00281	-0.0148	0.0349*	0.0336	0.0292	0.00909
	(0.00748)	(0.0104)	(0.0130)	(0.0126)	(0.0185)	(0.0217)	(0.0220)	(0.0165)
N	3918	3918	3918	3918	3918	3918	3918	3918
R^2	0.019	0.019	0.017	0.014	0.023	0.021	0.013	0.014

Standard errors in parentheses and are clustered by cohort level.

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

Estimates are based on Eq. (8), and department and fields of study fixed effects are included in the estimation. The dependent variable is a binary indicator for whether one switches the occupation or the firm from the initial placements over time. For column (1), the dependent variable is whether one ever switches the occupation within two years from graduation. Column (2)–(4) summarizes the result after the four, six, and eight years after graduation. Column (5)–(8) summarize the result for the firm switching. Occupation consists of R1 university, all other universities in the U.S., research organization (or government) in the U.S., international institutes, and private sectors.

Table 9: The effect of economic conditions on delaying graduation

	(1)	(2)	(3)	(4)
unemployment (β_u)	0.0246	0.0486*	0.0243	0.0209
	(0.0136)	(0.0240)	(0.0167)	(0.0161)
female	0.0211	0.0103	0.0210	0.0211
	(0.0143)	(0.0149)	(0.0145)	(0.0142)
usa	-0.0224	-0.0259	-0.0224	-0.0226
	(0.0359)	(0.0359)	(0.0359)	(0.0359)
rank 2		0.0101		
		(0.0283)		
rank 3		-0.0165		
		(0.0397)		
unemployment× rank 2 (β_1)		-0.0277		
		(0.0166)		
unemployment× rank 3 (β_2)		-0.0602		
		(0.0448)		
unemployment × female (β_1)			0.000804	
			(0.0161)	
unemployment × usa (β_1)				0.00838
				(0.0297)
P-val from F-test				
$\beta_u + \beta_1 = 0$		0.2436	0.0759	0.2618
$\beta_u + \beta_2 = 0$		0.6920		
N	2372	2372	2372	2372
R^2	0.069	0.027	0.069	0.069

Standard errors in parentheses and are clustered by cohort level.

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

Estimates are based on Eq. (8), and department and fields of study fixed effects are included in the estimation except column (2). Only fields of study fixed effect is included in column (2). The dependent variable is whether one studied longer than 5 years. The samples are limited since the records of the starting year of Ph.D. are partial. *rank 2* and *rank 3* are binary variable indicating whether one graduated from 11–23 ranked departments and 24–45 ranked departments, respectively.

Table 10: Robustness Check: Regressions without graduates from rank 1 school

	(1) R1 university	(2) R1 university	(3) R1 university	(4) pubs	(5) pubs
unemployment (β_u)	-0.0172**	-0.0179**	-0.0332***	-0.301***	-0.0586
	(0.00741)	(0.00708)	(0.00634)	(0.0748)	(0.0476)
female	0.0189	0.0189	0.0201*	-0.177*	-0.254**
	(0.0105)	(0.0105)	(0.0105)	(0.0906)	(0.0914)
usa	0.0643**	0.0644**	0.0644**	-0.0672	-0.177
	(0.0259)	(0.0260)	(0.0211)	(0.146)	(0.116)
unemployment × female (β_1)		0.00213			
		(0.00979)			
unemployment × usa (β_1)			0.0412*		
			(0.0196)		
P-val from F-test					
$\beta_u + \beta_1 = 0$		0.2079	0.6621		
N	2150	2150	2150	10667	10667
R^2	0.053	0.053	0.056	0.059	0.389

Standard errors in parentheses and are clustered by cohort level.

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

Estimates in column (1)-(3) are based on Eq. (8), and department and fields of study fixed effects are included in the estimation. The dependent variable for column (1)-(3) is whether one started the career in R1 university. Estimates in column (4)–(5) are based on Eq. (7), and department and fields of study fixed effects are included in the estimation. Column (5) further includes occupation experience fixed effects. The dependent variable for column (4)–(5) is the cumulative number of articles published in the top 50 economics journals. The journal ranks are quoted from *IDEAS/RePEc Simple Impact Factors for Journals*.

Table 11: Appendix?

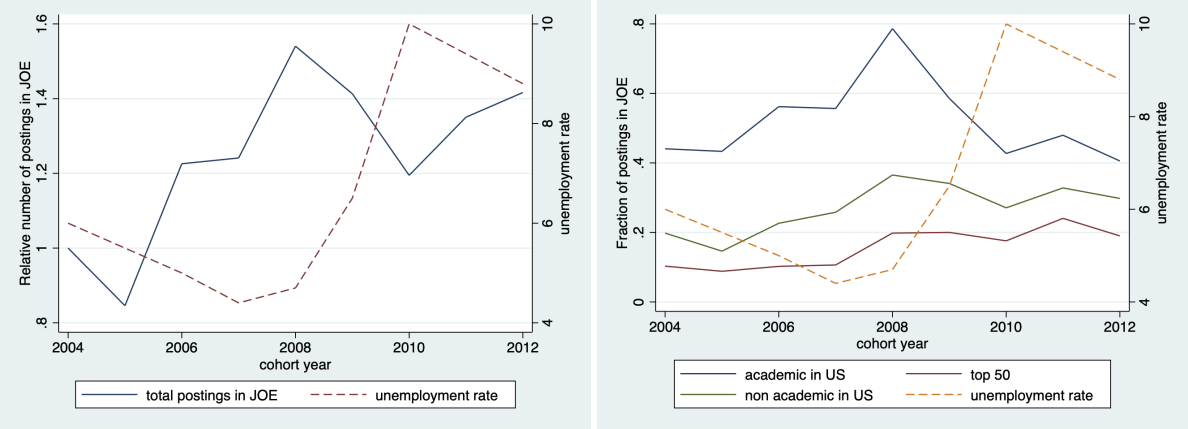
	(1)	(2)	(3)
unemployment × exp 0	-0.0141**	-0.0145**	0.00118
	(0.00610)	(0.00609)	(0.00407)
unemployment × exp 2	-0.00951	-0.0121*	0.00359
	(0.00801)	(0.00565)	(0.00480)
unemployment × exp 4	-0.0104	-0.0114*	0.00428
	(0.00573)	(0.00579)	(0.00532)
unemployment × exp 6	-0.00852	-0.00762	0.00803
	(0.00584)	(0.00511)	(0.00553)
unemployment × exp 8	-0.00990	-0.00694	0.00871
	(0.00860)	(0.00455)	(0.00526)
female	-0.00685	-0.00685	-0.0116
	(0.0139)	(0.0139)	(0.00664)
usa	0.100***	0.100***	0.0549***
	(0.00899)	(0.00899)	(0.00808)
R1 university			0.773***
			(0.00898)
N	19590	19590	19590
R^2	0.062	0.063	0.541

Standard errors in parentheses and are clustered by cohort level.

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

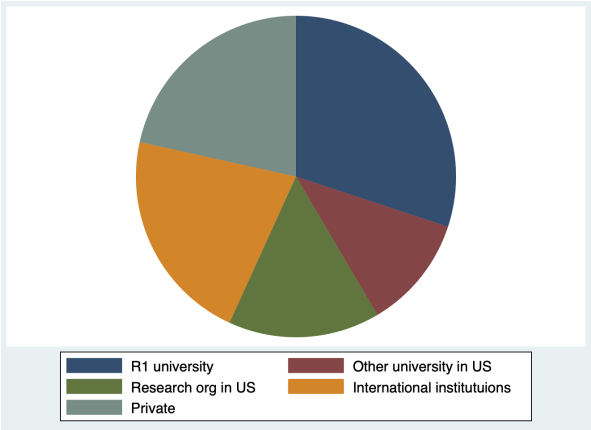
Estimates are based on Eq. (9), and the dependent variable is whether one works at the tenure-track position in R1 at time t. Department, fields of study, and labor market experience fixed effects are included in all estimations. Column (2) and (3) further include fixed effects for exp 0, exp 2, exp4, exp6 and exp8. R1 university is an indicator for whether one's initial placement is R1 university or not.

Figure 1: Macroeconomic Conditions and JOE Listings



For the left panel, *total postings in JOE* is the number of postings in JOE by an academic year, and unemployment rate is the U.S. unemployment rate as of October. The former is normalized so that 2004 $=$ 1. The right panel dissects the number of total postings. *academic in US* is the fraction of the total postings into full-time academic postings in US. *top 50* is the fraction of the total postings into full-time academic postings in top 50 universities in U.S. non academic in US is the fraction of the total postings into full-time non-academic postings in US. Note that all the numbers in the right panel except unemployment rate is normalized based on 2004.

Figure 2: Distribution of the Initial Placements



The figure summarizes the distribution of intitial placements. The percent of R1 university, other university in US, resaerch organization in US, international institutes and private sectors are: 30%, 11%, 15%, 22%, 22%

Figure 3: Job mobility over career

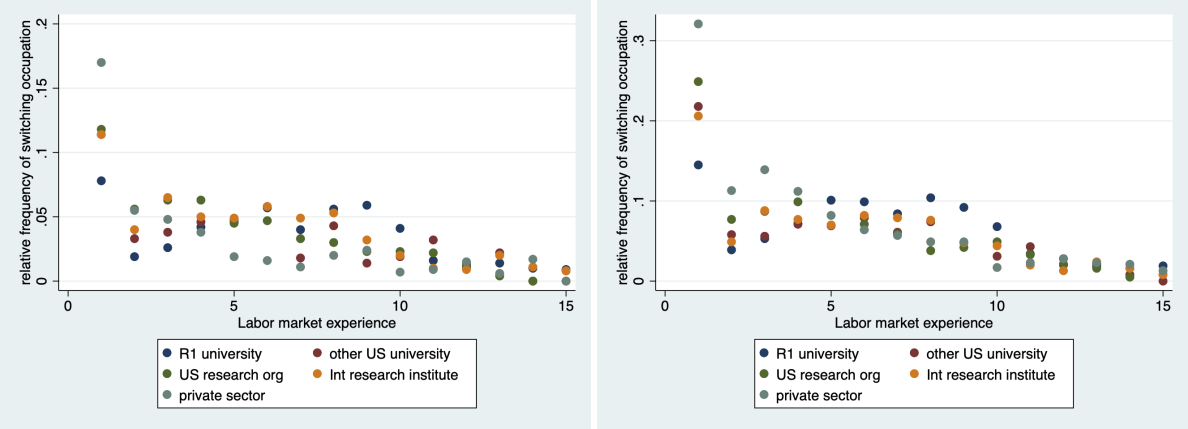
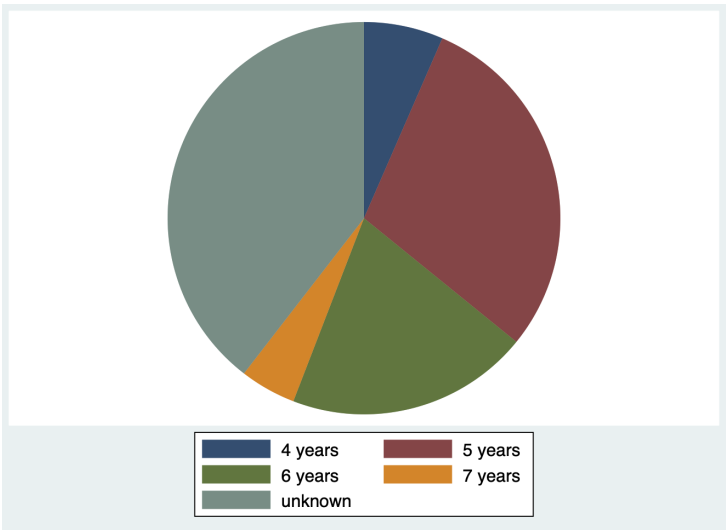


Figure graphs the job mobility over career by the initial occupation. The left panel shows the probability of switching an occupation over time from the initial occupation. The right panel shows the probability of switching a firm over time from the initial occupation. Both graphs exclude part-time worker in the occupation.

Figure 4: Distribution of the Year of Study



The figure summarizes the availablity of years of study.

APPENDIX A. TECHNICAL APPENDIX

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APPENDIX A.

Table 12: Descriptive statistics of Graduates by JEL classifications

JEL classificaitons	fields of study	rank 1 (%)	rank 2 (%)	rank 3 (%)
G	Financial Economics	27.05	27.47	22.01
J	Labor	18.27	21.46	18.29
D	Microeconomics	9.13	9.71	8.79
I	Health, Education	8.16	7.03	7.44
C	Mathemathical methods	6.15	3.89	5.86
M	Business	5.17	3.89	4.59
E	Macroeconomics	5.00	7.31	7.68
F	International Economics	4.42	5.00	5.94
O	Development	3.73	2.78	2.93
H	Public	2.99	2.96	2.53
L	IO	2.81	2.13	2.77
Q	Agriculture and Environment	2.47	2.59	5.15
K	Law	0.92	0.56	0.40
R	Urban	0.92	1.11	2.61
N	History	0.69	0.65	0.55
P	Economic System	0.63	0.19	0.40

To classify fields of study, I use grduates' ProQuest dissertation information: title, classification code, abstracts, identifiers, and subjects. See appendix for technical details. The each column summariz those who graduated from 1–9, 10–19, 20–45 departments in U.S., respectively.

Table 13: Classes: hours per week teaching credit classes

	1-3 hours (%)	4-7 hours (%)	More than 7 hours (%)
Estimates			
Total	22.4	27.8	49.8
Institution: level			
2-year	18.3	23.7	58
4-year non-doctoral granting	18.6	23.5	57.9
4-year doctoral granting	27.4	33.1	39.6

Source: U.S. Department of Education, National Center for Education Statistics, 2004 National Study of Post secondary Faculty