Initial Labor Market Conditions, Social Networks and Career Achievements: Evidence from the Economics Discipline [*]

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Abstract

This paper studies the impacts of initial labor market conditions on economists' early-career co-authorship networks and academic achievements. The identification leverages the plausibly exogenous variation in labor market conditions at initial entry, instrumented by predicted year of graduation unemployment rates. Utilizing new data collected on U.S. economics Ph.D. candidates from the top 10 departments, their co-authorship in the top 5 journals, and NBER affiliation, I find that economists graduating during adverse initial labor market conditions develop more extensive co-authorship networks and increase research output in their first five years post-graduation, with the difference diminishing afterward. The findings suggest that economists graduating during the Great Recession, who are male and non-US citizens, face reduced probabilities of securing tenure at top-ranked economics departments compared to their non-recession counterparts. Furthermore, heterogeneity analysis reveals that adverse initial labor market conditions primarily affect economists who are white, male, non-US citizens, or graduating from Tier 1 schools. I also explore the mechanisms behind the effects. The results indicate that increased extrinsic motivation may boost early-career social networks and research output, while anticipated tenure and post-doctoral pursuits may partially explain the later impact reversal. Moreover, underperformance in non-research factors may account for reduced tenure prospects at top economics departments as research contributions remain statistically indifferent.

Keywords: Labor Market Conditions, Social Networks, Research Output, Economists.
JEL Classification: A11, D85, E32, I23, J22, J24, J44.

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"Necessity is the mother of invention."

— Plato

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1   Introduction

The Great Recession ended over a decade ago, yet researchers continue to explore its enduring impact. While economists have conducted a substantial amount of work examining the effects of graduating during a recession on wages, other outcomes that hold significant implications for social welfare remain underexplored. For instance, how do labor market conditions affect the allocation of talent and the motivation of new researchers, thereby shaping the generation of new ideas?[1] Moreover, given the productivity-enhancing effects of collaborators (Ductor (2015)), how do labor market conditions influence the formation of researchers' social networks?

In this paper, I aim to investigate these questions within the context of academia. There are two advantages in examining the specific occupation: (1) I can accurately and directly measure innovation (i.e., research output) of specific individuals, and (2) the demand for academic publications plausibly exhibits limited responsiveness to the business cycle. Furthermore, by focusing on academia, I can precisely identify and quantify individuals' co-authorship networks, a dimension often unobserved for researchers in other occupations.

Specifically, the paper investigates the impacts of initial labor market conditions on young economists' early-career co-authorship networks and academic achievements such as research output and the attainment of tenure. I leverage the plausibly exogenous variation in the labor market conditions at economists' initial entry as a natural experiment to identify the effects. Although economists are unlikely to alter the macro-level conditions systematically, they might strategically time their entry into the job market in response to prevailing economic conditions, which leads to an endogeneity concern. For example, if higher-ability economists excel in both timing market entry and conducting research compared to their counterparts, this can lead to an issue of omitted variable bias. To address this challenge, I employ an instrumental variable strategy, using the labor market conditions of the predicted graduation year as an instrument for the actual graduation year's labor market conditions. The predicted graduation year is determined by the Ph.D. program's start year plus its average duration. Since the predicted year of graduation is not determined by individual economists, it helps eliminate potential selection biases

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[1]Note that empirical evidences suggest that the production of innovative ideas leads to large, positive social externalities. (e.g., Nadiri (1993), Jones and Williams (1998))

arising from their responses to market conditions.

To measure the outcomes of interest, I collect and construct three novel datasets: (1) *Ph.D. Candidate*, (2) *Top 5 Co-authorship Network*, and (3) *NBER Affiliated Scholar*.[2] The novel datasets enable me to assess co-authorship networks and academic achievements across multiple dimensions. For the co-authorship networks, I construct variables representing either the source of social network formation or the established co-authorship networks. For the academic achievements, I define variables that capture economists' high-quality research output (i.e., top 5 journal publications) and the probability of obtaining tenure. Plus, I generate variables from the novel datasets that reflect economists' mobility and initial occupational categories for the mechanism analysis. In addition, following the literature (e.g., Kahn (2010), Oreopoulos et al. (2012)), I employ the national unemployment rates in the U.S. as the primary measure of the labor market conditions. Additionally, given the significance of potential authors capable of publishing papers in the top 5 economics journals and the variation in initial labor market conditions, the main sample focuses on economists graduating from the top 10 economics departments in the United States during the academic year 2009-2015.[3]

I discuss two sets of findings. First, I present the results of economists' co-authorship networks. The results suggest that graduating during a period of elevated unemployment rates, on average, increases the likelihood of an economist being appointed as an NBER fellow and collaborating with other economists who are capable of publishing in top 5 economics journals, and also expands an economist's top 5 journal co-authorship networks. Moreover, the effects on the cumulative social network outcomes gradually increase up to the fourth year after graduation and then stabilize. However, the estimates become statistically insignificant over a longer period at the extensive margin. The findings indicate that the effects can be attributed to the disparity between recession and non-recession economists[4] during the initial four years since initial labor market conditions have no statistically significant impact on yearly social network outcomes beyond six years.

Second, I present the results of economists' academic achievements. I find that the average economist who entered the labor market during unfavorable labor market condi-

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[2]The Ph.D. Candidate dataset includes information on all candidates from the top 10 U.S. economics departments during the academic years 2009-2015. The Top 5 Co-authorship Network dataset includes information on co-authorship in the top 5 economics journals during the academic years 2009-2022. The NBER Affiliated Scholar dataset includes information on all NBER-affiliated scholars during the academic years 2009-2022.

[3]Some of the data collection for this project was informed by a larger study led by Randall Ellis and colleagues at Boston University, which examines related issues using U.S. economics department sample.

[4]Recession economists are defined as those who graduated during a recession (i.e., adverse labor market conditions), while non-recession economists are defined as those who did not graduate during a recession.

tions is more likely to publish and have higher publication counts in the top 5 economics journals. Similar to social network outcomes at the extensive margin, the effects on the cumulative research output remain statistically significant up to the fourth year after graduation, beyond which the estimates become less reliable at both margins. Moreover, the impact of graduating during a recession on yearly publications diminishes beyond five years after graduation. Furthermore, the findings indicate that adverse initial labor market conditions reduce the likelihood of obtaining tenure at the top 20 academic institutions, especially for economists who are male and non-US citizens.

Additionally, I conduct robustness checks from three different perspectives. The results suggest that the findings are not sensitive to the number of clusters, the alternative measure of initial labor market conditions, and the restricted sample. I further investigate the heterogeneity in the effects of initial labor market conditions. The results imply that the effects of the elevated unemployment rates are primarily driven by economists who are white, male, non-US citizens, or graduating from Tier 1 schools.[5]

I also explore the potential mechanisms underlying the effects of initial labor market conditions. First, the increased extrinsic motivation stemming from the expectation of heightened competition due to adverse initial labor market conditions may provide an explanation for the rise in social networks and research output during the initial four years following graduation. The reason is that increased extrinsic motivation can encourage economists to invest more effort in nurturing peer engagement and acquiring task-specific skills (i.e., research skills). Second, the reversal of the effects on research output in subsequent years could be attributed to two channels: the anticipated attainment of tenure for recession economists and the increased probability of pursuing post-doctoral positions for non-recession economists. Regarding the attainment of tenure, if recession economists anticipate securing tenure soon, they might decrease their research efforts, resulting in diminished research output. Regarding the post-doctoral position, if economists choose to pursue post-doctoral positions, they may experience an enhanced likelihood of securing academic employment and enriching their human capital, thereby fostering an increase in research output. Third, the finding that recession economists face a diminished likelihood of achieving tenure at the top 20 academic institutions may be explained by their comparatively weaker performance in non-research factors (e.g., institutional service and collegial relationships) in determining tenure attainment when research contributions remain statistically indifferent.

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[5]Tier 1 schools are defined as the top 5 universities (Harvard University, MIT, University of Chicago, Princeton University, and Stanford University) according to Tilburg University's Top 200 Worldwide Economics Schools Research Ranking, which assesses research contributions from 2010 to 2015.

My work contributes to two branches of research. The first is the literature examining the impacts of initial labor market conditions on young workers newly entering the job market (e.g., Oyer (2006), Kahn (2010), Oreopoulos et al. (2012), Altonji et al. (2016), Currie and Schwandt (2014), Maclean (2013), Schwandt and Von Wachter (2019), Schwandt and Von Wachter (2020)). This paper makes contributions in three aspects. First, I examine outcomes such as social networks and innovations that have been relatively underexplored in the existing literature. However, they play a vital role in understanding the early-career success of young workers and the policy implications related to mitigating the impact of recessions. To the best of my knowledge, the paper provides the first empirical evidence regarding the impact of initial labor market conditions on social networks. Second, I contribute to the literature by providing empirical evidence on the impact of graduating into the Great Recession, a more severe economic crisis, on Ph.D. economists' early-career achievements. Third, the paper contributes to the literature by introducing novel datasets that enable me to identify the year of labor market entry precisely and to study the differential effects of initial labor market conditions.

The second branch of literature this paper contributes to is investigating the formation of social networks among economists (e.g., Jackson et al. (2008), Goyal et al. (2006), Anderson and Richards-Shubik (2022)). The paper contributes to this literature by presenting empirical evidence on how different initial labor market conditions can affect economists' social capital and their position within the co-authorship networks of the top 5 economics journals.

The remainder of the paper is structured as follows. Section 2 introduces background of co-authorship among economists, related studies review, and the theories implying the effects of initial labor market conditions. Section 3 introduces the data and empirical approach. Section 4 presents the main results, robustness checks and the heterogeneous effects. Section 5 discusses the potential mechanisms for the effects of initial labor market conditions. Section 6 discusses the two potential threats to the internal validity of the results. Section 7 concludes and discusses the limitations of the paper.

2 Background and Expected Effects of Initial Labor Market Conditions

In this section, I start by documenting patterns of economists' co-authorship in the top 5 economics journals. Then, I present an overview of the relevant literature and discuss the paper's contribution. Lastly, I briefly introduce the theories that can imply the impact of initial labor market conditions on the outcomes of interest.

2.1. Co-authorship Among Economists

While the number of coauthors[6] among economists may not be as high as in fields such as computer science and medicine (e.g., Newman (2004), Sampaio et al. (2016)), there is a noticeable shift in economists' preferences towards co-authorship and a growing interest in teamwork. Figure 2 displays the trends in terms of the number of authors per paper in the top 5 economics journals (i.e., AER, QJE, Econometrica, JPE, and REStud), from 1990 onwards. The percentage of single-authored papers decreased from 48% in 1990 to 17% in 2021, while the prevalence of papers with multiple authors has been steadily increasing. Plus, there has been an upward trend in the occurrence of papers with four or more authors since 2010.[7] This is consistent with Anderson and Richards-Shubik (2022), suggesting that the trend towards larger research teams in economics is expected to persist due to the high impact of journal publications and the reduction in communication and coordination costs due to new technologies.

Moreover, Goyal et al. (2006) examine the evolution of social distance among economists from 1970 to 2000 and find that the distance between them has declined significantly (i.e., an emerging small world). Figure 3 supports the observation that economists experience a growing level of connectivity and centrality within the network by showcasing the dynamic evolution of an economist's top 5 co-authorship network (within a network distance of 2) from AY2011 to AY2020.[8]

Nevertheless, the development of the social network of the top 5 economics journals in economics is uneven across academic institutions. Appendix Figure 4 shows that economists affiliated with the top 50 US universities play a disproportionately crucial role in the co-authorship network of the top 5 economics journals, accounting for approximately two-thirds of the authors between AY2010 and AY2022. This can be attributed, at least partially, to the inbreeding behavior demonstrated in Figure 4. In the 2-authors

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[6]As appendix figure 1 indicates, the majority of papers published in top 5 economics journals are authored by either two or three economists.

[7]Appendix figure 2 plots similar trends for each individual journal. I observe similar patterns across the top 5 economics journals.

[8]"AY" is an abbreviation that stands for "academic year".

case, for example, I observe that economists affiliated with the most prestigious schools (e.g., top 10 US schools) are more likely to collaborate with economists from similar-level affiliations (e.g., top 20 US schools or top-tier schools outside of the US). That being said, the collaboration segregation persists among academic institutions.

2.2. Related Studies Review

My work contributes to two branches of research. The first is the literature that quantifies the effects of initial labor market conditions on new entrants to the job market. The empirical studies examining the impact of the higher unemployment rates on young workers' earnings have undergone significant development over the past two decades. The consensus findings indicate that graduating during a period of unfavorable labor market conditions leads to a persistent reduction in young workers' earnings. For example, Kahn (2010) reveals that US college graduates who entered the labor market during the severe recession of the early 1980s experienced enduring earnings declines that persisted for a duration of up to 15 years. Furthermore, using a large longitudinal university-employer-employee dataset, Oreopoulos et al. (2012) find that unlucky graduates in both the US and Canada experience enduring reductions in earnings, spanning a decade. And the less advantaged graduates' earnings can be permanently impacted by cyclical downgrading. Additionally, Altonji et al. (2016) study the same question by the field of study and discover that US graduates with high-paying majors experienced relatively smaller effects on various labor market outcomes, widening earnings inequality across different fields of study. They also find that the effect of the Great Recession on early earnings reduction is much larger due to the cyclical sensitivity of demand for college graduates.

The existing literature has expanded its focus beyond earnings to investigate the effect of higher unemployment rates on various outcomes. For instance, Currie and Schwandt (2014) point out that women's fertility decisions during their early 20s are particularly sensitive to high unemployment rates in the short term, with the negative effects on fertility growing over time. Moreover, Maclean (2013) reveals that male graduates during the early 1980s recession exhibit poorer health conditions at the age of 40, whereas female graduates experience reduced depressive symptoms at the age of 40. Plus, using large cross-sectional datasets, Schwandt and Von Wachter (2019)'s result suggests that graduating in a recession raises the receipt of Medicaid and Schwandt and Von Wachter (2020)'s finding indicates that cohorts reaching adulthood during the profound recession of the early 1980s face elevated mortality risks, with the effects becoming evident in their late 30s and progressively intensifying until reaching the age of 50.

This paper makes contributions to the existing literature in three key aspects. First,

I study a novel set of outcomes that have received relatively limited attention in the existing literature but are crucial for understanding the early-career success of young workers and the policy implications associated with addressing recessions. For example, to the best of my knowledge, this paper provides the first empirical evidence regarding the impact of initial labor market conditions on social networks. Additionally, while Oyer (2006) and Shu (2012) also examine the impact of business cycles on research output, the methodology in this paper is more credible because I explicitly tackle the potential endogeneity in timing the year of market entry through the instrumental variable strategy.[9] Second, I contribute by providing evidence of the impact on economists who graduated into the Great Recession,[10] which adds to the existing literature that primarily focuses on the effects of the early 1980s recession. Last, I contribute to the literature by providing novel datasets which enable me to: (1) precisely identify the timing of labor market entry, addressing concerns regarding potential endogenous timing (i.e., a crucial aspect that all studies of this nature must deal with), (2) study the differential effects of initial labor market conditions across multiple dimensions (e.g., race, gender, nationality and the tier of graduating school), offering insights into the impacts of such conditions.

The work is most closely related to Oyer (2006), who investigates the relationship between macroeconomic conditions at graduation and long-term outcomes for PhD economists over the period spanning 1980 to 2000. This paper differentiates itself from his work in terms of the time period examined, methodology employed, and the primary measure adopted to proxy labor market conditions. In contrast to Oyer (2006)'s finding based on OLS estimates, the IV estimates show that adverse initial labor market conditions do not exert a statistically significant impact on economists' probability of being placed at top 50 academic institutions in my sample. This implies that economists may indeed respond to economic conditions when timing their market entry, at least during the Great Recession. Furthermore, my work is related to Shu (2012). While her focus is solely on undergraduates from MIT between 1980 and 2005, my study, focusing on PhDs, yields similar results, suggesting that higher initial unemployment rates enhance the productivity of new graduates.

The second branch of research I contribute to is a fast-growing literature that examines the formation of social networks among economists (e.g., Jackson et al. (2008), Goyal et al.

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[9]The comparison between table 4 & 5 (i.e., IV estimates) and appendix table 2 (i.e., OLS estimates) implies that I cannot reject that possibility that economists strategically time the market entry at least in my sample because the coefficients are significantly different regarding magnitude and/or significance.

[10]The Great Recession was more severe and had a broader impact on the global economy compared to the 1980 recession. Altonji et al. (2016) also studies the impact of graduating into the Great Recession on earnings.

(2006), Anderson and Richards-Shubik (2022)). Ever since Mark Newman's (e.g., Newman (2003)) pioneer work in studying networks, the literature shown significant interest in the application of networks. Among others, Matthew Jackson has made substantial contributions to advancing the study of social networks in economics research.[11] I contribute to the literature by providing empirical evidence on how pure luck, triggered by initial labor market conditions, can affect the formation of economists' social capital (e.g., coauthors) and reshape the importance of an economist in their social networks (i.e., measured by degree centrality and betweenness centrality).

2.3. The Expected Effects of Initial Labor Market Conditions

The predictions stemming from theories regarding the expected effects of graduating during a recession remain ambiguous. I start by elucidating the components that determine the disparity in the outcome of interest. Then, I briefly present three types of theories that can suggest the impact of initial labor market conditions.

2.3.1. Decomposing Disparities in Outcomes of Interest

Taking research output as an illustrative example, the conceptual framework applies seamlessly to social networks. Assuming the supply of economists, denoted as N, remains constant throughout academic years in response to initial labor market conditions. Furthermore, assuming economists within the private sector[12] have zero top 5 publications.[13] The setup is presented in the following 2 x 2 matrix,

	Recession		Non-Recession	
	# of economist	# of top 5 publication each econ	# of economist	# of top 5 publication each econ
Private	a	0	b	0
Non-Private	$N - a$	c_i	$N - b$	d_j

where a and b are the number of economists who went to the private sector upon graduation during periods of recession and non-recession, respectively. c_i and d_j are research outputs for each economist graduating during periods of recession and non-recession, respectively.

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[11] For example, Jackson and Watts (2002), Jackson and Wolinsky (2003), and Jackson et al. (2008).

[12] I classify private sector jobs as non-publication-oriented occupations, while occupations like those in academia, where research and publishing play a significant role, are designated as publication-oriented (i.e., non-private sector jobs).

[13] While economists within the private sector may possess top 5 publications, I can standardize their publication counts to zero for the purpose of normalization.

The computation of the average economist's research output, represented by RO, is outlined as follows:

$$RO_{recession} = \frac{(a \times 0 + \sum_{i=1}^{N-a} c_i)}{N} = \frac{\sum_{i=1}^{N-a} c_i}{N}$$

$$RO_{non-recession} = \frac{(b \times 0 + \sum_{j=1}^{N-b} d_j)}{N} = \frac{\sum_{j=1}^{N-b} d_j}{N}$$

Then, the discrepancy in research output between an economist graduating during a recession and one graduating during a non-recession period, $RO_{recession} - RO_{non-recession}$, is defined as follows,

$$= \frac{\sum_{i=1}^{N-a} c_i - \sum_{j=1}^{N-b} d_j}{N} = \frac{\bar{c} \times (N-a) - \bar{d} \times (N-b)}{N}$$

$$= \frac{(\bar{c} - \bar{d}) \times \overbrace{(N-a)}^{>0} - \overbrace{\bar{d}}^{>0} \times (a-b)}{\underbrace{N}_{>0}}$$

where $\bar{c}$ and $\bar{d}$ are the average recession and non-recession economists' research outputs, respectively.

Therefore, the discrepancy in research output can be decomposed into two components: the discrepancy in the number of economists within the private sector, $(a - b)$, and the discrepancy in the productivity of the average economist, $(\bar{c} - \bar{d})$. Initial labor market conditions can potentially influence the discrepancy through these two components.

2.3.2. Predictions of the Effects of Initial Labor Market Conditions

The first prediction is based on search theory, discussed by Kahn (2010), suggesting that economists graduating during a recession are unlikely to experience persistent negative consequences. This is because an exogenous impediment to the job-matching process caused by adverse initial labor market conditions can be overcome if employees can swiftly change jobs as the economy recovers. Put differently, the equilibrium in the outcome of interest between recession economists and non-recession economists will be attained if the impediments to changing employers are minimal, resulting in no impact from unfavorable initial labor market conditions.

The second prediction based on theories such as firm-specific human capital models (e.g., Lazear (2009)) and task-specific human capital models (e.g., Gibbons and Waldman (2004), Gibbons and Waldman (2006)), proposed by Oyer (2006), argues that adverse initial

labor market conditions negatively influence economists through the initial job placement. A less favorable state of the economy is associated with a lower likelihood of being placed in high-quality[14] job positions, and securing a less favorable job position is correlated with limited access to resources (e.g., funding opportunities and influential colleagues), which imposes constraints on economists' career achievements. Keeping an economist's productivity (social networks) unchanged, I anticipate that adverse initial labor market conditions will negatively affect the average economist's research output (social networks) by allocating more economists to non-publication-oriented occupations.

The third prediction is derived from the job competition model (e.g., Thurow (1975), Reder (1955)), discussed by Devereux (2002), which suggests that economists can be influenced by variations in skill levels arising from the competition triggered by labor market conditions. The idea that new hires within occupations tend to possess enhanced skills during a recession can be explained by the fact that the labor market is perceived as a hierarchical structure, wherein workers compete for top-tier positions in the job hierarchy. This channel corresponds to the second component: the average economist's productivity (social networks), implying the positive impact of adverse initial labor market conditions.

3 Data and Empirical Approach

In this section, I provide an overview of the datasets used, as well as the measures of the outcomes of interest and the key independent variable - initial labor market conditions. Furthermore, I present the econometric model and discuss the identification strategy. Finally, I describe the summary statistics of the key variables.

3.1. Data and Measurements

3.1.1. Data

I collect and construct three novel datasets for the analysis: *PhD Candidates* dataset, which provides detailed information on economists graduated from the top 10 US economics departments[15] during AY2009-AY2015; *Top 5 Co-authorship Network* dataset, which provides information on the construction of the co-authorship networks; *NBER Affiliated Scholar* dataset, which provides information on the year of becoming an affiliated scholar along with the corresponding programs.[16] Please refer to appendix A for detailed in-

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[14]In my setting, a high-quality job is defined regarding whether it is publication-oriented.

[15]I specifically focus on the top 10 US economics departments because candidates from non-top 10 schools have shown limited top 5 publications during their early careers, making them an unsuitable population for studying the social network of top 5 economics journals.

[16]The dataset from the top 5 economics journals is employed to construct the co-authorship networks established, whereas the dataset of NBER affiliated scholars is utilized to capture the sources contributing

formation on datasets and variables construction. Additionally, the analysis utilizes the national monthly unemployment rate data from *U.S. Bureau of Labor Statistics* and the listing of (academic) jobs data from *Job Openings for Economists* in American Economic Association Papers & Proceedings.

3.1.2. Social Network Measurements

I measure economists' co-authorship networks from two perspectives: (1) sources contributing to the development of social networks and (2) the actual social networks established.

Source of social network formation. This measure of social network reflects the potential of cultivating social connections. The National Bureau of Economic Research (NBER), the leading research organization dedicated to economic research, offers a platform for junior economists to connect with potential research coauthors. I define a dummy variable, NBER Fellow, which equals one if an economist is appointed as an NBER fellow. Furthermore, I distinguish the variable across two (not mutually exclusive) periods: whether being an NBER fellow within three years since graduation and whether being an NBER fellow during a 7-year tenure-track period.[17]

Metrics of social network established. I adopt two metrics to measure social networks. The first metric quantifies the number of coauthors publishing in the top 5 economics journals.[18] The variable, at the extensive margin, is defined as a dummy variable that captures the probability of having top 5 journal coauthors,[19] and the variable, at the intensive margin, is defined as the actual number of top 5 journal coauthors. Likewise, I distinguish two variables across a 3-year- and 7-year periods. The second metric, following Jackson et al. (2008) and Freeman (1977), involves quantifying the importance of an economist in their co-authorship networks[20] of the top 5 economics journals. That is, degree centrality and betweenness centrality.[21]

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to the formation of the social networks.

[17]I also plot the results for the cumulative outcomes (i.e., social networks and academic achievements) from the first year to all seven years after graduation.

[18]There are two reasons for focusing on the top 5 economics journals: (1) the significance of publications in top 5 economics journals in achieving success in academia, especially for top schools, and (2) the feasibility of data collection by the author within a limited time period.

[19]"top 5 journal coauthors" refers to the coauthors with whom the economist collaborated and published in top 5 journals together.

[20]The co-authorship networks are constructed by including all papers published in the top 5 economics journals with at least two authors throughout a 7-year period (i.e., a regular tenure-track period for an economist). I thank professor Randall Ellis for sharing the idea of focusing this study on the subset of top five journals.

[21]I use the nwcommand package written by Grund (2015) to calculate the two centrality measures of social networks.

Degree centrality of economist i in their undirected co-authorship social network G_t is defined as the following formula:

$$Y_i^D(G_t) = \frac{\text{degree}_i(G_t)}{N-1}$$

where $\text{degree}_i(G_t)$ is the number of neighbors (i.e., coauthors) for economist i in their social network, $N-1$ represents the maximum number of coauthors an economist could have in G_t, and $Y_i^D(G_t) \in [0,1]$. Degree centrality tells how well an economist is connected to other economists in their social network in terms of direct connections.

Betweenness centrality of economist i in their undirected co-authorship social network G_t is defined as the following formula:

$$Y_i^B(G_t) = \sum_{k \neq j : i \notin \{k,j\}} \frac{P_i(kj)/P(kj)}{(N-1)(N-2)/2}$$

where $P_i(kj)$ is the number of shortest paths between economist k and economist j that economist i lies on, $P(kj)$ is the total number of shortest paths between economist k and economist j, $(N-1)(N-2)/2$ is maximum number of shortest paths between two economists that economist i could lie on, and $Y_i^B(G_t) \in [0,1]$. Betweenness centrality tells how influential an economist is in terms of connecting other economists as a bridge or controlling the information flow.

3.1.3. Academic Achievement Measurements

The paper utilizes two measures to assess the early-career academic achievements of young economists. The first metric, measuring the research output (i.e., innovation), is defined as an economist's publications in the top 5 economics journals. This metric captures the probability of publishing in the top 5 journals (the extensive margin) and the number of publications in the top 5 journals (the intensive margin). I further distinguish the variable across two time periods. The 3-year period variables provide information regarding the top 5 publications commencing from graduate school, and the 7-year period variables provide additional information regarding the top 5 publications during the tenure-track period. The second metric measures the tenure decision based on the employer's evaluations. It is defined as a dummy variable that equals one if an economist attains tenure within a 7-year period.[22]

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[22]It is well known that the tenure decision, on average, will be made after six years working in the initial school for a junior economist.

3.1.4. Economic Condition Measurements

The primary measure of the labor market conditions is the yearly average monthly national unemployment rates in the US, which is used in the broader literature (e.g., Kahn (2010), Oreopoulos et al. (2012)). Figure 1 shows the trend of unemployment rates during AY2002-AY2017, which provides enough variation to estimate the impacts of initial labor market conditions. I also, in line with Oyer (2006), adopt the academia-specific measure[23] of labor market conditions as a robustness check. That is, the total number of academic jobs listed in *Job Openings for Economists* (JOE) in AEA Papers & Proceedings.[24] I report the corresponding results in appendix table 4 and appendix table 5.

3.2. Empirical Approach

In this section, I formally introduce the econometric model and then discuss the identification strategy to address potential endogeneity concerns. Furthermore, I discuss two potential threats to the internal validity of the methodology and how I address those concerns in section 6.

3.2.1. Baseline Specification

I have observations for economist i in graduating cohort c (i.e., the year of graduation), who graduated from Ph.D. school s, with a research focus in field f. I observe a single economist once a year, tracking them for up to seven years following their graduation. The number of years following graduation is denoted as n.[25] To obtain causal effects of labor market conditions at job market entry on economists' early-career social networks and academic achievements, I estimate the following regression models[26] for each of several values of n:

$$Y^n_{i,c,s,f} = \alpha_0 + \alpha_1 Lmc_c + \alpha_2 C + \alpha'_3 \mathbf{X_i} + \theta_s + \phi_f + \varepsilon^n_{i,c,s,f} \tag{1}$$

where the outcomes, $Y^n_{i,c,s,f}$, are observed in n years after graduation, and each regression includes only one observation per economist. Lmc_c are the labor market conditions at initial entry, which vary depending on the graduating cohort. C is the graduation year trend, and it is included as a control variable because different cohorts may experience

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[23]Note that this measure might not reflect the overall state of the economy, especially the economic conditions for candidates who are seeking for non-academic positions. For example, there are only around 1,700 positions, as AEA says, are filled each year from a pool of 5,100+ candidates. Also, the F (first-stage) of the measure is much smaller than the F (first-stage) of unemployment rates (20 vs. 118).

[24]Since JOE only reported the new jobs rather than total listing jobs since 2014, I impute the total number of academic jobs for AY2014-AY2017. Please refer to appendix A for the imputation.

[25]n is an integer such that $n \in [1, 7]$

[26]I thank the suggestions from Scott Barkowski for the notation of the models.

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varying trends in aggregate outcomes of interest during their initial years. θ_s and ϕ_f are fixed effects for the PhD school and the research field, respectively. I include these fixed effects to rule out the cohort-invariant differences across departments and research fields, which may lack comparability. Furthermore, I add an additional vector of control variables, $\mathbf{X_i}$, into the model. Specifically, I include controls for the experience gained during master's degree studies[27] and any pre-PhD working experience that economist i acquire prior to entering the Ph.D. program, acknowledging their potential as confounding variables. Moreover, to account for potential labor market entry discrimination, I include controls such as gender, race, and nationality[28] in the baseline model. α_1 is the parameter of interest. It captures changes in outcomes resulting from changes in initial labor market conditions for the average economist.

3.2.2. Identification Strategy

For a causal interpretation of α_1, I am required to impose the condition that the initial labor market conditions upon entry be orthogonal to any other factors that are not accounted for in the baseline model but determine the outcomes. To a certain degree, this assumption is justified, as individual economists cannot typically systematically alter macro-level market conditions. In other words, for any given economist, we can regard initial labor market conditions as exogenous, subject to random variations of favorable or unfavorable conditions.

Does the exogenous variation in initial labor market conditions guarantee an unbiased estimate of the impact? The answer is not necessarily. It is widely acknowledged that graduates may strategically time their entry into the job market in response to prevailing economic conditions (e.g., Kahn (2010), Schwandt and Von Wachter (2019)). This has the potential to alter the composition of the graduating cohorts. If, for example, candidates with high ability excel both in timing their entry into the labor market and conducting research, then the baseline estimate could have omitted variable bias. To address this concern, I employ an instrumental variable strategy to tackle the potential sorting behavior in timing in response to labor market conditions. The instrumental variable utilized in the paper is the economic conditions of the predicted year of graduation, which is based on the year of starting the PhD program[29] and the duration of the Ph.D. program (i.e., 5 or 6 years).[30] To ensure the validity of the instrument, it is essential that both the relevance

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[27]The experience is measured by the duration of the master program in years.

[28]Gender: female and male; Race: White, Asian, Hispanic and Black; Nationality: US and Non-US.

[29]In section 6, I present evidence suggesting that the labor market conditions during the year of starting the PhD program exhibit no significant correlation with the outcomes of interest.

[30]The duration of the Ph.D. program is non-parametrically determined by the average duration of the

and exclusion assumptions hold.

Relevance assumption. Appendix Table 3 presents the coefficient estimates of the relationship between initial labor market conditions (i.e., the endogenous variable) and predicted initial labor market conditions (i.e., the instrument) using the specification in equation (3). The result suggests that the instrument significantly correlates with the actual labor market conditions. Furthermore, the first-stage F statistic of 118 indicates that the instrument is not weak (e.g., Olea and Pflueger (2013), Lee et al. (2022), Angrist and Kolesár (2023)). In addition, out of the sample, 542 candidates, or 42.8%, did not graduate in the expected number of years since starting the program. This indicates that there is no overwhelming overlap between the instrumental variable and the endogenous variable, thereby alleviating concerns regarding the endogeneity of the instrument itself. As a result, I conclude that the relevance assumption holds.

Exclusion assumption. Once again, the randomness in the predicted labor market conditions naturally qualifies the instrument as a strong candidate. Furthermore, candidates cannot react to the rule governing instrument generation ex-ante, as they are mandated to graduate at the end of the sixth year (i.e., the average duration of the Ph.D. program) ex-post. Consequently, any endogenously reactive behavior responding to the rule governing instrument generation should not introduce bias into my IV estimates. Nevertheless, in theory, it remains plausible that the instrument may influence the outcomes of interest through multiple channels. Such a scenario would potentially violate the exclusion assumption, which is unfortunately untestable. Given the absence of apparent alternative significant channels, the instrument demonstrates a reasonable level of validity in this paper.

Then, the preferred second-stage regression models using the Two-Stage Least Squares (2SLS) estimation procedure follow,

$$Y_{i,c,s,f}^n = \beta_0 + \beta_1 L\hat{m}c_c + \beta_2 C + \beta_3' \mathbf{X_i} + \theta_s + \phi_f + \epsilon_{i,c,s,f}^n \tag{2}$$

where $L\hat{m}c_c$ is estimated from the first-stage regression model in equation 3.[31]

β_1 is the Wald estimator, which is obtained as the ratio of the reduced-form and first-stage coefficients. It represents the effect of initial labor market conditions on the average

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economists graduating during AY2009-AY2015 within a program. There are nine schools with a six-year duration, while one school has a five-year duration.

[31] The first-stage regression model follows:

$$Lmc_c = \gamma_0 + \gamma_1 Predict\text{-}Lmc_c + \gamma_2 C + \gamma_3' \mathbf{X_i} + \theta_s + \phi_f + u_c \tag{3}$$

economist's co-authorship networks and academic achievements.

3.2.3. Sample Restrictions

The main sample is constructed by selecting young economists graduating from the top 10 economics departments in the United States during AY2009-AY2015. I focus on this sample due to their significance as potential authors who are capable of publishing papers in the top 5 economics journals. This renders them the most relevant population to examine when studying the co-authorship network of the top 5 journals in economics.

Following Jackson et al. (2008), I exclude single-authored papers when constructing the top 5 journals' co-authorship network because authors of such papers are isolated from the network. To ensure comparability among economists, I further restrict my sample to economists with less than two years of Pre-PhD working experience in results reported in Appendix Table 8 because these economists have already entered the labor market for some time, and the estimates may not entirely reflect the impact of initial labor market conditions.[32]

3.2.4. Descriptive Statistics

Table 1 presents the summary statistics of the economists who graduated from the top 10 US economics departments during AY2009-AY2015. First, I summarize economists' demographics and primary research field at the academic graduation year, which are potential confounders. In the sample, 26% of the economists are female, and 37% of the economists possess US nationality. Furthermore, White economists comprise 60% of the total, and Asian economists constitute most non-White economists. It is noted that the Black population experiences a profound underrepresentation in the economics discipline. Moreover, two-thirds of the economists are majoring in applied microeconomics and macroeconomics fields.[33]

Second, I summarize economists' initial placement and mobility (i.e., potential mechanisms). The table shows that over half of the economists pursue tenure-track positions in academia, with around half working in the top 50 departments. Additionally, more than 5% of the economists possessed post-doctoral experience,[34] significantly increasing their likelihood of being admitted to the top 50 departments. Also, on average, economists

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[32]The restricted sample accounts for 84% of the total population. The results are similar to the main results when these economists are included.

[33]Please refer to appendix A to see how I categorize economists' primary research of interest into six groups.

[34]The post-doctoral experience is restricted to the case that economists did not have a tenure-track position offer in the meanwhile.

changed their jobs 0.16 times within three years since initial placement, and only 14% of them ever switched their employers.

Third, I summarize economists' social network and academic outcomes over a 7-year period (i.e., outcomes of interest). The table shows that 20% of the economists attained tenure, but fewer were promoted to tenured professors in prestigious schools. Plus, economists, on average, have 0.52 papers published in the top 5 economics journals. Additionally, 13% of the economists are appointed as NBER Fellow, and economists, on average, have 0.76 top 5 journal coauthors. Besides, an average economist is generally not extensively connected to others and does not possess a significant influence in controlling the information flow in their social network, with an average size of 3,030.

4 Estimates of the Effects of Initial Labor Market Conditions

In this section, I present the main findings of the paper. I begin by presenting the results of social networks and academic outcomes. Subsequently, I examine the robustness of the results through various analyses. Lastly, I delve into the heterogeneity underlying the main findings.

4.1. Results

4.1.1. Results for Social Networks

I first show the dynamics of the effects graphically. Figure 6 plots the effects of initial labor market conditions on economists' cumulative social networks over the years since graduation (i.e., experience[35]). I plot the coefficients and the upper and lower bounds of 95% confidence interval against years since graduation, spanning up to 7 years. The effects of initial labor market conditions on being an NBER fellow, collaborating with the top 5 coauthors (both extensive and intensive margin), and degree centrality experience a similar trajectory: starting from a marginal impact, the effect exhibits a gradual increase and reaches its peak around the third or fourth year after graduation, and subsequently maintaining a steady level after a decrease in the fifth year. It should be noted that the effects on the likelihood of being an NBER fellow and collaborating with the top 5 coauthors become statistically insignificant beyond six years of working experience. To ascertain the reasons behind this, I draw figure 8, which displays similar plots depicting yearly social networks in the first four panels. I observe a reversal in the impact of initial labor market conditions on yearly social networks in the fifth year, and subsequently, the

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[35]The experience indicates the potential experience in which one year since graduation means one year experience. Since econ PhDs barely stay unemployed, the proxy measure should be reliable.

impact diminishes as economists gain more experience. On the other hand, figure 6 shows that the effect on cumulative betweenness centrality remains insignificant during a 7-year period except for the fifth year following graduation. Furthermore, figure 8 suggests a growing adverse impact on the average recession economist's importance regarding connecting others in the yearly social network.

Next, I present the point estimates for the 3-year and 7-year periods following graduation. Table 2 shows the coefficient estimates for the effects of initial labor market conditions, using the preferred specification with time trend, all fixed effects, and controls introduced in equation (2). The results show that the unemployment rate has positive effects on the average economist's social networks. That is, graduating during a period of adverse initial labor market conditions increases the likelihood of an economist being appointed as an NBER fellow and collaborating with the top 5 journal coauthors, and also expands their co-authorship networks of the top 5 economics journals. Columns (1) and (3) show that a one percentage point increase in the unemployment rate at the time of entering the job market, on average, increases the expected probability of an economist being an NBER fellow and having top 5 journal coauthors during the initial three years after graduation by 21.9% and 16.3%, respectively.[36] Furthermore, column (5) points out that a one percentage point increase in the unemployment rate at the time of entering the job market increases the average economist's expected number of top 5 journal coauthors within the first three years following graduation by 18.4%. This is equivalent to roughly 2 top 5 journal coauthors per year since an average cohort with a size of 200 economists collaborates with 32 top 5 journal coauthors during the first three years. Additionally, I find that graduating during a challenging period enhances the direct connections with potential top 5-journal coauthors in an economist's social networks, though the magnitude is relatively small. Nevertheless, I do not find a statistically significant impact on the betweenness centrality. This means that, at least in my sample, economists' importance in terms of connecting other economists as a bridge or controlling the information flow is not affected by initial labor market conditions. Moreover, the coefficient estimates for the 7-year cumulative social network measures at extensive margin lose statistical significance. This suggests that the effects at extensive margins may diminish as economists accumulate more post-graduation experience.

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[36]Note that the unemployment rate is normalized to AY2009. This means that the normalized coefficient = the coefficient × 7.1, where 7.1 is the unemployment rate in AY2009.

4.1.2. Results for Top 5 Publications and Tenure Attainment

Similarly, I begin by visually illustrating the dynamics of the effects. Figure 7 plots the effects of the unemployment rate on economists' cumulative high-quality research output[37] (i.e., top 5 publications) over the years since graduation. The plot shows that graduating during a recession increases the average economist's research output at both extensive and intensive margins. Furthermore, the effects are persistent over a 7-year period, although with increased variability beyond five years of experience. Moreover, panels E and F in figure 8 show that the persistent effects on cumulative research output can be attributed to the increase in the top 5 publications during the initial four years. Additionally, the impacts on annual publications undergo a reversal in the fifth year and diminish beyond the sixth year.

I then present the point estimates for the 3-year and 7-year periods after graduation. Table 3 presents the coefficient estimates for the effects of elevated initial unemployment rates on economists' cumulative top 5 publications and the probability of obtaining tenure within seven years after graduation, using the preferred specification in equation (2). I find that entering the job market during a recession increases the average economist's high-quality research output. At the extensive margin, column (1) shows that a one percentage point increase in the unemployment rate at the time of entering the job market, on average, increases the expected probability of an economist publishing papers in the top 5 economics journals within the initial three years after graduation by 23.8%. At the intensive margin, column (3) indicates that a one percentage point increase in the unemployment rate at the time of entering the job market increases the average economist's expected number of top 5 publications during the initial three years after graduation by 22.6%. Nevertheless, the effects on research output for a 7-year period, observed at both margins, become statistically insignificant. Additionally, while I do not find that the elevated unemployment rate has a statistically significant impact on the probability of attaining tenure during the 7-year period, there is evidence, as reported in columns (5) and (6) of Appendix Table 5, suggesting that the adverse initial labor market conditions measured by the reduction in total academic jobs in JOE decrease the likelihood of obtaining tenure at prestigious schools (i.e., the top 20 universities).

4.2. Robustness of the Effects

I conduct robustness checks to validate the main findings presented in section 4.1.1 and section 4.1.2. The results suggest that the findings are not sensitive to the number of

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[37]By high quality research output, I refer to the impact factors of the publications.

clusters, the alternative measure of initial labor market conditions, and the restricted sample.

Inference Robustness. The results may suffer a downward bias, as the existing econometric literature (e.g., Imbens and Kolesar (2016)) indicates, in estimating the cluster-robust standard errors due to the small number of clusters. To address this concern, I implement the wild bootstrap procedure (e.g., Cameron et al. (2008), Canay et al. (2021)) with 999 replications[38] and the jackknife method (e.g., Hansen (2022)) to check the robustness of the results reported in the preceding sections.

Table 4 shows the point estimates of the effects of initial labor market conditions, where the cluster-robust standard errors and the jackknife standard errors are reported in square brackets. Following Canay et al. (2021)'s recommendation, I report the bootstrap-based p-values rather than standard errors in the parentheses because t-tests based on bootstrap-based standard errors are not asymptotically valid in an asymptotic framework where the number of clusters is fixed. As the table presents, the results in table 2 and table 3 are robust after accounting for the small number of clusters.

Measurement Robustness. Additionally, I examine the robustness of the results through an alternative measure, the total number of academic job postings in *Job Openings for Economists*, of the labor market conditions used in Oyer (2006). The estimates are reported in Appendix Table 4 and Appendix Table 5. The findings are consistent with this alternative measure's results, though the significance might disagree for some outcomes.

Restricted Sample Robustness. For economists who had already entered the job market before their Ph.D. program, the estimates may encompass the effects of factors other than initial labor market conditions. To enhance comparability among economists, I restrict the sample by excluding those with pre-PhD working experience. Appendix Table 8 shows that the findings in the preceding sections are similar to the results based on the restricted sample.

4.3. Heterogeneity in the Effects of Initial Labor Market Conditions

I then examine the heterogeneity in the impacts of graduating during a period of adverse labor market conditions. My novel datasets enable me to conduct analyses spanning four dimensions: race, gender, nationality, and the prestige of Ph.D. school. I divide the sample into two distinct groups along each dimension to consider the power of the t-tests due to the number of observations.

Table 7 shows the coefficients estimates for the effects on cumulative social network outcomes, and table 8 shows the coefficients estimates for the impacts on cumulative top

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[38]The 999 replications is the default number of replications in Version 2.0.6 of bootest command in stata.

5 publications and the likelihood of attaining tenure, but for regression models estimated separately for each subgroup. In summary, the results imply that the effects of the adverse initial labor market conditions are primarily experienced by economists who are white, male, non-US citizens, or graduating from Tier 1 schools.

White & Non-White. I first present the results along the racial dimension. The results point out that white economists' social network outcomes are significantly affected by higher initial unemployment conditions, and the effects persist and grow over the 7-year period after graduation. Moreover, the impacts on research output are statistically significant in the early years but become insignificant later. However, I do not find evidence indicating that white economists graduating during a recession are more likely to obtain tenure. In contrast, the point estimates for non-white economists are smaller in magnitude across outcomes and are not statistically significant.

Female & Male. I then present the results along the gender dimension. Similar to the findings in the racial dimension, the results show that recession male economists, relative to their counterparts, are more likely to be appointed as an NBER fellow, collaborate with economists who are capable of publishing in top 5 economics journals, and publish more top 5 papers during initial years after graduation. What differentiates the finding in the racial dimension is that graduating during a recession decreases the probability of male economists obtaining tenure at prestigious schools.

What could potentially drive the heterogeneity along racial and gender dimensions? Note that the underrepresentation of economists who are female and from racial minorities, particularly the black community, within the economics discipline has been a persistent issue over time. In addressing the issue, policymakers have undertaken efforts in line with affirmative action aimed at enhancing employment opportunities within the field of economics. For example, CSWEP[39], a division of the American Economic Association, is dedicated to promoting careers and monitoring the progress of women economists. Those policies could mitigate the disadvantage resulting from a recession, nullifying the impact arising from adverse initial labor market conditions for economists who are female and from racial minorities.

US Citizen & Non-US Citizen. Next, I present the results along the nationality dimension. The results in the citizenship dimension are slightly different from the previous dimensions. First, recession US and Non-US economists are more likely to be appointed NBER fellows than their counterparts. Second, the point estimates of the effects on the cumulative top 5 coauthors and top 5 publications during earlier periods exhibit opposite signs, despite signs becoming consistent over a 7-year period after graduation. This could

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[39]CSWEP stands for Committee on the Status of Women in the Economics Profession.

be attributed to US economists holding an advantage in language proficiency and visa status,[40] potentially rendering them more competitive in the labor market. Consequently, this advantage could contribute to a lesser impact stemming from a recession. Third, in line with male economists, non-US recession economists are less likely to obtain tenure at prestigious schools, although they are more productive than their counterparts. This may reflect the potential national hiring preference within prestigious academic institutions.

Tier 1 Schools & Tier 2 Schools. Lastly, I present the results along the dimension of the prestige of PhD institutions. I interpret the difference between Tier 1 and Tier 2 schools as the disparity in candidates' research skills, social capital, and university resources. Note that the school's average prestige reflects the combination of the higher-skill (e.g., the number of pre-market papers) candidates for doing research and more resources (e.g., funding and alumni networks) that the school can provide. The results show that the effect of higher initial unemployment conditions on research output is comparable between economists from Tier 1 and Tier 2 schools. However, there is no significant impact on social networks for economists from Tier 2 schools. This could reflect that economists graduating from Tier 2 schools may be less likely to collaborate with the top 5 coauthors. Furthermore, graduating during a recession increases the probability of obtaining tenure in academia for economists from Tier 2 schools, although not at prestigious schools. This could be attributed to the fact that economists from Tier 2 schools may find competitive opportunities in relatively less prestigious institutions, where they do not have to contend with economists from Tier 1 schools.

5 Mechanisms Exploration for Effects of Initial Labor Market Conditions

The preceding results demonstrate the effect of initial labor market conditions on junior economists, in which adverse labor market conditions expand their social networks and increase their research output within the initial four years after graduation but reduce the likelihood of obtaining tenure at prestigious schools for specific subgroups. However, the underlying mechanisms behind the impacts of initial labor market conditions remain unknown. In this section, I explore and analyze the potential channels through which these effects operate.

5.1. Effects on Mobility

Based on the search model with small search friction, one hypothesis suggests that adverse initial labor market conditions would not significantly impact job seekers' labor

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[40]For example, certain positions within the Federal Reserve (FED) may require candidates to possess U.S. citizenship.

outcomes if they can quickly switch to better jobs as the economy recovers. The evidence from Oreopoulos et al. (2012) aligns with this hypothesis, in which they find that more advantaged graduates suffer less from graduating in recessions due to higher mobility across jobs and industries. In contrast to Oreopoulos et al. (2012), my targeted group, Ph.D. in economics, displays a pattern of low mobility. In my sample, for example, only roughly 14% of economists ever changed their employers during the first three years after graduation, and this proportion decreases to 8% among those whose initial job is in academia.

I explicitly examine whether initial labor market conditions affect economists' mobility during their early careers. To do so, I run a regression model in equation (2), where the outcome variables include a dummy indicating employment changes and the number of employers during the first 3-year career.[41] Columns (1) and (2) in table 5 show that the higher initial unemployment rate significantly affects neither the probability of changing employers nor the actual times of changing employers within three years since graduation. The results in columns (1) and (2) of table 9 also confirm that the challenging initial labor market conditions do not affect economists' mobility across employers in subgroups.[42] This implies that economists in my sample did not exhibit a higher likelihood of quickly changing employers due to adverse initial labor market conditions. Therefore, I rule out the hypothesis that mobility across employers, as the main channel, explains the variation in social network and research output owing to initial high unemployment rates.

5.2. Effects on Initial Occupation Placement

Given the limited job mobility observed during the early-career period, I expect that initial job placement (e.g., Oyer (2006), Shu (2012), Böhm and Watzinger (2015)) may be crucial in explaining the effects of graduating during a recession.

To examine this channel, I run a regression model in equation (2), where the outcome variable is the occupation categories of initial placement. The results in table 5 are in line with this hypothesis. Column (5) shows that economists who graduate during periods of elevated unemployment rates are more likely to enter the private sector for employment. Additionally, I examine the channel across eight subgroups. Column(5) in table 9 indicates that this mechanism works well for economists who are non-white, non-US citizens, and

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[41]I also examine the outcomes within the first year and the first two years, and the results are similar.

[42]There is one exception – female economists. The results show that initial labor market conditions affect female economists' mobility. In particular, they are more likely to switch employers during periods of favorable market conditions. This, in turn, implies that their social network and research output are, as table 7 and table 8 indicate, insensitive to the business cycle. This could be attributed to programs like CSWEP at the American Economic Association, which focuses on supporting women in economics.

graduating from Tier 1 schools. These findings suggest that adverse initial labor market conditions allocate more economists to the private sector, resulting in a reduced number of top 5 publications and smaller top 5 co-authorship networks. Nevertheless, table 6 shows that adverse initial labor market conditions do not appear to influence the quality of employment, as measured by the ranking of academic institutions, for individuals employed in academia.

Given the findings indicating a positive impact of adverse initial labor market conditions within the first four years after graduation, the results suggest the potential existence of channels through which adverse initial labor market conditions increase the average economist's social networks and productivity.

5.3. What Could Be the Channels Explain the Findings?

5.3.1. Extrinsic Motivation May Exist

I argue that heightened extrinsic motivation emerges from the anticipation of increased competition arising from adverse initial labor market conditions, which could explain the findings. This is because heightened extrinsic motivation could lead economists to invest more effort in fostering engagement with peers and acquiring task-specific skills (e.g., honing high-quality research abilities). Although I cannot provide direct evidence due to data limitations, I provide evidence that aligns with the implication that adverse initial labor market conditions enhance the skills of the average recession economist, potentially through extrinsic motivation. Figure 9 and table 10 present the results of the differential impact of initial labor market conditions, categorized according to the co-author count of the papers.[43] The results in panel A of table 10 indicate that unfavorable initial labor market conditions primarily increase the cumulative top 5 publications with one or two coauthors during the initial years after graduation. This could potentially reflect the augmentation of social skills.

Additionally, the job competition model (e.g., Thurow (1975), Reder (1955)) implies that those economists who pursue careers in publication-oriented occupations (e.g., academia), on average, exhibit higher ability[44] in conducting high-quality research (i.e., top 5 publications). This, in turn, leads to a more significant number of top 5 publications for them. The results in panel B of table 10 indicate that adverse initial labor market conditions lead to an increase in sole-authored annual top 5 publications in the third year following graduation. This could indicate an enhancement of research skills.

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[43]Specifically, I categorize papers into sole-authored, one or two coauthors, and three or more coauthors.
[44]Shu (2012) provides supporting evidence for the implication in the context of MIT undergraduates' innovation.

To what extent can social networks account for variations in research output? It is widely recognized that co-authorship networks have the potential to enhance research output. If initial labor market conditions affect the formation of economists' co-authorship networks of economists, I expect these networks could serve as a channel through which the impact operates. To examine the significance of this channel, I run the regression model in equation (2), where I add the measures of social networks. Table 11 presents the results for the effect on the top 5 publications within four years after graduation. I find that the number of top 5 coauthors and degree centrality within four years can account for 82% and 87% of the variation in the estimated coefficient, respectively. I also find that prior co-authorship networks account for a noteworthy portion of the variation. As a result, social networks play a pivotal role as a critical channel.

5.3.2. Understanding the Reversal of the Effects in Later Years

Note that, as shown in figure 8, the signs of the impacts on yearly outcomes underwent a complete reversal in the fifth year after graduation. If the only driving mechanism is enhanced ability, the pronounced shift across all outcomes would not be anticipated. In order to delve into the potential explanations, I conduct additional analysis.

Does the reversal phenomenon exhibit systematicity? The results, shown in figure 10 and figure 11, dismiss the possibility that specific individual subgroups drive this phenomenon and establish that the observed reversal remains consistent and systematic across all subgroups. Given the systematicity, it becomes imperative to investigate the potential underlying mechanisms.

Is the decline experienced by recession economists, or is the progress made by non-recession economists catching up, that leads to the observed reversal of the effect? To simplify the question, I categorize economists into two groups based on the predicted unemployment rates at the time of their graduation. Specifically, those who encountered an unemployment rate below the median are classified as non-recession economists (i.e., Low UR). In contrast, those above the median are categorized as recession economists (i.e., High UR). Figure 12 displays the trends in the annual count of the top 5 coauthors and publications per economist over the years after graduation by unemployment rate (High vs. Low). On the one hand, I observe a sharp decline in research output and coauthors in the fifth year among the average recession economist. On the other hand, I observe a continuous rise in research output and coauthors in the fifth year among the average non-recession economist. Together, the two observations suggest that the reversal of the impact can be attributed to both the decline among recession economists and the increase among non-recession economists.

Does attainment of tenure matter? A well-documented fact is that economists with tenure, on average, demonstrate lower productivity compared to their counterparts. The observed reduction in research output among recession economists in the fifth year may stem from an increased probability of attaining tenure, which could be attributed to more robust academic performance during the initial years. I examine this possibility by running the regression model in equation (2), where the outcome variables are a binary indicator denoting tenure attainment within the first five years after graduation (i.e., realized tenure), as well as a binary indicator denoting tenure attainment in the sixth year (i.e., expected tenure). The results are reported in columns 1 and 2 in table 12, implying that the expected tenure serves as a channel through which adverse initial labor market conditions contribute to the decline in research output among recession economists during the later stages of the tenure-track periods (i.e., beyond fifth year after graduation).

Does post-doctoral position matter? This potential channel is motivated by the significant fraction of economists in the sample who had post-doctoral experience, which was uncommon among economists in the 1980s and 1990s, as Oyer (2006) studies. The hypothesis is that favorable market conditions provide more opportunities (i.e., more post-doctoral positions[45]) for non-recession economists to develop their research skills further and gain additional experience, increasing their likelihood of securing positions in academia, including prestigious institutions. Consequently, this may result in more extensive co-authorship networks and more top 5 publications than their recession counterparts. Nevertheless, the impact might only become apparent at a later stage, as economists strategically postpone publishing papers during their post-doctoral periods,[46] aiming to increase their publications upon joining their employing institution.

To examine the channel, I run a regression model in equation (2), where the outcome variable is a dummy indicating post-doctoral experience. Column (6) in table 12 shows that favorable labor market conditions increase economists' inclination to pursue post-doctoral positions. Furthermore, the coefficients plotted in figure 6 and figure 7 decrease and lose statistical significance when I incorporate achievements beyond the fifth year after graduation into the cumulative outcomes. This implies that non-recession economists who have undergone post-doctoral experience during favorable market conditions are reducing the disparity with their counterfactual trajectory, following a phase of dedicated investment. Additionally, column(6) in table 9 presents heterogeneity in the effects of initial labor market conditions on the likelihood of having a post-doctoral position. The

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[45]The post-doctoral positions in economics have not become an integral part of the career trajectory for many aspiring economists until recent decades.

[46]In the sample, these economists, on average, took 2 years to pursue a post-doctoral position.

results suggest that economists who are male, non-US citizens, and graduating from Tier 1 schools exhibit an elevated inclination towards pursuing post-doctoral positions during favorable labor market conditions, resulting in higher research output in later years, as shown in figure 11, relative to their unlucky counterparts. Put together, the results suggest the existence of a post-doctoral channel in explaining the reversal of the effect of initial labor market conditions in the later years.

5.3.3. Understanding the Diminished Tenure Odds at Top Academic Institutions

The finding indicates that recession economists, primarily male and non-US citizens, are less likely to secure tenure positions at top academic institutions despite demonstrating greater research output during the initial four years. Given that research output, particularly top 5 publications, holds significant sway in securing tenure at prestigious academic institutions, the finding, at first glance, may appear counterintuitive.

Is the increased research output primarily driven by the economists' efforts or by collaborative endeavors with others? Appendix Figure 5 presents the results for non-US and male economists' cumulative publications categorized by the number of coauthors during the tenure-track period. I find that the increased research output is primarily attributable to publications with one or two coauthors, which could potentially discount the economist's contribution to the institution. In other words, the disparity in research contribution is not substantially significant for recession economists compared to their non-recession counterparts. Thus, the finding can be explained by other factors that determine the attainment of tenure. For instance, recession economists may allocate less effort to institutional service (e.g., teaching) and building relationships with colleagues since they may concentrate more on their research. This, in turn, leads to a situation where other factors dominate research contribution, resulting in a reduced probability of attaining tenure at prestigious academic institutions.

6   Potential Threats

I present the findings of the impacts of initial labor market conditions in section 4 and provide the potential mechanisms through which higher initial unemployment rates can affect economists' social networks, research output, and tenure at prestigious schools in section 5. However, while the identification strategy is credible, there are at least two concerns that may pose a threat to the internal validity of the results.

Firstly, economists may strategically choose the year of starting their PhD program. If this is the case, the instrumental variable raises concerns about the exclusion assumption since I treat the year starting the Ph.D. program as exogenous in the preferred specification.

To address this concern, I directly examine the association between the market conditions of starting PhD program and the outcomes of interest. I run the baseline regression model, using the unemployment rates for the year of starting PhD program as the main explanatory variable.

Table 13 reports the coefficient estimates for all outcome variables listed in table 4 using the specification in equation (1). As the results indicate, none of the coefficients are statistically significant. This implies that economists in my sample did not systematically time the year of entering the Ph.D. program in response to the fluctuations in labor market conditions. Thus, the instrumental variable remains valid.

Secondly, the effects of the initial unemployment rate on outcomes of interest may be driven by cohort-specific changes in the labor supply of economists. The idea is that both the initial labor market conditions and economists' labor participation decisions can be correlated with prior labor market conditions and with the outcomes of interest.

Unfortunately, I cannot address this concern by directly controlling the cohort-fixed effect because it can absorb all variations in the main explanatory variable. Nevertheless, note that, according to the *Survey of the Labor Market for New Ph.D. Hires in Economics* conducted by the Center for Business and Economic Research at the University of Arkansas Deck et al. (2014), the employment rate of economics Ph.D.s, for example, was 93.5% in AY2015. This means that economics Ph.D. candidates seldom opt for unemployment.[47] Moreover, my tabulation suggests that the employment rate of economics Ph.D. graduates from the top 10 schools approaches nearly 100%. Taking this into account, I examine whether the number of job market candidates correlates with preceding labor market conditions, which I quantify by utilizing the unemployment rates of the year of starting the program.[48]

Appendix Table 7 shows that the supply of economists in my sample does not respond to prior labor market conditions, controlling for the time trend, the fixed effects, and controls in equation (1). Therefore, the results are not driven by the labor supply decisions due to preceding market conditions.

7 Discussion and Conclusions

In this paper, I investigate how graduating during the Great Recession affects economists' co-authorship networks and academic achievements. I find that recession economists, on average, are more likely to expand their social networks, such as by being appointed as an

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[47]Figure 5 shows the supply and demand of economists in my sample. Visually, the number of candidates remains relatively consistent across academic years, whereas a clear trend in demand emerges.

[48]Alternatively, the results are similar using the unemployment rates during the PhD program.

NBER fellow and collaborating with other economists who are capable of publishing in the top 5 economics journals. I also find that recession economists become more (directly) connected with others in their co-authorship networks but not more important (central) in terms of connecting other economists as a bridge or controlling information flow.

Furthermore, the results suggest that adverse initial labor market conditions enhance recession economists' research output by increasing both the probability and the number of published papers in the top 5 economics journals. Nevertheless, recession economists are unlikely to secure tenure at prestigious schools despite making more contributions than their counterparts during the 7-year period after graduation.

Recall that economists' primary output is innovation and social networks serve as a means for facilitating the spillover of their new ideas. Also, empirical evidence (e.g., Nadiri (1993), Jones and Williams (1998)) suggests that producing innovative ideas leads to significant, positive social externalities. Hence, the findings carry two potential policy implications. First, the paper suggests that newly-entered economists in times of non-recession may need additional incentives to increase their research output in the initial years after graduation. Second, the paper suggests that newly-entered economists in times of recession may need additional compensation to sustain their heightened productivity, despite securing tenure at prestigious schools might be less likely for them.

This paper has certain limitations. First, the results may not generalize to broader labor markets, given that the study focuses on economists as the targeted population. Second, I need more data on economists' ability and motivation for research to provide direct evidence of the underlying mechanisms (i.e., the external motivation channel). Lastly, the relatively short sample period hinders us from investigating the longer-run impacts of initial labor market conditions on innovation patterns, which paves the way for future research.

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Figure 1: Trends of Measures of Initial Labor Market Conditions
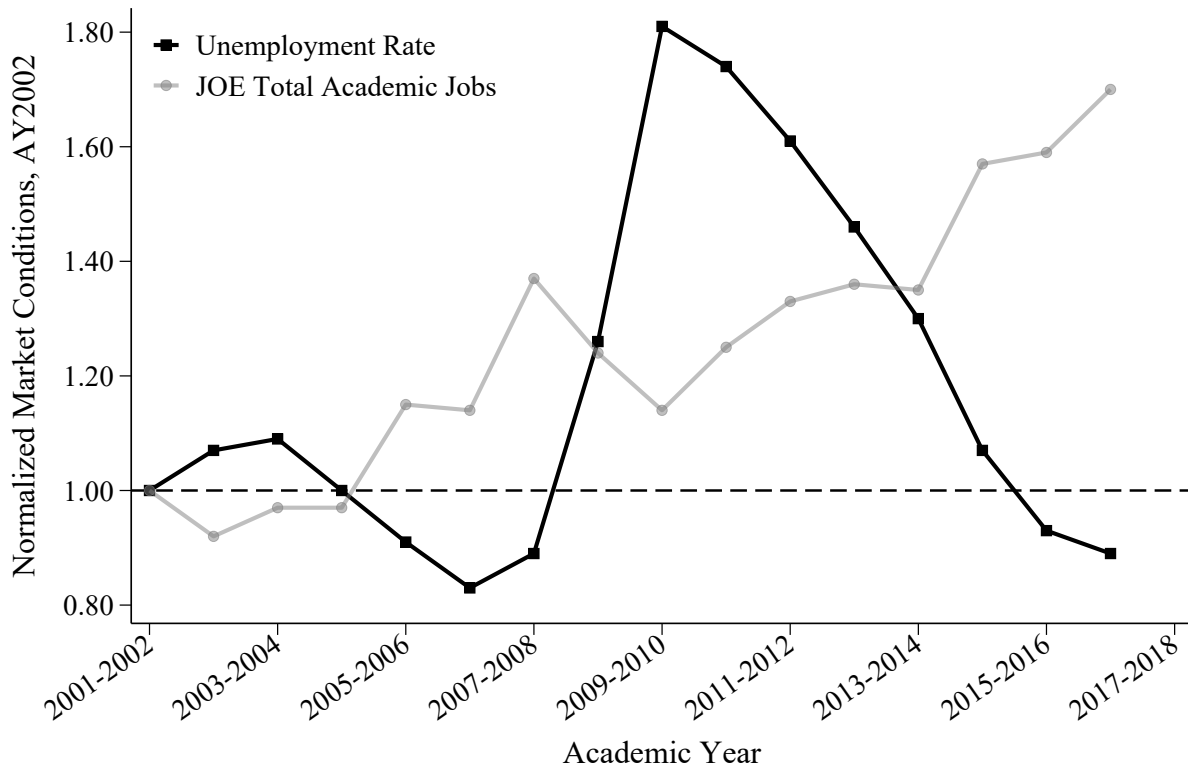
Notes: The figure displays the trends of the measures of labor market conditions from academic year 2002 to academic year 2017 (academic year T is defined as the period between September Year T-1 and August Year T). "Unemployment Rate" refers to the U.S. national unemployment rates adjusted for the academic year. "JOE Total Academic Jobs" refers to the total number of academic job postings in JOE. The measures are normalized to AY2002.
Sources: The unemployment Rate is from *U.S. Bureau of Labor Statistics* and the total number of JOE (academic) job postings is based on *Job Openings for Economists* in AEA Papers & Proceedings.

Figure 2: Trends in the Fraction of Papers with Varying Numbers of Authors in Top 5 Economics Journals: 1990-2021
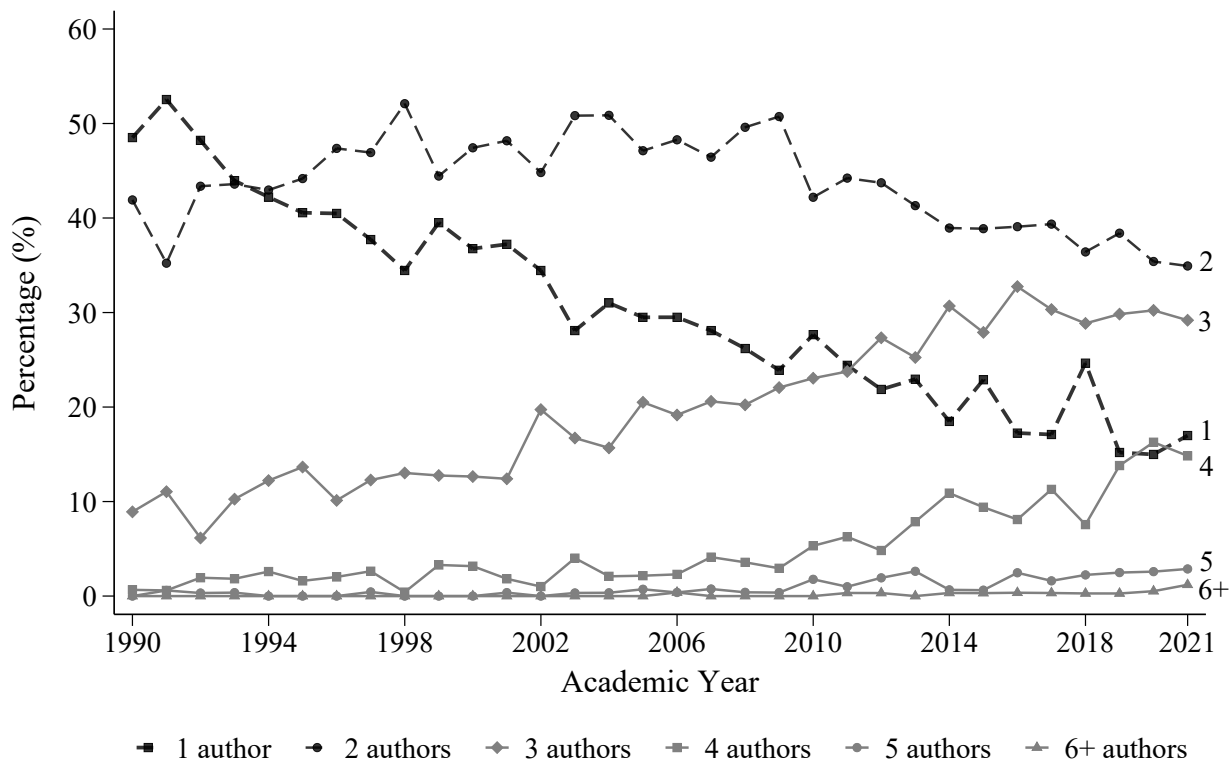
Notes: The figure represents the trends of the fraction of papers in the top 5 economics journals by number of authors per Paper from academic year 1990 to 2021 (academic year T is defined as the period between September Year T-1 and August Year T). To ensure comparability, the graph excludes articles published before 2019 in the May issue of AER, as well as comments, replies, notes, errata, corrigenda, and Nobel lectures.

Sources: Data from 1990 to 2009 were sourced from Card et al. (2022), while data from 2010 to present were collected by the author from the websites of top5 economics journals (AER, QJE, Econometrica, JPE, and REStud).

Figure 3: Evolution of An Economist 1's Top5 Co-authorship Network, 2011-2020

Panel A: Year 2011

● Economist 1 ● Economist 2 ● Economist 3 ● Others

Panel B: Year 2014

● Econ 1 ● Econ 2 ● Econ 3 ● Econ 4 ● Econ 5 ● Others

Panel C: Year 2017

● Econ 1 ● Econ 2 ● Econ 3 ● Econ 4 ● Econ 5 ● Others

Panel D: Year 2020

● Econ 1 ● Econ 2 ● Econ 3 ● Econ 4 ● Econ 5 ● Others

Notes: The figure displays the evolution of the top5 co-authorship network (within a network distance of 2) of economist 1 and his/her four high-frequent coauthors from academic year 2011 to 2020 (academic year T is defined as the period between September Year T-1 and August Year T). As the size of the dots increases, it indicates a higher frequency of collaboration between the two economists. I designate the starting year as 2011 and disregard the previous coauthors of the economist. To ensure comparability, the graph excludes articles published before 2019 in the May issue of AER, as well as comments, replies, notes, errata, corrigenda, and Nobel lectures. I used *nwcommand* package written by Grund (2015) to draw the network figure.
Sources: Data were collected by the author from the websites of top5 economics journals (AER, QJE, Econometrica, JPE, and REStud).

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Figure 4: Who Collaborates with Whom, 2-Authors Case
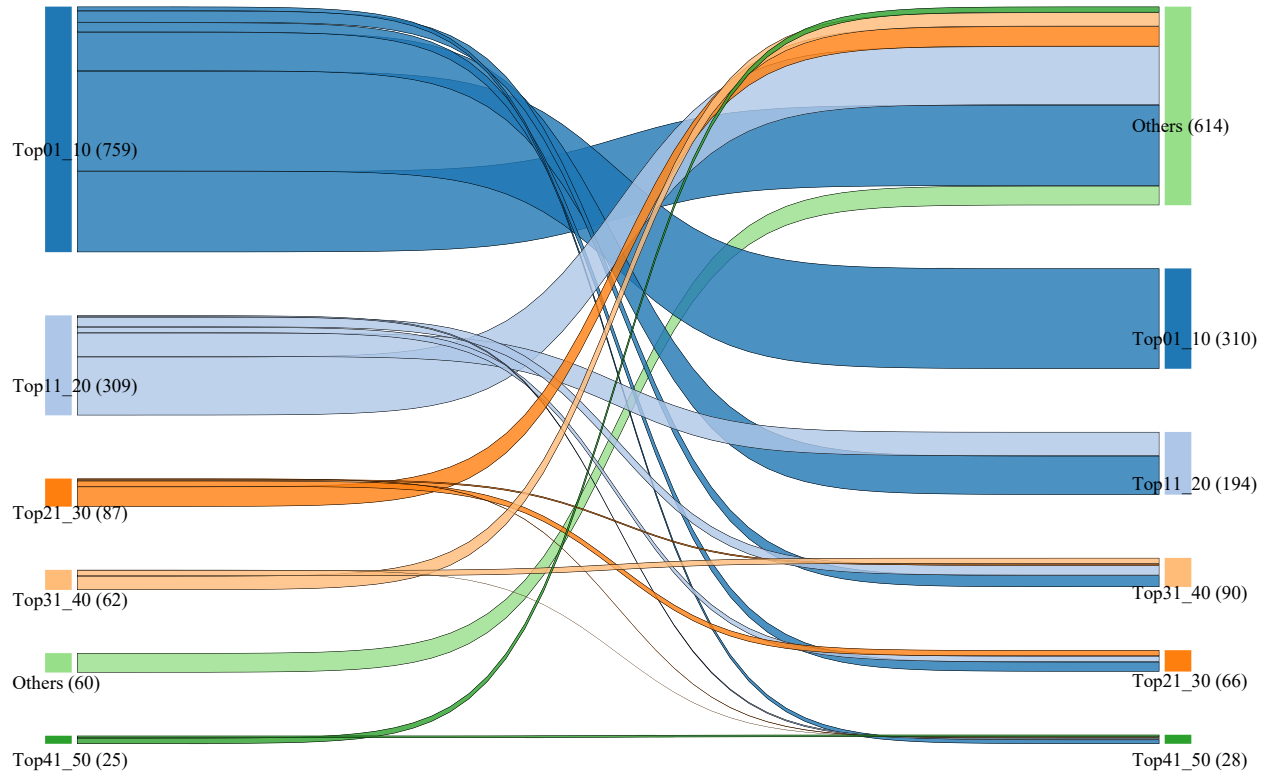
Notes: The figure displays the sankey diagram of the authorship pattern in terms of author's affiliation for 2-authors case of all top 5 economics journals from academic year 2010 to 2022 (academic year T is defined as the period between September Year T-1 and August Year T). The categories starting with 'Top' refer to the top U.S. universities, while 'Others' refers to institutions that are not top 50 U.S. universities (e.g., non-academic institutions, non-U.S. institutions, and lower-ranked U.S. institutions). To ensure comparability, the graph excludes articles published before 2019 in the May issue of AER, as well as comments, replies, notes, errata, corrigenda, and Nobel lectures. I use *sankey* package written by Naqvi (2023) to draw the figure.

Sources: Data were collected by the author from the websites of top5 economics journals (AER, QJE, Econometrica, JPE, and REStud).

Figure 5: Supply and Demand of Economists
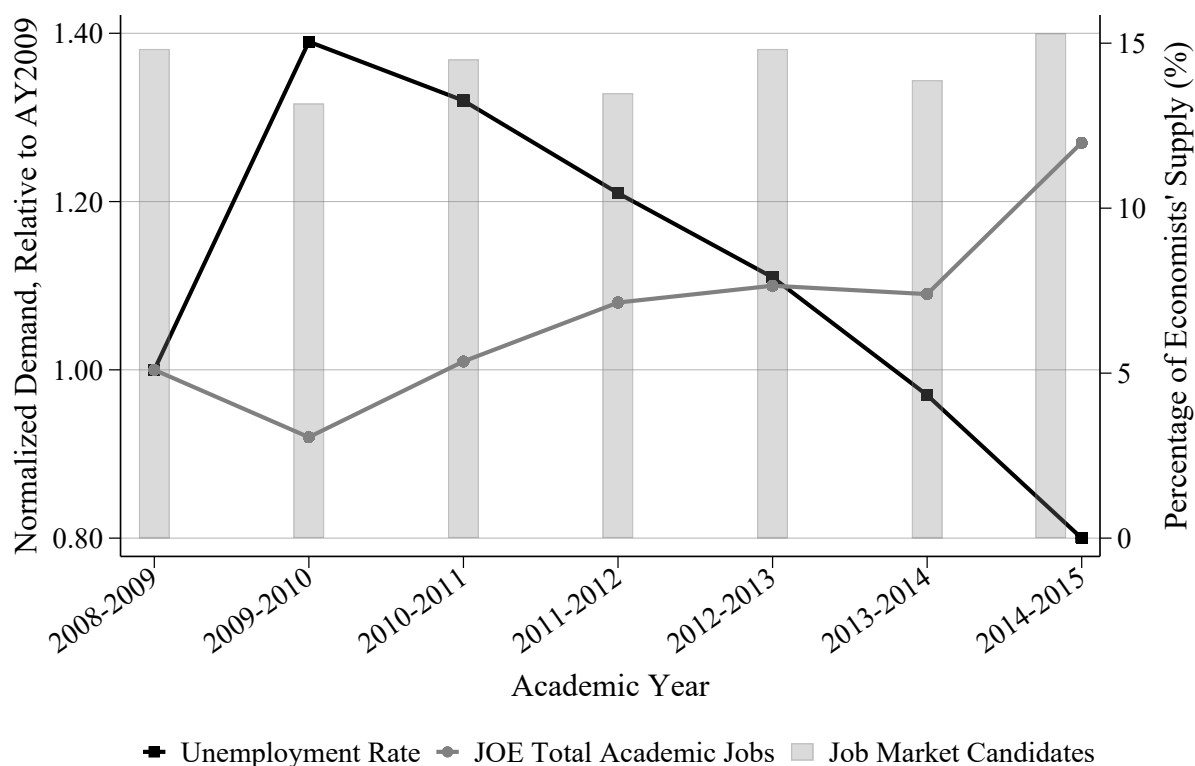
Notes: The figure displays the supply and demand of economists from academic year 2009 to academic year 2015 (academic year T is defined as the period between September Year T-1 and August Year T). The left y-axis represents the normalized total number of academic job postings listed in JOE and the normalized unemployment rate, while the right y-axis shows the fraction of job market candidates.

Sources: The number of job market candidates is based on a dataset collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics* and the total number of jobs listed on JOE is based on *Job Openings for Economists* in AEA Papers & Proceedings.
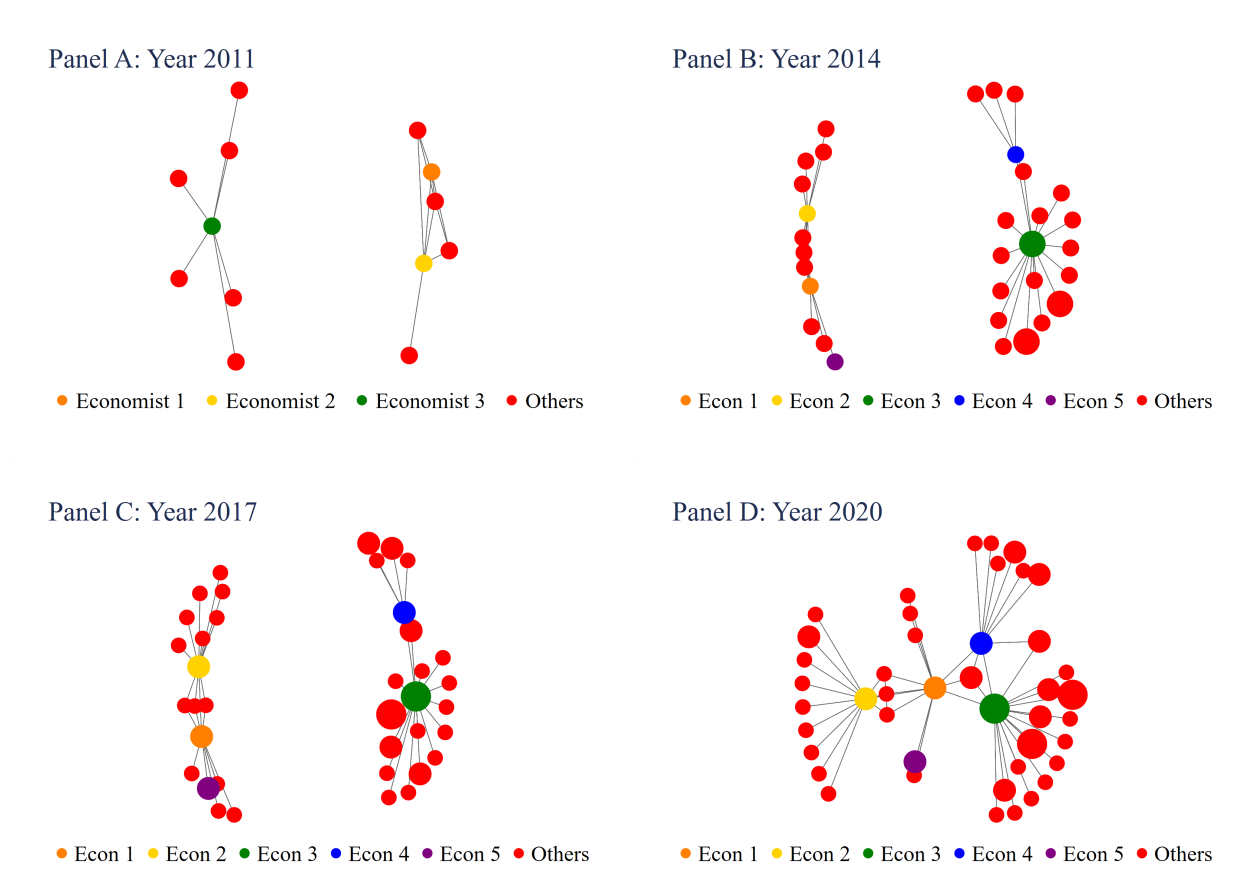
Figure 6: Effects of Initial Labor Market Conditions on Cumulative Social Networks
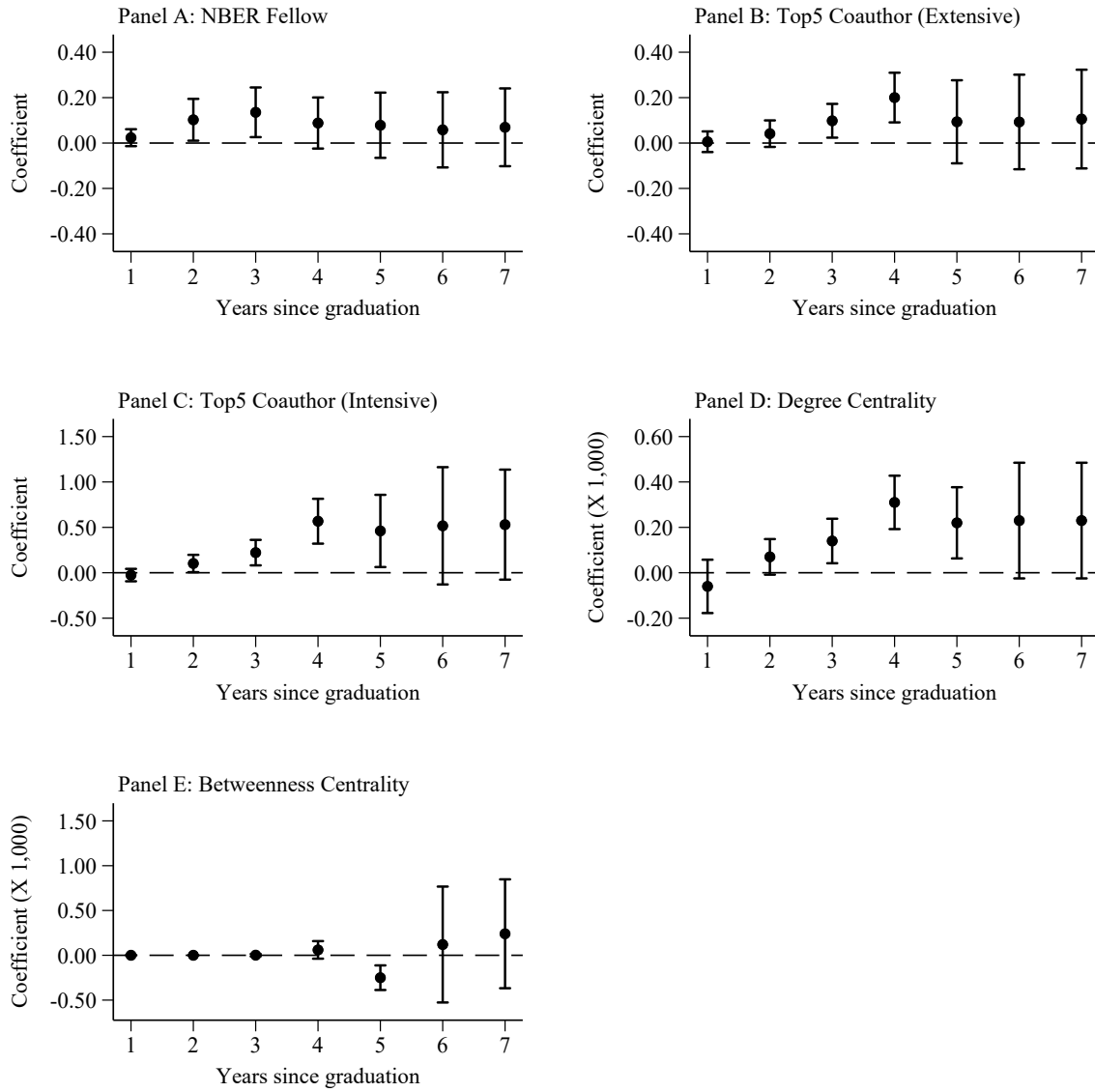
Notes: The figure displays coefficient estimates of the effect of initial labor market conditions on economists' cumulative social network over years since graduation using the preferred specification in equation (2) that includes a time trend, PhD school fixed effect, research field fixed effect, and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The lower bound and upper bound of the 95% confidence interval are also plotted. The measure of labor market conditions is unemployment rate. The outcome at the extensive margin is represented as dummy variables that equal 1 if the condition is satisfied, while the outcome at the intensive margin is expressed as the actual counts of the outcome. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper.

Sources: The information of job market candidates is based on a dataset collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics*.

Figure 7: Effects of Initial Labor Market Conditions on Cumulative Top 5 Publications
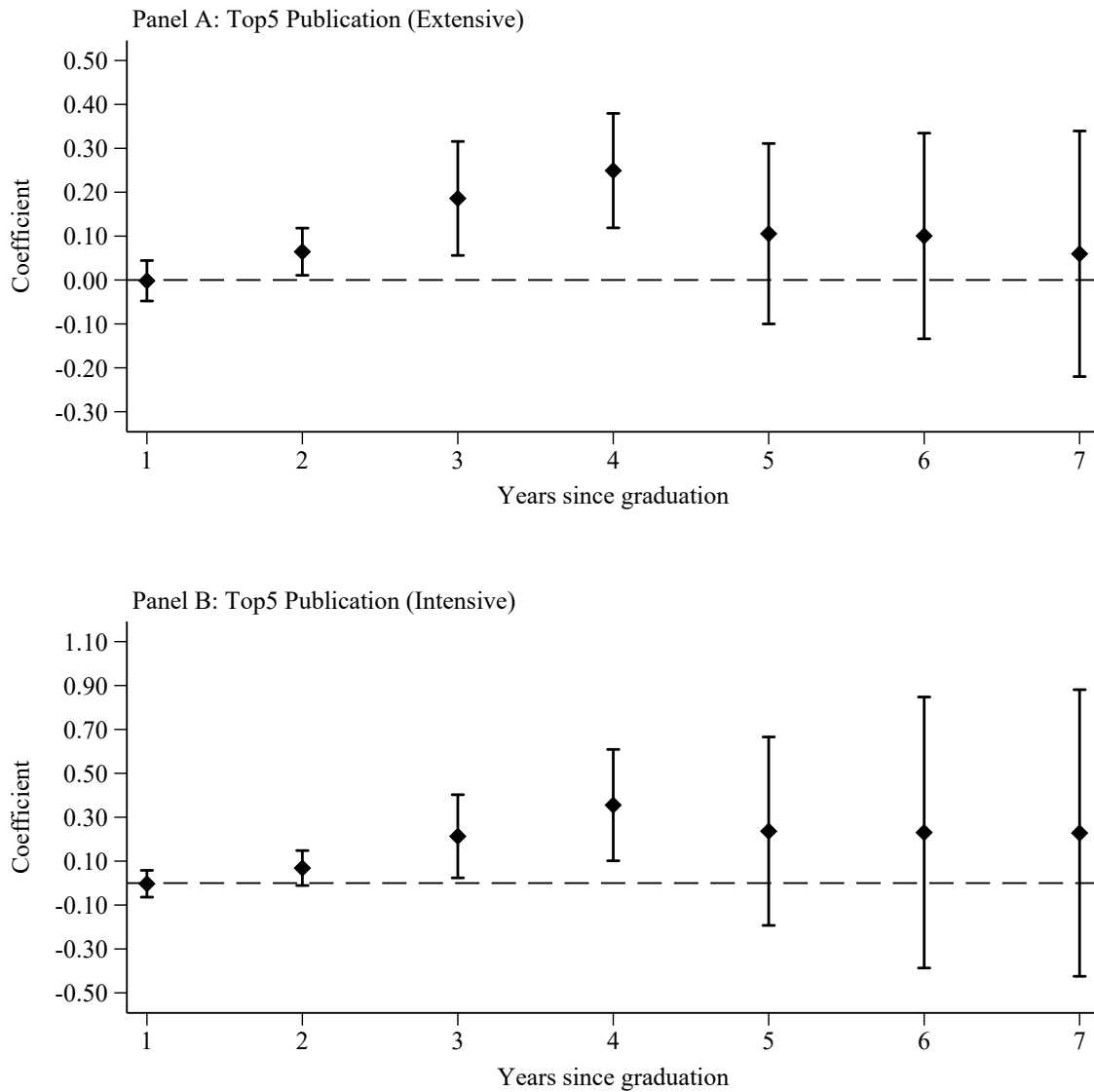
Panel A: Top5 Publication (Extensive)

Panel B: Top5 Publication (Intensive)

Notes: The figure displays coefficient estimates of the effect of initial labor market conditions on economists' cumulative productivity over years since graduation using the preferred specification in equation (2) that includes a time trend, PhD school fixed effect, research field fixed effect, and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The lower bound and upper bound of the 95% confidence interval are also plotted. The measure of labor market conditions is unemployment rate. The outcome at the extensive margin is represented as dummy variables that equal 1 if the condition is satisfied, while the outcome at the intensive margin is expressed as the actual counts of the outcome.
Sources: The information of job market candidates is based on a dataset collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics*.

Figure 8: Effects of Initial Labor Market Conditions on Yearly Social Networks and Top 5 Publications

Notes: The figure displays coefficient estimates of the effect of initial labor market conditions on economists' yearly social network and research output over years since graduation using the preferred specification in equation (2) that includes a time trend, PhD school fixed effect, research field fixed effect, and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The lower bound and upper bound of the 95% confidence interval are also plotted. The measure of labor market conditions is unemployment rate. The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper.
Sources: The information of job market candidates is based on a dataset collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics*.

Figure 9: Effects of Initial Labor Market Conditions on Cumulative and Yearly Number of Top 5 Publications
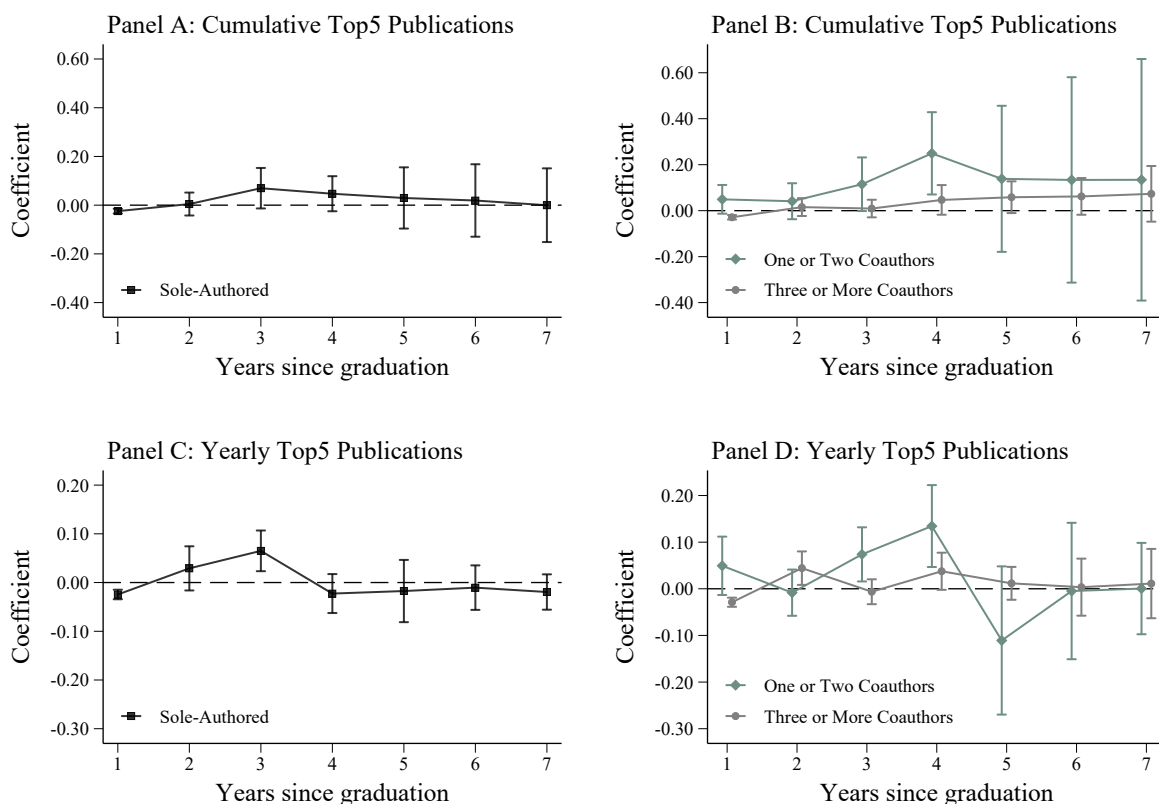
Notes: The figure displays coefficient estimates of the effect of initial labor market conditions on economists' cumulative and annual count of top5 publications by the number of coauthors over years since graduation using the preferred specification in equation (2) that includes a time trend, PhD school fixed effect, research field fixed effect, and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The lower bound and upper bound of the 95% confidence interval are also plotted. The measure of labor market conditions is unemployment rate.

Sources: The information of job market candidates is based on a dataset collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics*.

Figure 10: Effects of Initial Labor Market Conditions on Yearly Number of Top 5 Coauthors by Subgroups
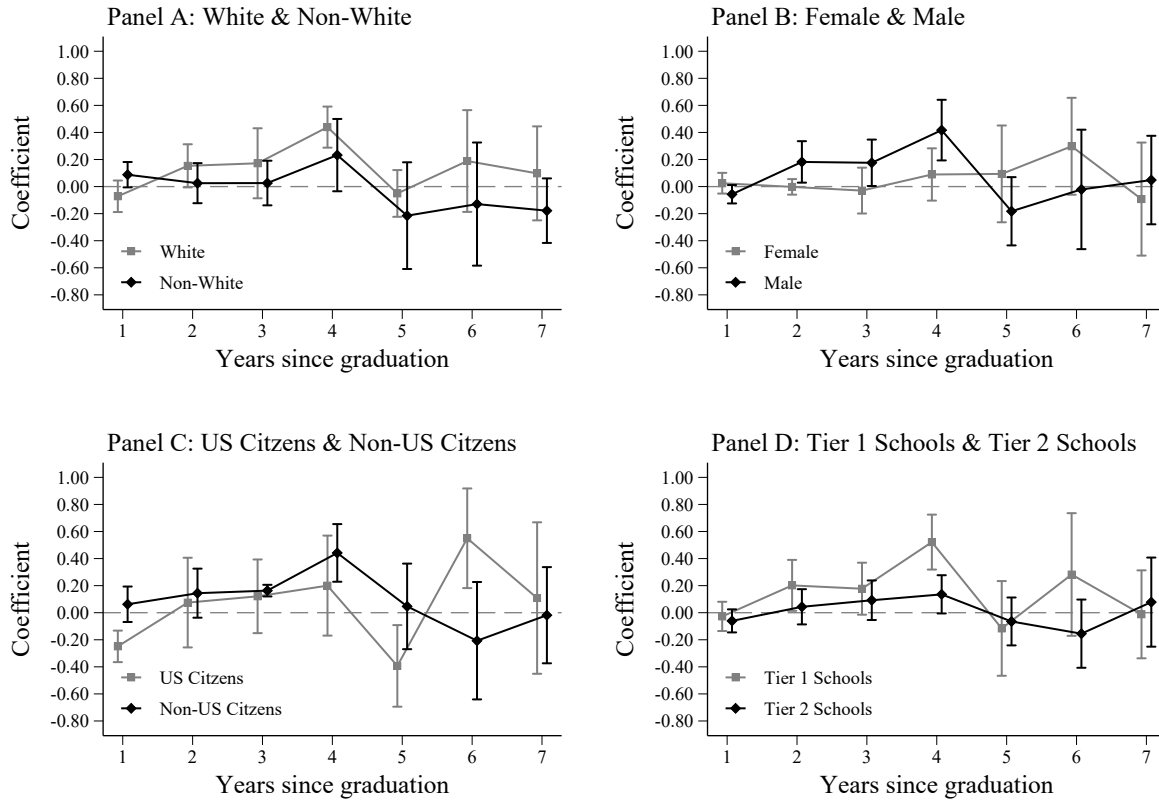
Notes: The figure displays coefficient estimates of the effect of initial labor market conditions on economists' annual count of top5 coauthors by each subgroup over years since graduation using the preferred specification in equation (2) that includes a time trend, PhD school fixed effect, research field fixed effect, and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The lower bound and upper bound of the 95% confidence interval are also plotted. The measure of labor market conditions is unemployment rate.
Sources: The information of job market candidates is based on a dataset collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics*.
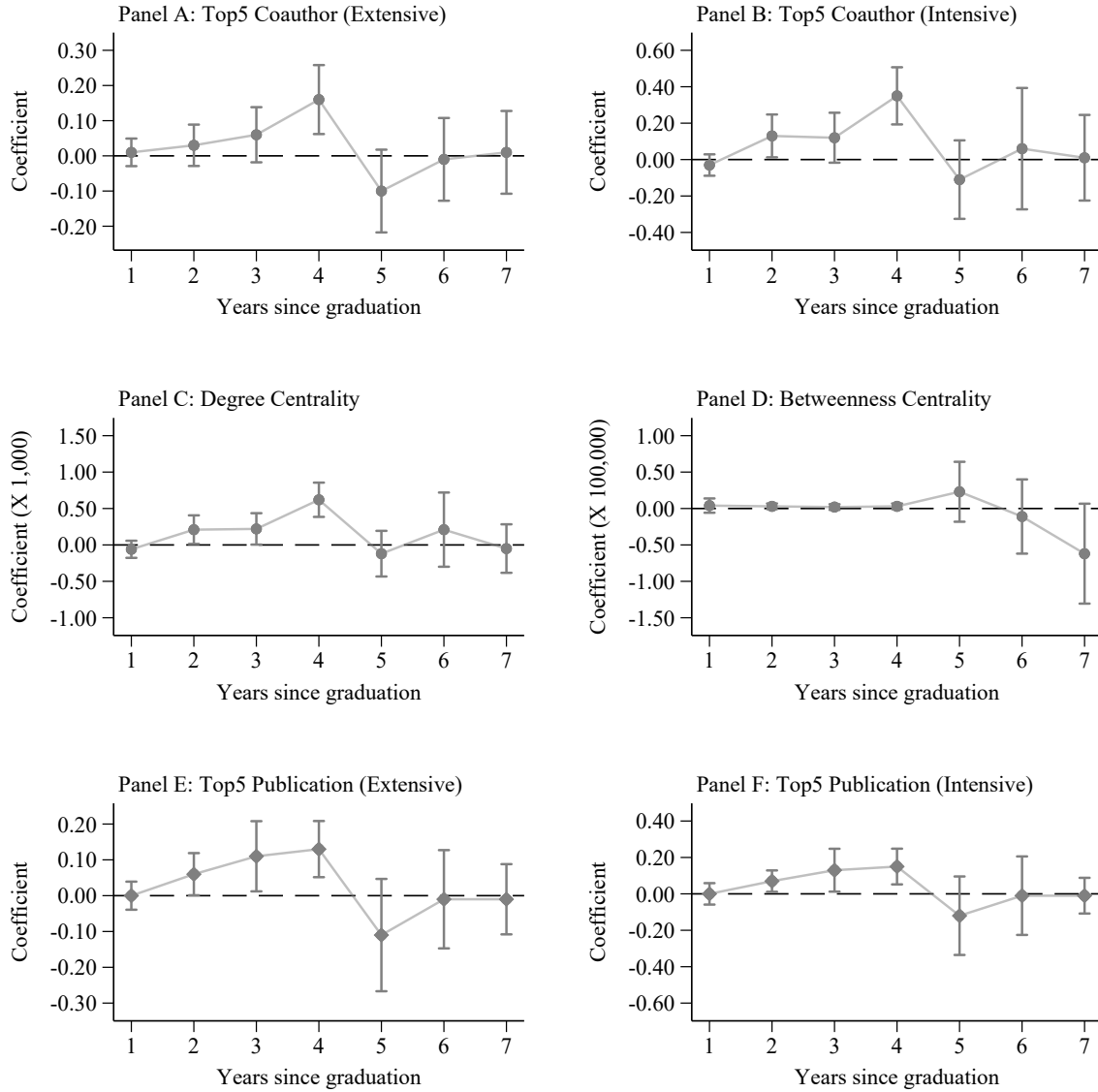
Figure 11: Effects of Initial Labor Market Conditions on Yearly Number of Top 5 Publications by Subgroups
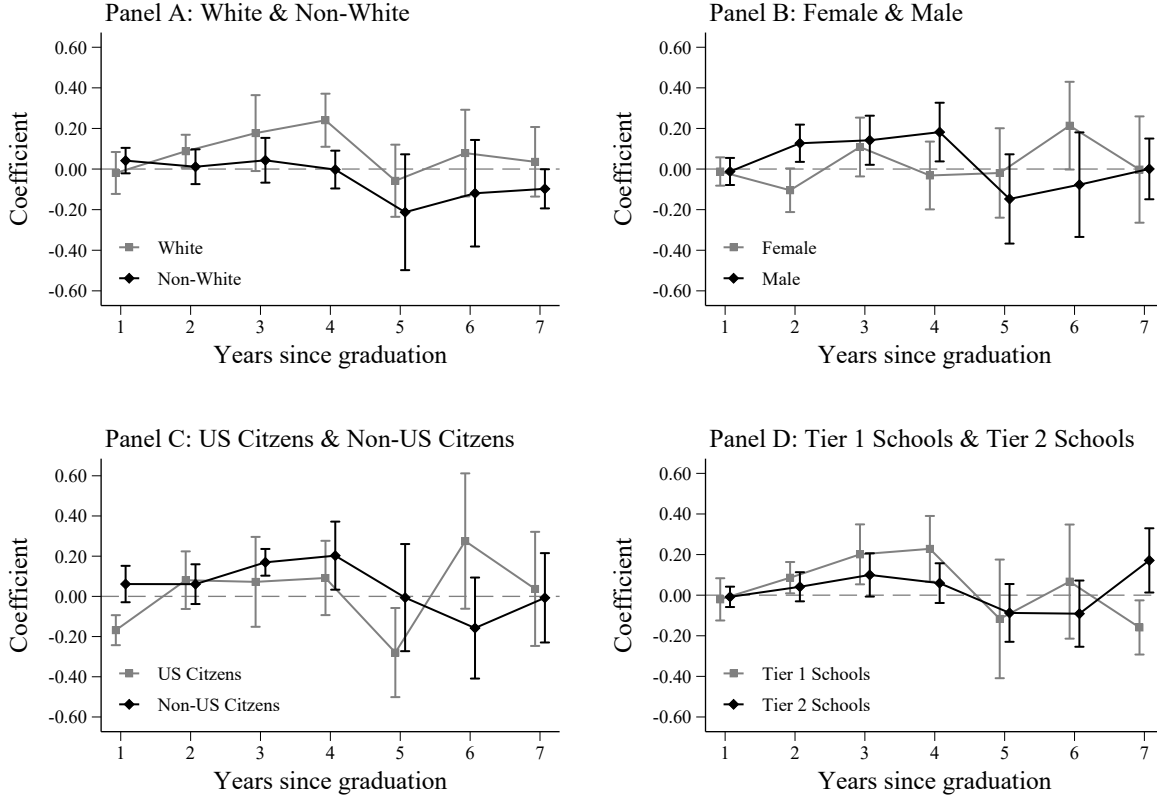
Notes: The figure displays coefficient estimates of the effect of initial labor market conditions on economists' annual count of top5 publications by each subgroup over years since graduation using the preferred specification in equation (2) that includes a time trend, PhD school fixed effect, research field fixed effect, and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The lower bound and upper bound of the 95% confidence interval are also plotted. The measure of labor market conditions is unemployment rate.
Sources: The information of job market candidates is based on a dataset collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics*.

Figure 12: Trends in Yearly Count of Top 5 Coauthors and Publications per Economist
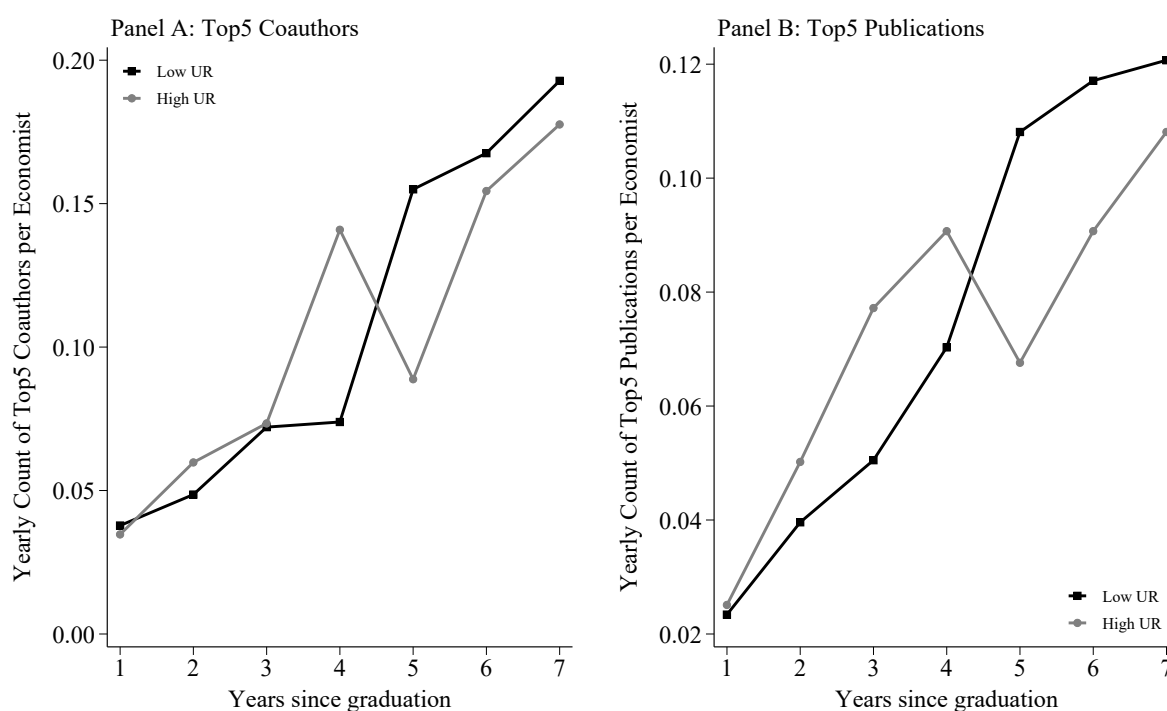
Notes: Panel A in the figure displays the trends in annual count of top5 coauthors per economist over years after graduation by unemployment rate (High vs. Low), while Panel B in the figure displays the trends in annual count of top5 publications per economist over years after graduation by unemployment rate (High vs. Low).

Sources: The information of job market candidates is based on a dataset manually collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics*.

Table 1: Summary Statistics, Economists AY2009-AY2015

	Variables	N	Mean	SD
Demographics:	Female	1,266	0.26	0.44
	Asian	1,266	0.28	0.45
	Black	1,266	0.01	0.10
	Hispanic	1,266	0.11	0.32
	US Citizen	1,266	0.37	0.48
Research Field:	Applied Micro	1,266	0.31	0.46
	Micro Theory	1,266	0.11	0.31
	Macroeconomics	1,266	0.32	0.47
	Econometrics	1,266	0.05	0.21
	Finance	1,266	0.14	0.35
	Industrial Organization	1,266	0.08	0.26
Initial Placement:	Tenure-Track (TT) Academia	1,266	0.62	0.49
	Top50 TT Academia	1,266	0.24	0.42
	Public Sector	1,266	0.16	0.37
	Private Sector	1,266	0.13	0.34
	Post Doc	1,266	0.05	0.22
Mobility:	3-Year Mobility (extensive)	1,266	0.14	0.35
	3-Year Mobility (intensive)	1,266	0.16	0.41
7-Year Outcomes:	All Tenured	1,266	0.20	0.40
	Top50 Tenured	1,266	0.10	0.30
	Top20 Tenured	1,266	0.08	0.28
	Top10 Tenured	1,266	0.06	0.24
	Top5 Publication	1,266	0.52	1.04
	NBER Fellow	1,266	0.13	0.34
	Top5 Coauthor	1,266	0.76	1.73
	Degree Centrality	1,266	0.0002	0.0006
	Betweenness Centrality	1,266	0.0002	0.0015
	(Mean) Network Size		3,030	

Notes: Gender is inferred through visual analysis of economists' photographs, while race is inferred through using Namsor software based on economists' name, undergraduate school, and picture. The unreported country of residence is inferred through native language and the country where the undergraduate school is located. Research Field is the primary area of research for the economist. The initial placement of economists is classified into six categories: (1) Tenure-Track Academia, (2) Public Sector, (3) Independent Institution, (4) Private Sector, (5) Post Doc, and (6) Other (e.g., non-tenure-track positions). The rankings are based on Tilburg University's Top 200 Worldwide Economics Schools Research Ranking, which assesses research contributions from 2010 to 2015. Academic year T is defined as the period between September Year T-1 and August Year T. There are 1,266 economists in the sample. "3-Year Mobility (extensive)" refers to whether ever changed employer during initial 3 years.

Sources: The data on economists is derived from a dataset manually collected by the author from departments' webpages using Wayback Machine, as well as from economists' CVs. Additionally, the data on economists' top5 economics journal network is obtained from a dataset manually collected by the author from the websites of the top5 economics journals (i.e., AER, QJE, Econometrica, JPE, and REStud).

Table 2: The Effects of Initial Labor Market Conditions on Cumulative Social Networks
(Coefficients × 100)

	Extensive Margin				Intensive Margin			
	3-Year NBER Fellow	7-Year NBER Fellow	3-Year Top5 Coauthor	7-Year Top5 Coauthor	3-Year Top5 Coauthor	7-Year Top5 Coauthor	7-Year Degree Centrality	7-Year Betweenness Centrality
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Condition (UR)	13.539**	6.942	9.805***	10.559	22.189***	53.011*	0.022**	0.025
	(5.584)	(8.742)	(3.798)	(11.092)	(7.152)	(30.906)	(0.011)	(0.032)
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F (First-stage)	118	118	118	118	118	118	118	118
R^2	0.111	0.131	0.076	0.106	0.055	0.108	0.101	0.036
Observations	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
Dep. Mean (× 100)	8.689	13.191	8.452	24.803	16.983	75.592	0.025	0.023
N (Economists)	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
Mean Network Size							3,030	3,030

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career social network using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). An economist's social network is defined as including all authors who have published papers with coauthor(s) in the top 5 economic journals over a 7-year period. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper. The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. "NBER Fellow" indicates whether an economist is an NBER affiliated scholar within a given time period since graduation. At extensive margin, "Top5 Coauthor" indicates whether an economist has coauthors from the top 5 economic journals. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Table 3: The Effects of Initial Labor Market Conditions on Cumulative Publications and Tenure (Coefficients × 100)

	Extensive Margin		Intensive Margin					
	3-Year Top5 Pub	7-Year Top5 Pub	3-Year Top5 Pub	7-Year Top5 Pub	7-Year Top10 Tenure	7-Year Top20 Tenure	7-Year Top50 Tenure	7-Year All Tenure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Condition (UR)	18.584***	5.977	21.313**	22.819	-4.454	-5.689	2.105	5.721
	(6.622)	(14.269)	(9.666)	(33.307)	(4.678)	(6.905)	(7.127)	(8.256)
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F (First-stage)	118	118	118	118	118	118	118	118
R^2	0.080	0.110	0.074	0.122	0.091	0.089	0.085	0.060
Observations	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
Dep. Mean (× 100)	10.979	28.909	13.270	52.369	5.924	8.293	10.347	20.221
N (Economists)	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career academic outcomes using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. For example, "Top10 Tenure" indicates whether an economist has tenure at top10 school within 7 years since graduation. The rankings are based on Tilburg University's Top 200 Worldwide Economics Schools Research Ranking, which assesses research contributions from 2010 to 2015. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009}$ = 7.1. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.
Sources: See appendix A for details.

Table 4: The Effects of Initial Labor Market Conditions with Robust Inference
(Coefficients × 100)

	Extensive Margin				
	3-Year NBER Fellow	4-Year Top5 Coauthor	4-Year Top5 Pub	4-Year Degree Centrality	4-Year Betweenness Centrality
	(1)	(2)	(3)	(4)	(5)
Market Condition (UR)	13.539*	20.033**	23.701**	0.032***	0.006
Cluster SE	[5.583]	[5.581]	[6.371]	[0.007]	[0.005]
Bootstrap P-Value	(0.067)	(0.016)	(0.014)	(0.006)	(0.313)
Jackknife SE	[6.020]	[7.954]	[9.326]	[0.011]	[0.004]
Observations	1,266	1,266	1,266	1,266	1,266
	Extensive Margin			Intensive Margin	
	7-Year Top10 Tenure	7-Year Top20 Tenure	7-Year All Tenure	4-Year Top5 Coauthor	4-Year Top5 Pub
	(6)	(7)	(8)	(9)	(10)
Market Condition (UR)	-4.454	-5.689	6.139	56.765***	34.312**
Cluster SE	[4.678]	[6.905]	[8.748]	[12.596]	[12.494]
Bootstrap P-Value	(0.416)	(0.478)	(0.543)	(0.006)	(0.045)
Jackknife SE	[6.436]	[7.128]	[11.003]	[19.272]	[12.432]
Observations	1,266	1,266	1,266	1,266	1,266
Time Trend	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
F (First-stage)	118	118	118	118	118
N (Economists)	1,266	1,266	1,266	1,266	1,266

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career social network using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). We calculate the bootstrap-based p-values using wild bootstrap method with 1,000 replications, and they are reported in the parentheses. We also report Jackknife SEs (in square brackets) using Jackknife method with 1,266 replications. An economist's social network is defined as including all authors who have published papers with coauthor(s) in the top5 economic journals over a given-year period. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper. The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$, where * is based on bootstrap p-value.
Sources: See appendix A for details.

Table 5: The Effects of Initial Labor Market Conditions on Mobility and Occupation
(Coefficients $\times$ 100)

	Extensive	Intensive				
	3-Year	3-Year	Initial Placement			
	Mobility	Mobility	Academia	Public	Private	Postdoc
	(1)	(2)	(3)	(4)	(5)	(6)
Market Condition (UR)	1.346	-3.672	-3.886	0.620	14.641***	-5.620*
	(5.693)	(7.479)	(14.936)	(6.099)	(4.538)	(2.894)
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
F (First-stage)	118	118	118	118	118	118
R^2	0.024	0.026	0.059	0.073	0.065	0.035
Observations	1,266	1,266	1,266	1,266	1,266	1,266
Dep. Mean ($\times$100)	14.849	16.271	62.164	15.956	12.954	5.292
N (Economists)	1,266	1,266	1,266	1,266	1,266	1,266

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career mobility and initial occupation using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Table 6: The Effects of Initial Labor Market Conditions on the Quality of Initial Placement (Coefficients × 100)

	USNEWS (1)	QS (2)	IDEAS (3)	Tilburg (4)	AK (5)
Market Condition (UR)	-7.585	2.364	-9.235	6.584	0.593
	(19.510)	(20.587)	(20.628)	(17.438)	(21.148)
Time Trend	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
F (First-stage)	118	118	118	118	118
R^2	0.097	0.096	0.122	0.106	0.111
Observations	1,266	1,266	1,266	1,266	1,266
N (Economists)	1,266	1,266	1,266	1,266	1,266

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on the quality of their initial placement using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The outcomes are dummy variables that equal to 1 if the initial placement is in top50 department worldwide. Column (1) to column (5) corresponding to the rankings by US News Rankings of Global Universities for Economics and Business, QS World University Rankings (Economics & Econometrics), RePEc Ranking of Institutions, Tilburg University Worldwide Economics Schools Research Ranking based on research contribution research contribution, and Amir & Knauff (2008)'s Economics Departments Worldwide rankings based on the Basis of PhD Placement. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Table 7: The Heterogeneous Effects of Initial Labor Market Conditions on Cumulative Social Networks (Coefficients × 100)

		Extensive Margin				Intensive Margin			
		3-Year NBER Fellow	7-Year NBER Fellow	3-Year Top5 Coauthor	7-Year Top5 Coauthor	3-Year Top5 Coauthor	7-Year Top5 Coauthor	7-Year Degree Centrality	7-Year Betweenness Centrality
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
White:	Market Condition (UR)	18.860***	11.704	12.570*	17.541**	25.416*	92.974***	0.036***	0.045
(N=755)		(6.412)	(8.660)	(6.854)	(7.552)	(14.363)	(31.078)	(0.011)	(0.043)
	F (First-stage)	109	109	109	109	109	109	109	109
	R^2	0.096	0.118	0.073	0.116	0.047	0.104	0.104	0.043
Non-White:	Market Condition (UR)	6.355	2.051	4.288	-0.889	13.929	-14.977	-0.001	0.016
(N=511)		(5.011)	(13.585)	(8.179)	(19.606)	(15.234)	(45.028)	(0.014)	(0.016)
	F (First-stage)	127	127	127	127	127	127	127	127
	R^2	0.128	0.141	0.080	0.097	0.083	0.109	0.116	0.052
Female:	Market Condition (UR)	7.950	10.515	5.247	14.973	-0.646	38.297	0.017	0.015
(N=328)		(11.055)	(10.861)	(6.514)	(18.908)	(13.355)	(43.898)	(0.014)	(0.021)
	F (First-stage)	77	77	77	77	77	77	77	77
	R^2	0.143	0.189	0.059	0.113	0.074	0.122	0.120	0.044
Male:	Market Condition (UR)	15.264**	4.978	11.354***	8.008	30.183***	56.463	0.022*	0.033
(N=938)		(7.077)	(10.810)	(4.062)	(11.527)	(8.818)	(37.660)	(0.013)	(0.038)
	F (First-stage)	103	103	103	103	103	103	103	103
	R^2	0.120	0.134	0.093	0.109	0.062	0.109	0.104	0.038
US:	Market Condition (UR)	24.215**	17.844	-4.158	2.392	-5.250	41.296	0.016	-0.001
(N=473)		(11.857)	(18.543)	(4.884)	(15.537)	(14.419)	(60.467)	(0.020)	(0.050)
	F (First-stage)	84	84	84	84	84	84	84	84
	R^2	0.147	0.144	0.125	0.145	0.105	0.133	0.141	0.053
Non-US:	Market Condition (UR)	9.675**	2.609	15.951***	14.547	36.992***	63.299	0.025	0.035
(N=793)		(4.152)	(6.057)	(4.245)	(14.722)	(10.926)	(44.559)	(0.016)	(0.032)
	F (First-stage)	91	91	91	91	91	91	91	91
	R^2	0.085	0.101	0.077	0.097	0.057	0.105	0.107	0.038
Tier 1 Schools:	Market Condition (UR)	15.954***	0.626	14.454***	18.381	35.191***	102.78**	0.039**	0.011
(N=687)		(4.873)	(6.220)	(4.567)	(16.962)	(7.372)	(43.728)	(0.015)	(0.042)
	F (First-stage)	119	119	119	119	119	119	119	119
	R^2	0.121	0.131	0.084	0.114	0.060	0.103	0.103	0.037
Tier 2 Schools:	Market Condition (UR)	11.848	12.696	4.934	2.121	7.529	6.965	0.003	0.011
(N=579)		(6.628)	(13.094)	(5.817)	(7.821)	(9.234)	(15.566)	(0.005)	(0.018)
	F (First-stage)	85	85	85	85	85	85	85	85
	R^2	0.059	0.062	0.072	0.076	0.047	0.066	0.066	0.035

Notes: The table presents IV estimates of the heterogeneous impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career social network using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, country residence, experience of master degree, and pre-PhD working experience). An economist's social network is defined as including all authors who have published papers with coauthor(s) in the top 5 economic journals over a 7-year period. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper. The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. "NBER Fellow" indicates whether an economist is an NBER affiliated scholar within a given time period since graduation. At extensive margin, "Top5 Coauthor" indicates whether an economist has coauthors from the top 5 economic journals. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$. "N" stands for number of economists.
Sources: See appendix A for details.

Table 8: The Heterogeneous Effects of Initial Labor Market Conditions on Cumulative
Top5 Publications and Tenure Attainment (Coefficients × 100)

		Extensive Margin		Intensive Margin					
		3-Year Top5 Pub	7-Year Top5 Pub	3-Year Top5 Pub	7-Year Top5 Pub	7-Year Top10 Tenure	7-Year Top20 Tenure	7-Year Top50 Tenure	7-Year All Tenure
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
White:	Market Condition (UR)	23.397**	14.075	28.464*	55.635	-4.804	-7.942	3.366	-0.812
(N=755)		(9.966)	(11.016)	(16.014)	(34.281)	(5.399)	(8.565)	(7.062)	(10.674)
	F (First-stage)	109	109	109	109	109	109	109	109
	R^2	0.069	0.114	0.058	0.114	0.090	0.102	0.098	0.071
Non-White:	Market Condition (UR)	7.076	-13.263	8.868	-37.628	-3.733	0.047	2.498	16.402*
(N=511)		(7.374)	(22.249)	(8.275)	(35.938)	(3.114)	(3.965)	(8.590)	(8.540)
	F (First-stage)	127	127	127	127	127	127	127	127
	R^2	0.097	0.086	0.106	0.112	0.126	0.084	0.088	0.094
Female:	Market Condition (UR)	1.228	9.794	-0.265	16.443	5.281	5.281	3.938	10.272
(N=328)		(13.975)	(20.863)	(13.756)	(38.731)	(6.966)	(6.966)	(10.371)	(24.046)
	F (First-stage)	77	77	77	77	77	77	77	77
	R^2	0.063	0.115	0.072	0.131	0.108	0.108	0.112	0.069
Male:	Market Condition (UR)	23.478***	2.886	28.212**	24.108	-7.013*	-8.706	1.941	5.096
(N=938)		(6.751)	(14.154)	(11.061)	(37.457)	(4.118)	(7.660)	(7.193)	(6.275)
	F (First-stage)	103	103	103	103	103	103	103	103
	R^2	0.092	0.118	0.085	0.129	0.099	0.093	0.092	0.072
US:	Market Condition (UR)	1.591	-0.545	-1.531	10.914	3.655	12.089	18.819	6.403
(N=473)		(10.184)	(19.778)	(12.392)	(51.932)	(12.519)	(16.988)	(16.334)	(15.353)
	F (First-stage)	84	84	84	84	84	84	84	84
	R^2	0.136	0.140	0.143	0.167	0.144	0.135	0.145	0.078
Non-US:	Market Condition (UR)	23.965***	8.770	29.182***	32.359	-7.235**	-11.983**	-4.214	8.439
(N=793)		(6.406)	(16.844)	(10.138)	(44.161)	(3.381)	(5.496)	(8.495)	(11.382)
	F (First-stage)	91	91	91	91	91	91	91	91
	R^2	0.072	0.110	0.061	0.112	0.060	0.073	0.062	0.074
Tier 1 Schools:	Market Condition (UR)	19.420**	-2.340	26.658**	28.601	-6.138	-11.675	-8.107	-12.303
(N=687)		(12.392)	(18.865)	(11.731)	(42.238)	(7.339)	(10.182)	(10.300)	(10.262)
	F (First-stage)	119	119	119	119	119	119	119	119
	R^2	0.100	0.129	0.091	0.126	0.071	0.069	0.081	0.080
Tier 2 Schools:	Market Condition (UR)	12.853*	13.625	13.290**	18.502	-2.503	1.473	12.112	28.205**
(N=579)		(6.896)	(11.725)	(6.392)	(21.404)	(1.710)	(3.766)	(9.138)	(11.685)
	F (First-stage)	85	85	85	85	85	85	85	85
	R^2	0.076	0.069	0.074	0.068	0.045	0.038	0.031	0.033

Notes: The table presents IV estimates of the heterogeneous impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career academic outcomes using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, country residence, experience of master degree, and pre-PhD working experience). The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. For example, "Top10 Tenure" indicates whether an economist has tenure at top10 school within 7 years since graduation. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$. "N" stands for number of economists.
Sources: See appendix A for details.

Table 9: The Heterogeneous Effects of Initial Labor Market Conditions on Mobility and Occupation (Coefficients × 100)

		Extensive	Intensive	Initial Placement			
		3-Year Mobility	3-Year Mobility	Academia	Public	Private	Postdoc
		(1)	(2)	(3)	(4)	(5)	(6)
White:	Market Condition (UR)	-5.734	-16.789	-12.355	6.340	9.568	-3.389
(N=755)		(10.599)	(12.783)	(17.830)	(9.097)	(10.042)	(7.775)
	F (First-stage)	109	109	109	109	109	109
	R^2	0.018	0.014	0.061	0.078	0.074	0.029
Non-White:	Market Condition (UR)	15.453	21.924	13.016	-13.304	26.922***	-9.142
(N=511)		(11.917)	(14.381)	(19.493)	(10.656)	(6.318)	(7.266)
	F (First-stage)	127	127	127	127	127	127
	R^2	0.060	0.059	0.089	0.097	0.076	0.079
Female:	Market Condition (UR)	-18.446***	-32.204***	67.314***	6.467	7.148	0.104
(N=328)		(4.153)	(3.379)	(24.937)	(5.251)	(8.212)	(7.098)
	F (First-stage)	77	77	77	77	77	77
	R^2	0.073	0.068	0.077	0.095	0.090	0.098
Male:	Market Condition (UR)	7.261	4.793	-20.292	-29.539**	-13.258	-6.082**
(N=938)		(6.643)	(7.856)	(15.330)	(14.819)	(12.207)	(2.979)
	F (First-stage)	103	103	103	103	103	103
	R^2	0.033	0.036	0.073	0.129	0.119	0.040
US:	Market Condition (UR)	-9.092	-14.744	-10.980	-7.185	6.813	-8.417
(N=473)		(13.884)	(14.651)	(17.451)	(19.653)	(9.182)	(6.700)
	F (First-stage)	84	84	84	84	84	84
	R^2	0.028	0.028	0.069	0.079	0.078	0.049
Non-US:	Market Condition (UR)	6.540	1.656	-3.291	4.335	20.342**	-6.518*
(N=793)		(6.003)	(7.220)	(17.058)	(4.461)	(8.066)	(3.595)
	F (First-stage)	91	91	91	91	91	91
	R^2	0.033	0.034	0.074	0.097	0.061	0.060
Tier 1 Schools:	Market Condition (UR)	19.175	15.794	-29.884*	11.311	30.360***	-18.296***
(N=687)		(15.628)	(17.272)	(17.702)	(7.514)	(10.131)	(5.067)
	F (First-stage)	119	119	119	119	119	119
	R^2	0.042	0.044	0.093	0.089	0.079	0.045
Tier 2 Schools:	Market Condition (UR)	-16.185	-23.261*	30.223	-16.601*	-2.511	6.678
(N=579)		(11.197)	(13.384)	(19.574)	(9.910)	(6.378)	(5.231)
	F (First-stage)	85	85	85	85	85	85
	R^2	0.032	0.036	0.054	0.082	0.039	0.031

Notes: The table presents IV estimates of the heterogeneous impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career mobility and occupation using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, country residence, experience of master degree, and pre-PhD working experience). The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$. "N" stands for number of economists. *Sources*: See appendix A for details.

Table 10: The Effects of Initial Labor Market Conditions on Cumulative and Yearly Number of Top5 Publications by Number of Coauthors

	Cumulative Top5 Publications						
Panel A:	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years
Sole-Authored:							
Market Condition (UR)	-0.024***	0.0046	0.0696	0.0470	0.0296	0.0192	-0.0002
	(0.0050)	(0.0240)	(0.0424)	(0.0367)	(0.0641)	(0.0759)	(0.0772)
One or Two Coauthors:							
Market Condition (UR)	0.0493	0.0411	0.1149*	0.2494***	0.1386	0.1338	0.1343
	(0.0319)	(0.0399)	(0.0595)	(0.0913)	(0.1621)	(0.2280)	(0.2681)
Three or More Coauthors:							
Market Condition (UR)	-0.0288***	0.0155	0.0092	0.0468	0.0585*	0.0620	0.0732
	(0.0050)	(0.0198)	(0.0195)	(0.0329)	(0.0352)	(0.0407)	(0.0618)
Observations	1,266	1,266	1,266	1,266	1,266	1,266	1,266
	Yearly Top5 Publications						
Panel B:	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years
Sole-Authored:							
Market Condition (UR)	-0.0245***	0.0291	0.0651***	-0.0226	-0.0174	-0.0104	-0.0194
	(0.0050)	(0.0231)	(0.0213)	(0.0204)	(0.0326)	(0.0233)	(0.0185)
One or Two Coauthors:							
Market Condition (UR)	0.0493	-0.0083	0.0738**	0.1345***	-0.1108	-0.0048	0.0005
	(0.0319)	(0.0253)	(0.0296)	(0.0448)	(0.0811)	(0.0746)	(0.0500)
Three or More Coauthors:							
Market Condition (UR)	-0.0288***	0.0443**	-0.0063	0.0376*	0.0117	0.0035	0.0112
	(0.0050)	(0.0183)	(0.0136)	(0.0203)	(0.0180)	(0.0312)	(0.0379)
Observations	1,266	1,266	1,266	1,266	1,266	1,266	1,266
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N (Economists)	1,266	1,266	1,266	1,266	1,266	1,266	1,266

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their number of top5 publications by number of coauthors using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition_{AY2009}^{UR} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Sources: See appendix A for details.

Table 11: The Effects of Initial Labor Market Conditions on Cumulative Number of Top5 Publications in First 4 Years (Coefficients × 100)

	4-Year Top5 Pub	4-Year Top5 Pub	4-Year Top5 Coauthors	4-Year Top5 Pub	4-Year Degree Centrality
	(1)	(2)	(3)	(4)	(5)
Market Condition (UR)	34.31***	6.02	21.64**	4.35	21.66**
	(12.49)	(5.91)	(9.79)	(5.88)	(9.69)
Time Trend	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Top5 Coauthors Within 4 Years	No	Yes	No	No	No
Top5 Coauthors Within 3 Years	No	No	Yes	No	No
Degree Centrality Within 4 Years	No	No	No	Yes	No
Degree Centrality Within 3 Years	No	No	No	No	Yes
Observations	1,266	1,266	1,266	1,266	1,266
N (Economists)	1,266	1,266	1,266	1,266	1,266

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their number of top5 publications within 4 years after graduation using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Table 12: The Effects of Initial Labor Market Conditions on the Attainment of Tenure and Post-Doctoral Position (Coefficients × 100)

	Realized Tenured	Expected Tenure	Post-Doc
	(1)	(2)	(3)
Market Condition (UR)	1.59	11.62*	-5.62*
	(3.24)	(6.84)	(2.89)
Time Trend	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	1,266	1,266	1,266
N (Economists)	1,266	1,266	1,266

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on the attainment of tenure and post-doctoral position using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). "Realized Tenured" is defined as whether an economist attained tenure during initial four years, "Expected Tenure" is defined as whether an economist attained tenure in the sixth year, and "Post-Doc" is defined as whether an economist had a post-doc experience. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Table 13: The Effects of Labor Market Conditions at the Start of PhD Program
(Coefficients × 100)

	Extensive Margin				
	3-Year NBER Fellow	4-Year Top5 Coauthor	4-Year Top5 Pub	4-Year Degree Centrality	4-Year Betweenness Centrality
	(1)	(2)	(3)	(4)	(5)
Market Condition (UR)	-4.094	-1.879	-2.777	-0.002	0.000
	(5.002)	(1.937)	(3.012)	(0.004)	(0.004)
Observations	1,266	1,266	1,266	1,266	1,266
	Extensive Margin			Intensive Margin	
	7-Year Top10 Tenure	7-Year Top20 Tenure	7-Year All Tenure	4-Year Top5 Coauthor	4-Year Top5 Pub
	(6)	(7)	(8)	(9)	(10)
Market Condition (UR)	1.030	1.534	-2.733	-3.196	0.584
	(2.110)	(1.656)	(3.988)	(6.589)	(4.268)
Observations	1,266	1,266	1,266	1,266	1,266
Time Trend	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
N (Economists)	1,266	1,266	1,266	1,266	1,266

Notes: The table presents OLS estimates of the impacts of labor market conditions experienced by economists at the start of economists' PhD programs on their early-career social network and academic outcomes using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). An economist's social network is defined as including all authors who have published papers with coauthor(s) in the top 5 economic journals over a given period. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper. The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition_{AY2009}^{UR} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Table 14: The Effects of Initial Labor Market Conditions on Number of Top5 Coauthors and Publications in the Fifth Year (Coefficients × 100)

	Top5 Coauthors	Top5 Coauthors	Top5 Coauthors	Top5 Coauthors
	(1)	(2)	(3)	(4)
Market Condition (UR)	-10.70	-10.14	-9.65	-8.94
	(10.94)	(11.33)	(10.66)	(11.04)
	Top5 Pub	Top5 Pub	Top5 Pub	Top5 Pub
	(5)	(6)	(7)	(8)
Market Condition (UR)	-11.65	-11.28	-10.38	-9.91
	(10.51)	(10.57)	(9.81)	(9.83)
Time Trend	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Tenured Within 5 Years	No	Yes	No	Yes
Post-Doc Position	No	No	Yes	Yes
Observations	1,266	1,266	1,266	1,266
N (Economists)	1,266	1,266	1,266	1,266

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their number of top5 coauthors and publications in fifth year after graduation using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

APPENDIX

to

Initial Labor Market Conditions, Social Networks and Career Achievements: Evidence from the Economics Discipline

by

Liqiang Liu

Appendix A contains more details relating to my novel datasets. I present the data sources, method of collection, and the definition of each variable. Moreover, I briefly discuss the disadvantages of the alternative measure, the total number of job postings on JOE, of initial labor market conditions, and introduce a simple imputation method to impute the missing JOE data. Appendix B provides additional figures and tables to supplement my main arguments and findings.

A   Data and variable construction

In this section, I present the specifics of three novel datasets and the process of constructing variables. Specifically, I outline the data sources that provide the raw information, elaborate on the tools/platforms used for data access and automated collection, introduce the platform employed for imputing race, gender, and nationality, and detail my imputation method for variables that require imputation.

A.1.   PhD Candidates Dataset

Appendix Table 1 presents a list of variables in PhD candidates dataset. I collected the raw information on economists from departments' webpages using Wayback Machine, as well as from economist's CV and LinkedIn.

Person ID (Person_ID) is the unique identifier for an economist to merge information across multiple datasets [49]. I recorded the information on the academic year of starting the PhD program (Cohort_AY) based on the roster of PhD students available on the respective department's webpages from the previous academic year. In cases where the information was not available for a particular school in a given academic year, I relied on economists' CVs and LinkedIn profiles to record the missing data. I captured the data on the academic year entering job market (Class_AY) by referencing the department's webpages of job market candidates. I focus on top 10 US economics departments (School_Grad) due to the reason that candidates from non-top 10 schools have shown limited top 5 publications

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[49]Fortunately, the vast majority of economists in this dataset can be uniquely identified by their names, thereby eliminating any challenges associated with the many-to-many mapping issue in this paper.

during their early careers, making them an unsuitable population for studying the social network of top 5 economics journals.

The department's webpages of job market candidates provide information on the primaray research fields for each candidate. To avoid the case where there is only a small number of observations within each field of interest, I aggregate subfields into six distinct categories (Primary_Field_C): 1) Applied Microeconomics (Applied Microeconomics, Labor Economics(micro), Health Economics, Environmental Economics, Education of Economics, Public Economics, Behavioral Economics, Experimental Economics, Development Economics(Micro), Urban Economics, Organizational Economics, Economic History); 2) Microeconomic Theory (Microeconomic Theory, Game Theory, Decision Theory, Applied Microeconomic Theory, Contract Theory); 3) Macroeconomics (Macroeconomics, Applied Macroeconomics, International Economics, International Trade, Economic Growth, Monetary Economics); 4) Econometrics (Econometrics, Applied Econometrics, Applied Microeconometrics); 5) Finance (Finance, Corporate Finance, Public Finance, International Finance, Financial Economics, Asset pricing, Behavioral Finance); 6) Industrial Organization (Industrial Organization, Applied Industrial Organization). In cases where the raw information is ambiguous, I record the variable based on the job market paper and the research field(s) of their advisor(s).

The missing gender is inferred through visual analysis of economists' photographs, while the missing race is inferred through using *Namsor* software based on economists' name, country of residence, and picture. The missing country of residence is inferred through economists' country of their undergraduate school and their native language. The missing birth year is imputed by subtracting 22 from the year of undergraduate graduation. The missing year of undergraduate graduation is estimated by subtracting the duration of the master program from the year of master graduation[50].

I record initial placement (Initial_Placement) based on the available information on the department's webpages of job market placement history. In cases where the name of the candidates are not reported, I combine their CVs and LinkedIn to determine the variable. I categorize the initila placement into six distinct categories[51]: 1) Tenure-Track Academia; 2) Public Sector; 3) Independent Institution; 4) Private Sector; 5) Post Doc; 6) Other (e.g., non-tenure-track positions).

In coding the initial placement rank (Initial_Placement_Rank), I combine multiple sources of ranking data. Particularly, there are five sources: 1) the rankings by US

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[50]The tricky cases are those economists from Europe such as Germany who reported has a degree called "Diplom". Since the "Diplom" degree was equivalent to a master's degree, I subtract the duration of the master program (e.g., 2 years) to attaion the year of undergraduate graduation.

[51]"Tenure-Track Academia" includes those who directly went to TT position or those who had a one-year Post-Doc experience before joining the department. "Post Doc" only includes those who had Post-Doc position without a TT position offer.

News Rankings of Global Universities for Economics and Business; 2) QS World University Rankings (Economics & Econometrics); 3) RePEc Ranking of Institutions; 4) Tilburg University Worldwide Economics Schools Research Ranking based on research contribution research contribution during AY2010-AY2017; 5) Amir & Knauff (2008)'s Economics Departments Worldwide rankings based on the Basis of PhD Placement[52]. I conducted the same exercises for economists who had post-doc experience, as post-doctoral positions are not typically regarded as formal jobs.

Lastly, I record the year of achieving tenure (if applicable in academia), work history (to indicate the frequency of mobility during early career), and visiting history (to explore alternative paths for establishing social networks)[53].

Figure 1 shows the time series trend of the demand of economists. I collected information from two sources: *U.S. Bureau of Labor Statistics* and *Job Openings for Economists* in AEA Papers & Proceedings. I further divide the academic demand into academic V.S. non-academic jobs. Additionally, I choose the average national monthly U.S. unemployment rate, as the primary measure, to represent the general economic conditions.

A.2. Top 5 Co-authorship Network Dataset

To construct the top 5 economics journals dataset, I extract the publish dates, titles and authors' information from papers published in top 5 economics journals through *Octoparse*, a web scrapping tool. Additionally, I conduct a manual search for each paper to further extract information regarding authors' primary affiliated school/institution and affiliated organization(s)[54].

To make the articles as comparable as possible, 1) I exclude erratum, corrigendum, reply, note and comment papers, and nobel lectures; 2) I also exclude articles with a length of four pages or less, to avoid shorter articles; 3) I exclude articles in the May issue of the AER before 2019 (i.e., AEA Papers & Proceedings) as well since they are not peer-reviewed papers.

Based on my top 5 economics journals dataset, I identify the coauthors for a given paper. This helps us rule out the unrealized co-authorship from a $\binom{n}{2}$ combinations, leading to the top 5 co-authorship network dataset.

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[52]Sources 1, 3, 4 and 5 are recommended by the American Economic Association.

[53]Work history and visiting history are used to investigate the mechanisms.

[54]This information is crucial for the unique mapping of candidates in the PhD candidates dataset to authors in this dataset.

Appendix Table 1: Variable Dictionary, Econ PhD Candidates

Variables	Labels
Name	Name
Person_ID	Person identifier
Cohort_AY	Academic year starting PhD Program
Class_AY	Academic year entering job market
School_Grad	PhD School
School_Grad_Id	PhD School identifier
Primary_Field	Primary research field(s)
Primary_Field_C	Category of primary research field(s)
PhD_Advisor	PhD dissertation advisor(s)
Gender	Imputed gender
Race	Imputed race
Residence_Country	(Imputed) Country of residence at the time of graduation
Residence_Continent	Continent of residence
Birth_AY	Year of birth
Year_of_Undergraduate	Academic year of undergraduate
Initial_Placement	Initial placement
Initial_P_C	Category of initial placement
Initial_Placement_Rank	Ranking of initial placement if in academia
PD_Initial_P_AY	Academic year of starting working after post doc
PD_Initial_Placement	Initial placement after post doc
PD_Initial_P_C	Category of initial placement after post doc
Year_Tenured	Academic year of obtaining tenured
Working_History	Working history during the first seventh years
Visiting_History	Visiting history during the first seventh years

Notes: Gender is inferred through visual analysis of economists' photographs, while race is inferred through using Namsor software based on economists' name, undergraduate school, and picture. Research Field is the primary area of research for the economist (Applied Microeconomics, Microeconomic Theory, Macroeconomics, Econometrics, Finance, Industrial Organization). The initial placement of economists is classified into six categories: (1) Tenure-Track Academia, (2) Public Sector, (3) Independent Institution, (4) Private Sector, (5) Post Doc, and (6) Other (e.g., non-tenure-track positions).

Sources: The data on economists is derived from a dataset manually collected by the author from departments' webpages using Wayback Machine, as well as from economist's CV and LinkedIn.

A.3. NBER Affiliated Scholar

The National Bureau of Economic Research (NBER) is the largest research organization based in the United States to conduct economic research. I extract information (name, current primary affiliated school and programs)[55] on affiliated scholars from its webpage using *Octoparse*. However, NBER does not publicly report the exact date of an affiliated scholar's appointment. My strategy to determine the date in two steps: 1) I collect the roster of affiliated scholars for each year dating back to 2009 through *Wayback Machine*, and 2) I identify newly appointed affiliated scholars by cross-referencing their names with the previous year's records, enabling us to code the date of their appointment as an affiliated scholar at NBER.

A.4. JOE Listings Dataset

Consistent with Oyer (2006), I opt for the total number of (academic) job postings on *Job Openings for Economists* in AEA Papers & Proceedings, as an alternative proxy for the initial labor market conditions for economists at the job market entry. While the demand measure is specific to candidates in the field of economics, it has at least two disadvantages: (1) the total number of job postings are not reported since AY2014, and (2) the measure may not accurately reflect the overall state of the economy, particularly when it comes to jobs in the private sector.

A.5. Market Condition Imputation

AEA stopped reporting the total number of job postings on JOE since 2014 and instead started reporting new job postings only. Since my analysis extends up to AY2017, I need to impute the missing data between AY2014 and AY2017. Using linear extrapolation for imputation is not a straightforward approach due to the potential influence of macro-level shocks that could disrupt the trend in certain years. However, I find that the ratio of total number of (academic) jobs to new number of (academic) jobs stays relatively stable during my analysis time periods. For example, the mean ratio of total jobs to new jobs for the first half of the academic year is around 80% with 2% standard deviation. As a result, I impute the missing values by simply multiplying the new jobs number by the corresponding mean ratio.

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[55]These information combined is used to uniquely identify the economists who is NBER affiliated scholar in PhD candidates dataset

B   Additional Figures and Tables

In this section, I provide supplementary figures and tables that complement the findings and arguments presented in the main sections.

Appendix figure 1 shows the distribution of author(s) per paper in top 5 economics journals from AY2010 to AY2022. Appendix figure 2 shows trends in top 5 economics journals by number of authors per paper from AY2010 to AY2022. These two figures confirm the observation that collaboration in economics, especially for lager teams, is exhibiting a gradual increasing trend. And I do not find heterogeneity across five economics journals.

Appendix figure 3 shows the trends in number of published papers in top 5 economics journals from AY2009 to AY2021. I observe an increasing trend during this period, which is mainly driven by the increase in publications by JPE, QJE and Econometrica. This motives us to add a time trend in my preferred specification to rule out the variation in publications demand over time.

Appendix figure 4 shows distribution of fraction of authors from top 50 US universities by number of authors per paper from AY2010 to AY2022. Note that the figure is conditional on three criteria: 1) at least two authors, 2) the number of authors is below 7, and 3) the paper has at least one US-academia author. The figure suggests that the disproportional importance of scholars from top 50 US universities in terms of their papers published in top 5 economics journals.

Additionally, appendix table 2 shows the coefficient estimates using my baseline regression model in equation (1). Appendix table 3 shows the first-stage estimates using the specification in equation (3). Appendix table 4, 5 and 6 show the impacts of initial labor market conditions on the outcomes of interest across three measures of the labor market conditions.

Lastly, appendix table 7 shows the coefficient estimates of the relationship between preceding market conditions and the supply of economists, as well as the relationship between preceding market conditions and the labor market conditions of the year of graduation. Appendix table 8 shows the estimates of the effects of graduating during the Great Recession on the outcomes of interest using a restricted sample (i.e., excluding economists who already had a pre-PhD working experience).

Appendix Figure 1: Distribution of Author(s) per Paper in Top 5 Economics Journals: AY2010-AY2022
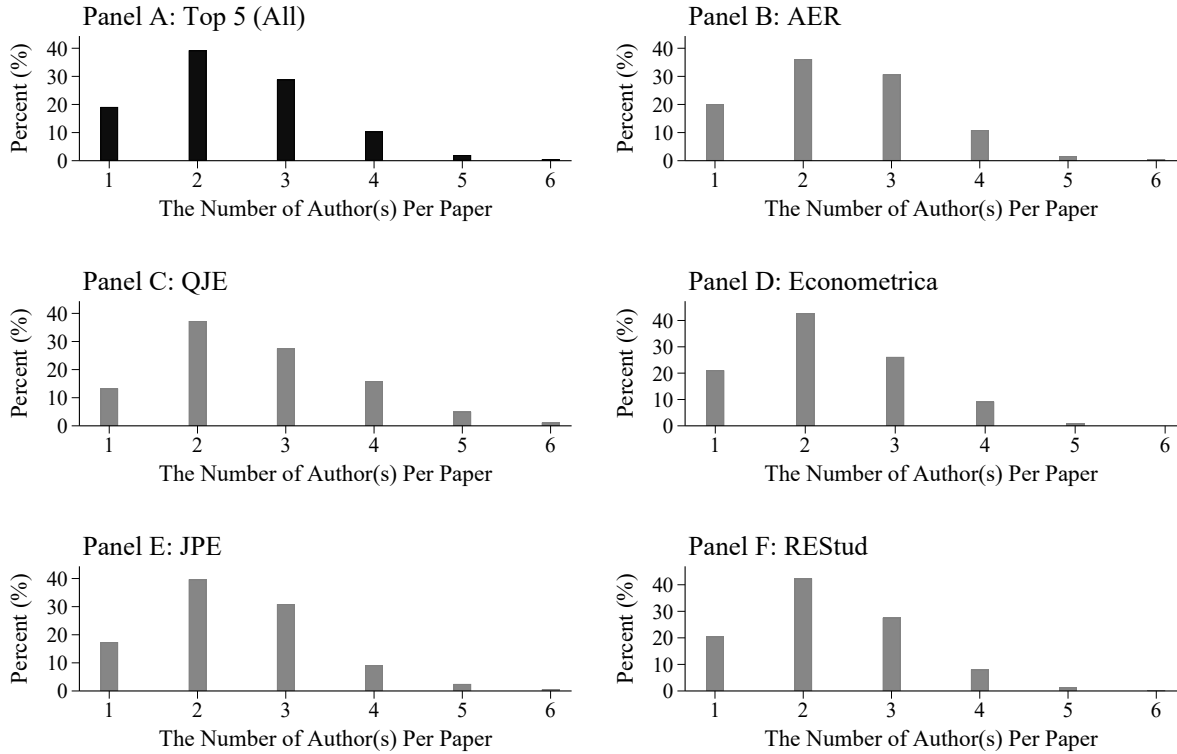
Notes: The figure represents the distribution of authors per paper for the total papers published in the top 5 economics journals from academic year 2010 to 2022 (academic year T is defined as the period between September Year T-1 and August Year T). I set an upper limit by capping the number of authors at six. Panel A displays the distribution of authors per paper for all top 5 journals combined, while the other panels illustrate the distribution for each individual journal. To ensure comparability, the graph excludes articles published before 2019 in the May issue of AER, as well as comments, replies, notes, errata, corrigenda, and Nobel lectures.

Source: Data were collected by the author from the websites of top5 economics journals (AER, QJE, Econometrica, JPE, and REStud).

Appendix Figure 2: Trends in Top 5 Economics Journals by Number of Authors per Paper: AY2010-AY2022
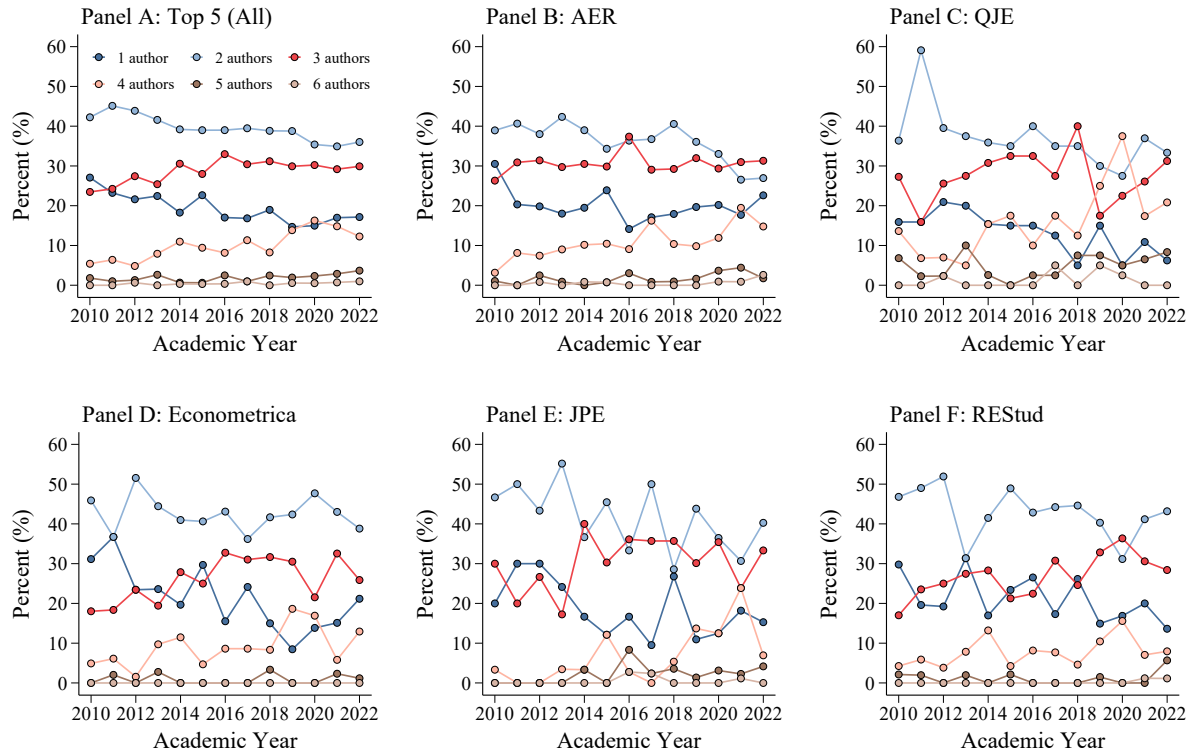
Notes: The figure represents the trends by number of authors per paper in the top 5 economics journals from academic year 2010 to 2022 (academic year T is defined as the period between September Year T-1 and August Year T). Panel A displays the trends for all top 5 journals combined, while the other panels illustrate the trends for each individual journal. To ensure comparability, the graph excludes articles published before 2019 in the May issue of AER, as well as comments, replies, notes, errata, corrigenda, and Nobel lectures.

Source: Data were collected by the author from the websites of top5 economics journals (AER, QJE, Econometrica, JPE, and REStud).

Appendix Figure 3: Trends in Number of Published Papers in Top 5 Economics Journals: AY2009-AY2021

Panel A: Top 5 (All)

Panel B: Top 5 (Individual)

Notes: Panel A displays the trend of published papers for all top 5 journals combined, while Panel B illustrates the trend of published papers for each individual journal from academic year 2009 to 2021 (academic year T is defined as the period between September Year T-1 and August Year T). To ensure comparability, the graph excludes articles published before 2019 in the May issue of AER, as well as comments, replies, notes, errata, corrigenda, and Nobel lectures.
Source: Data were collected by the author from the websites of top5 economics journals (AER, QJE, Econometrica, JPE, and REStud).
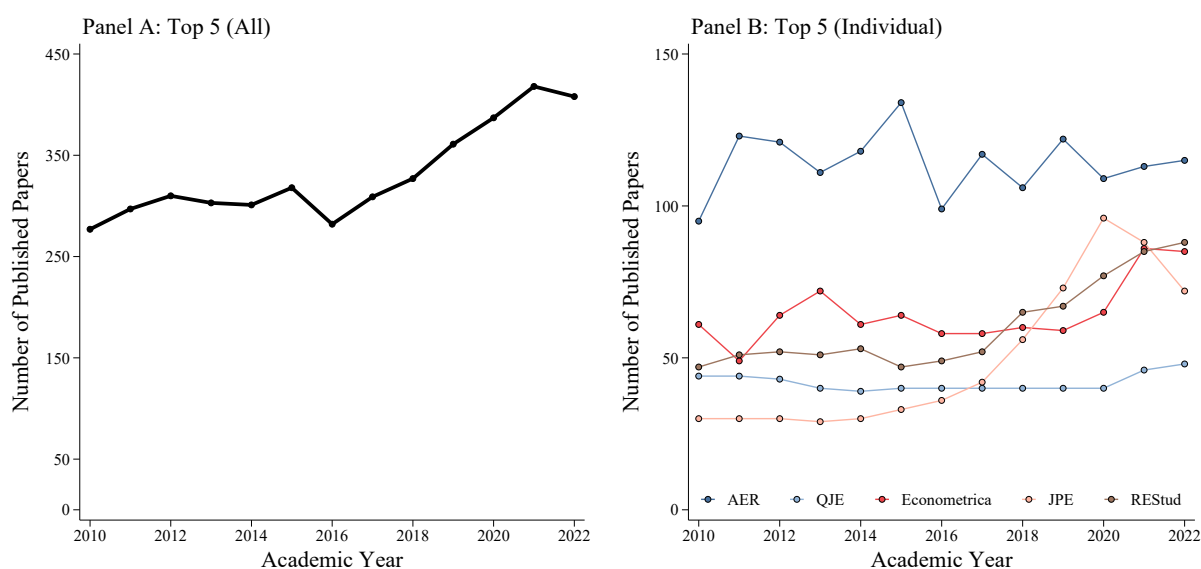
Appendix Figure 4: Distribution of Fraction of Authors from Top50 US Universities among Top 5 Journals by Number of Authors per Paper: AY2010-AY2022
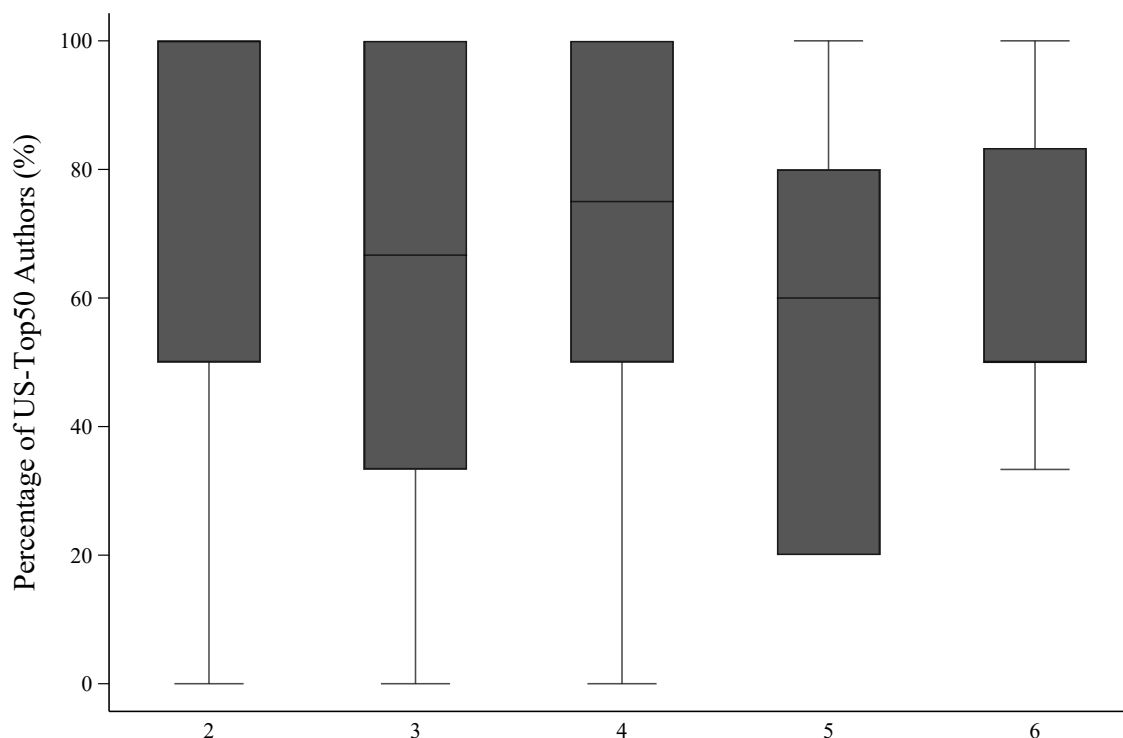
Notes: The figure displays the distribution of proportion of authors from top50 US economics departments in terms of number of authors per paper for a subset of all top 5 economics journals from academic year 2010 to 2022 (academic year T is defined as the period between September Year T-1 and August Year T). The sample criteria are: 1) at least two authors, 2) the number of authors is below 7, and 3) the paper has at least one US-academia author. To ensure comparability, the graph excludes articles published before 2019 in the May issue of AER, as well as comments, replies, notes, errata, corrigenda, and Nobel lectures.
Source: Data were collected by the author from the websites of top5 economics journals (AER, QJE, Econometrica, JPE, and REStud).
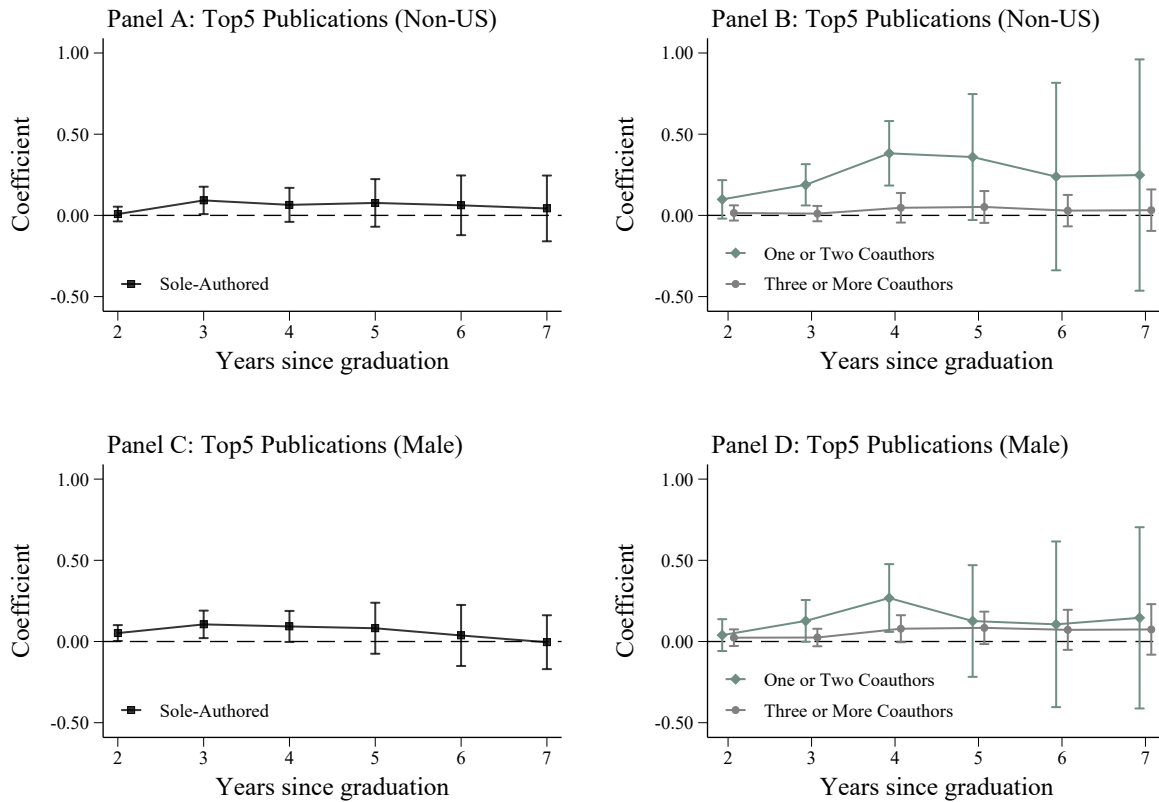
Appendix Figure 5: Effects of Initial Labor Market Conditions on Cumulative Number of Top5 Publications, Non-US Citizen & Male

Notes: The figure displays coefficient estimates of the effect of initial labor market conditions on male and non-US economists' cumulative count of top5 publications by the number of coauthors over years since graduation using the preferred specification in equation (2) that includes a time trend, PhD school fixed effect, research field fixed effect, and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). The lower bound and upper bound of the 95% confidence interval are also plotted. The measure of labor market conditions is unemployment rate.

Sources: The information of job market candidates is based on a dataset manually collected by the author from departments' webpages using Wayback Machine, while the unemployment rate is from *U.S. Bureau of Labor Statistics*.

Appendix Table 2: The Effects of Initial Labor Market Conditions, Baseline Estimates
(Coefficients × 100)

	Extensive Margin				
	3-Year NBER Fellow	4-Year Top5 Coauthor	4-Year Top5 Pub	4-Year Degree Centrality	4-Year Betweenness Centrality
	(1)	(2)	(3)	(4)	(5)
Market Condition (UR)	8.079	3.655***	5.759**	0.006*	0.004
	(4.286)	(0.950)	(1.575)	(0.003)	(0.005)
Observations	1,266	1,266	1,266	1,266	1,266
	Extensive Margin			Intensive Margin	
	7-Year Top10 Tenure	7-Year Top20 Tenure	7-Year All Tenure	4-Year Top5 Coauthor	4-Year Top5 Pub
	(6)	(7)	(8)	(9)	(10)
Market Condition (UR)	1.264	-2.090	8.088	11.958	1.549
	(2.892)	(3.373)	(4.783)	(6.338)	(3.521)
Observations	1,266	1,266	1,266	1,266	1,266
	Extensive	Intensive			
	3-Year Mobility	3-Year Mobility	Initial Placement		
			Academia	Private	Postdoc
	(11)	(12)	(13)	(14)	(15)
Market Condition (UR)	3.491	3.645	-5.592	15.914***	-1.792
	(2.997)	(4.161)	(4.783)	(1.507)	(1.393)
Observations	1,266	1,266	1,266	1,266	1,266
Time Trend	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
N (Economists)	1,266	1,266	1,266	1,266	1,266

Notes: The table presents OLS estimates of the impacts of initial labor market conditions on economists' early-career social network, academic outcomes, mobility and occupation using the specification in equation (1) that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). An economist's social network is defined as including all authors who have published papers with coauthor(s) in the top 5 economic journals over a given period. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper. The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} =$ 7.1. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Appendix Table 3: Estimates of the First-Stage Regression

	Actual UR	Actual TJ	Actual TAJ
	(1)	(2)	(3)
Predicted Unemployment Rate (UR)	0.644***	-	-
	(0.059)	-	-
Predicted Total JOE Jobs (TJ)	-	0.292***	-
	-	(0.064)	-
Predicted Total JOE Academic Jobs (TAJ)	-	-	0.389***
	-	-	(0.077)
Time Trend	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
R^2	0.627	0.545	0.821
Observations	1,266	1,266	1,266
N (Economists)	1,266	1,266	1,266
Dep. Mean	1.110	1.001	1.069

Notes: The table presents OLS estimates of the relationship between initial labor market conditions and predicted initial labor market conditions using the preferred specification in equation (3) that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). All measures of labor market conditions are normalized to AY2009. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Sources: The unemployment Rate is from *U.S. Bureau of Labor Statistics* and the total number of JOE (academic) job postings is based on *Job Openings for Economists* in AEA Papers & Proceedings.

Appendix Table 4: The Effects of Initial Labor Market Conditions on Cumulative Social Networks (Coefficients × 100)

	4-Year Degree Centrality	4-Year Betweenness Centrality	Extensive Margin				Intensive Margin	
			3-Year NBER Fellow	7-Year NBER Fellow	3-Year Top5 Coauthor	7-Year Top5 Coauthor	3-Year Top5 Coauthor	7-Year Top5 Coauthor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Condition (UR)	0.032***	0.006	13.539**	6.942	9.805***	10.559	22.189***	53.011*
	(0.006)	(0.005)	(5.584)	(8.742)	(3.798)	(11.092)	(7.152)	(30.906)
Market Condition (TAJ)	-0.102*	-0.028	11.080	16.223	-51.063*	-8.130	-157.826*	-133.499
	(0.059)	(0.023)	(33.926)	(45.049)	(27.138)	(47.343)	(84.552)	(182.525)
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F (UR)	118	118	118	118	118	118	118	118
R^2 (UR)	0.065	0.021	0.111	0.131	0.076	0.106	0.055	0.108
First-stage F (TAJ)	25	25	25	25	25	25	25	25
R^2 (TAJ)	0.066	0.022	0.109	0.131	0.074	0.107	0.050	0.110
Observations	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
N (Economists)	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
Dep. Mean (×100)	0.014	0.022	8.689	13.191	8.452	24.803	16.983	75.592
Mean Network Size	1,898	1,898						

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career social network using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, country residence, experience of master degree, and pre-PhD working experience). An economist's social network is defined as including all authors who have published papers with coauthor(s) in the top 5 economic journals over a 7-year period. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper. The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. "NBER Fellow" indicates whether an economist is an NBER affiliated scholar within a given time period since graduation. At extensive margin, "Top5 Coauthor" indicates whether an economist has coauthors from the top 5 economic journals. There are three measures of market condition that are normalized to AY2009: (1) Unemployment rate ($Demand^{UR}_{AY2009} = 7.1$), (2) Total number of jobs listed in *Job Openings for Economists* ($Demand^{TJ}_{AY2009} = 3,604$), and (3) Total number of academic jobs listed in *Job Openings for Economists* ($Demand^{TAJ}_{AY2009} = 2,224$). Standard errors (in parentheses) are adjusted for any correlation within year. $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Appendix Table 5: The Effects of Initial Labor Market Conditions on Cumulative Top5 Publications and Tenure Attainment (Coefficients × 100)

	Intensive Margin		Extensive Margin					
	3-Year Top5 Pub	7-Year Top5 Pub	3-Year Top5 Pub	7-Year Top5 Pub	7-Year Top10 Tenure	7-Year Top20 Tenure	7-Year Top50 Tenure	7-Year All Tenure
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Condition (UR)	18.584**	22.819	18.584***	5.977	-4.454	-5.689	2.105	5.721
	(9.666)	(33.307)	(6.622)	(14.269)	(4.678)	(6.905)	(7.127)	(8.256)
Market Condition (TAJ)	-70.677	-22.569	-46.167	1.293	48.318*	58.008*	27.657	7.551
	(45.155)	(125.050)	(31.650)	(52.603)	(25.552)	(34.563)	(36.777)	(45.577)
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F (UR)	118	118	118	118	118	118	118	118
R^2 (UR)	0.074	0.122	0.080	0.110	0.086	0.089	0.085	0.060
First-stage F (TAJ)	25	25	25	25	25	25	25	25
R^2 (TAJ)	0.086	0.126	0.093	0.115	0.079	0.079	0.081	0.059
Observations	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
N (Economists)	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
Dep. Mean (×100)	13.270	52.369	10.979	28.909	4.502	6.319	8.372	20.221

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career academic outcomes using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, country residence, experience of master degree, and pre-PhD working experience). The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. For example, "Top10 Tenure" indicates whether an economist has tenure at top10 school within 7 years since graduation. There are three measures of market condition that are normalized to AY2009: (1) Unemployment rate ($Demand_{AY2009}^{UR} = 7.1$), (2) Total number of jobs listed in *Job Openings for Economists* ($Demand_{AY2009}^{TJ} = 3,604$), and (3) Total number of academic jobs listed in *Job Openings for Economists* ($Demand_{AY2009}^{TAJ} = 2,224$). Standard errors (in parentheses) are adjusted for any correlation within year. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Appendix Table 6: The Effects of Initial Labor Market Conditions on Mobility and Occupation (Coefficients $\times$ 100)

	Extensive	Intensive	Initial Placement			
	3-Year Mobility	3-Year Mobility	Academia	Public	Private	Postdoc
	(1)	(2)	(3)	(4)	(5)	(6)
Market Condition (UR)	1.346	-3.672	-3.886	0.620	14.641***	-5.620*
	(5.693)	(7.479)	(14.936)	(6.099)	(4.538)	(2.894)
Market Condition (TAJ)	2.522	17.135	3.883	-1.130	-16.103	26.308*
	(30.795)	(39.950)	(48.571)	(30.250)	(33.270)	(15.340)
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F (UR)	118	118	118	118	118	118
R^2 (UR)	0.024	0.026	0.059	0.073	0.065	0.035
First-stage F (TAJ)	25	25	25	25	25	25
R^2 (TAJ)	0.023	0.024	0.059	0.072	0.061	0.030
Observations	1,266	1,266	1,266	1,266	1,266	1,266
N (Economists)	1,266	1,266	1,266	1,266	1,266	1,266
Dep. Mean ($\times$100)	14.849	16.271	62.164	15.956	12.954	5.292

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on their early-career mobility and occupation using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, country residence, experience of master degree, and pre-PhD working experience). The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. There are three measures of market condition that are normalized to AY2009: (1) Unemployment rate ($Demand^{UR}_{AY2009} = 7.1$), (2) Total number of jobs listed in *Job Openings for Economists* ($Demand^{TJ}_{AY2009} = 3,604$), and (3) Total number of academic jobs listed in *Job Openings for Economists* ($Demand^{TAJ}_{AY2009} = 2,224$). Standard errors (in parentheses) are adjusted for any correlation within year. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Appendix Table 7: The Association between Past Labor Market Conditions and Economists Supply / Initial Labor Market Conditions (Coefficients × 100)

	Economists Supply	Initial Labor Market Conditions
	(1)	(2)
Past Market Conditions (UR)	12.866	-0.375**
	(10.088)	(0.153)
Time Trend	Yes	Yes
PhD School FE	Yes	-
Research Field FE	Yes	-
Controls	Yes	-
R^2	0.224	0.594
Observations	1,266	1,266
N (Economists)	1,266	1,266
Dep. Mean	181.335	1.110

Notes: The table presents OLS estimates of the relationship between labor market conditions at the start of economists' PhD programs and the supply of economists / initial labor market conditions using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). I use the unemployment rate of the year of starting the program to measure the prior labor market conditions. I measure the initial labor market conditions using the unemployment rate of the year entering job market. All measures of labor market conditions are normalized to AY2009. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.

Appendix Table 8: The Effects of Initial Labor Market Conditions, A Restricted Sample
(Coefficients × 100)

	Extensive Margin				
	3-Year NBER Fellow	4-Year Top5 Coauthor	4-Year Top5 Pub	4-Year Degree Centrality	4-Year Betweenness Centrality
	(1)	(2)	(3)	(4)	(5)
Market Condition (UR)	13.978**	15.259***	17.227***	0.028***	0.006
	(5.775)	(5.104)	(5.718)	(0.006)	(0.005)
Observations	1,070	1,070	1,070	1,070	1,070
	Extensive Margin			Intensive Margin	
	7-Year Top10 Tenure	7-Year Top20 Tenure	7-Year All Tenure	4-Year Top5 Coauthor	4-Year Top5 Pub
	(6)	(7)	(8)	(9)	(10)
Market Condition (UR)	-7.005	-8.841	1.724	51.215***	29.089**
	(5.347)	(7.181)	(10.172)	(11.247)	(11.687)
Observations	1,070	1,070	1,070	1,070	1,070
	Extensive	Intensive			
	3-Year Mobility	3-Year Mobility	Academia	Initial Placement Private	Postdoc
	(11)	(12)	(13)	(14)	(15)
Market Condition (UR)	1.198	-5.062	-1.852	10.677	-7.225***
	(8.633)	(10.805)	(15.367)	(6.928)	(2.223)
Observations	1,070	1,070	1,070	1,070	1,070
Time Trend	Yes	Yes	Yes	Yes	Yes
PhD School FE	Yes	Yes	Yes	Yes	Yes
Research Field FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
N (Economists)	1,070	1,070	1,070	1,070	1,070

Notes: The table presents IV estimates of the impacts of initial labor market conditions experienced by economists upon entry into the job market on economists' early-career social network, academic outcomes, mobility and occupation using the preferred specification that includes a time trend, PhD school fixed effect, research field fixed effect (research field is the primary area of research for the economist, including Applied Micro, Micro Theory, Macroeconomics, Econometrics, Finance, and Industrial Organization), and controls (i.e., gender, race, nationality, experience of master degree, and pre-PhD working experience). An economist's social network is defined as including all authors who have published papers with coauthor(s) in the top 5 economic journals over a given period. "Degree Centrality" and "Betweenness Centrality" are defined in Section II of this paper. The outcomes at the extensive margin are represented as dummy variables that equal 1 if the condition is satisfied, while the outcomes at the intensive margin are expressed as the actual counts of each of them. The measure of labor market conditions, unemployment rate, is normalized to AY2009: $Market\_Condition^{UR}_{AY2009} = 7.1$. Cluster-robust standard errors (in parentheses) are reported (Liang and Zeger (1986), Arellano (1987)). $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.
Sources: See appendix A for details.