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ARE RECESSIONS GOOD FOR GOVERNMENT HIRES? THE EFFECT OF UNEMPLOYMENT ON PUBLIC SECTOR HUMAN CAPITAL

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ABSTRACT

Utilizing a large dataset on U.S. federal government employees covering 24 years, we estimate and analyze the persistent wage effect of entering government employment during recessions for recent college graduates and other new employees. Contrary to previous results in the literature for private sector employees, we document a significant and long-term wage increase for federal civil servants who enter government service in recessions. We show this result is robust to alternative samples and model specifications. We conclude by examining agency occupation composition and job matching as mechanisms for these results.

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Abstract

Utilizing a large dataset on U.S. federal government employees covering 24 years, we estimate and analyze the persistent wage effect of entering government employment during recessions for recent college graduates and other new employees. Contrary to previous results in the literature for private sector employees, we document a significant and long-term wage increase for federal civil servants who enter government service in recessions. We show this result is robust to alternative samples and model specifications. We conclude by examining agency occupation composition and job matching as mechanisms for these results.

Keywords: Recession; Wages; Government

JEL classification: I23; J28; J31; J38

1 Introduction

There is increasing evidence that new college graduates who enter the labor market during a recession have a significant and long-term negative effect on wage prospects relative to those hired in a macroeconomic growth period (Genda et al. (2010); Kahn (2010); Oreopoulos et al. (2012); Altonji et al. (2016)). Additional evidence shows that this long-term wage decrease is not limited to new college workers, but extends to all types of workers starting new jobs in recessions (Baker et al. (1994); Beaudry and DiNardo (1991); Devereux (2002)), from displaced workers to graduating doctoral students in economics (Oyer (2006); Schmieder and Von Wachter (2010)).

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There is, however, a positive side to graduating or switching jobs in a recession. The government is hiring. We show those cohorts of employees hired by the U.S. federal government in recessions have a significant and long-term wage increase relative to those hired in boom periods. Using a longitudinal dataset of over 3 million U.S. Federal Government employees over 24 years, we track the entry level wage and the subsequent annual wage profile of each individual over a 10-year period.

We document that, contrary to previous work on the private sector, recent college cohorts joining the government in recessions obtain a persistent wage advantage. We demonstrate that for a 1 percentage point increase in the unemployment rate, recent college graduates experience on average a 1% long-term wage increase relative to those cohorts hired in a boom. The full wage advantage takes 3-4 years to be realized and it persists for up to 10 years after entry into government service. The results stand in contrast to Oreopoulos et al. (2012) who have shown a 1.5% decrease in wages followed by a gradual recovery in the following ten years for all college students in Canada graduating in recessions.

2 Data and sample

Our longitudinal dataset is obtained from the Central Personnel Data File (CPDF) of the U.S. Office of Personnel Management (OPM), the human resources department of the federal government. The dataset records broad arrays of information, including individual characteristics and employment status on 3 million non-sensitive, non-Department of Defense federal employees in total, over the 24-year period from 1988 to 2011. The longitudinal data allow us to track each individual's career history and assign each person a vector of the preceding unemployment rates he or she has experienced. This dataset allows us to map each individual to the state in which he or she is hired and thus to exploit both cross-sectional variation across, and time-series variation within, states for each cohort.

For this study, the relevant variables are: annual basic real earnings as reported by OPM and unemployment rates for the 50 states of the US across the 24 years as reported by the Bureau of Labor Statistics.

We include in our sample frame only full-time and non-seasonal employees because part-time or seasonal workers are likely to have different labor supply behavior. In addition, we retain in the main sample only individuals from 20 to 24 years of age (at entry) with college degrees to proxy for recent college graduates entering the labor market.[1] Finally, we keep only those individuals who entered between 1989 and 2011 so that we can conduct a complete cohort analysis. The main sample includes 226,268 individuals.

3 Empirical strategy

Over seventy percent of federal employees work outside of the DC-Metro area. In this paper, we map each individual in the sample to the state in which they work, and we exploit

[1]OPM released data to us only in age ranges because age is considered a highly sensitive personnel variable. We used the 20-24 years age range because we believe civil servants in that age range with four-year college degrees are likely to be a representative proxy, albeit imperfect, of new college graduates.

cross-sectional and time-varying state level unemployment rates as our main independent variables of interest, assuming unemployment rates are exogenous macroeconomic variables. In order to make concrete comparisons, we estimate the effects of recessions on real earnings using the dynamic cell level model employed by Oreopoulos et al. (2012).

The main independent variables, unemployment rates (UR), have variation only at the state-year level. Following Oreopoulos et al. (2012), we collapse the individual level data into cells. For each cohort (c), first duty state (s_0) and calendar year (t), we create a cell, calculate the log cell mean real earnings and associate each cell with its corresponding unemployment rate at entry. The model is specified as

$$\begin{aligned}\log(\bar{w}_{cs_0t}) = \beta_0 + \beta_{e,0}UR_{s_0,0} + \beta_{e,1}UR_{s_1,1} + \beta_{e,2}UR_{s_2,2} + \cdots + \beta_{e,e}UR_{s_t,e} \\ + \phi_c + \eta_{s_0} + \lambda_t + \chi_e + \epsilon_{cs_0t}\end{aligned} \tag{1}$$

We can write (1) more explicitly and efficiently. Assume, a given individual with l years' working experience enters into the following regressions

$$\begin{aligned}\log(\bar{w}_{cs_00}) &= \beta_{0,0}UR_{s_0,0} + \beta_0 + \epsilon, \\ \log(\bar{w}_{cs_01}) &= \beta_{1,0}UR_{s_0,0} + \beta_{1,1}UR_{s_1,1} + \beta_0 + \epsilon, \\ &\cdots\cdots \\ \log(\bar{w}_{cs_0l}) &= \beta_{l,0}UR_{s_0,0} + \beta_{l,1}UR_{s_1,1} + \cdots + \beta_{l,l}UR_{s_l,l} + \beta_0 + \epsilon.\end{aligned} \tag{2}$$

For simplicity, fixed effects are not presented in (2). We define experience (e) as the difference between calendar year (t) and the entry year (c). After controlling for cohort fixed effects (ϕ_c), first duty state fixed effects (η_{s_0}), calendar year fixed effects (λ_t) and experience fixed effects (χ_e), the coefficients $\beta_{\cdot,0}$ represent the short- and long-term effects of entering in recessions on average real earnings. We allow correlations within first duty state and cohort, thus using multi-level clustering at first-duty-state-cohort level.

The dynamic cell level model fully exploits individual level information. We keep track of each individual's career history and record all the unemployment rates she faces. Also, the model controls for unemployment autocorrelation across years and cross-sectional correlation across states. We include both the initial unemployment rate and all the subsequent unemployment rates to isolate the effect of the very first shock.

4 Main results

4.1 College graduates

Overall, we find a persistent positive effect of recessions on wages in the federal government. Figure 1 shows the effect of the recession at entry on real earnings of recent college graduates. By comparison, we also include in the figure the estimates of Oreopoulos et al. (2012) who use Canadian college graduates to answer the same question we examine for the private sector. They report that in the face of each additional 1 percentage point increase in the unemployment rate, the average wage drops by 1.5% initially followed by a gradual recovery, and the negative wage effect almost vanishes after 10 years.

On the contrary, our results show that even though recent college graduates who enter the government in recessions also suffer a wage disadvantage at first, the initial wage cut disappears one year after entry and becomes a wage advantage in the second and later years. The full advantage takes 3-4 years to be completely realized, and the positive effect remains strong even at years 9-10.

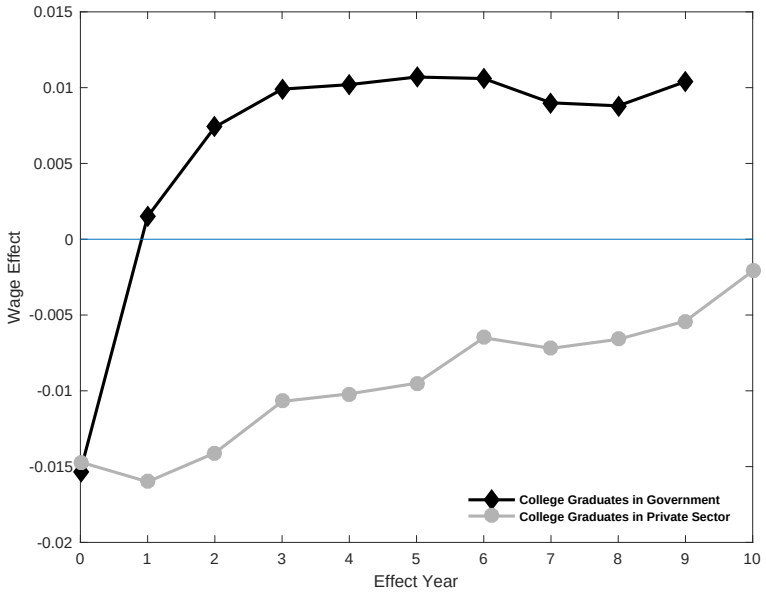

Figure 1: The Persistent Effect of the Initial Unemployment Rate on Real Earnings of College Graduates by Year Since Entry.

Notes: This figure shows estimates from regressing log average real earnings on unemployment rates for recent college graduates. The results for the private sector in Oreopoulos et al. (2012) are also presented. All point estimates can be found in Table A.1.

4.2 Non-college graduates

We also examine whether this increasing wage effect is restricted to new college graduates or if it can be extended to other types of workers. In Figure 2 we present results for employees who start with the government in recessions but do not have a college degree *or* are not in the age range 20-24 ("non-College graduates", n=2,843,594).

Our results indicate that the positive wage effect is experienced on average by all workers starting their jobs in the government during recessions. New entrants of non-College graduates follow similar patterns as college graduates, experiencing a positive wage effect that is even stronger than that experienced by college graduates. This would indicate that the wage advantage is a universal effect that applies on average to all federal government employees.

4.3 Entrants versus incumbents

Finally, we examine continuing workers ("incumbents") who entered the government as new college graduates but prior to the recession, to explore whether they are affected in the same ways as new college graduates who enter right in the recession.

Our results indicate that the continuing workers who enter government service just one to three years before the recession are shielded from these external economic fluctuations. In the empirical model, the coefficients $\beta_{\cdot,1}$ in (2) denote a recession's effects on insiders with 1-2 years' experience, and $\beta_{\cdot,2}$ denote a recession's effect on insiders with 2-3 years' experience. As shown in Figure 2, the point estimates for incumbents are close to zero and have no statistical significance.[2] In view of our results, one can deduce that the very first shock at entry has much stronger effects than shocks occurring at higher years of experience.

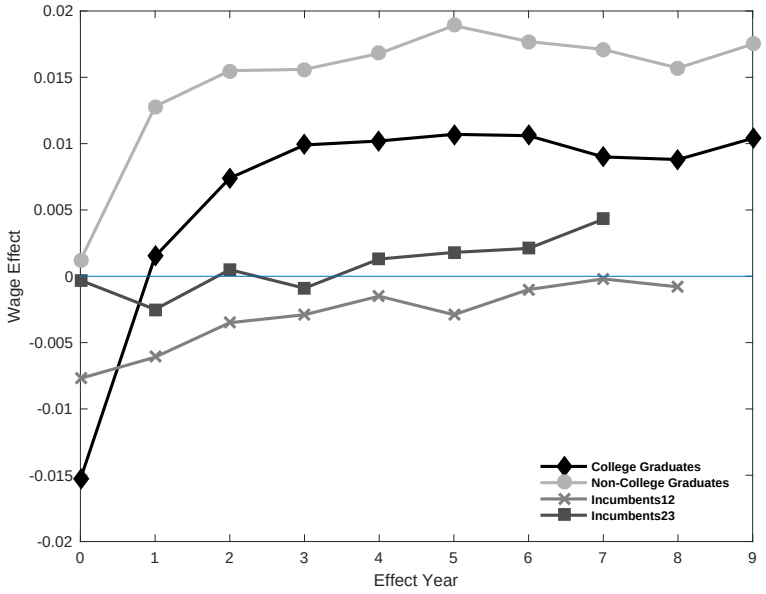

Figure 2: The Persistent Effect of the Initial and Subsequent Unemployment Rates on Real Earnings by Year Since Entry in Federal Service.

Notes: "College Graduates" depicts the wage effects for recent college entrants, the same as Figure 1; "Non-College Graduates" depicts the wage effects for entrants without college degree *or* not in the age range 20-24. "Incumbents12" depicts the wage effects for insiders who started as recent college graduates and have been in the government for 1-2 years when the recession occurs. The same interpretation applies to "Incumbent23".

4.4 Robustness

4.4.1 Model Specification

To draw comparison to related research in the private sector (e.g. Kahn (2010); Altonji et al. (2016)), we consider a specification where we include only $UR_{s_0,0}$ and the multiple fixed effects in (1), without controlling for unemployment rates between year c and year t. In this specification, all intervening labor market changes between c and t are absorbed by $UR_{s_0,0}$, and thus, results of this regression can be interpreted as the overall effect of joining

[2]Because of the structure of our model (see (2)), we will lose one estimate for employees with 1-2 years' experience and two estimates for employees with 2-3 years' experience. The curves of "Incumbents12" and "Incumbents23" are placed on the left end of the figure so that the effect year 0 denotes the start of a recession.

the government in recessions. The results, presented Table A.1, are robust to this alternative specification and are similar to those presented in Figure 1.

4.4.2 Attrition

Another concern that may arise with this analysis is the positive wage effects may be a result of attrition of poorly-matched workers who typically underperform in the government. Under this argument, poorly-matched workers who are paid less than well-matched workers will depart the government for the private sector when the recession is over. If this is true, it could generate the positive wage effect in later years.

To address this concern, we first study the effect of recessions on the departure rates of each (cohort and initial state) cell over different experience-years.[3] As shown in Table A.2, the departure rates are statistically higher for those hired in recessions than for those hired in growth periods, especially in the first three years after entry. This result indicates that college graduates hired by the government in recessions are more likely to be short-term employees compared to those hired in booms.

To control for this effect, we compare the estimated wage curve for all recent college graduates to recent college graduates who stay in the dataset for at least 10 years (n=135,730) (a sample where is no attrition). Figure 3 presents our result. The estimated wage curve of longtime workers is similar to the estimated wage curve of all workers, suggesting that worker attrition is not likely to be a major driving force of our results.

[3]The regression model used here takes the form $Y_{cs_0e} = \beta_0 + \beta_{e,0} UR_{s_0,0} + \phi_c + \eta_{s_0} + \chi_e + \epsilon_{cs_0e}$, where Y_{cs_0e} denotes the departure rate at different experience-years for a (cohort and initial-state) cell. The regression is weighted by the number of individuals.

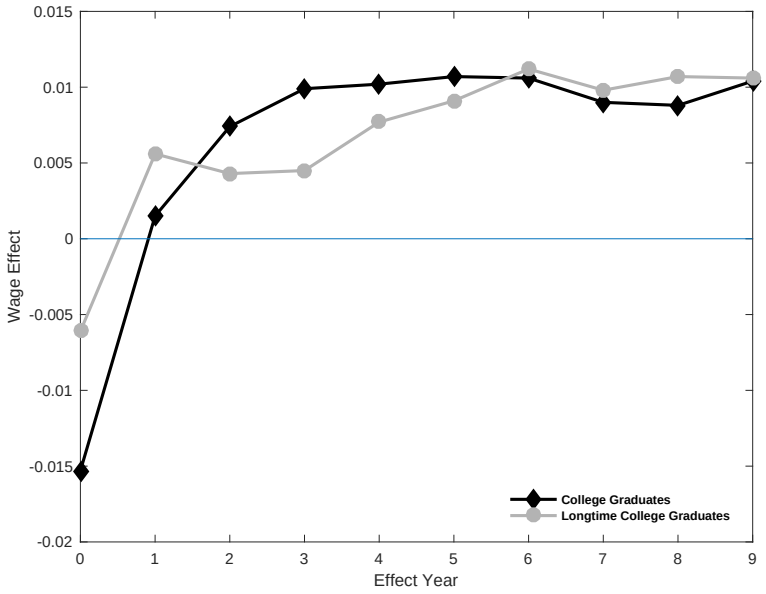

Figure 3: The Wage Effect: All College Graduates and Longtime College Graduates in Federal Service.

Notes: "College Graduates" depicts the wage effects for recent college entrants, the same as Figure 1; "Longtime College Graduates" depicts the wage effects for employees who started as recent college graduates and have been in the government for at least ten years.

5 Mechanisms

5.1 Occupation Composition

One evident pattern in our main results is a noticeable negative initial wage for college graduates who join the government in recessions, followed by a rapid recovery after one year of employment, which transforms into a wage advantage in the long-run. A change of the composition of occupations hired over time contributes to explaining this finding. College graduate occupations fall into three main categories: administrative, professional, and technical, and their shares of hiring fluctuate around the 40%, 40% and 20%-level, respectively. During recessions, college graduates tend to enter into administrative jobs with higher incidence; these jobs have lower initial wages but higher wage growth than other job categories (see Table 1 and Figure 4). A 1 percentage point increase in the unemployment rate at entry results in a 1.86 percentage point increase in administrative jobs filled by the new college graduates.[4] In contrast, professional jobs, a category that has a higher starting wage but lower wage growth rate than administrative jobs, witnesses a 1.20 percentage point decrease in hiring during recessions.[5] Together, these shifts in hiring during recessions coupled

[4]The regression model used in this section takes the form $Y_{cs_0} = \beta_0 + \beta_1 UR_{s_0,0} + \phi_c + \eta_{s_0} + \epsilon_{cs_0}$, where Y_{cs_0} denotes the fraction of new college entrants that start in a particular occupation category. This cell-level regression is weighted by the number of individuals.

[5]The fraction of new college entrants who take technical jobs also decreases by 0.48 percentage point for 1 percentage point increase in the unemployment rate.

with different wage trajectories across occupational categories partly explain the negative wage effect in year 0 and the quick recovery in year 1.

Occupation Category	Average Real Earnings in Year 0
Administrative	$ 37,215
Professional	$ 42,032
Technical	$ 29,475

Table 1: Average Starting Real Earnings of New College Graduate Entrants for Different Occupation Categories

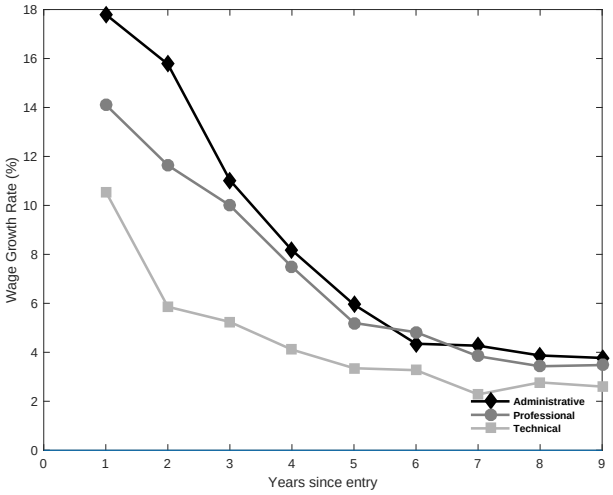

Figure 4: Wage Growth Rate by Year Since Entry

We also examine the effect of recessions on the job composition at entry for short-term college graduate employees who stay in the federal service for no more than 3 years. In fact, we find that the effect is particularly strong for this group. A 1 percentage point increase in the unemployment rate will lead to a 3.32 percentage point increase in the hiring of administrative jobs and a 2.11 percentage point decrease in professional jobs.[6] This finding, together with employee attrition, can partly explain the relative magnitudes of the initial effects at year 0 and their convergence in later years (shown in Figure 3) for longtime employees and all recent college graduates.

5.2 Matching

Another possible contributing factor for the long-term wage increase for college graduates joining the government during recession is that hires during recessions are better matched to government jobs than those hired in booms (Lazear et al. (2016)). Although we cannot measure the quality of employees directly, we can investigate matching using the data on awards won. Awards are given by government agencies to those employees who perform exceptionally well in their units. Conditional on winning awards, it takes an average of three years for college graduates to earn an award after entry into government service. We therefore look six years out after a new employee's entry into the government agency to calculate per capita awards for each entering (cohort and initial state) cell, and eliminate all employees with less than six years of experience.

Conditional on staying, our results show that a 1 percentage point increase in the unemployment rate at hiring results in higher per capita awards for employees within the first six

[6]Technical occupations also witnesses a 0.74 percentage point decrease for 1 percentage point increase in the initial unemployment rate.

years of service.[7] Though the effect is small, a 1.4% (0.28 percentage point) rise in awards on a base award rate of 20.15%, the result is statistically significant at the 1% level of confidence. Although awards is a small and imperfect measure of matching, we believe that this result does provide suggestive evidence that better employee-job matching may be occurring in recessions for new college graduates who stay in government service for at least six years.

Together, the results of Sections 5.1 and 5.2 suggest the underlying cause of this lower initial wage and higher wage growth could be a combination of both shifts in the composition of jobs created by government agencies and the unobservable quality of matched employees hired during recessions.

6 Discussion

This paper has shown that individuals who join the government in recessions will receive a long-term wage gain relative to those who join the government in boom periods. This result is in contrast to the private sector where the opposite has been shown to be true. We suggest that two possible explanations are contributing to this result: changes over time in occupation composition and employee-job matching. However, other explanations for this difference are possible, as well. It may be that politics enters into the timing and magnitude of nominal wage increases for the civil service-politics that is not pervasive in the private sector. In addition, these results may be related to the differences in sorting between workers who are mission oriented and those who are wage oriented. We leave it to future work to explore these and other possible explanations.

[7] We calculate for each cell (initial state and cohort) the per capita awards in the first 6 year horizon and regress it on UR at entry, controlling for initial state and cohort fixed effects. The regression is again weighted by the number of individuals.

A Appendix

Table A.1: The Persistent Effect of the Unemployment Rate in the Year of Entry into Federal Service on Real Earnings of Government Employees by Years Since Entry.

Effects of unemployment rate on real earnings by years since entry	College Grad Entrants	Incumbents (1-2)	Incumbents (2-3)	Non-College Grads	Longtime College Grads	College Grad Entrants (static)
Effect Year 0-1	-0.0153**	-0.0077*	-0.0003	0.0012	-0.0061	-0.0151**
	(0.0041)	(0.0032)	(0.0021)	(0.0040)	(0.0053)	(0.0042)
Effect Year 1-2	0.0015	-0.0061^{+}	-0.0025	0.0128**	0.0056	-0.0054
	(0.0042)	(0.0037)	(0.0029)	(0.0040)	(0.0066)	(0.0035)
Effect Year 2-3	0.0074^{+}	-0.0035	0.0005	0.0156**	0.0043	0.0011
	(0.0042)	(0.0032)	(0.0026)	(0.0041)	(0.0064)	(0.0035)
Effect Year 3-4	0.0099*	-0.0029	-0.0009	0.0156**	0.0045	0.0049
	(0.0040)	(0.0033)	(0.0029)	(0.0043)	(0.0055)	(0.0034)
Effect Year 4-5	0.0102**	-0.0015	0.0013	0.0168**	0.0077	0.0068*
	(0.0039)	(0.0036)	(0.0033)	(0.0045)	(0.0051)	(0.0033)
Effect Year 5-6	0.0107**	-0.0029	0.0018	0.0189**	0.0091^{+}	0.0088*
	(0.0040)	(0.0035)	(0.0034)	(0.0044)	(0.0051)	(0.0034)
Effect Year 6-7	0.0106**	-0.0010	0.0021	0.0177**	0.0112*	0.0086*
	(0.0040)	(0.0034)	(0.0032)	(0.0042)	(0.0049)	(0.0035)
Effect Year 7-8	0.0090*	-0.0002	0.0043	0.0171**	0.0098*	0.0088*
	(0.0040)	(0.0033)	(0.0031)	(0.0041)	(0.0050)	(0.0035)
Effect Year 8-9	0.0088*	-0.0008		0.0157**	0.0107*	0.0097**
	(0.0040)	(0.0035)		(0.0043)	(0.0048)	(0.0035)
Effect Year 9-10	0.0104*			0.0175**	0.0106*	0.0116**
	(0.0041)			(0.0044)	(0.0048)	(0.0035)
Sample size (number of employees)	226,268	226,268	226,268	2,843,594	135,730	226,268

Notes: Robust standard errors clustered at the first duty-state-cohort level are in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%.

Table A.2: The Effect of the Unemployment Rate in the Year of Entry into Federal Service on Departure Rates by Years Since Entry.

Effects of unemployment rate on departure rates by years since entry	Coeff. $\beta_{e,0}$
Effect Year 1-2	0.0038**
	(0.0008)
Effect Year 2-3	0.0128**
	(0.0007)
Effect Year 3-4	0.0119**
	(0.0008)
Effect Year 4-5	0.0004
	(0.0008)
Effect Year 5-6	0.0084**
	(0.0008)
Effect Year 6-7	-0.0004
	(0.0008)
Effect Year 7-8	0.0015^{+}
	(0.0008)
Effect Year 8-9	0.0014
	(0.0009)
Effect Year 9-10	0.0044**
	(0.0008)

Notes: Standard errors are in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%.

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References

Altonji, Joseph G, Lisa B Kahn, and Jamin D Speer (2016). "Cashier or consultant? Entry labor market conditions, field of study, and career success". *Journal of Labor Economics* 34.S1, S361–S401. DOI: 10.1086/682938.

Baker, George, Michael Gibbs, and Bengt Holmstrom (1994). "The wage policy of a firm". *The Quarterly Journal of Economics* 109.4, pp. 921–955. DOI: 10.2307/2118352.

Beaudry, Paul and John DiNardo (1991). "The effect of implicit contracts on the movement of wages over the business cycle: Evidence from micro data". *Journal of Political Economy* 99.4, pp. 665–688. DOI: 10.1086/261774.

Devereux, Paul J. (2002). "The Importance of Obtaining a High Paying Job." Los Angeles: University of California at Los Angeles, Department of Economics. Unpublished.

Genda, Yuji, Ayako Kondo, and Souichi Ohta (2010). "Long-term effects of a recession at labor market entry in Japan and the United States". *Journal of Human Resources* 45.1, pp. 157–196. DOI: 10.1353/jhr.2010.0005.

Kahn, Lisa B (2010). "The long-term labor market consequences of graduating from college in a bad economy". *Labour Economics* 17.2, pp. 303–316. DOI: 10.1016/j.labeco.2009.09.002.

Lazear, Edward P, Kathryn L Shaw, and Christopher Stanton (2016). "Making do with less: working harder during recessions". *Journal of Labor Economics* 34.S1, S333–S360. DOI: 10.1086/682406.

Oreopoulos, Philip, Till Von Wachter, and Andrew Heisz (2012). "The short-and long-term career effects of graduating in a recession". *American Economic Journal: Applied Economics* 4.1, pp. 1–29. DOI: 10.1257/app.4.1.1.

Oyer, Paul (2006). "Initial labor market conditions and long-term outcomes for economists". *The Journal of Economic Perspectives* 20.3, pp. 143–160. DOI: 10.1257/jep.20.3.143.

Schmieder, Johannes F and Till Von Wachter (2010). "Does wage persistence matter for employment fluctuations? Evidence from displaced workers". *American Economic Journal: Applied Economics* 2.3, pp. 1–21. DOI: 10.1257/app.2.3.1.