Why Didn't the College Premium Rise Everywhere? Employment Protection and On-the-Job Investment in Skills

Matthias Doepke and Ruben Gaetani

Explaining Trends in College Wage Premium

- The question:
  - Large rise in college wage premium since 1980s in the United States, but not in continental Europe.
  - What explains the difference?

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  - Large rise in college wage premium since 1980s in the United States, but not in continental Europe.
  - What explains the difference?
- Our conjecture:
  - Differences in labor market regulation are (in part) responsible.
  - Firing restrictions affect incentive to invest in relationship-specific capital, which is more critical for less-educated workers.
  - Restrictions for firing older workers particularly relevant, which is where US-Europe differences are the largest.

Employment Protection and Change in College Wage Premium

OECD index of employment protection versus change in college premium, 1980–2006:

Overview of Mechanism

- Develop a quantitative model of job creation and on-the-job skill accumulation.
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- Develop a quantitative model of job creation and on-the-job skill accumulation.
- College education increases skill transferability across jobs.
- As a result of an increase in macroeconomic "turbulence" starting in the 1980s (Ljungqvist and Sargent 1998), model predicts:
  - A decline in investment in job-specific skills for less-educated workers.
  - A deterioration in the "quality" of jobs for less-educated workers.

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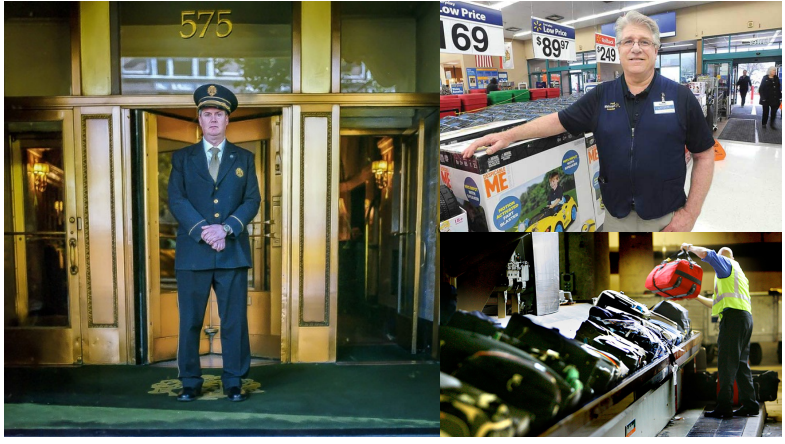
  - Low probability of separation even without firing restrictions.
  - Many high-quality jobs, most workers invest in skills regardless of regulation.

Overview of Mechanism

- Mechanism is sensitive to the introduction of labor protection legislation such as firing restrictions.
- Firing restrictions interact with changes in turbulence.
- Low turbulence:
  - Low probability of separation even without firing restrictions.
  - Many high-quality jobs, most workers invest in skills regardless of regulation.
- High turbulence:
  - No firing restrictions (U.S.): Few skilled vacancies for less-educated workers; only educated workers invest in skills; high wage premium.
  - Firing restrictions (Europe): More skilled vacancies; most workers continue to invest; low wage premia.

United States



Germany

Germany

Relationship to Literature

- Rich literature on increase in the college premium focuses on what happens at the top of the income distribution (Katz and Murphy 1992, Krusell et al. 2000, Acemoglu 2002, . . .)
- This paper focuses on what happens at the bottom of the income distribution:
  - Why did the labor market outcomes of less-educated workers deteriorate?
  - Evidence on stagnation in earnings (Guvenen et al. 2017); worsening measures of job quality and security (Segal and Sullivan 1997; Hollister 2011) and other indicators of economic well-being (Coile and Duggan 2019).
- Related mechanisms: Guvenen, Kuruscu, and Ozcan (2014), Alon (2017).

Outline

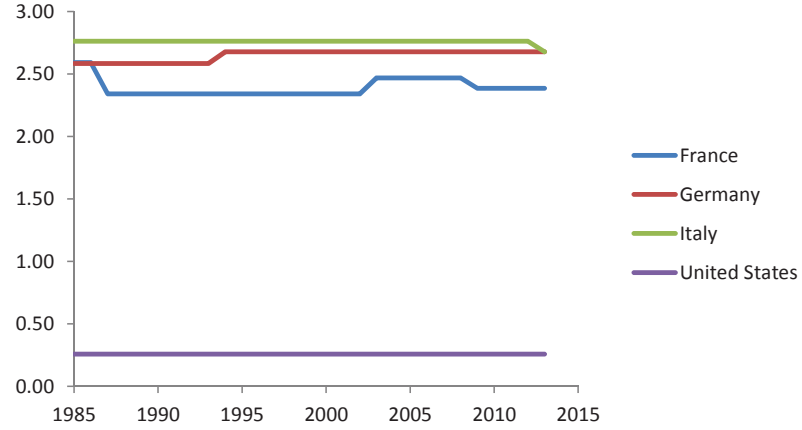
1. Facts on employment protection, college premium, and worker tenure, US versus Germany.
2. Model of investment in job-specific skills.
3. Effect of rise in turbulence on college premium.
4. Role of employment protection.

1. Facts

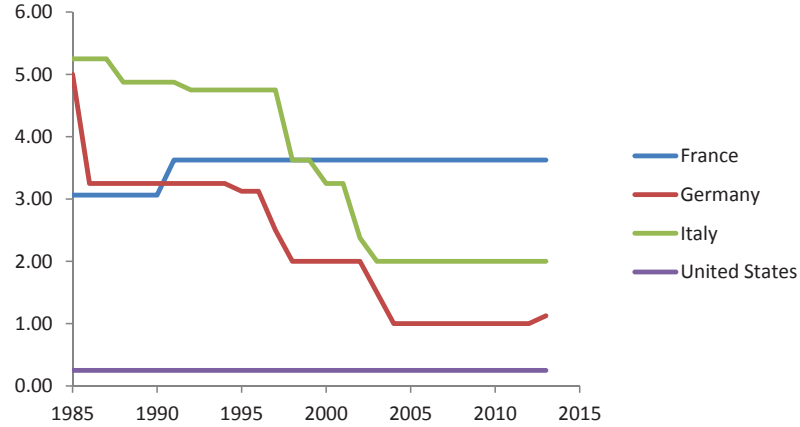
Labor Market Regulation

- European labor markets more regulated.
- In many cases, explicit or implicit age discrimination:
  - Distinction between regular and temporary contracts.
  - Features like “Sozialauswahl” in Germany for layoffs.
- Protection for older/experienced workers particularly relevant for mechanism.

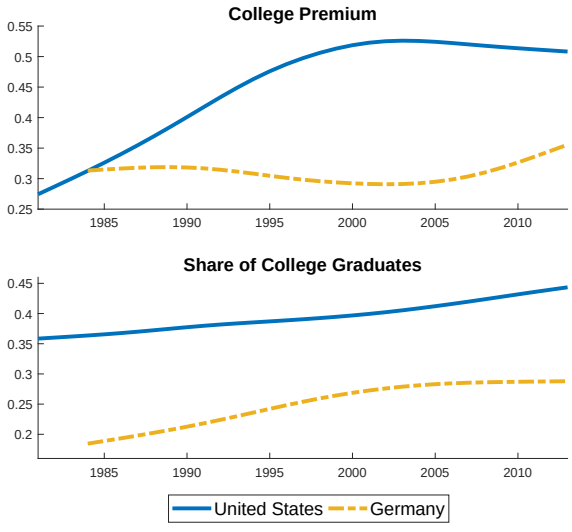
OECD Index of Employment Protection for Regular Employees



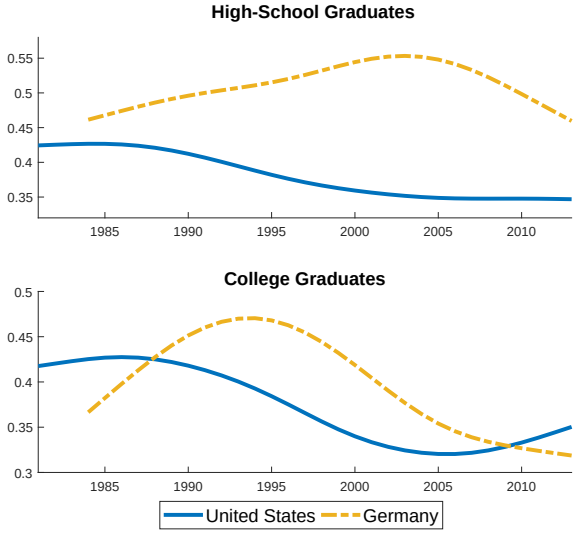
OECD Index of Employment Protection for Temporary Employees



College Premium and Share of College Graduates, US versus Germany



Fraction of Workers with Long-term Tenure, US versus Germany



Education and Transferability of Skills - United States

	Log of hourly wage (ages 45–54) USA (PSID)			
	1981–1995		1996–2013	
Tenure >= 20, High school	.272***		.257***	
	(.043)		(.030)	
Tenure >= 20, College		.180**		.187***
		(.064)		(.045)
Experience (polynomial)	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	1,895	1,197	2,606	1,836
R^2	.126	.048	.073	.043

Education and Transferability of Skills - Germany

	Log of hourly wage (ages 45–54) Germany (GSOEP)			
	1984-1995		1996-2013	
Tenure >= 20, High school	.097***		.137***	
	(.021)		(.022)	
Tenure >= 20, College		-.030		-.063
		(.051)		(.041)
Experience (polynomial)	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	4,008	1,066	3,817	1,247
R^2	.042	.052	.246	0.229

2. Model

A Model of the Impact of Labor Market Turbulence on Skill Acquisition

- Life cycle model, ages 25 to 64.
- Two education types $s \in \{H, L\}$:
  - H acquire (mostly) general skills.
  - L acquire (mostly) job-specific skills.
- Two types of jobs:
  - All jobs for educated workers allow accumulation of skill.
  - For less-educated workers, only fraction v_A of jobs does.

Investment in Relationship-Specific Capital

- Young workers $s \in \{H, L\}$ draw initial productivity $h \in \{h_1, \ldots, h_n\}$ from $F^s(h)$.
- If job allows for skill accumulation, worker chooses costly effort e at cost $c(e)$ to upgrade skill with probability $p(e)$.
- Potential for skill loss after separation.
- Period utility:
  - If employed: $u_W^s = w^s(h, x, t, \epsilon) - c(e)$
  - If unemployed: $u_U^s = b^s(h, x)$

Labor Market

- Separate labor markets by education; Unemployed worker finds job with probability λ.
- In L market, firms draw heterogeneous cost k_A for posting accumulation-type vacancy from distribution $G(k_A; c_0, c_1)$.
- Firm opens accumulation-type vacancy if:

$$k_A \leq E\left[J_A^L\right] - E\left[J_N^L\right].$$

- Wages determined via Nash bargaining with downward wage rigidity: wage cannot fall below "prevailing wage" for worker with education s, skill h, experience x.

Production in Normal and Turbulent Times

- Match output in regular times for workers of education s, skill level h and experience x:
$$y^s(h, x) = a^s(x)\ h.$$
- With probability γ, turbulence shock reduces productivity by factor $\epsilon \sim \text{Uniform}\,(0, \bar{\epsilon})$.
- Productivity returns to normal with probability ϵ.

Separations and Skill Loss

- Exogenous separation for worker with tenure t: $\theta^s(t)$.
- Endogenous separation: continuation value of firm is lower than firing cost.
- Skill loss upon separation: For $j < i$, transition probability $Q^s(i,j)$ defined by:

$$Q^s(i,j) = \sigma^s Q^s(i,j+1), \quad \sum_{j=1}^{i} Q^s(i,j) = 1.$$

- If $\sigma^H < \sigma^L$: skill loss more severe for less-educated workers.

Bellman Equations for Employed Workers

$$V_N^s(x,h) = w_N^s(x,h) + \beta\left[(1-\gamma^s)V_N^s(x+1,h) + \gamma^s E\left(\tilde{V}_N^s(x+1,h',\epsilon)\right)\right]$$

$$V_A^s(x,h) = \max_e \Big\{ w_A^s(x,h) - a^s(x)he^2 + \beta\left[(1-\gamma^s)E\left(V_A^s(x+1,h')\right) + \gamma^s E\left(\tilde{V}_A^s(x+1,h',\epsilon)\right)\right] \Big\}$$

Bellman Equation for Firm Experiencing Turbulence

$$\tilde{J}_p^s(x,h,\epsilon) = \max\Big\{a^s(x)h\epsilon - \delta w_p^s(x,h) + \beta\Big[\gamma^s E\left(\tilde{J}_p^s(x+1,h,\epsilon')\right) + (1-\gamma^s)(1-\pi^s)\tilde{J}_p^s(x+1,h,\epsilon) + (1-\gamma^s)\pi^s J_p^s(x+1,h)\Big], -f^s\Big\}$$

Bellman Equation for Unemployed Worker

$$U^s(x,h) = a^s(x)h\bar{b} + \beta\Big\{\lambda^s\left[v_A^s V_A^s(x+1,h) + (1-v_A^s)V_N^s(x+1,h)\right] + (1-\lambda^s)U^s(x+1,h)\Big\}$$

3. Quantitative Evaluation

Calibration Exercise for the United States

- Parameterize model to match college premium, tenure premium, and share of low-tenure and high-tenure workers in 1980.
- Choose change in overall skill bias and turbulence shock to match college premium, tenure premium, and share of low-tenure and high-tenure workers in 2010.
- Examine role of investment in relationship-specific capital for the impact of these change on college wage premium in 2010.

Preset Parameters

Assigned parameters			
	Parameter	Value	Source-Target
Discount rate	β	0.95	Yearly $r = 5.25\%$
Job finding rate	λ	0.8	Ave duration of search 3mths
Bargaining weight	α	0.5	Gertler and Trigari (2009)
Non-market prod	b	0.2	50% replacement 0.4
Prod. loss in turbulence	$\bar{\epsilon}$	0.6	minimum 40% loss

1980 US Calibration - Data vs Model

Calibration: 1980 US Steady State - Model fit					
Moment	Data	Model	Moment	Data	Model
L Tenure premium	.2376	.2319	College prem. 25-34	.2437	.2340
H Tenure premium	.1259	.1272	College prem. 35-44	.2816	.3018
Long tenure share	.4140	.4141	College prem. 45-54	.3668	.3567
Short tenure share	.1543	.1548	*H* Exp. prem. 35-44	.2289	.2093
L S.D. log-wage at 25	.3641	.366	*H* Exp. prem. 45-54	.3830	.3673

1980 US Calibration - Parameter Values

Calibration: 1980 US Steady State - Parameter values			
	Parameter	Value	Target
L skill specificity	σ^L	.3182	L Tenure premium
H skill specificity	σ^H	.0453	H Tenure premium
Prob. skill upgrade	$\bar{e}$	.4941	Exper. and Educ. premium by age
L Exog. prod. growth	g^L_{80}	.0006	Exper. and Educ. premium by age
Skill-biased tech.	A^H_{80}	1.290	Educ. premium
Freq. of turbulence	γ_{80}	.0134	Long-term tenure
Exog. separation	$\theta_{80}(1)$	.2069	Short-term tenure
Pareto initial skills	η	4.571	L S.D. log-wage age 25

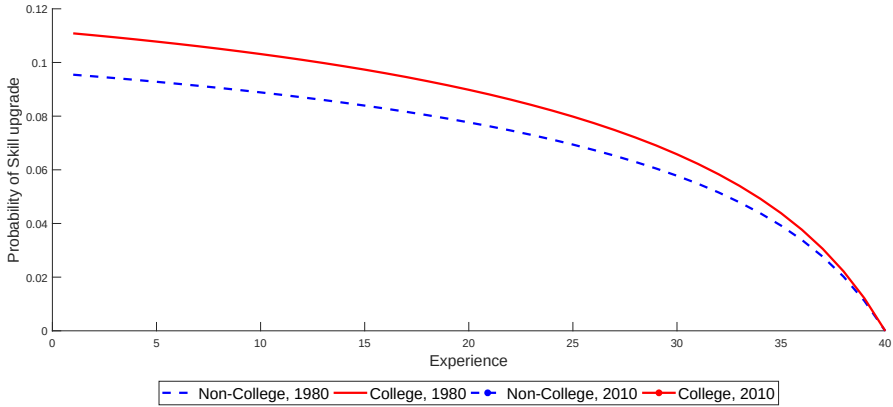
2010 US Calibration - Data vs Model

Calibration: 2010 US Steady State - Model fit					
Moment	Data	Model	Moment	Data	Model
Δ long tenure share	$-.0807$	$-.0803$	College prem. 25-34	.4080	.4103
Δ short tenure share	.0091	.0096	College prem. 35-44	.5408	.5367
H Exp. premium, 35-44	.3065	.2754	College prem. 45-54	.6452	.6464
H Exp. premium, 45-54	.5059	.5229			

2010 US Calibration - Parameter Values

Calibration: 2010 US Steady State - Parameter Values			
	Parameter	Value	Target
Δ Exog. prod. growth	Δg_{10}	.0063	Exp. and Educ premium by age
Fraction of A jobs for	$v^L_{A,10}$	.5563	Exp. and Educ premium by age
Skill-biased tech.	A^H_{10}	1.4990	Exp. and Educ premium by age
Freq. of turbulence	γ_{10}	.0372	Long-term tenure
Exog. separation	$\theta_{10}(1)$	.1732	Short-term tenure, 2010

Investment in Skill Upgrading



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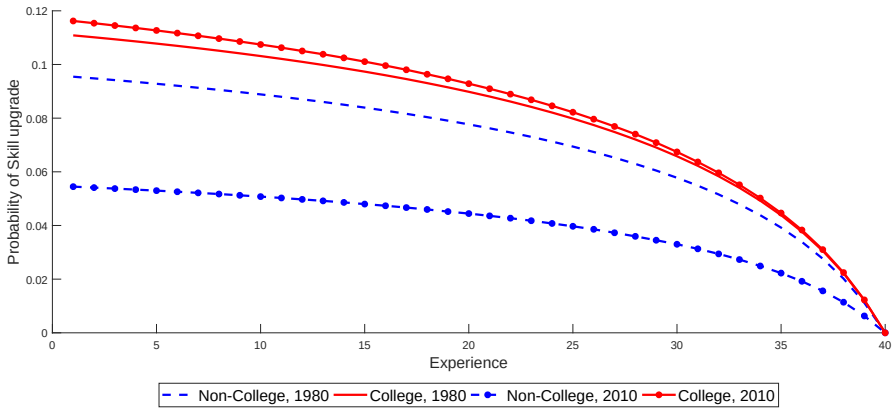

Impact of Turbulence on College Premium

Setting	College Premium
1980 steady state	0.381

Impact of Turbulence on College Premium

Setting	College Premium
1980 steady state	0.381
2010 steady state with turbulence, SBTC	0.812

Impact of Turbulence on College Premium

Setting	College Premium
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2010 steady state with turbulence, SBTC	0.812
2010 steady state with turbulence	0.538

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Setting	College Premium
1980 steady state	0.381
2010 steady state with turbulence, SBTC	0.812
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2010 steady state with turbulence (fixed job comp.)	0.400

Impact of Turbulence on College Premium

Setting	College Premium
1980 steady state	0.381
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2010 steady state with turbulence	0.538
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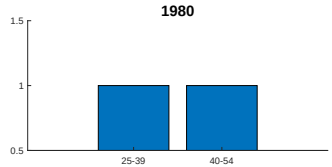
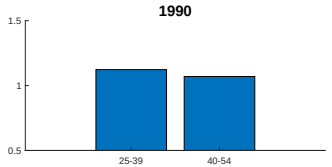
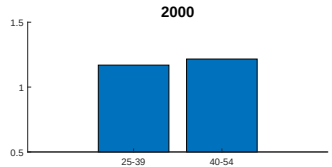
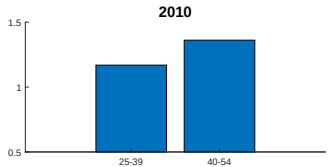
$\rightarrow$ Turbulence accounts for 36% percent of rise in college premium.
$\rightarrow$ Most of the effect comes from deteriorating job quality.

Cohort Effects in the Model

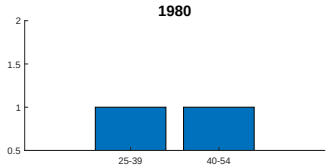


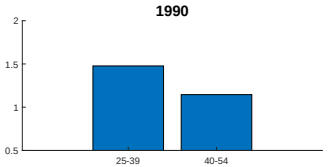


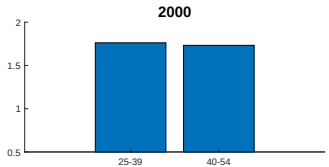


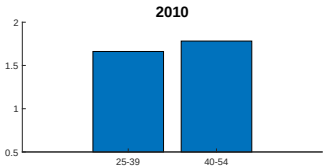


Cohort Effects in the Data





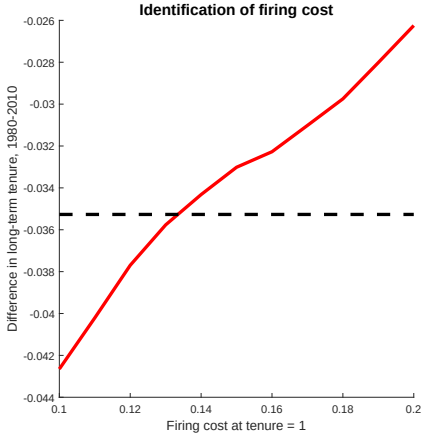


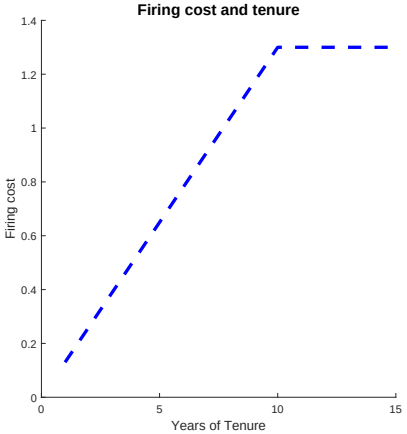


4. Role of Employment Protection

Effect of Turbulence with Employment Protection

- Calibrate firing cost to match long term tenure in Germany with same turbulence shock as in the US.





Relative Profitability of Good Jobs with and without Firing Cost

A to N relative profitability		
	1980	2010
United States	1.64	1.54
Germany	1.70	1.75

College Premium with Employment Protection

	College premium	
Setting	NO firing cost	Firing cost
1980 steady state	0.381	0.378

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College Premium with Employment Protection

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Setting	NO firing cost	Firing cost
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2010 steady state with turbulence, SBTC	0.812	0.605
2010 steady state with turbulence	0.538	0.390

College Premium with Employment Protection

	College premium	
Setting	NO firing cost	Firing cost
1980 steady state	0.381	0.378
2010 steady state with turbulence, SBTC	0.812	0.605
2010 steady state with turbulence	0.538	0.390

$\rightarrow$ Employment protection reduces rise in college premium by 45 percent.

Welfare Effect of Employment Protection

Setting	Output	Welfare
1980 model	1	1

Welfare Effect of Employment Protection

Setting	Output	Welfare
1980 model	1	1
2010 model with turbulence	0.925	0.930

Welfare Effect of Employment Protection

Setting	Output	Welfare
1980 model	1	1
2010 model with turbulence	0.925	0.930
2010 model with turbulence, employment protection	0.979	0.975

Welfare Effect of Employment Protection

Setting	Output	Welfare
1980 model	1	1
2010 model with turbulence	0.925	0.930
2010 model with turbulence, employment protection	0.979	0.975
2010 model with turb., empl. protection - only separations	0.920	0.925

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2010 model with turbulence, employment protection	0.979	0.975
2010 model with turb., empl. protection - only separations	0.920	0.925
2010 model with turb., empl. protection - only investment	0.984	0.981

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$\rightarrow$ Employment protection improves welfare by promoting creation of good jobs.

Conclusion

- Employment protection matters for investment in relationship-specific capital.
- Without protection, rise in turbulence erodes supply of skill-intensive jobs and raises education premium.
- Helps explain cross-country differences in inequality trends.