Labor Market Fluidity and Human Capital Accumulation *

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PRELIMINARY DRAFT—PLEASE DO NOT CIRCULATE

Abstract

Using individual-level panel data from 14 advanced economies, I document three facts about cross-country differences in career outcomes. First, wages grow more over the life cycle in countries with higher rates of job-to-job mobility. Second, this stronger wage growth is only partly accounted for by the wage gains workers realize when they switch jobs, with wages also growing faster within ongoing job spells in more fluid labor markets. Third, in high-fluidity countries, young workers are more likely to be employed by large firms that offer greater training opportunities, and they tend to experience faster wage growth at such firms. I interpret these facts through the lens of a search model of careers in which firms differ both in productivity and in the quality of their learning environment. Policies that inhibit labor market fluidity raise mismatch, which in turn affects skill accumulation through two channels. First, young workers are less likely to match with firms that provide better learning environments. Second, greater mismatch reduces the return to skill, lowering the value young workers place on those environments. In a preliminary calibration, I find that a 30 percent decline in labor market fluidity is associated with a drop of more than 30 log points in life-cycle wage growth, driven mainly by weaker skill accumulation.

*Niklas Engbom: ne466@nyu.edu. This paper expands on an earlier draft by incorporating new cross-country data on the allocation of workers across heterogeneous firms and a richer theory of sorting of workers across firms that differ in multiple attributes.

1 Introduction

A large literature documents substantial cross-country differences in labor market flows and argues that policies and institutions that impede reallocation generate misallocation and depress aggregate productivity (Bentolila and Bertola, 1990; Hopenhayn and Rogerson, 1993; Ljungqvist and Sargent, 1998). Most of this work emphasizes firms' job creation and destruction decisions and the static misallocation of labor across producers. Yet labor market frictions and regulations also shape how workers move across jobs and the work experiences they accumulate over their careers. These dynamic margins may be first-order for both individual outcomes and aggregate performance because workers' earnings and productivity are built over time. This paper studies how cross-country differences in labor market fluidity affect workers' life-cycle wage growth and human capital accumulation when firms differ both in contemporaneous productivity and in their learning environment.

My starting point is three facts about worker careers across advanced economies. First, wages grow more over the life cycle in countries with higher rates of job-to-job mobility—what I call more *fluid* labor markets. Second, although job-to-job transitions are typically associated with wage gains, these gains account for only part of the stronger life-cycle wage growth in more fluid markets. Put differently, wages of young workers also grow faster *within* jobs in more fluid labor markets. Third, workers in more fluid labor markets are more likely to work at larger firms and at firms that offer on-the-job training, precisely the firms in which young workers' wages tend to grow faster.

I interpret these patterns through an equilibrium model of finitely lived workers and heterogeneous firms. Firms differ along two dimensions: current productivity and the quality of the learning environment they provide. Workers therefore climb a two-dimensional job ladder, trading off current pay against future skill accumulation. Young workers, who have a long career ahead of them and are better at learning new things, place greater value on learning-rich jobs. As workers age, they increasingly sort toward high-productivity firms that make better use of the human capital they have already accumulated. In more fluid labor markets, young workers reach learning-rich firms more quickly. Moreover, because later moves toward high-productivity employers are easier, they have stronger incentives to invest in skills early in life. Consequently, young workers in high-fluidity countries place greater weight on finding a good learning environment. Both forces raise life-cycle wage growth.

My empirical analysis builds an individual-level panel covering advanced economies in Western Europe and the United States, with more than twenty years of data for each country. I first construct a consistent measure of labor market fluidity across countries and over time: the share of workers who were *poached* from another employer at some point during the previous twelve months. I find substantial cross-country variation in this measure. The most fluid labor market in the sample has more than twice the poaching rate of the least fluid one.

To relate fluidity to life-cycle wage growth while accounting for differential selection into employment over the life cycle, I exploit the panel dimension of the data. Specifically, I estimate country-level life-cycle wage growth controlling for individual fixed effects and aggregate time trends, under the model-guided assumption that wages are approximately flat late in life (Lagakos et al., 2018). I find large cross-country differences in life-cycle wage growth: in some countries, real wages rise by more than 50 log points between ages 20–29 and 50–59, while in others they rise by less than 15 log points.

More fluid labor markets exhibit systematically steeper wage profiles. Across countries, college-educated workers tend to experience faster wage growth over the life cycle, so one natural concern is that more fluid labor markets simply employ more highly educated workers. But once I allow life-cycle profiles to vary by education, gender, and broad occupation, the relationship between fluidity and wage growth changes little.

Across countries in my sample, job-to-job moves come with wage increases on average. But the direct contribution of these transition gains explains only part of the cross-country pattern. Workers in more fluid labor markets also enjoy faster wage growth while remaining with the same employer.

Motivated by recent evidence of important firm-level heterogeneity in their learning environment (Gregory, 2026), I document that young workers in more fluid labor markets are more likely to work at large firms and at firms offering more training opportunities. Moreover, conditional on individual fixed effects, young workers experience faster wage growth at large firms and at training firms, whereas older workers display little such differential growth.

Motivated by these facts, I develop a model in which labor market fluidity affects wage growth not only through wage gains at reallocation events, but also through worker sorting toward firms that foster skill accumulation. I use the model to quantify the implications of labor market fluidity for worker mobility, training, life-cycle wages, and aggregate output. The model is disciplined to match observed firm heterogeneity and worker–firm sorting patterns in a representative economy.

I study counterfactual changes in fluidity motivated by wedges to hiring and job creation emphasized in the labor market and misallocation literatures (Hopenhayn and Rogerson, 1993; Pries and Rogerson, 2005). Lower fluidity reduces early-career mobility toward learning-rich firms, weakens incentives to invest in skills, flattens wage profiles, and lowers aggregate productivity. In a tentative calibration, I find that a 30 percent decline in labor market fluidity is associated with a more than 30 log point decline in life-cycle wage growth, mostly through a fall in skill accumulation. Taking into account the dynamic consequences of policies that reduce job flows on workers' skill accumulation substantially amplify the static effect of such policies.

Most of the paper deliberately avoids taking a strong stand on the precise policies responsible for cross-country differences in labor market fluidity. Instead, I focus on the implications of those differences for worker behavior and human capital accumulation. That said, I provide com-

plementary reduced-form evidence showing that fluidity is lower where policy and institutional environments appear to make hiring and firm operation more costly, consistent with the broader literature on labor market regulation and reallocation (Bentolila and Bertola, 1990; Hopenhayn and Rogerson, 1993; Ljungqvist and Sargent, 1998).

Related literature. This paper contributes to several literatures. First, it relates to work on cross-country differences in labor market outcomes and labor market dynamics. Existing work has documented important international differences in unemployment and worker flows, as well as cross-country variation in job-to-job mobility (Ljungqvist and Sargent, 1998; Jolivet, Postel-Vinay and Robin, 2006). It also connects to the literature on life-cycle wage growth across countries (Lagakos et al., 2018). My contribution is to link these facts by showing that labor market fluidity helps account for cross-country differences in workers' wage growth over the life cycle.

Second, the paper contributes to the literature that combines search frictions and human capital accumulation in models of workers' careers. My framework builds on classic work on human capital accumulation and labor market frictions (Becker, 1962; Ben-Porath, 1967; Diamond, 1982; Mortensen and Pissarides, 1994; Burdett and Mortensen, 1998) and is particularly related to equilibrium search models with human capital dynamics such as Bagger et al. (2014). My main departure is to allow firms to differ in their learning environments, following the central insight of Gregory (2026). Relative to models in which firms differ only in productivity or amenities, learning heterogeneity implies that mobility affects not only the level of wages but also their growth rate, because job mobility changes where workers accumulate skills over the life cycle.

2 Three Facts on Cross-Country Differences in Career Outcomes

This section establishes three facts on cross-country differences in worker career outcomes.

2.1 Data

I use individual-level panel data from the European Community Household Panel (ECHP), the European Union Survey of Income and Living Conditions (EU-SILC) and the Panel Study of Income Dynamics (PSID), which collectively provide 21–30 years of data for 14 advanced economies.

Sample selection. I focus on men and women aged 20–59. Since the data do not allow me to consistently distinguish private and public employees and wage employees from the self-employed, I classify as employed both private sector wage employees, public sector wage employees, and self-employed workers. The non-employed consist of everyone else.

I recode education into less than a college degree or a college degree or higher. Occupation is

standardized into two digit ISCO codes. Wages is total wage and salary income last year over total hours worked, constructed as the product of weeks worked and hours per week. Nominal wages are first converted to real local 2022 wages and then to real USD using the 2022 PPP-adjusted exchange rate.

Labor market fluidity. Data limitations prevent me from consistently constructing a monthly job-to-job mobility rate. However, the available data allow me to construct the annual poaching rate—the share of currently employed workers who started working for their current employer in the past 12 months without having been non-employed at any point in the past 12 months. I am able to construct this moment consistently across countries over the whole 1993–2024 sample period (1984–2023 period for the U.S.).

Life-cycle wage growth. I estimate life-cycle wage growth controlling for individual fixed effects by exploiting the panel dimension of the data. Specifically, I project log hourly earnings on an individual fixed effect, country-year fixed effects and country-age effects, where the latter are restricted to be flat past age 45 in order to the perfect collinearity between individual, year and age fixed effects

$$\log w_{it} \quad = \quad \alpha_i \; + \; \gamma_{ct} \; + \; \xi_{ca} \; + \; \varepsilon_{it}$$

My object of interest is the estimated country-specific age effects ξ_{ca}.

2.2 Wages Grow More Over the Life-cycle in More Fluid Labor Markets

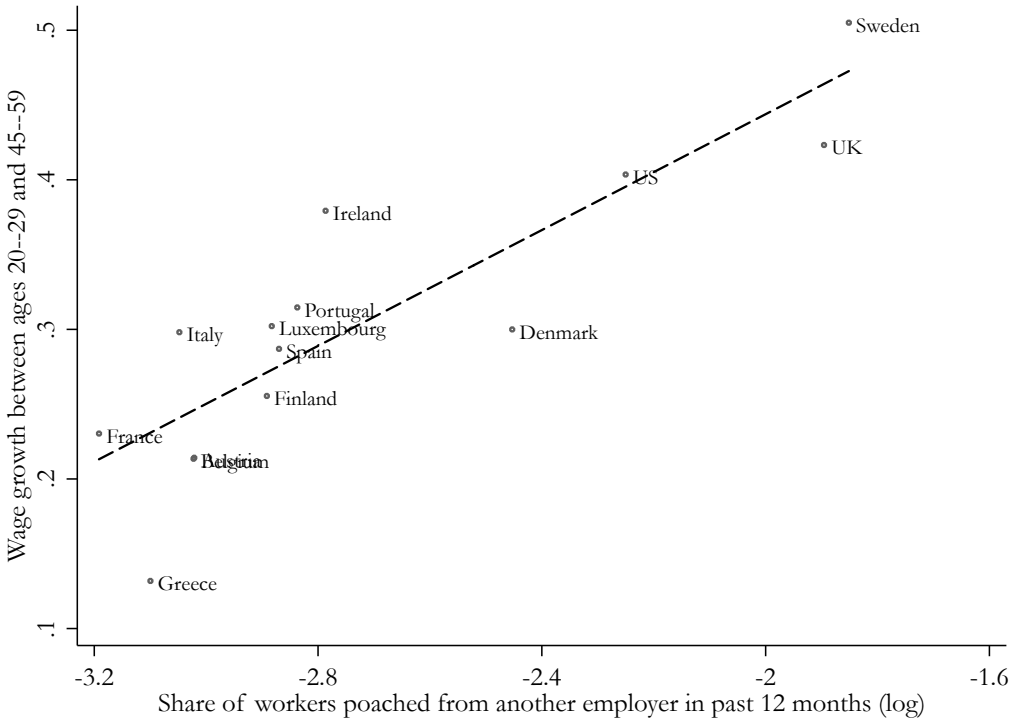
Figure 1 plots estimated wage growth between ages 20–29 and 50–59 against the share of workers who were poached in the past year. Three observations stand out. First, countries differ dramatically in their level of labor market fluidity. In the most fluid labor market, workers are over twice as likely to be poached in a year relative to the least fluid country.

Second, countries also differ in the extent of life-cycle wage growth. Between ages 20-29 and 50–59, real wages grow only by about 15 percent in Greece, holding fixed aggregate growth with calendar time. In constrast, wages grow by over 50 percent between the same ages in Sweden.

Third, wages grow more over the life-cycle in countries characterized by a higher frequency of job-to-job mobility. This pattern is not accounted for observable differences in workforce composition. To show this, I project wages on an interaction between the steepness of the life-cycle wage profile (restricted as above past age 45) and aggregate labor market fluidity, controlling for individual fixed effects, country-year fixed effects, and restricted age effects interacted with education (college/non-college), with gender and with one-digit occupation

$$\log w_{it} \quad = \quad \beta * \text{fluidity}_c * \text{age}_{it} + \alpha_i + \gamma_{ct} + \xi_{ae} + \xi_{ag} + \xi_{ao} + \varepsilon_{it}$$

Figure 1: Life-cycle Wage Growth and Labor Market Fluidity



Notes: Source: ECHP 1993–2001; EU-SILC 2002–2024; PSID 1984–2023.

Table 1 summarizes my findings. Although college educated workers tend to grow their wage more over their careers, as do men and certain occupations, workforce composition do not co-vary systematically with fluidity. Consequently, differences in workforce composition along education, gender and occupational dimensions do not account for the patterns in Figure 1.

Although differences in workforce composition do not drive my results, if the pattern in Figure 1 is particularly stark for some subpopulations, it might guide my understanding of its potential causes. According to the third and fourth columns of Table 1, life-cycle wage growth is particularly steep in high-fluidity countries for college graduates. Since college educated workers are less likely to be affected by forces such as the minimum wage or union-negotiated pay, this pattern suggests that such are not primarily responsible for the aggregate pattern.

The final two columns of Table 1 relates wages at age 20–29 to labor market fluidity, where entry wages have been converted to 2022 USD using the PPP-adjusted exchange rate. Entry wages are modestly higher in more fluid markets, but the relationship is not statistically significant. It is not the case that workers in high fluidity countries start at lower wages and catch up. Rather workers across these advanced countries enter the labor market at similar levels of pay, but wages subsequently grow faster in more fluid labor markets.

Table 1: Life-cycle Wage Growth, Entry Wages and Labor Market Fluidity

	(1)	(2)	(3)	(4)	(5)	(6)
	Life-cycle wage growth		By education		Entry wages	
	Raw	Residual	Non-college	College	Raw	Residual
Fluidity	0.010***	0.010***	0.006***	0.014***	0.063	0.035
	(0.002)	(0.002)	(0.002)	(0.004)	(0.130)	(0.117)
Individual-years	1,730,856	1,730,856	1,049,439	681,417	238,512	238,512
Individuals	509,886	509,886	312,167	197,719	122,710	122,710
Years	29	29	29	29	29	29
Countries	14	14	14	14	14	14

2.3 Wages Grow More Within Firms

Across all countries in my sample, a job-to-job transition tends to be associated with a wage increase. In this sense, it is not surprising that wages grow more over the life-cycle in countries where workers make more such transitions during their careers. To assess the importance of this direct, mechanical effect, I project year-on-year wage growth on an indicator for whether the worker is younger than 45 interacted with labor market fluidity, together with country-year, age-year, education-year, gender-year and occupation-year controls

$$\Delta \log w_{it} = \beta * \text{young}_{it} * \text{fluidity}_c + \alpha * \text{jj}_{it} + \xi_{cy} + \xi_{ay} + \xi_{ey} + \xi_{gy} + \xi_{oy} + \varepsilon_{it}. \quad (1)$$

Regression (1) relates excess wage growth of young workers in the country relative to their older peers to aggregate fluidity.

Table 2 summarizes my results. As expected given Figure 1, wage growth of young workers is higher in more fluid countries. Some of this is accounted for by the direct wage gains associated with making a job-to-job transition. Yet as shown in column (2), wage growth of young workers is higher in more fluid labor markets also in years when the worker did not make a job-to-job transition. Put another way, wages grow more also within employment spells in more fluid labor markets.

2.4 Workers Are Employed at Larger Firms Offering more Training

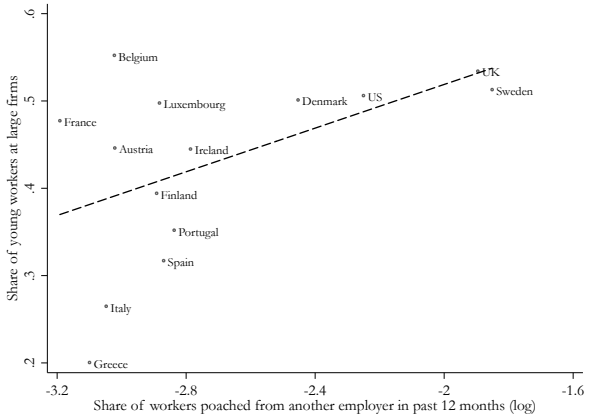
Why would wages grow more on-the-job in more fluid labor markets? A recent literature highlights important differences across firms in their *learning environment* (Gregory, 2026), leading workers to grow their skills more in some firms. Figure 2 shows that the allocation of young workers to firms differ in important dimensions across countries, with young workers in more fluid labor markets being more likely to work in large firms and firms that offer training.

Table 2: Wage Growth Within and Between Jobs and Labor Market Fluidity

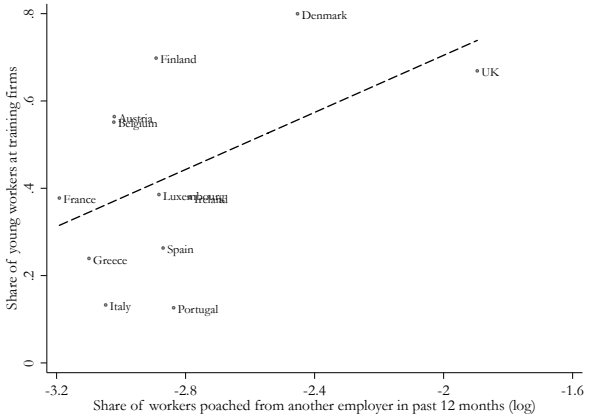
	(1)	(2)
	Baseline	Direct+Eq.
Aggregate fluidity	0.007***	0.006**
	(0.003)	(0.003)
JJ transition in last 12 months		0.028***
		(0.007)
Individual-years	625,936	625,936
Individuals	292,608	292,608
Years	24	24
Countries	14	14

Figure 2: Employment Share at Large, High-Training Firms and Labor Market Fluidity

(a) Share at Large Firms



(b) Share at Training Firms



To analyze the implications of this pattern for wage growth, I regress wage growth on an indicator for whether the respondent's firm is large (50+ employees) interacted with whether the worker is younger then 45, controlling for individual fixed effects, country-year fixed effects and country-age fixed effects, where the latter are restricted as above

$$\Delta \log w_{it} \quad = \quad \beta * \text{young}_{it} * \text{large}_{iy} + \xi_i + \xi_{cy} + \xi_{ca} + \varepsilon_{it}. \tag{2}$$

Alternatively, I exchange firm size for an indicator for whether the respondent's firm offers on-the-job training. This training measure is only available in the 1993–2001 ECHP, shrinking my sample size.

Table 3 summarizes my results. A young worker tends to grow her wage more when she works in a larger firms or in a firm offering training. I stress that this is conditional on individual fixed

Table 3: Wage Growth at Large and Training Firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline		Different returns		Hired interaction	
	Large	Training	Large	Training	Large	Training
Age 20–34	0.020***	0.020***	0.023***	0.017**	0.021***	0.002
	(0.004)	(0.006)	(0.004)	(0.007)	(0.003)	(0.004)
× hired					-0.046***	-0.038***
					(0.004)	(0.006)
× fluidity			0.046***	-0.016		
			(0.012)	(0.027)		
Age 35–44	0.010**	0.005	0.009**	0.006	0.025***	-0.002
	(0.004)	(0.005)	(0.004)	(0.007)	(0.003)	(0.004)
× hired					-0.024***	-0.011
					(0.005)	(0.008)
× fluidity			-0.004	0.003		
			(0.012)	(0.027)		
Age 45–59	-0.005	-0.004	-0.004	-0.007	0.033***	0.007
	(0.004)	(0.006)	(0.005)	(0.007)	(0.003)	(0.004)
× hired					-0.033***	0.013
					(0.005)	(0.011)
× fluidity			0.009	-0.022		
			(0.012)	(0.026)		
Individual-years	467,521	139,584	467,521	139,584	532,161	141,351
Individuals	158,778	32,544	158,778	32,544	177,258	33,424
Years	24	7	24	7	23	7
Countries	14	11	14	11	14	11

effects. This is true to a lesser extend for workers aged 35–44, and not at all for older workers. The wage gains from working at a larger firm for young workers are particularly large in more fluid labor markets, whereas there is no correlation between the size of the wage gains associated with training and labor market fluidity. The final two columns show that a given worker earns more at large firms and firms that offer training. However, at the point of being hired into such a firm, workers tend to earn less at such firms.

3 Model

This section outlines an equilibrium search model in which firms differ in both their productivity and learning environment.

3.1 Environment

I consider a steady-state economy populated by a unit mass of workers and a mass M of firms.

Demographics. Young workers enter the economy as unemployed with normalized human capital $h = 0$. They subsequently age to the next age group at rate κ. Having reached age group A, they permanently exit at rate κ and receive zero continuation value.

Preferences. Workers and firms have linear preferences over flow income/profits discounted at rate ρ. Unemployed workers enjoy flow value of leisure e^{b+h}.

Technology. Firms differ in two dimensions: their permanent productivity z and their learning environment x. Let $\Gamma(z, x)$ be the CDF of firms and $\gamma(z, x)$ the associated density. A firm with productivity z that hires a worker with human capital h produces output

$$y = e^{z+h}$$

The human capital of a worker of age a at a firm x evolves while employed as

$$dh = \psi_a x dt,$$

while it grows at rate ξ when unemployed (with typically $\xi < 0$).

Market structure. The final goods market is competitive and its price serves as the numeraire.

The labor market is frictional. Unemployed workers search for jobs at random with an intensity normalized to one. Employed workers search for alternative employment at random with intensity $\phi \geq 0$. Employed workers lose their job either because they opt to separate to unemployment, or at exogenous rate δ. Firms advertise v jobs subject to cost $c(v)$.

Let U be the aggregate number of unemployed workers across all age groups

$$U = \sum_{a=1}^{A} \int u_a(h)\, dh,$$

where $u_a(h)$ is the number of unemployed of age a with human capital h. Let

$$S = U + \phi(1 - U)$$

be aggregate search intensity and V the total number of jobs created

$$V = M \int v(z, x) d\Gamma(z, x)$$

where $v(z,x)$ is the number of vacancies advertised by a firm with productivity z and learning environment x. The job finding rate p and worker finding rate q are given by a standard Cobb-Douglas matching function

$$p = \chi\left(\frac{V}{S}\right)^{\alpha} \qquad \text{and} \qquad q = \chi\left(\frac{V}{S}\right)^{\alpha-1}$$

Conditional on meeting a firm, a worker contacts a firm drawn at random from the vacancy-weighted distribution of open jobs

$$f(z,x) = \frac{Mv(z,x)\gamma(z,x)}{V}.$$

Let $F(z,x)$ denote the CDF associated with the density $f(z,x)$.

The firm and worker bargain over how to split match surplus following the protocol of **?**, with worker bargaining weight β.

3.2 Solving the model

Because h enters flow payoffs only through the multiplicative factor e^h, and because the law of motion $\dot{h} = \psi_a x$ and $\dot{h} = \xi dt$ is independent of the current level of h, it is straightforward to show that unemployment and match values are homogeneous of degree one in human capital. We therefore write the value of unemployment as $e^h W_a$ and the joint value of a match as $e^h J_a(z,x)$.

Value functions. The value of unemployment satisfies

$$(\rho+\kappa)W_a = e^{b_a} + p\beta \int_{(z,x)\in\mathcal{A}_a} \left(J_a(z,x) - W_a\right) dF(z,x) + \kappa W_{a+1},$$

with $W_{A+1} = 0$. The acceptance region is the set of job offers that are accepted:

$$\mathcal{A}_a = ((z,x) : J_a(z,x) > W_a).$$

The joint value of a match satisfies

$$\begin{aligned}(\rho+\kappa+\delta-\psi_a x)J_a(z,x) &= e^z + \delta W_a \\ &\quad + \phi p\beta \int_{(\tilde{z},\tilde{x})\in\mathcal{M}_a(z,x)} \left(J_a(\tilde{z},\tilde{x}) - J_a(z,x)\right) dF(\tilde{z},\tilde{x}) \\ &\quad + \kappa \max\left(J_{a+1}(z,x), W_{a+1}\right),\end{aligned}$$

where $J_{A+1}(z,x) = 0$ for all z and x. The mobility region is the set of outside offers that are accepted:

$$\mathcal{M}_a(z,x) \quad = \quad ((\tilde{z},\tilde{x}) : J_a(\tilde{z},\tilde{x}) > J_a(z,x)).$$

I assume a standard iso-elastic form for the vacancy cost, $c(v) = cv^{1+\eta}/(1+\eta)$, so that firms' first-order condition for optimal vacancy creation writes

$$\frac{cv(z,x)^{\eta}}{q(1-\beta)} \quad = \quad \frac{1}{S}\sum_{a=1}^{A}\int e^{h}\left(u_a(h)\left(J_a(z,x)-W_a\right)^{+}+\phi\int\left(J_a(z,x)-J_a(\tilde{z},\tilde{x})\right)^{+}g_a(\tilde{z},\tilde{x},h)\,d\tilde{z}\,d\tilde{x}\right)dh,$$

where $g_a(z,x,h)$ is the number of employed workers of age a with human capital h currently employed at a firm with characteristics (z,x).

Laws of motion. Let

$$e_a(h) \quad = \quad \int g_a(z,x,h)\,dz\,dx$$

denote the total mass of employed workers of age a with human capital h. Then the number of unemployed workers of age a with human capital h satisfies

$$\begin{aligned}\mathcal{B}_a\Psi(h) \quad &= \quad \delta e_a(h) - pF(\mathcal{A}_a)u_a(h) \\ &\qquad +\kappa\left(u_{a-1}(h)+\int\limits_{(z,x)\in\mathcal{R}_a} g_{a-1}(z,x,h)\,dz\,dx - u_a(h)\right),\end{aligned}$$

where $\mathcal{R}_a = ((z,x) : (z,x) \notin \mathcal{A}_a)$ is the set of offers that are rejected, $u_0(h) = 0$, $g_0(z,x,h) = 0$, $\mathcal{B}_1$ is the stationary inflow of entrants into age group 1, and $\mathcal{B}_a = 0$ for $a \geq 2$.

For a job in the acceptance region $(z,x) \in \mathcal{A}_a$, the stationary employed densities satisfy

$$\begin{aligned}0 \quad &= \quad -\psi_a x\frac{\partial g_a(z,x,h)}{\partial h} - g_a(z,x,h)\left(\delta+\phi pF(\mathcal{M}_a(z,x))+\kappa\right) \\ &\qquad +f(z,x)\left(pu_a(h)+\phi p\int\limits_{(z,x)\in\mathcal{M}_a(\tilde{z},\tilde{x})} g_a(\tilde{z},\tilde{x},h)\,d\tilde{z}\,d\tilde{x}\right)+\kappa g_{a-1}(z,x,h).\end{aligned}$$

Equilibrium. A stationary equilibrium is a collection of age-specific value functions W_a and $J_a(z,x)$, acceptance and mobility regions $\mathcal{A}_a$ and $\mathcal{M}_a(z,x)$, a vacancy policy $v(z,x)$, finding rates p and q, an offer distribution $f(z,x)$, aggregate search intensity S and vacancies V, and worker distributions $u_a(h)$ and $g_a(z,x,h)$ such that

1. The value functions, acceptance and mobility policies solve workers' problem given the job

finding rate and offer distribution;

2. The vacancy policy solves firms' problem given the value functions, the worker finding rate and the distribution of workers;
3. The finding rates are consistent with aggregate search intensity and vacancy creation;
4. The offer distribution is consistent with firms' vacancy policy;
5. The distributions are consistent with the acceptance and mobility policies of workers, the job finding rate and the offer distribution.

My counterfactual exercises below assess the impact of variation in the cost of advertising jobs, c, on worker life-cycle outcomes. An increase in the cost of creating jobs reduces firms' incentives to advertise vacancies, resulting in a decline in the job finding rate p. Before I quantify this impact, it is useful to analyze the partial equilibrium impact of a fall in p on the type of jobs an unemployed worker accepts.

To that end, consider the set of jobs that a young unemployed worker is indifferent between. Specifically, let $\overline{x}(z)$ be the minimum learning environment a job with productivity z must offer for an unemployed worker to accept such a job. To simplify the notation, assume that if a worker of age a is indifferent between unemployment and employment at job $(z, \overline{x}(z))$, a worker of age $a+1$ strictly prefers unemployment. Then

$$(\rho + \kappa - \psi_a \overline{x}(z)) W_a \quad = \quad e^z + \beta\phi p \int\limits_{(\tilde{z},\tilde{x})\in\mathcal{A}_a} (J_a(\tilde{z},\tilde{x}) - W_a)\, dF(\tilde{z},\tilde{x}) + \kappa W_{a+1}$$

Subtracting the value of unemployment gives

$$\overline{x}(z) \quad = \quad -\frac{1}{\psi(a) W_a} \left(e^z - e^{b_a} - \beta p \Big(1-\phi\Big) \int\limits_{(\tilde{z},\tilde{x})\in\mathcal{A}_a} \big(J_a(\tilde{z},\tilde{x}) - W_a\big) dF(\tilde{z},\tilde{x}) \right)$$

The slope of the indifference curve is hence given by

$$\overline{x}'(z) \quad = \quad -\frac{e^z}{\psi(a) W_a}.$$

Since $\psi_a \geq 0$ and $W_a > 0$, this is negative as expected. The derivative of this with respect to the job finding rate is

$$\frac{\partial \overline{x}'(z)}{\partial p} \quad = \quad \frac{e^z}{\psi(a) W_a^2} \frac{\partial W_a}{\partial p}$$

which is positive since $\partial W_a / \partial p > 0$. That is, an increase in p flattens the indifference curve—to sacrifice a given amount of learning environment, workers require a larger productivity compen-

sation in a high-fluidity economy. A high job finding rate makes human capital more valuable, raising incentives to accumulate it.

3.3 Wage determination

Having solved for the equilibrium allocation, it remains to determine wages. I assume that pay is delivered as a piece rate w of output, so that take-home pay is we^{z+h}. By the same homogeneity argument, the worker's value under piece rate w can be written as

$$\tilde{V}_a(z,x,h,w) \quad = \quad e^h V_a(z,x,w).$$

Then, for all $a = 1,\ldots,A$,

$$\begin{aligned}(\rho+\kappa+\delta-\psi_a x)V_a(z,x,w) \quad = \quad & we^z + \delta W_a \\ & +\phi p \int\limits_{(\tilde{z},\tilde{x})\in\mathcal{N}_a(z,x,w)} (\beta J_a(z,x)+(1-\beta)J_a(\tilde{z},\tilde{x})-V_a(z,x,w))\; dF(\tilde{z},\tilde{x}) \\ & +\phi p \int\limits_{(\tilde{z},\tilde{x})\in\mathcal{M}_a(z,x)} ((1-\beta)J_a(z,x)+\beta J_a(\tilde{z},\tilde{x})-V_a(z,x,w))\; dF(\tilde{z},\tilde{x}) \\ & +\kappa \max\left(V_{a+1}(z,x,w), W_{a+1}\right),\end{aligned}$$

with $V_{A+1}(z,x,w) = 0$ for all z, x, and w. Here $\mathcal{N}_a(z,x,w)$ is the renegotiation region,

$$\mathcal{N}_a(z,x,w) \quad = \quad ((\tilde{z},\tilde{x}) : (\tilde{z},\tilde{x}) \notin \mathcal{M}_a(z,x) \text{ and } \beta J_a(z,x)+(1-\beta)J_a(\tilde{z},\tilde{x}) > V_a(z,x,w)).$$

Since the age-specific match value $J_a(z,x)$, mobility region $\mathcal{M}_a(z,x)$, and unemployment value W_a are already known, the normalized worker value can be rewritten as

$$\begin{aligned}\left(T_a(z,x)+\phi p F(\mathcal{N}_a(z,x,w))\right)V_a(z,x,w) \quad = \quad & we^z + B_a(z,x) + \kappa \max\left(V_{a+1}(z,x,w), W_{a+1}\right) \\ & +\phi p \int\limits_{(\tilde{z},\tilde{x})\in\mathcal{N}_a(z,x,w)} (\beta J_a(z,x)+(1-\beta)J_a(\tilde{z},\tilde{x}))\; dF(\tilde{z},\tilde{x}),\end{aligned}$$

where

$$T_a(z,x) \quad = \quad \rho+\kappa+\delta+\phi p F(\mathcal{M}_a(z,x)) - \psi_a x$$

and

$$B_a(z,x) \quad = \quad \delta W_a + \phi p \int\limits_{(\tilde{z},\tilde{x})\in\mathcal{M}_a(z,x)} ((1-\beta)J_a(z,x)+\beta J_a(\tilde{z},\tilde{x}))\; dF(\tilde{z},\tilde{x}),$$

for each age group $a = 1,\ldots,A$.

The wage paid to a worker hired out of unemployment is age-specific and given by

$$V_a(z, x, w_a(z, x, u)) \quad = \quad W_a + \beta\big(J_a(z, x) - W_a\big),$$

while the wage paid when the worker receives a less attractive outside offer $(\tilde{z}, \tilde{x})$ is

$$V_a(z, x, w_a(z, x, \tilde{z}, \tilde{x})) \quad = \quad \beta J_a(z, x) + (1 - \beta) J_a(\tilde{z}, \tilde{x}).$$

4 Calibration

I now take the model to the data to quantify the impact of observed differences in labor market fluidity on life-cycle career outcomes. I assume that the life-cycle consists of $A = 2$ phases.

4.1 Methodology

I calibrate the model to match key outcomes for a hypothetical average fluidity country in three steps. First, some parameter values are fixed externally to standard values in the literature or normalized. Panel A of Table 4 summarizes these parameter values, which includes an annual discount rate ρ of five percent, a worker bargaining power of $\beta = 0.5$ and a curvature of the matching technology of $\alpha = 0.5$. I normalize the learning ability of young workers, $\psi_1 = 1$, and set $\psi_2 = 0$. The vacancy cost is normalized to $c = 1$.

I assume that the underlying firm distribution over (z, x) is jointly normal, with zero correlation between z and x. Although z and x are uncorrelated in the underlying firm distribution, workers' endogenenous mobility choices result in a non-zero correlation between z and x across workers. Since the scale of the economy is indeterminate, I construct a grid for z such that the third grid point is zero, $z_3 = 0$. I also construct a grid for x such that the third grid point is zero, $x_3 = 0$. I fix the mean of z and x in the underlying firm distribution to zero, and normalize b_a such that workers of each age are indifferent between employment in a (z_2, x_2) match and unemployment.

Next, I pre-set some parameter values that map directly to one particular moment in the data. Panel B summarizes these parameters. I set the exogenous separation rate $\delta = 0.004$ to match the EU rate among older workers. I set the mass of firms $M = 0.1$ to match an average firm size of around 10. The aging rate κ is set so that workers spend on average 15 years in each stage.

Finally, I estimate internally six parameters to jointly match a set of moments from the microdata. Although the estimation is joint, some moments particularly inform some parameters. For instance, the UE rate informs aggregate matching efficiency χ, while the aggregate job-to-job mobility rate is informative of relative search efficiency on the job, ϕ.

The standard deviation of productivity dispersion σ_z is informed by the average wage change of a job-to-job mover—greater productivity dispersion is associated with greater wage gains of

Table 4: Parameter Values (TENTATIVE)

Parameter	Description	Value
Panel A. External or Normalized Parameters		
ρ	Discount rate	0.005
β	Worker bargaining weight	0.300
α	Matching elasticity	0.500
ψ_1	Young learning slope	1.000
ψ_2	Old learning slope	0.000
c	Vacancy cost scale	1.000
Panel B. Calibrated Parameters		
δ	Exogenous separation hazard	0.004
M	Mass of firms	0.100
κ	Age-transition hazard	0.006
Panel C. Estimated Parameters		
χ	Matching efficiency	0.150
ϕ	On-the-job search efficiency	0.500
σ_z	Std. dev. productivity	0.200
η	Vacancy cost curvature	2.000
σ_x	Std. dev. learning environment	0.003
ξ	Unemployment human capital depreciation	0.005

job-to-job movers. The curvature in the vacancy cost η is set to match the employment share of large firms.

To inform dispersion in learning environment σ_x, we compute wage growth of young and old workers at small and large firms. Large firms in general are characterized by both better learning environment and higher productivity, and both forces contribute to steeper wage growth at such firms. However, old workers do not benefit from a better learning environment. Consequently, we double difference this moment—we compare the wage growth of young versus old workers at large relative to small firms. This differences out the impact of productivity differences, which to a first order affects young and older workers similarly, to isolate dispersion in learning environment, which only benefits young workers.

The mean learning environment is informed by life-cycle wage growth, while the depreciation of skills in unemployment is set to match the behavior of wages late in life.

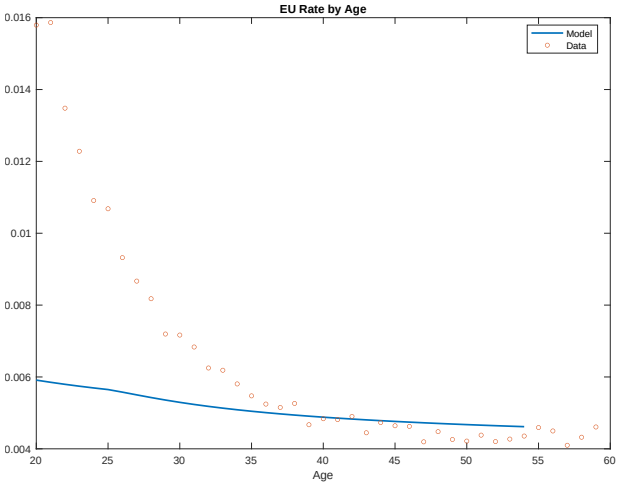
4.2 Model Fit

Figure illustrates the model's ability to fit the data in the targeted dimensions based on a rough calibration. For instance, the model cannot generate the decline in the UE rate with age in the data, which may require allowing search efficiency to fall with age. It matches some of the fall in the EU rate with age, as some young workers in high training environment firm age into jobs they no

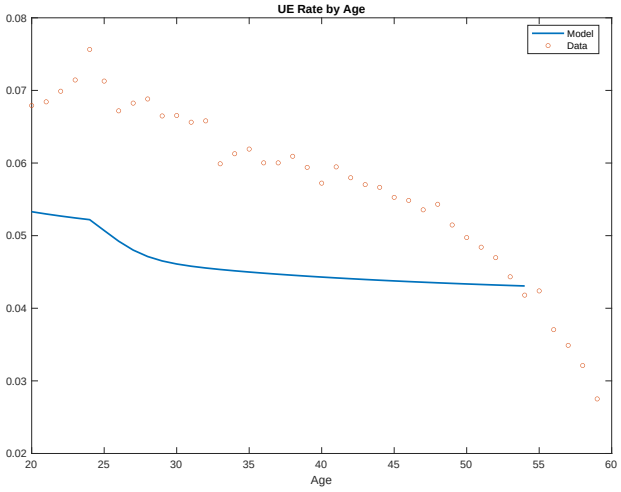
longer want, but it cannot match the magnitude of the empirical decline. I am currently working on an extension in which (z, x) evolve over time, which generates endogenous separations that are more common among young workers.

Figure 3: Model Fit (TENTATIVE)

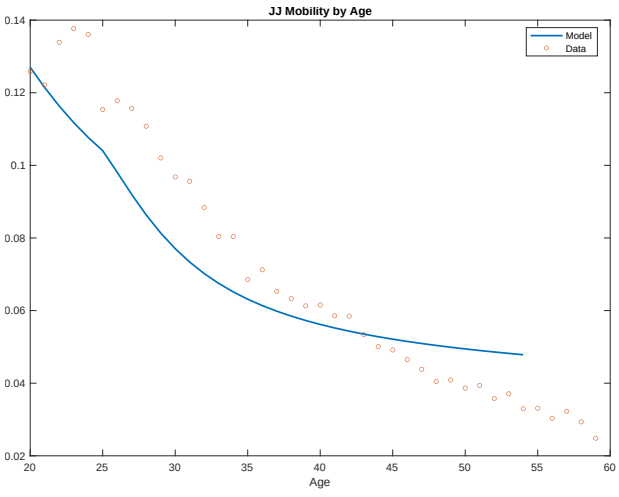
(a) EU Rate



(b) UE Rate



(c) JJ Rate



(d) Life-Cycle Wages

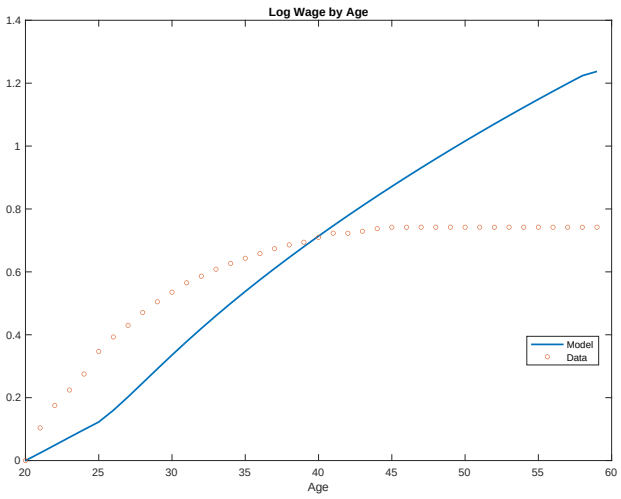


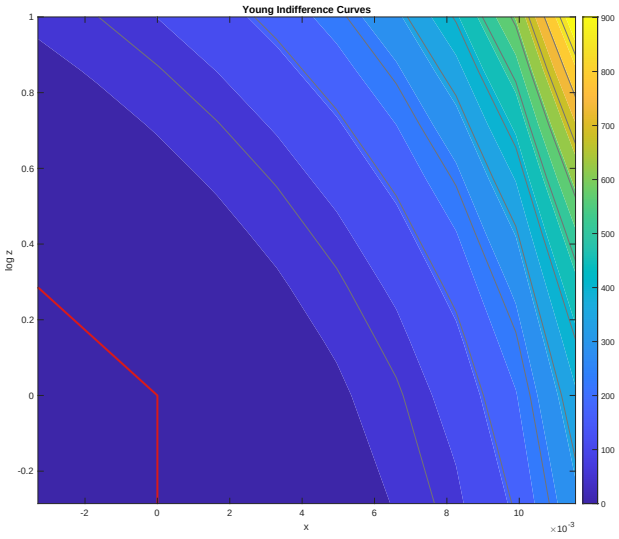
Figure shows how workers resort with age.

4.3 The Impact of Differences in Labor Market Fluidity

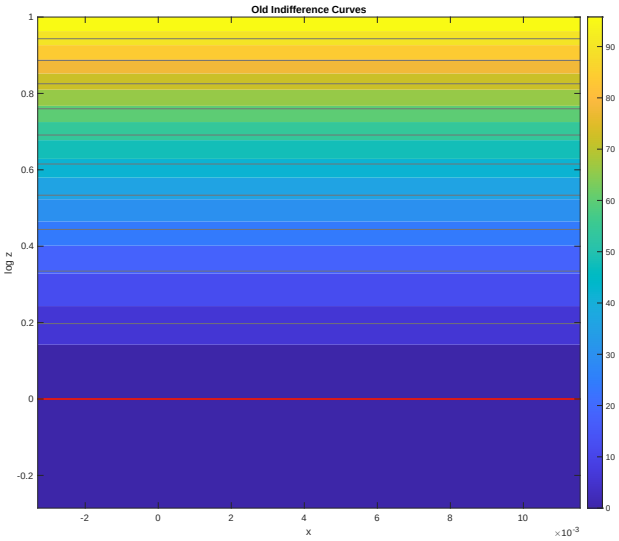
To quantify the impact of differences in labor market fluidity on worker career outcomes, I consider the following counterfactual exercise. Holding all other parameter fixed, I recalibrate the cost of creating jobs, c, to match observed cross-country differences in labor market fluidity. Figure 5 shows that in response to a roughly 30 percent decline in labor market fluidity, life-cycle

Figure 4: Model Outcomes (TENTATIVE)

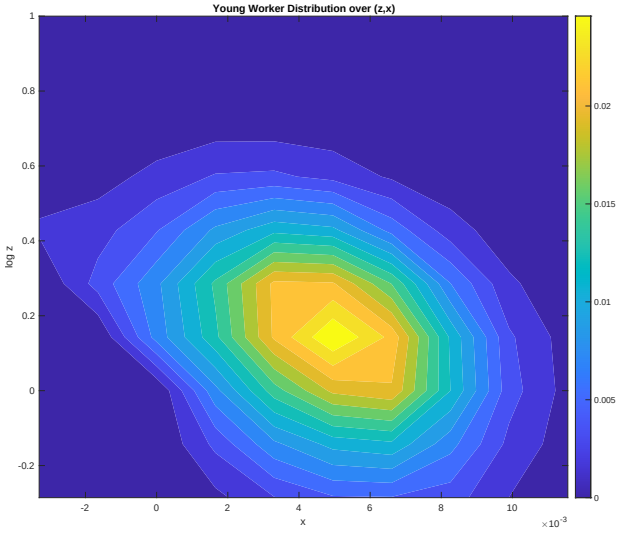
(a) Indifference Curves, Young



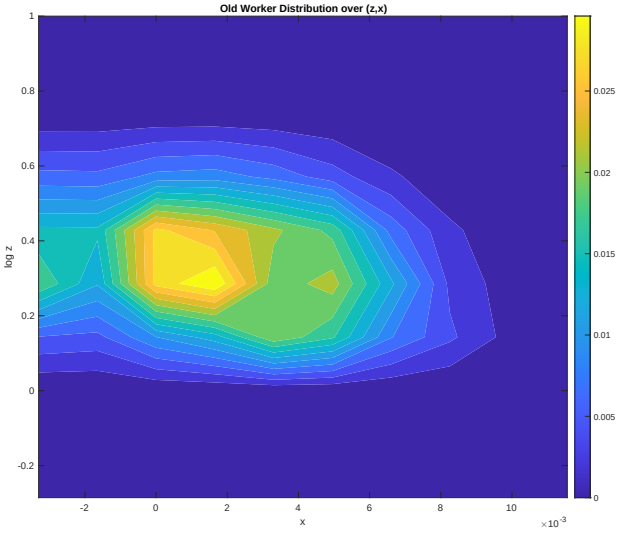
(b) Indifference Curves, Old



(c) Distribution, Young



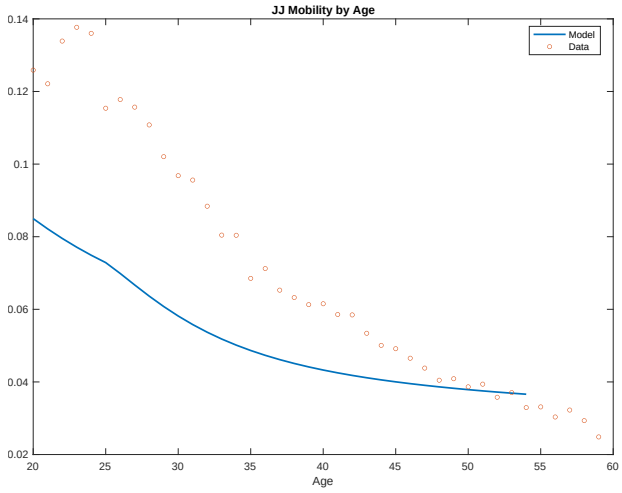
(d) Distribution, Old



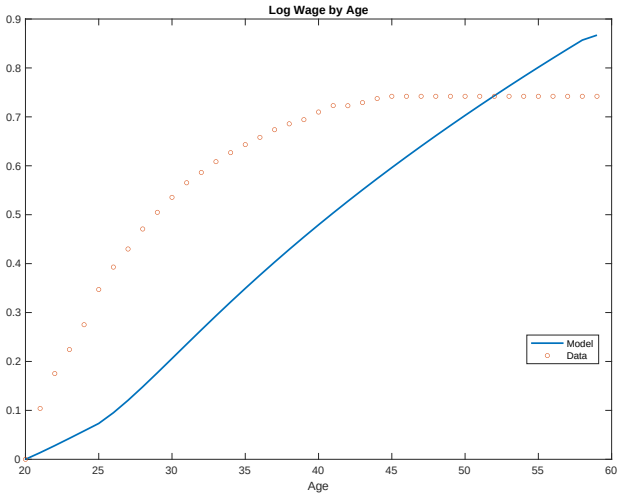
wage growth falls by over 30 log points. A large share of this decline in wage growth is accounted for by less growth in human capital.

Figure 5: Counterfactual Exercise (TENTATIVE)

(a) JJ Rate



(b) Life-Cycle Wages



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