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## Earnings growth, job flows and churn

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## ABSTRACT

How much do workers making job-to-job transitions benefit from moving away from a shrinking and towards a growing firm? Matched employer-employee data show that earnings growth in the transition increases with net employment growth at the destination firm and, to a lesser extent, decreases if the origin firm is shrinking. These results are not driven by composition, that different workers are going to growing or from shrinking firms, but rather implies that firm dynamics themselves are key to workers' earnings growth during job-to-job transitions. Further, firms' net employment growth rather than gross hires mostly drives the growth.

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## 1. Introduction

Workers' earnings changes are concentrated around periods in which they change jobs (see e.g. Moscarini and Postel-Vinay (2017); Topel and Ward (1992)). This insight is fundamental to a vast body of literature in which workers make job-to-job transitions to capture a larger share of the match surplus or to increase the productivity of their match. However, not every job-to-job transition brings the average earnings gain—there is a surprising amount of heterogeneity. These differences are now a central focus of research attention (see e.g. Bilal et al. (2019); Tjaden and Wellschmied (2014)).

This paper contributes new evidence that net employment growth at the firms who hire and lose these workers is particularly important to why some job-to-job transitions bring larger earnings gains than others. These patterns hold even after conditioning on the firm's fixed characteristics such as age, size, and average wage. Moreover, these patterns are not driven by worker characteristics, for example, if growing firms attracted workers who tend to gain more earnings. Further,

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the relationship is with net employment growth—not hiring itself—because firms' hires in excess of their net employment growth are considerably less important for earnings growth.

Quantitatively, the impact of firms' net employment growth on earnings growth is similar in magnitude to the impact of other firm characteristics such as size and wage, which are known to affect earnings growth. The elasticity of earnings growth to the destination firms' employment growth is about half as large compared to the elasticity with respect to the firms' average wage level. Differences in the growth rates at the destination and origin firm imply earnings growth differences of \$1,712 between the 90th and 10th percentiles. The largest effect comes from workers being hired at growing firms, growth that passes through to larger-than-expected earnings gains. In sum, this paper provides direct evidence that workers' earnings increase as a function of the firms' growth rates, particularly when workers move to a faster-growing firm. This relationship is quantitatively important even after conditioning on firm and worker characteristics.

Of course, many of these patterns between employer growth and earnings growth might be driven by composition: just as wage levels across firms are largely due to the wage levels of their workers, it may be that growing firms attract workers with faster-growing earnings. We present evidence that this composition effect does not drive the elasticity of earnings growth with firm dynamics. By using earnings growth, an individual's change in earnings, we are already differencing out many confounding fixed characteristics, but further, our baseline results include individual fixed effects. Hence, identification is based on multiple transitions by the same worker and thereby controls for unobservable heterogeneity. Selection into firms is, however, not random and this is quantitatively significant. Higher lifetime earners do move to faster-growing firms and they make larger gains in job-to-job transitions, however, this selection does not interact with the earnings growth associated with firm growth. Similarly, business cycle expansions bring larger average gains from job-to-job transitions and may change the composition of those making job transitions, but these do not seem to interact with the earnings premia associated with firm-level job growth.

Churn, the considerable number of excess hires above firms' net employment growth, has a notably smaller effect on earnings growth. This suggests an important distinction between hires that grow the firm and those that only replace a worker, with stronger earnings effects from the former. This distinction has broad implications for models of firm dynamics, because it means that growing—in contrast to hiring itself—incurs costs in the form of an extra earnings premium.

This project links the hiring and separation rates of firms to workers' job-to-job transitions. To do so, it uses the Longitudinal Employer-Household Dynamics (LEHD) dataset, administrative data that links nearly every worker to their firm and measures earnings at a quarterly frequency. The sample consists of approximately 1.2 million job-to-job transitions drawn from 17 states between 1998–2013. Because this is administrative data at a relatively high frequency, it is possible to identify job-to-job transitions and to obtain a precise measure of workers' earnings growth in the surrounding periods. The length of the panel also allows us to see multiple job transitions for an individual, meaning the estimators can use individual-level fixed effects to control for worker composition. More fundamentally, the project inherently requires matched employee-employer data because worker-side survey data does not observe changes at the firm level.

Looking at earnings growth across job-to-job transitions, [Topel and Ward \(1992\)](#) is an important early example emphasizing the outsized role of job transitions in overall earnings growth. We explore their role—and their interaction with firms' employment dynamics—in the cross-sectional dispersion of earnings outcomes. In doing so, this paper is similar to [Addario et al. \(2021\)](#), which includes the potential for firm fixed effects to be determinants of individual earnings dynamics.

There are well-established relationships between firm characteristics such as age, size, and average wages on earnings (e.g. [Brown and Medoff \(1989\)](#)). We extend these findings beyond the static characteristics of the firm to consider employment dynamics, that is, net and gross worker flows. Relating firm characteristics and worker flows, [Haltiwanger et al. \(2018a\)](#) shows that job-to-job transitions play a reallocation role, moving workers from less productive to more productive firms. [Bachmann et al. \(2017\)](#) and [Elsby et al. \(2017\)](#) are important examples considering the joint dynamics of gross and net flows of a firm, as we do. While the previous three papers focus on flows themselves, our paper shows that these flows affect the growth of workers' earnings similarly to the effects of firms' static characteristics on wage levels.

These facts about earnings growth in job transitions serve as evidence to the role of the firm in a frictional labor market and should inform a growing literature of labor market search models with large firms. [Belzil \(2000\)](#) establishes a relationship between faster-growing firms and wages that are higher than the workers' fixed effect. Such evidence informs how firms use wages to recruit, fundamental to a burgeoning set of structural models of dynamic, multi-worker firms.<sup>2</sup> In many of these papers, wages are an important motive for employment mobility, and we will discuss further in [Section 6](#) how each can align with our findings. [Carrillo-Tudela et al. \(2020\)](#); [Davis et al. \(2013\)](#) present important empirical evidence on firm recruiting methods, and, most closely related to this paper, [Kettemann et al. \(2018\)](#) shows that job-filling rates are higher at high-paying firms and that these rates increase with their employment growth rate. This paper's focus on earnings growth, instead of levels, is an important distinction from [Kettemann et al. \(2018\)](#). It allows us to better control for unobservable individual-level characteristics and relates to a different theoretical concept: the job ladder step-size.

The rest of this paper is organized as follows. In [Section 2](#) we describe the LEHD and our measurement of job transitions, earnings growth, and the related firm dynamics associated with each job transition. In [Section 3](#) we present the unconditional relationships between earnings growth, job flows, and churn. In [Section 4](#) we describe our findings from an earnings

<sup>2</sup> [Bilal et al. \(2019\)](#); [Coles and Mortensen \(2016\)](#); [Elsby and Gottfries \(2019\)](#); [Kaas and Kircher \(2015\)](#); [Schaal \(2017\)](#) are examples of such models.

change regression. Then, in Section 5, we extend those findings and present robustness checks. We discuss the implications of our results for theoretical models of job search in Section 6. Finally, we conclude in Section 7.

## 2. The data

This paper's data comes from the LEHD, a matched employer-employee panel put together from administrative data collected from state unemployment insurance files. The observations are quarterly earnings, rather than wages.

### 2.1. Sample selection

To construct our sample, we randomly draw 10% of individuals in the labor force in a 17 state sample which runs from 1998 to 2013.<sup>3</sup> Because the dataset is created from unemployment accounts, our coverage excludes any employment not covered by unemployment insurance.<sup>4</sup> For each individual, we extract birth year from the individual characteristics file. For more details on the sample, see McKinney and Vilhuber (2011).

From this sample, we use the job-history file, which lists earnings at each job spell during a worker's lifetime. For each period in which the worker has earnings, we select a "dominant" employer by maximum two-quarter earnings in the same way as Hahn et al. (2017). A job-to-job transition is a change in dominant job from one period to the next when the new dominant job had positive earnings in the same period as the old dominant job. This means that we will count job-to-job transitions in the uncommon event that a worker is continually employed at two employers but earnings fluctuations change which is the dominant job. The quarterly frequency also poses some challenges for measuring job-to-job transitions. Time aggregation implies that there may be transitions through non-employment that last up to 11 weeks. Because we require overlapping quarters of earnings, we also miss some true job-to-job transitions that occur over a weekend at the seam of two quarters.

For data on firms, we use the establishment-level Quarterly Workforce Indicators (QWI).<sup>5</sup> This is again collected at the state level, so we use employment weights to aggregate establishments within the state to the State Employer ID Number level. This means that multi-state firms will be counted as separate firms in each state, but transitions across establishments within the firm are not counted. For each firm, we compute hires as employer-level "accessions," which includes all new employees and does not exclude recalls. We exclude firms that start up or shut down in that quarter as well as those with more than 200% turnover.

We restrict our sample in two principal ways. On the worker side, we restrict to workers who are between 25–65 years old when their job begins. By cutting out the very young, we reduce labor turnover and the prevalence of very short job spells and this restriction is also consistent with much of the earnings risk literature. On the firm side, we remove transitions involving firms with fewer than 10 employees to eliminate large percentage changes from discrete employment changes. The result is about 2.7 million job-to-job transitions measured at the quarterly frequency and 1.2 million job-to-job transitions at the annual frequency.<sup>6</sup> We deflate earnings in all quarters to 2009 dollars.

### 2.2. Key variables

Our primary variable is earnings change,  $\Delta w_{i,t}$ . For a worker  $i$  who switches from one employer to another in period  $t$ , we skip over that period's earnings to compute the growth rate

$$\Delta w_{i,t} = \ln \sum_{k=1}^4 w_{i,t+k} - \ln \sum_{k=1}^4 w_{i,t-k}, \quad (2.1)$$

where  $\sum_{k=1}^4 w_{i,t+k}$  and  $\sum_{k=1}^4 w_{i,t-k}$  are full-year earnings at the destination and origin firm. Full-year earnings require that the employer-employee match existed for 6 consecutive quarters (from  $t$  to  $t+5$  and  $t$  to  $t-5$ ), ensuring that for each of the interior 4 quarters from which we calculate earnings, the worker was employed for the entire duration of the quarter. We exclude the quarter of the transition,  $t$ , because we do not know how many weeks of work were with each employer. Job transitions without earnings for a full year at each firm are dropped from our sample.<sup>7</sup> This is summarized in Appendix A, Figure A.1.

<sup>3</sup> The sample includes data from California, Colorado, Hawaii, Idaho, Illinois, Indiana, Kansas, Maine, Maryland, Missouri, Montana, Nevada, North Dakota, Tennessee, Texas, Virginia and Washington. These states represent 42% of national employment.

<sup>4</sup> This excludes all federal employees. Also, because of this provenance, the earnings measured are those that appear as W2 pre-tax labor income, but does not include contract work and other income.

<sup>5</sup> The firm-level data covers the firms' entire workforce, not only our 10% sample.

<sup>6</sup> The reason for the large decline in observations of annual earnings growth is that there are many job transitions where the origin or destination match does not last 6 quarters, which we require to measure annual earnings. This is consistent with observations in Hyatt and Spletzer (2017), who report that about  $\frac{1}{3}$  of all job matches last less than 1 quarter.

<sup>7</sup> Using full-year earnings restricts our analysis to a subset of job transitions where we observe sufficiently long tenure in both the origin and destination job. We relax this restriction and look at quarterly frequencies in Appendix B.2.

On the firm side, we measure several employment flows. Net job flows, i.e. net employment growth, at the firm are represented by

$$\Delta L_{\ell,t} = \frac{\sum_{k=1}^4 \mathbb{H}_{\ell,t-k} - \sum_{k=1}^4 \mathbb{S}_{\ell,t-k}}{\frac{1}{2}(L_{\ell,t} + L_{\ell,t-4})}, \quad \Delta L_{d,t} = \frac{\sum_{k=1}^4 \mathbb{H}_{d,t+k} - \sum_{k=1}^4 \mathbb{S}_{d,t+k}}{\frac{1}{2}(L_{d,t} + L_{d,t+4})}. \tag{2.2}$$

Here  $\mathbb{H}_{j,t}$  are the hires and  $\mathbb{S}_{j,t}$  are the separations of firm  $j$  in period  $t$ , which we accumulate for 4 quarters to get an annual measure. For a transition in period  $t$ ,  $\Delta L_{\ell,t}$  looks 4 quarters prior to the transition and  $\Delta L_{d,t}$  looks 4 quarters after the transition, just like earnings growth. Throughout,  $\ell$  will index the origin firm and  $d$  the destination firm associated with a transition.<sup>8</sup> So that the growth rate of the firm is not mechanically affected by the transition of the worker we observe, firm characteristics indexed  $t$  skip the period of transition, i.e.  $t + 1$  to  $t + 4$  and  $t - 1$  to  $t - 4$ . We also break net job flows at zero: net job creation,  $\Delta L_{j,t}^+ = \max(\Delta L_{j,t}, 0)$ , and net job destruction,  $\Delta L_{j,t}^- = -\min(\Delta L_{j,t}, 0)$ . In some specifications, we will create indicators,  $\mathbb{I}_{\Delta L_{j,t}^+} = \mathbb{I}_{\Delta L_{j,t} > 0.02}$ ,  $\mathbb{I}_{\Delta L_{j,t}^-} = \mathbb{I}_{\Delta L_{j,t} < -0.02}$ , and a no-change indicator,  $\mathbb{I}_{\Delta L_{j,t}^0} = \mathbb{I}_{|\Delta L_{j,t}| < 0.02}$ .

To represent job “churn,” the gross flows above and beyond net employment growth, we measure excess hires.  $F_{j,t}$  is the number of hires beyond the ones needed for the firm’s net growth in that period. This is equivalent to the churn measure in [Elsby et al. \(2017\)](#):

$$F_{j,t} = H_{j,t} - \max(\Delta L_{j,t}, 0) = \min(H_{j,t}, S_{j,t}) \\ = \frac{1}{2}(H_{j,t} - \max(\Delta L_{j,t}, 0) + S_{j,t} - \min(\Delta L_{j,t}, 0)). \tag{2.3}$$

where  $H_{\ell,t} = \frac{\sum_{k=1}^4 \mathbb{H}_{\ell,t-k}}{\frac{1}{2}(L_{\ell,t} + L_{\ell,t-4})}$ ,  $H_{d,t} = \frac{\sum_{k=1}^4 \mathbb{H}_{d,t+k}}{\frac{1}{2}(L_{d,t} + L_{d,t+4})}$  are the hiring rates and  $S_{\ell,t} = \frac{\sum_{k=1}^4 \mathbb{S}_{\ell,t-k}}{\frac{1}{2}(L_{\ell,t} + L_{\ell,t-4})}$  and  $S_{d,t} = \frac{\sum_{k=1}^4 \mathbb{S}_{d,t+k}}{\frac{1}{2}(L_{d,t} + L_{d,t+4})}$  are the separation rates.

An important goal of this paper is to isolate worker heterogeneity and to that end, we will use a measure of lifetime earnings as a proxy. We define  $Q(\tilde{w}_i)$  as the worker’s quantile of total earnings across all employment and in all quarters conditional on year-of-birth. Conditioning on year-of-birth controls for a rather mechanical relationship due to the finiteness of our sample: if the period in which we observe the worker is during their prime earning ages, they will seem to have higher lifetime earners, whereas young and old workers who enter the sample late or leave early will seem low. Similarly, using quantiles avoids changes in the distribution of earnings.<sup>9</sup>

On the firm side, we measure each firm’s two-digit NAICS industry, firm age as the age of the firm’s oldest establishment and firm size as the firm’s total employment. We summarize earnings of firms as the log of the average real earnings a firm pays its employees for every quarter the firm is operational,  $\tilde{w}_j$ . Staying agnostic about the firm effect, whether it comes from the firm itself or the workers it groups, this measure incorporates the full effect from the firm, both from the selection of co-workers and the firm itself. As a robustness check, we will also use firm-level grouped fixed effects.

### 2.3. Additional variables

In a measure of the business cycle, we want to capture the way labor market tightness might affect the incentives and actions of firms posting jobs and offering wages. Hence, we use a “local” measure of the cycle, state-level unemployment rates from the BLS’ Local Area Unemployment Statistics.<sup>10</sup> Each state’s log unemployment is individually HP-filtered because there are both level and trend differences across the states. With the cyclical components, we create a recession indicator for when it is above the 80th percentile.<sup>11</sup>

As a supplement for  $\Delta L_{j,t}$ , our analysis will also look at firm-level revenue per worker as in [Foster et al. \(2008\)](#). It captures both productivity and profitability differences across firms, either of which could drive labor demand. We create variables  $\Delta P_{\ell,t}$  and  $\Delta P_{d,t}$  as the change in revenue per worker at the origin,  $\ell$ , and destination,  $d$  using the newly available revenue information in the Longitudinal Business Dynamics dataset (LBDREV).

## 3. Relationships between earnings growth and job flows

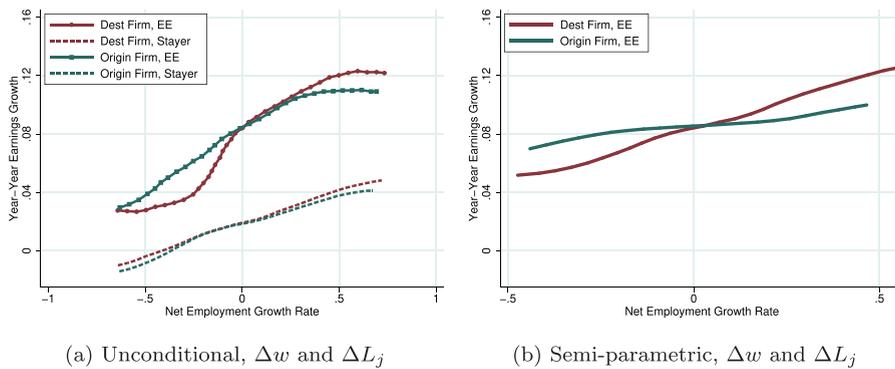
To quantify the relationship between firm-level net employment growth and earnings growth, we first examine this without conditioning on other determinants. Here we show that, compared to the average job-to-job transition, workers leaving shrinking firms have less earnings growth and those going to growing firms have more earnings growth. [Fig. 1](#) plots the lo-

<sup>8</sup> The slight abuse of notation with the index  $t$  is because these are chosen to go with the transition, indexed  $i, t$ . The firms indexed  $d$  and  $\ell$  are also functions of  $i, t$  though we suppress this notation.

<sup>9</sup> An interesting alternate strategy would be to use a job-ladder rank, the worker side analog to the poaching rank in [Bagger and Lentz \(2018\)](#) or [Sorkin \(2018\)](#). Theoretically, the number of unemployment spells should be negatively related to job-ladder rung, but in practice there is far too little variation in this measure among our sample. On the side, number of job-to-job transitions or employment tenure should be positively correlated, but again transitions could be a function of other features, e.g. match quality.

<sup>10</sup> To expand on this, we also present results with state and industry fixed effects in case there are industry specific cycles that are part of our estimated effects.

<sup>11</sup> Specifically, for the annual change  $\Delta L_{\ell,t}$ , we take unemployment for the year prior to separation and for  $\Delta L_{d,t}$ , we take unemployment for the year after accession. We will label these as  $u_{\ell,t}$  and  $u_{d,t}$ , respectively.



**Fig. 1.** Nonparametric plot for earnings growth associated with net employment growth at origin firm (Green) and destination firm (Red). Dotted line plots earnings growth of incumbent workers at these firms. Right panel isolates the firm growth effect, plotting the earnings growth residual of firm and worker characteristics.

**Table 1**

Left panel is the joint distribution of firm growth categories and worker flows. Right panel explores interactive effects, conditioning mean earnings growth on both origin and destination employment growth category. Growing firms have  $\Delta L_{j,t} > 0.02$ , shrinking have  $\Delta L_{j,t} < -0.02$  and stable firms are defined by  $|\Delta L_{j,t}| \leq 0.02$ .

Origin \ Destination	Fraction			Average $\Delta w$		
	Growing	Stable	Shrinking	Growing	Stable	Shrinking
Growing	0.238	0.084	0.134	0.132	0.119	0.089
Stable	0.090	0.040	0.052	0.122	0.110	0.082
Shrinking	0.175	0.066	0.120	0.107	0.094	0.061
Total	0.504	0.190	0.306			

cal, unconditional relationship between earnings growth and net employment growth at the origin and destination firm for workers who make a job-to-job transition.<sup>12</sup> Earnings growth is strongly positively correlated with the employment growth of the destination firm. The origin firm’s growth rate has a weaker correlation with earnings growth, but it is especially lower when workers transition away from a shrinking firm. Note that Fig. 1a shows the earnings gains associated with net employment growth, which is importantly distinct from hiring. Of course, growing firms will hire, but the correlation can be imperfect.

For comparison, we also include the earnings growth of workers who stay at the same firm, the median earnings growth for incumbent workers at the destination and origin firms. In these two lines, stayers have a lower level, meaning less earnings growth overall, but still have some correlation with the firms’ employment growth. The magnitude of this correlation is between that of the destination and origin firms, seen as the slopes of the stayer lines. The rest of the paper will focus on earnings growth of transitioners, but the non-zero slope for stayers is a useful benchmark; we would expect to see this relationship given the evidence on pass-through from e.g. Guiso et al. (2005). The similarity between earnings growth of stayers at origin and destination firms is also informative: this is a dimension in which, conditional on the growth rate of the firm, destination firms are not systematically different from origin firms.

Table 1 reinforces what we see in Fig. 1a, which shows earnings by the employment growth of destination and origin. Table 1 also examines the interaction of origin and destination firm effects by reporting the expected earnings gain for workers in each combination of origin and destination firm growth type. This interaction is actually not particularly important because the growing destination has a roughly constant  $\Delta w$  premium between 4.0 to 4.5pp above a shrinking destination firm regardless of whether the worker is coming from a shrinking, growing, or stable firm. For the origin firm, the difference between coming from a shrinking firm vs. a growing one is about 2.5pp regardless of the destination firm’s growth.

To understand Fig. 1 we also need to know how many workers transit to growing firms from shrinking firms, and the rest of the joint distribution of transitions across origin and destination growth rates. Table 1 breaks net flow rates into three categories defined by  $\mathbb{I}_{\Delta L^+}$ ,  $\mathbb{I}_{\Delta L^0}$ , or  $\mathbb{I}_{\Delta L^-}$  (growing, stable or shrinking). This transition matrix shows large flows to all firm categories, rather than simply growing firms absorbing all of the new hires and shrinking firms losing them. Looking at origin firms, another striking feature is how many workers leave growing firms. While about 50% of hires go to growing firms, just under 50% of hires come from growing firms. Thus to interpret Fig. 1, one should not imagine all workers going from left of zero on the origin line to right of zero on the destination line. Instead, observations are spread across both domains. Reinforcing this point, Table A.2 in Appendix A.2 runs linear probability models for the growth category of the

<sup>12</sup> In each of these figures, we omit confidence intervals because, with our very large sample, the locally estimated means have very small standard errors and they do not add much information.

**Table 2**  
Baseline estimates of earnings growth across job-to-job transitions.

	(1) Uncond.	(2) Controls	(3) Indus/State/Time FE	(4) Individual FE
$\Delta L_{\ell}$	0.0646	0.0404	0.0261	0.0559
$\Delta L_d$	0.0772	0.0741	0.0662	0.0910
$F_{\ell}$		-0.0165	-0.0135	-0.0141
$F_d$		0.0178	0.0132	0.0225
$Q(\tilde{w}_i)$		0.00181		
$\tilde{w}_{\ell}$		-0.182	-0.165	-0.148
$\tilde{w}_d$		0.197	0.169	0.152
$\log L_{\ell}$		-0.00141	-0.00325	-0.00222
$\log L_d$		0.00125	0.00313	0.00308
Indus/Time FE			X	X
State FE			X	X
Individual FE				X
N	1.2 Mil	1.2 Mil	1.2 Mil	0.4 Mil

All specifications except Column (1) include controls for firm age, worker age and its square, and gender. All columns present annual earnings growth. Column 4 contains the individual fixed effects estimation and therefore drops several variables that are constant within an individual and observations with only one transition.

workers' destination controlling for worker composition and the same transition patterns hold. In fact, worker characteristics vary little across destination categories except for lifetime income, which we explore in [Section 5.1](#).<sup>13</sup>

#### 4. Firm-level labor dynamics and individual earnings growth: Conditional results

In this section, we present regression evidence to disentangle the relationship between workers' earnings growth and firm employment dynamics and also other firm and worker characteristics. This will provide conditional, marginal effects to go along with the patterns in [Section 3](#) and verify that they remain after conditioning on other, known determinants. The regression also lets us control for unobservable differences by incorporating individual-level fixed effects, which will form our baseline estimates. We estimate the following:

$$\Delta w_{i,t} = \beta_{1,\ell} \Delta L_{\ell,t} + \beta_{1,d} \Delta L_{d,t} + \beta_{2,\ell} F_{\ell,t} + \beta_{2,d} F_{d,t} + \beta_{3,\ell} \tilde{w}_{\ell} + \beta_{3,d} \tilde{w}_d + \beta_4 Q(\tilde{w}_i) + x'_{\ell,t} \beta_{\ell} + x'_{d,t} \beta_d + u_i + e_t + \epsilon_{i,t} \quad (4.1)$$

where  $\Delta w_{i,t}$  on the left-hand side is the earnings change for worker  $i$  who switches from one employer to another in period  $t$ .  $\Delta L_{j,t}$  is the employment growth of the firm,  $F_{j,t}$  is the churn measure,  $\tilde{w}_j$  is the average earnings of the firm, and  $Q(\tilde{w}_i)$  is the quantile of the worker  $i$ 's lifetime earnings in the same birth cohort, as defined in the previous section.  $x$  denotes a vector of controls for origin and destination firms. These include log employer size, employer age, a quadratic in worker age, worker sex, 2-digit 2012 NAICS industry dummies, and state dummies. The indices for the origin,  $\ell$ , and destination,  $d$ , are functions of  $i, t$ , but we suppress notation for clarity. Individual fixed effects are  $u_i$ , time effects and  $e_t$ , and the residual is  $\epsilon_{i,t}$ . Results for the regression in [Eq. 4.1](#) are presented in [Table 2](#). For visual clarity and because all of the coefficients are very precisely estimated, we suppress standard errors and significance stars, though these and additional regressors can be found in [Appendix A](#).

[Table 2](#)'s Column (1) presents essentially the average slopes in [Fig. 1a](#), affirming the stronger effect of the destination firm and statistically significant effects from both origin and destination firms. Column (2) adds excess hires and controls for firm characteristics like average wage. In Column (3), we add industry, state, and time fixed effects, all of which significantly weaken the effect associated with the origin,  $\Delta L_{\ell,t}$ , but not the destination,  $\Delta L_{d,t}$ . It makes sense that including these regressors, which capture aggregate effects, would mostly weaken the effect from the origin because the origin's dynamics determine the outside option of the worker and that should also be related to aggregates like time and industry.

The final column is our preferred benchmark. This adds individual-level fixed effects into the regression so we are looking at multiple job switchers and asking whether the switch with more growth at the destination led to more-than-average earnings growth. The effect associated with the destination is somewhat stronger than in the pooled OLS. This dispels the concern that unobserved characteristics drove the observed patterns, that workers who would gain most from a growing firm were the ones who transitioned in the direction of employment growth—if anything the reverse is true.

To look at this more closely, the most striking result is that the fixed-effect coefficient on  $\Delta L_d$  is actually larger than the pooled regression coefficients. This means that individuals who normally gain less in a transition were switching into growing firms. After controlling for that averse, unobservable characteristic, destination growth increases earnings by more. The origin coefficient also becomes larger, meaning that the group of workers leaving shrinking firms is actually made up of workers who tend to experience high earnings growth—the negative side drives the overall coefficient. When we

<sup>13</sup> For more, [Table A.1](#) in [Appendix A](#) presents raw characteristics of workers conditional on the origin and destination growth rate categories.

condition on workers' fixed effects, controlling for this composition, losses from leaving a shrinking firm are larger. While the quantitative difference between our fixed-effect and pooled specifications suggests some selection or sorting, this sorting works to weaken the effect of firm dynamics slightly, and the main coefficients are qualitatively the same regardless of fixed effects. It is particularly interesting that sorting does not appear much in observable characteristics shown in Table A.1 where, for instance, workers going to growing firms only have lifetime incomes of a couple percentage points higher than those of workers going towards shrinking firms.

Note that the number of workers in our sample drops when we introduce fixed effects, and this is a non-random selection. This selection of workers who experience more than one job transition might also be the source of the differences in coefficients in Column (4) rather than the fact that it controls for unobserved heterogeneity in the workers making these job transitions. Table A.5 in Appendix A presents these same regressions with and without individual fixed effects on the same sample as Column (4) of Table 2 and finds nearly identical coefficients. For instance, the unconditional coefficients in Column (1) go from 6.46% and 7.72% with the full sample to 6.37% and 7.22% in the fixed effects sample. In other words, selecting on the sample of workers making multiple transitions has little effect on our results.

In all of these specifications, notice how much smaller the effects from  $F_{j,t}$  are compared to the net employment growth effects.<sup>14</sup> This shows an important distinction: mostly, the earnings gains do not come from hiring itself, but rather from firm employment growth. This divergence is because hiring and employment growth are only imperfectly correlated and the excess hires measure helps clarify where they diverge. The more firms grow, the more they separate and hence, the more they hire in excess of their net growth. On the other side, shrinking firms are also hiring, and for much of the domain of employment growth, faster-shrinking firms hire more than slower-shrinking firms. These excess hires have a distinct, V-shaped association with net employment growth shown in Appendix A, Figure A.2.<sup>15</sup> The coefficients on  $F_{j,t}$  show that within an employment growth rate, differences in the additional hiring are considerably less strongly related to earnings growth.

The largest effect of excess hiring is the positive effect from excess hiring at the destination. This suggests that firms that need to hire more will offer an earnings premium.

To dive further into these results, we split job creation and job destruction at the firm,  $\Delta L_{j,t}^+$  and  $\Delta L_{j,t}^-$ , respectively, for origin and destination firms. Table 3 presents these point estimates and Table A.4 in Appendix in A adds standard errors and additional covariate estimates.

First, we show just the raw relationships, without other regressors, to show the correlations between earnings growth and  $\Delta L_{\ell,t}$  and  $\Delta L_{d,t}$  splitting left and right of 0. In all of our specifications, the largest effects come from job creation at the destination and job destruction at the origin,  $\Delta L_{d,t}^+$  and  $\Delta L_{\ell,t}^-$ , respectively. The sign flips for  $\Delta L_{\ell,t}^-$  because a positive number for the regressor now means  $\Delta L_j < 0$ , so this should correspond to negative earnings effects. As a check, note that Table 2 coefficients essentially average these directions weighting by flows: the coefficient on  $\Delta L_d$  is between  $\Delta L_d^+$  and  $\Delta L_d^-$  but closer to the former, and the  $\Delta L_\ell$  coefficient is between  $\Delta L_\ell^+$  and  $\Delta L_\ell^-$  and also closer to the former.

From Column (2) on, we resume our fixed-effects specification, controlling for unobserved characteristics of workers. The most striking change as we go from Column (1) to the others, essentially from the unconditional to conditional correlations, is in  $\Delta L_{d,t}^+$ . Here, the coefficient on a growing destination firm gets considerably larger as we control for worker characteristics, which means that growing firms take workers whose characteristics predict lower earnings growth. In our baseline fixed-effect specification, Column (2), the elasticity of earnings with respect to job creation at the destination is about twice the magnitude of the elasticity with respect to destruction at the destination.

Turning to the origin firm, the strongest effect comes from destruction and that coefficient is nearly unaltered by including other regressors. Job destruction is a considerably stronger effect than job creation, which goes near zero when regressors and fixed effects are included. In this way, one sees some effect from composition: the types of workers leaving a growing firm would be expected to experience earnings gains anyway.

To reinforce these findings, Fig. 1b uses a semi-parametric approach to allow the relationship between employment growth,  $\Delta L_j$ , and earnings growth,  $\Delta w_{i,t}$ , to be fully flexible while conditioning on the other regressors. We regress  $\Delta w$  and  $\Delta L_j$  on the other regressors and then plot the local polynomial regression of the residuals. As emphasized in our regression specification, the effects from  $\Delta L_d$  are stronger when the firm is growing more quickly. For the origin firm growth,  $\Delta L_\ell$ , Fig. 1b shows very clearly a flatter relationship albeit there is a large negative effect—lower growth than otherwise expected—associated with fast shrinking firms.

In Columns (3) and (4), we look for interaction effects. First, Column (3) looks for a relationship between creation or destruction at the destination and what is happening at the origin and vice-versa. This specification looks for ways in which the origin effects and destination effects may interact, i.e. a growing destination firm treats a hire from a shrinking firm differently than one from another growing firm. The destination effect for a worker coming from either a shrinking or growing origin firm,  $\mathbb{I}_{\Delta L_t^+}$  or  $\mathbb{I}_{\Delta L_t^-}$ , is slightly smaller than if the worker is coming from a firm with stable employment,  $\mathbb{I}_{\Delta L_t^0}$ . In the same vein, destruction at the origin firm has the most negative effect if the worker goes to a static firm,  $\mathbb{I}_{\Delta L_d^0}$ . The

<sup>14</sup> Because all of the coefficients are presented as elasticities, we can make quantitative comparisons, and conclude that the earnings effect from  $F_{j,t}$  is considerably smaller than that associated with  $\Delta L_{j,t}$ .

<sup>15</sup> This was actually implied by the “hockey stick” figure of Davis et al. (2013). Bachmann et al. (2017) also find a similar pattern in Germany.

**Table 3**  
Estimates from Eq. 4.1 but splitting and interacting  $\Delta L$ .

	(1) Uncond.	(2) Controls	(3) $\Delta L$ interactions	(4) $\Delta L \times F$
$\Delta L_{\ell}^{+}$	0.0290	0.00822		0.0048
$\Delta L_d^{+}$	0.0720	0.122		0.114
$\Delta L_{\ell}^{-}$	-0.112	-0.118		-0.116
$\Delta L_d^{-}$	-0.0830	-0.0592		-0.0518
$F_{\ell}$		-0.0119	-0.0119	
$F_d$		0.0202	0.0201	
$\mathbb{I}_{\Delta L_d^{+}} \times \Delta L_{\ell}^{+}$			0.0126	
$\mathbb{I}_{\Delta L_d^{0}} \times \Delta L_{\ell}^{+}$			0.0208	
$\mathbb{I}_{\Delta L_d^{-}} \times \Delta L_{\ell}^{+}$			-0.0123	
$\Delta L_d^{+} \times \mathbb{I}_{\Delta L_{\ell}^{+}}$			0.122	
$\Delta L_d^{+} \times \mathbb{I}_{\Delta L_d^{0}}$			0.142	
$\Delta L_d^{+} \times \mathbb{I}_{\Delta L_{\ell}^{-}}$			0.101	
$\mathbb{I}_{\Delta L_d^{+}} \times \Delta L_{\ell}^{-}$			-0.0939	
$\mathbb{I}_{\Delta L_d^{0}} \times \Delta L_{\ell}^{-}$			-0.148	
$\mathbb{I}_{\Delta L_d^{-}} \times \Delta L_{\ell}^{-}$			-0.124	
$\Delta L_d^{-} \times \mathbb{I}_{\Delta L_{\ell}^{+}}$			-0.0425	
$\Delta L_d^{-} \times \mathbb{I}_{\Delta L_d^{0}}$			-0.0722	
$\Delta L_d^{-} \times \mathbb{I}_{\Delta L_{\ell}^{-}}$			-0.0636	
$\mathbb{I}_{\Delta L_{\ell}^{+}} \times F_{\ell}$				-0.00769
$\mathbb{I}_{\Delta L_d^{0}} \times F_{\ell}$				-0.0127
$\mathbb{I}_{\Delta L_{\ell}^{-}} \times F_{\ell}$				-0.0176
$F_d \times \mathbb{I}_{\Delta L_d^{+}}$				0.0220
$F_d \times \mathbb{I}_{\Delta L_d^{0}}$				0.0182
$F_d \times \mathbb{I}_{\Delta L_d^{-}}$				0.0184
Indus/Time FE		X	X	X
State FE		X	X	X
Individual FE		X	X	X
N	1.2 Mil	0.4 Mil	0.4 Mil	0.4 Mil

All specifications except Column (1) include controls for firm age, size and wage, worker age and its square, gender, and wage quantile. All columns present annual earnings growth,  $\Delta w$ , as the dependent.

**Table 4**  
Distribution of Implied Earnings Gains (\$).

Variable	p75-p25	p90-p50	p50-p10	p90-p10
$\Delta L$	455	960	752	1,712
$\Delta L_d$	428	1,192	266	1,458
$\Delta L_{\ell}$	237	71	666	737
$\tilde{w}$	1,299	2,139	750	2,889
$\ln(Emp)$	1,038	590	1,662	2,252

main lesson is that most of the effect comes from the origin or destination growth rates, with little difference associated with their interaction.<sup>16</sup>

Column (4) looks for gross hires  $F_{j,t}$  to interact meaningfully with net growth. This specification is particularly important for understanding the motivation behind replacement hires. Recent work like [Elsby et al. \(2017\)](#) suggests that these hires may have particularly high marginal products because, e.g., the capital to pair with the worker already exists. To see whether this feeds through into earnings, the final coefficients are informative.

If the coefficients on  $F_d \times \mathbb{I}_{\Delta L_d^0}$  were considerably larger than those on  $F_d \times \mathbb{I}_{\Delta L_d^+}$ , this would suggest replacement hires—those counted by  $F_d \times \mathbb{I}_{\Delta L_d^0}$ —are rewarded for filling this high marginal product position. This phenomenon does not seem to be a particularly strong driver of earnings growth, and instead, the results again reinforce that firm growth, rather than hiring itself, drives the earnings premia. Looking at this interaction the other way, faster-growing firms do seem to pay a larger premium for their excess hires.

[Table 4](#) better establishes the magnitude of the implied effects on earnings growth. It uses the point estimates from the fixed-effects specification in [Table 2](#) and empirical transition patterns to estimate the 90th and 10th percentiles of earnings change associated with each characteristic—that is, the dispersion in earnings growth across job-to-job transitions that can be ascribed to each firm characteristic. The difference in firms’ average wages implies a 90-10 differential of \$2, 889, the difference between firm sizes explains \$2, 252, and net employment growth,  $\Delta L_{\ell}$ ,  $\Delta L_d$ , implies a 90-10 differential of

<sup>16</sup> The slightly larger effects associated with static firms from destruction at the origin and creation at destination could be partly mixing in firm size effects, as firms that are neither growing nor shrinking are more likely to be very small.

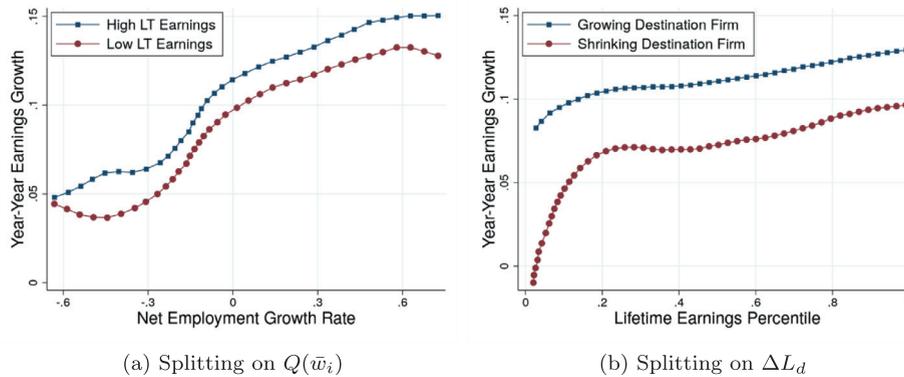


Fig. 2. The relationship between net employment growth at the destination, lifetime earnings and earnings growth in a job-to-job transition.

\$1,712. This is to say, whether a worker moves from a low- to a high-wage firm is the largest predictor of the dispersion in earnings growth during a job-to-job transition, but the effect of a change in employment growth is only somewhat smaller. Another way to give context to the scale, the 90-10 differential implied by  $\Delta L$  is about 5% of the overall 90-10 dispersion of earnings growth during a transition. On the other hand, firms' average wage,  $\bar{w}$ , accounts for about 8% of 90-10 dispersion.<sup>17</sup> Table 4 gives additional details about top and bottom tail dispersion.

## 5. Extensions

In this section, we extend the results from Section 4 to consider how these effects interact with lifetime income and business cycles. Because the effects were strongest on the destination firm and to preserve brevity, we focus most of the discussion here on results analyzing the destination firm.

### 5.1. The interaction with lifetime income and sorting

Job-to-job transitions are well understood to be important to overall earnings growth, and (Guvenen et al. (2015)) show large differences in the earnings growth trajectories across lifetime income,  $Q(\bar{w}_i)$ . Further, Table A.1 showed that workers moving to growing firms have higher  $Q(\bar{w}_i)$ . As lifetime earnings rise, workers are more likely to transit to higher growth firms and less likely to transit to shrinking firms. We show this quite monotonic relationship in Figure A.4 in Appendix A. This begs the question, are the faster growth paths and larger job-to-job gains of higher earners further augmented by a larger premium from growing destination firms? It turns out, these lifetime earnings differences do predict job-to-job earnings gains but have only limited interaction with the effect from net employment growth.

This connection between  $Q(\bar{w}_i)$  and  $\Delta L_j$  also helps one to understand the role worker composition might play in the coefficients on employment growth,  $\Delta L_{j,t}$ . The quantitative difference between fixed-effects and pooled specifications implied that the composition of unobservable worker types across transition directions was non-random and somewhat correlated with  $\Delta L_{j,t}$ . Hence, in this section, we will explore the relationship between firm dynamics and a proxy for worker type,  $Q(\bar{w}_i)$ .<sup>18</sup>

Fig. 2 presents what is essentially a three dimensional relationship in two panels. The first panel, 2 a, takes Fig. 1 b and splits the effect of the destination firms' growth rate by whether the worker was above or below median lifetime earnings. The next panel, Fig. 2 b, treats lifetime earnings as continuous along the horizontal axis but splits between firms that are growing or shrinking by more than 2%.

The figure shows that higher-earning workers make job-to-job transitions with larger earnings gains and that workers going to growing firms make larger earnings gains. However, these effects are mostly orthogonal. The effect from the destination firms' growth rate shows up as the parallel shift between the lines in Fig. 2 b. The exception is among the poorest quintile of workers, for whom going to a shrinking firm is particularly bad, but because they are often marginally attached to employment, they make relatively few job-to-job transitions and do not factor much into the overall effect. Just as Fig. 2 b is upward sloping, the High Earnings line in Fig. 2 a is above Low Earnings; however, the shift is parallel, meaning that high earners make more in a transition, but the firm growth effect is approximately the same.

The results of this summary statistic of individual heterogeneity, lifetime income, show that composition is not the primary driver of the association between net employment growth and workers' earnings growth. This is true despite compo-

<sup>17</sup> Of course, there is still considerable residual variation left after these firm characteristics both because  $\bar{w}_j$  is not the complete set of firm fixed effects and more importantly because we are looking at earnings growth in periods of large earnings change, so there is considerable within-individual variation.

<sup>18</sup> Among the concerns with a measure of worker type is the degree to which they actually encapsulate firm types because of sorting. Adding more flexible firm fixed effects to this whole exercise is inconsequential to our results (as will be discussed more).

**Table 5**  
Business cycle effects for earnings growth in job transitions.

	(1) $d, \ell$	(2) Avg	(3) $d, \ell, FE$	(4) Avg, FE
$\Delta L_\ell \times \mathbb{I}_{u_{\ell/avg} > \bar{u}}$	-0.0157	-0.0143	-0.0182	-0.0168
$\Delta L_d \times \mathbb{I}_{u_{d/avg} > \bar{u}}$	-0.00347 <sup>†</sup>	-0.00683	-0.000558 <sup>†</sup>	-0.00308 <sup>†</sup>
$\mathbb{I}_{u_\ell > \bar{u}}$	0.00659		0.00354 <sup>†</sup>	
$\mathbb{I}_{u_d > \bar{u}}$	-0.0161		-0.0143	
$\mathbb{I}_{u_{avg} > \bar{u}}$		-0.00892		-0.0104
$\Delta L_\ell$	0.0390	0.0398	0.0661	0.0667
$\Delta L_d$	0.0748	0.0760	0.0949	0.0958
$F_\ell$	-0.0130	-0.0132	-0.0129	-0.0129
$F_d$	0.0177	0.0180	0.0254	0.0257
Industry FE	X	X	X	X
Individual FE			X	X
N	1.2 Mil	1.2 Mil	0.4 Mil	0.4 Mil

All regressions include the same individual and firm controls as Eq. 4.1 for firm age, size and wage, worker age and its square, gender, wage quantile and time effects. All columns present annual earnings growth,  $\Delta w$ , as the dependent. <sup>†</sup>These coefficients are not statistically significant at the 90% level. For the full list of coefficients and standard errors, see columns (1)–(4) of Table C.3 in Appendix C.

sitional differences in which workers go to growing or shrinking firms. We show that over the support of lifetime income,  $Q(\bar{w}_i)$ , the  $\Delta L_{d,t}$  effect does not vary much by worker type. Hence, in the main regression, Eq. 4.1, interactions between  $\Delta L_{d,t}$  and  $\Delta L_{\ell,t}$  and  $Q(\bar{w}_i)$  are insignificant. The conclusion is that, though the composition of workers going to growing or shrinking firms is non-random, that composition effect does not drive the results.

## 5.2. The interaction with business cycles

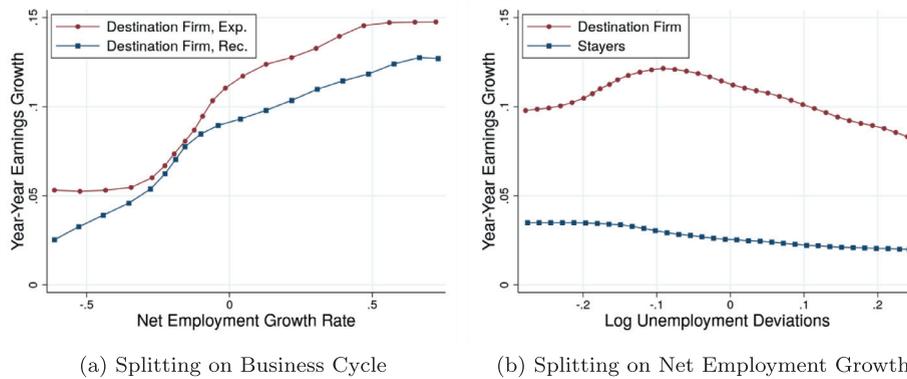
Prior empirical evidence and the potential theoretical underpinnings of our driving mechanism make it natural to check how our estimates vary with the cycle. Haltiwanger et al. (2018b) suggests that the types of job-to-job transitions in expansions are different from those in recessions, with more reallocation towards growing firms in expansions. If so, perhaps the premia for net employment growth are also different because expanding firms need to compete more to recruit. We first present regression estimates with an interaction between  $\Delta L_{j,t}$  and a cyclical indicator. This indicator,  $\mathbb{I}_{u_{j,t} > \bar{u}_t}$ , is 1 when the cyclical component of the log HP-filtered state unemployment rate is greater than its 80th percentile, a cyclical component of 0.1. These regressions build off the specification in Eq. 4.1 but include interactions,  $\Delta L_{j,t} \times \mathbb{I}_{u_{j,t} > \bar{u}_t}$  and  $\mathbb{I}_{u_{j,t} > \bar{u}_t}$ . We index each by  $j \in \{d, \ell, avg\}$ , where  $d$  or  $\ell$  indicate unemployment that covers the same period as net employment growth at the destination and origin firm. There may be non-trivial variation in unemployment over the two years covered by  $u_\ell, u_d$ , so it may be important to interact each  $\Delta L_j$  with the relevant  $u_j$  and to use the corresponding level regressor. But, a single indicator  $\mathbb{I}_{u_{avg,t} > \bar{u}_t}$  gives a more easily interpretable coefficient. So, we use both forms.

Table 5 shows the estimates from this regression. Notice that the coefficient on the interaction between destination employment growth and the indicator,  $\Delta L_d \times \mathbb{I}_{u_{d/avg} > \bar{u}}$ , is near zero.  $\Delta L_\ell \times \mathbb{I}_{u_{\ell/avg} > \bar{u}}$  is meaningfully negative because workers leaving shrinking firms in recessions have worse outcomes.<sup>19</sup> This holds whether we use  $u_d, u_\ell$  or  $u_{avg}$  definitions in Columns (1) and (3) or (2) and (4). Columns (3) and (4) of Table 5 use fixed effects and present a consistent picture, suggesting that changing composition over the cycle does not drive the result. The coefficients on our main variables,  $\Delta L_j$  and  $F_j$ , are very similar to our baseline specifications in Table 2, suggesting that the cyclical effect is largely orthogonal to the firm-level flow effects.

The very small coefficient on  $\Delta L_d \times \mathbb{I}_{u_{d/avg} > \bar{u}}$  might be surprising given that recruiting firms face tighter labor markets and hence lower yields. However, our result is consistent with other empirical literature on the subject. For instance, Forsythe and Weinstein (2021) use firm survey data on recruiting techniques and find that firms increase salaries when they want to hire or when markets are tight but find an insignificant interaction between the two. Constant returns-to-scale recruiting costs in both size and aggregate tightness (as in Merz and Yashiv (2007)) can be consistent with such an observation if it is equally costly for the firm to scale up their hiring no matter the levels of their aggregate or idiosyncratic states. Looking at the level regressor,  $\mathbb{I}_{u_{avg} > \bar{u}}$ , our results echo evidence like Hahn et al. (2017) that job-to-job transitions have a larger effect on earnings growth in expansions, the negative coefficient.

Looking at the three-dimensional relationship shows why the destination's interaction coefficient is approximately zero. Fig. 3 presents the relationship between earnings, net employment growth at the destination firm, and the business cycle, as measured by the cyclical component of the state unemployment rate. Fig. 3a splits the earnings growth–employment growth relationship across expansions and recessions. For much of the employment growth domain, there is a parallel shift except for a slightly steeper portion among shrinking firms. That is, an expansion brings an increase in earnings growth but it largely does not depend on the rate at which the firm is growing. Turning to Fig. 3b, earnings grow more as unemployment

<sup>19</sup> This may also reflect some of the difficulty separating job-to-job transitions from those involving unemployment, which recessions would exacerbate.



**Fig. 3.** The relationship between net employment growth, business cycle and earnings growth in a job-to-job transition. Left panel shows earnings growth and employment growth split between expansions and recessions and right panel shows average earnings growth by the cyclical component of the state unemployment rate.

declines at the destination firm.<sup>20</sup> The sign flips slightly for very low unemployment rates because this indicates it is the very bottom of the cycle and an expansion is about to end. For reference on the magnitude of the cyclicity of these earnings gains, we also include the relationship between earnings growth and unemployment among stayers. Both curves are sloped downward because earnings grow more in expansions but the steeper slope for job-to-job transitions shows they are more cyclically sensitive as we would expect.<sup>21</sup>

Just as in our discussion of sorting across worker type, the relationship between job-to-job earnings growth, employment growth and business cycles also depends on whether the worker flow directions change over the cycle. That is, do workers become more likely to go to growing firms in expansions or recessions? Figure C.1 in Appendix C shows a mostly flat relationship between the cycle and the employment growth category at which workers are hired. Growing firms are, however, somewhat less likely destinations when unemployment is high.

Appendix C further documents the cyclicity of flow directions and (a)cyclicity of returns and the characteristics of workers who move to understand to what extent compositional changes in flows affect cyclical coefficient estimates. Most prominently, expansions feature more flows both to and from growing firms relative to recessions. Thus, even if the interaction between the cycle and employment growth is negligible, more employment flows to growing firms implies some cyclicity in the earnings gains to job-to-job transitions. Changing the types of flows, but keeping returns at their average, implies wage growth for a job-to-job transition will be 0.21pp higher in an expansion than a recession. The additional change in returns conditional on  $\Delta L_j$  is small, however (additional details are in Table C.1). This reinforces that the change in cyclical returns conditional on a category of  $\Delta L_j$  is essentially a level shift; it is not that growing firms' premia move more.

### 5.3. Robustness

In addition to these extensions, the appendix contains several robustness exercises. Appendix B.1, checks whether the effects we observe die out over time by summing discounted future earnings after a transition. This analysis then substitutes the change in present discounted value of earnings across a transition for the dependent variable,  $\Delta w$ . These results are remarkably similar to our baseline. The exception is that workers hired at shrinking destination firms see larger losses, likely because when they leave these shrinking firms, they will have lower earnings growth.

Appendix B.2 shows that the major results hold with quarterly earnings and quarterly job flows, though the transitioners' effects are slightly steeper and at a considerably lower level of earnings growth. These level differences highlight how our sample of year-long tenured employees is a selected subset of all job changers. Despite the level differences, the slopes are very similar, meaning that annual and quarterly data show similar relationships between earnings growth and  $\Delta L_{j,t}$ .

Appendix B.3 presents another important check, replacing net employment growth,  $\Delta L_{j,t}$ , in our baseline specification with revenue per worker growth,  $\Delta P_{j,t}$  from the new Longitudinal Business Database (LBDREV). In most models, firms' employment growth responds to productivity shocks; hence, it is natural to check if earnings growth is more related to another proxy for productivity shocks than  $\Delta L_{j,t}$ . We find that  $\Delta P_{d,t}$  has a 3% elasticity with  $\Delta w$ , considerably smaller than the coefficient on  $\Delta L_{d,t}$ , and the elasticity for  $\Delta P_{t,t}$  is near zero. When both  $\Delta L_{j,t}$  and  $\Delta P_{j,t}$  are included, the coefficients on  $\Delta L_{j,t}$  are almost the same as they are in the baseline, while  $\Delta P_{j,t}$  attenuates towards zero. This may be a problem of measurement, as several factors make  $\Delta P_{j,t}$  imperfect, discussed more in Appendix B.3.

<sup>20</sup> To understand the magnitude of the x-axis, remember this is the cyclical component of the HP-filtered log unemployment rate. Our recession indicator is 1 when this level is above 0.1, the 80th percentile.

<sup>21</sup> The stayers' cyclicity is potentially due to hours adjustments as shown in Kurmann and McEntarfer (2019).

Finally, Table A.5 assesses whether the individual fixed effects also capture firm-specific variation. In particular, in the cross-section, worker and firm fixed effects can be quite correlated because of sorting, and so it is helpful to check that our understanding of the worker fixed effect outcomes are not simply standing in for the omitted firm fixed effect. While we include a bevy of firm controls in our baseline, in this specification we also added firm grouped fixed effects. The method is described more in Appendix A.6. These have explanatory power, increasing the log-likelihood, but leave our coefficients of interest substantively unchanged from the baseline. Further, the coefficient on  $Q(\bar{w}_i)$  is unaffected.

## 6. Implications for frictional labor market models

The empirical evidence of the relationship between firm growth and earnings growth can inform job ladder models. In this section, we review how our empirical findings interact with structural models of firm dynamics in frictional labor markets. Particularly important are two findings: A worker hired at a faster-growing firm will see higher earnings growth and there is a greater effect from net employment growth than from excess hires.

It is not trivial in many directed search job ladder models to attain the positive association between hired workers' earnings growth and their destination firms' employment growth. This is because equilibrium often implies that gains from a job transition decrease with the worker's current wage rung (see [Delacroix and Shi \(2006\)](#)). In models of directed search with firm dynamics like [Kaas and Kircher \(2015\)](#) and [Schaal \(2017\)](#), employment growth of the firm comes from posting relatively high wages. However, with on-the-job search, the growing firm that posts a high wage will attract recruits from among higher wage workers. These high wage workers achieve smaller earnings gains in the transition than a recruit at a firm posting lower wages. Putting these pieces together, employment and productivity growth leads a firm to post higher wage levels, but the hires will experience smaller increases when they make a transition. Of course, a directed search model can be consistent with this paper's findings with a number of adaptations that, for example, change the information workers have when directing their search. A similar result can be shown regarding the origin firm dynamics and earnings outcomes. If the origin is shrinking, this is akin to the searchers' outside option deteriorating and the incremental wage gain of the worker in a transition may go up. Our empirical exercise showed smaller earnings gains of workers leaving shrinking firms. With directed search, workers will search in a different submarket, a ladder rung with a lower wage and higher finding rate. If the worker's previous wage didn't adjust with the firm's employment decline and the decline in the worker's reservation wage, then wage growth would shrink with the shrinking origin firm.

Turning to random search environments, such as [Coles and Mortensen \(2016\)](#), [Elsby and Gottfries \(2019\)](#) and [Bilal et al. \(2019\)](#), reconciling the  $\Delta L_d$  effects brings requirements on the equilibrium wage and offer distributions. To give workers a greater than usual wage increase in a job transition, the firm must post a higher wage while the expected previous wage of the worker it attracts can not have increased as much. The latter condition implies that the expectation of the poached workers' prior wages must not shift rightward by as much as the new poaching firm's wage shifts. In [Elsby and Gottfries \(2019\)](#), for instance, whether this condition is satisfied depends crucially on the joint distribution of firm size and productivity. In essence, the condition relies on the distribution of the reservation wages of employed workers in all of these random search models. Dynamics at the origin affect earnings changes in random search through their effect on reservation wages relative to the current wage. Exactly how this translates depends on the wage-setting protocol, but in frameworks featuring counteroffers or periodic wage re-bargaining, a decline at the origin weakens the workers' reservation values without a change to their current wages, decreasing the expected earnings gains from a transition.

The other important result is that net flows into the firm matter quantitatively more than gross flows. While they are correlated—faster-growing firms also do more excess hiring—the excess hiring itself does not lead to as much earnings growth. The coefficients on  $F_d$  suggest about a 2% premium, which is not zero but is smaller than the net growth effect of 9%. This can speak to some of the motives behind excess hiring (e.g. [Elsby et al. \(2017\)](#) or [Acharya and Wee \(2020\)](#)). For example, if replacement hires have a particularly high marginal product, one might expect large premia. The small estimates are not, however, dispositive evidence because productivity might not pass through to earnings.

Further, in many models with search frictions, hiring more requires firms to use extra recruiting effort such as wage premia. However, these results suggest that earnings premia are associated with employment growth instead of hiring per se. This lends evidence to theories with non-linear adjustment costs in size, as paying workers more is potentially such an adjustment cost.

## 7. Discussion/conclusion

In this paper, we show that firms' employment dynamics are related to the earnings growth that workers receive when they switch jobs. Workers' earnings growth is particularly responsive to employment growth at the destination firm and employment declines at the origin firm. These effects are qualitatively consistent over specifications, including when comparing the same worker making multiple transitions, i.e. with worker fixed effects. Further, the employment growth effect is not due to composition and is largely orthogonal to other factors that might affect earnings growth in a job transition such as lifetime of income workers and the business cycle.

This paper highlights a quantitatively important dimension driving the differences in earnings growth across otherwise similar job-to-job transitions. We see these findings as informative for the relationship between firm dynamics and wages but also as testable implications for labor search models where firms are dynamic and employ multiple workers.

## Data availability

Data will be made available on request.

## Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.jmoneco.2023.01.004](https://doi.org/10.1016/j.jmoneco.2023.01.004).

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