U.S. Worker Mobility Across Establishments within Firms: Scope, Prevalence, and Effects on Worker Earnings *

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Abstract

Multi-establishment firms account for around 60% of U.S. workers' primary employers, providing ample opportunity for workers to change their work location without changing their employer. Using U.S. matched employer-employee data, this paper analyzes workers' access to and use of such between-establishment job transitions, and estimates the effect on workers' earnings growth of greater access, as measured by proximity of employment at other within-firm establishments. While establishment transitions are not perfectly observed, we estimate that within-firm establishment transitions account for 7.8% percent of all job transitions and 18.2% of transitions originating from the largest firms. Using variation in worker's establishment locations within their firms' establishment network, we show that having a greater share of the firm's jobs in nearby establishments generates meaningful increases in workers' earnings: a worker at the 90th percentile of earnings gains from more proximate within-firm job opportunities can expect to enjoy 2% higher average earnings over the following five years than a worker at the 10th percentile with the same baseline earnings.

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1 Introduction

Several recent papers have documented the increasing concentration of U.S. employment and revenue among a small set of large "superstar" firms (Song et al., 2019; Autor et al., 2020; De Loecker et al., 2020). These large firms tend to divide their employment across several establishments: at least 25% of U.S. workers are at firms operating more than 100 establishments and overall at least 60% of workers are at multi-establishment firms, with both of these values increasing over time. Thus, most workers have some potential to switch establishments without switching firms, and many workers have a large set of possible establishment options. While the study of promotion ladders and internal labor markets at large firms has a long history in economics (Doeringer and Piore, 1970), the prevalence and importance of opportunities for between-establishment job mobility within firms (denoted BEM below) has been underexplored, particularly given the importance of the job-to-job transition rate as an indicator of labor market dynamism (Moscarini and Postel-Vinay, 2017) and as a driver of earnings dynamics (Topel and Ward, 1992).

Seeking to fill this gap, this paper exploits U.S. matched employer-employee data to make two empirical contributions. First, we characterize both the scope of opportunities for BEM among U.S. workers as well as the frequency with which such job transitions actually occur. In particular, we examine heterogeneity in the prevalence of such mobility by a variety of worker and firm characteristics, emphasizing throughout the important role played by geographic distance to other establishments within the same firm in mediating these transitions. Second, we exploit variation in the locations of workers' establishments within the firms' broader network of establishments to estimate the causal effect on workers' earnings growth of a particular measure of access to BEM opportunities, greater geographic proximity to jobs at the firm's other establishments.

Research on between-establishment job mobility within the United States is complicated by two key features of the U.S. matched employer-employee data, the Longitudinal Employer Household Dynamics database (hereafter, LEHD). First, while each firm's full employee roster is faithfully reported in each state, each worker's establishment must be imputed in nearly all states for firms who group multiple establishments within the same State Employer Identification Number (hereafter SEIN).[1] Second, the imputation procedure used by the Census Bureau intentionally es-

[1]SEINs are a state-specific accounting identity used by firms primarily to manage taxes, unemployment insurance, and legal liability. SEINs are commonly used as employer identifiers in labor market statistics such as the LEHD-based

chews imputing between-establishment job transitions within an employment spell at a SEIN in order to avoid creating spurious job transitions (Vilhuber and McKinney, 2014). We show that these aspects of the data are less limiting than they appear, and highlight two other data features that permit fruitful analysis of between-establishment mobility.

First, between-establishment job transitions are observed when a worker changes SEIN within a firm. Thus, we observe all between-state transitions within the same firm among the 25 states in our sample.[2] Additionally, we document that large firms generally create many SEINs within the same state. In particular, we find that 90% of employment at multi-establishment firms is contained within the subset of firms featuring multiple SEINs (56.9% of all U.S. workers). Our back-of-the envelope calculations suggest that we observe 59% of all between-establishment moves.

This insight motivates our analysis of between-SEIN transitions within a firm. We find that between-SEIN mobility is quite common: among our 25-state sample, about 1.4% of workers at multi-SEIN firms change SEINs within the same firm each year, with at least 6.6% changing SEINs at least once within 7 years. Adding in our estimates of within-SEIN mobility and SEIN mobility to out-of-sample states brings the total rate of between-establishment mobility to 2.2% for workers at multi-SEIN firms and 1.4% among all workers. Since 16.7% of workers make between-firm job transitions each year on average, this implies that about 7.8% of all transitions to different establishments and a full 26.9% of between-state transitions occur within the same firm.

These aggregate numbers mask substantial heterogeneity in the prevalence of establishment mobility by both firm and worker characteristics. Particularly striking are differences by firm size, where annual rates of observed SEIN mobility are 1.8% for the 27.5% of workers at firms with more than 5,000 employees vs. 0.1% for the 37.5% of workers at firms with fewer than 100 workers.

The second valuable LEHD feature is that all establishments' locations are fully observed, so that access to opportunities for between-establishment mobility can be correctly measured and analyzed even though actual within-firm establishment transitions are not fully observed. Our earnings growth estimates exploit the fact that assignment to establishments with differential opportunities for moves to nearby establishments may contain an exogenous component.

Specifically, we measure a worker's access to BEM opportunities by constructing the shares

Quarterly Workforce Indicators (QWI).

[2]Each state must provide separate approval of LEHD data access for each project.

of within-firm employment that lie within discrete distance bands relative to the worker's origin establishment. Regressing average percentage changes in annual earnings over a time window (3, 5 or 7 years) on this vector of distance shares estimates the degree to which a more geographically proximate employment distribution within the firm contributes to workers' earnings growth.

A crucial element of our identification strategy is the use of both firm-by-year and county-by-year fixed effects in all of our regressions. This allows us to leverage the fact that locations that are central to one firm's establishment network may be quite remote in another's. For example, CVS and Rite Aid pharmacies may both hire pairs of workers in Philadelphia and Boston who all have nearly identical jobs, but Rite Aid's Philadelphia worker will be near a much larger share of other Rite Aid jobs than its Boston worker, and the opposite will be true for the CVS workers.

This approach removes two potential biases that would otherwise obscure the causal relationship of interest: (1) more productive firms may generate faster growth in revenue and earnings while also expanding outward geographically, so that higher worker earnings growth would be correlated with smaller shares of nearby BEM opportunities, and (2) workers with greater earnings prospects regardless of firm may sort into larger firms with more geographic breadth.

The position of a worker's establishment within the firm's network is also likely to contain an endogenous component. The sorting of workers with greater growth potential to particular establishments within firms may be non-random and correlated with the geographic centrality of the establishment (e.g., workers being groomed for management getting assigned to the headquarters). Also, some establishments may enjoy higher revenue and award greater raises than others independently of worker composition or BEM opportunities. Furthermore, establishments in rural locations will tend to have a smaller share of nearby jobs at the firm, and may experience different earnings growth trends. We address these sources of bias by including a variety of worker, establishment, and location controls, and then assess the potential for remaining bias by examining patterns of selection on observable characteristics and constructing placebo tests.

The findings from our baseline specification suggest that a greater share of employment at more proximate establishments leads to meaningfully faster earnings growth for workers at multi-establishment firms. Specifically, shifting just 10% of the firm's employment from establishments more than 500 miles away to those within 10 miles increases average annual earnings over the following 5 years by 0.27% relative to baseline year earnings. Predicted earnings gains fall mono-

tonically as one considers alternative 10% shifts to less proximate jobs: 0.17%, 0.15%, 0.10%, and 0.06% for 10-25, 25-50, 50-100, and 100-500 miles, respectively. Our distance profile estimates are quite robust to alternative ways of measuring the geographic distribution of BEM opportunities.

Since there is substantial variation in the distance distribution of other-establishment employment within and particularly across firms, these estimated distance profiles can potentially account for a non-trivial amount of variation in earnings growth among workers at multi-SEIN firms: a worker at the 90th percentile of earnings gains from more proximate within-firm job opportunities can expect to enjoy 2% higher average real earnings growth over the following five years than a worker at the 10th percentile with the same baseline earnings.

Consistent with the idea that greater BEM opportunity is the mechanism driving these earnings gains, we also find a strong monotonic relationship between greater employment shares at closer establishments and within-firm SEIN transition rates: 10% employment shifts from very distant establishments to those 0-10, 10-25, 25-50, 50-100, and 100-500 miles away predict increases in the worker share making a SEIN transition within 5 years of 1.0%, 0.9%, 0.7%, 0.4%, and 0.2%

We also find substantial heterogeneity across different types of workers and firms in the sensitivity of worker's earnings growth and SEIN mobility rates to the distance distribution of jobs at their firms' other establishments. For example, for workers at the largest firms ($>$ 5000 workers), the same 10% shift in employment share from establishments over 500 miles away to those within 10 miles predicts a 0.35% increase in per-year earnings over 5 years and a 0.5% increase in annual SEIN mobility. More generally, we see that elevated baseline SEIN mobility rates and elevated earnings and SEIN mobility sensitivity to the distance distribution of BEM opportunities all tend to occur in concert, with greater levels of all three occurring at higher paying firms, at firms in the information, finance/real estate, and trade/transportation/utilities supersectors, as well as among younger workers and workers with higher baseline earnings.

We construct placebo tests that (1) replace future earnings growth with past earnings growth for new hires and (2) replace workers' BEM access measures with those of workers from other firms in the same census tract. We find no evidence of selection into more central establishments of workers with higher persistent ability to raise their earnings nor evidence of systematically lower earnings growth among workers in tracts that tend to be less central to their firms' networks, conditional on other location controls. Examination of the sensitivity of our results to the exclusion

of various establishment and worker controls does not reveal evidence of bias from unobserved establishment-level factors correlated with BEM access (Altonji et al. (2005)), but does indicate some selection of workers with favorable characteristics for growth into establishments with a greater share of more distant job opportunities. This suggests that our substantial estimates may actually understate the earnings growth impact of greater BEM access.

Our paper builds upon and bridges a number of existing strands of research. Most directly, there are studies from Norway (Huttunen, Møen and Salvanes, 2011) and Portugal (Tavares, Carneiro and Varejão, 2018) that document the prevalence and importance of between-establishment job mobility in those countries. Huttunen et al. (2011) show that the ability to move to the same firm's other establishments reduces the earnings losses from plant closings, while Tavares et al. (2018) find that switching establishments within the same firm yield greater earnings premia than switching firms. Because these papers focus on quite small countries, they are not well-positioned to assess how the proximity of other establishments affects their value to workers. Our paper is the first to document the prevalence of and scope for between-establishment mobility in the U.S., and the first to estimate the importance of access to BEM opportunities for earnings growth.

A second literature, mostly centered in macroeconomics, focuses on measuring levels of and trends in worker residential and employer mobility (Molloy, Smith and Wozniak, 2011; Hyatt, McEntarfer, Ueda and Zhang, 2018; Fujita, Moscarini and Postel-Vinay, 2024), with the goal of understanding the role of moving and search frictions in equilibrating markets and shaping the evolution of the business cycle (Moretti, 2011; Moscarini and Postel-Vinay, 2016; Cadena and Kovak, 2016). A sub-literature on the scale of local labor markets documents how job and residential mobility rates decay with distance to potential destinations (Tolbert and Sizer, 1996; Manning and Petrongolo, 2017; Mansfield, 2018). We contribute to this literature by highlighting the importance of distinguishing within-firm from between-firm transitions when measuring worker employer-to-employer mobility rates, particularly for long-distance moves that govern rates of regional wage convergence in macroeconomic models (Blanchard and Katz, 1992).[3] We estimate that within-firm establishment transitions account for 26.9% of all job transitions between states

[3]For example, two commonly used sources for job-to-job mobility rates are at odds on how to handle establishment mobility. The Quarterly Workforce Indicators (QWI) measure SEIN transition rates in LEHD data, which reflect within-firm and between-firm mobility (Abowd et al., 2009); in contrast, the Current Population Survey (CPS) asks respondents whether they still work at the same company as the previous wave, which mostly measures between-firm mobility (Fallick and Fleischman, 2004) and struggles to capture between-state transitions involving a change of residence.

and 26.0% of all transitions over 500 miles. Our paper also illustrates how internal labor markets are shaped by and help workers overcome frictions associated with long-distance moves.

A third, long-standing literature consisting of empirical evaluations of internal labor markets within particular firms documents the important role of well-defined within-firm job ladders in earnings dynamics, particularly for workers at large firms (Baker, Gibbs and Holmstrom, 1994; DeVaro and Waldman, 2012). A major challenge in this literature has been to determine the scope of an internal labor market: a single large establishment, a set of establishments in a local area, an entire multi-establishment firm, etc. (Althauser, 1989). We show that internal labor markets can and do operate at a national scale: the ratio of long-distance to short-distance SEIN transitions within firms is far greater than its analogue among workers switching firms. That said, greater distance between establishments still dramatically reduces within-firm flows, so that multi-establishment internal labor markets are likely to be more effective when establishments are closer together.

A related literature uses national matched employer-employee data, often from Europe, to jointly characterize worker mobility within and across firms, and quantify the relative contributions of internal and external job transitions to worker earnings growth (Van der Klaauw and Dias da Silva, 2011; DeVaro, Kauhanen and Valmari, 2019; Kramarz, Postel-Vinay and Robin, 2014; Papageorgiou, 2018). By leveraging workers' relative positions in their firms' geographic network of establishments, we provide causal estimates of obtaining greater access to an internal labor market, rather than simply observing the distribution of outcomes within one firm's internal labor market or comparing earnings changes of those changing jobs (and sometimes occupations) internally versus externally.

A fourth literature demonstrates that workers at large firms tend to enjoy higher earnings and faster earnings growth (Brown and Medoff, 1989; Arellano-Bover, 2024). We find greater mobility and earnings gains among large firms, suggesting that the greater opportunities for establishment mobility within larger firms may be one mechanism or mediating force through which such superior earnings growth is realized.

A related literature measures the extent of monopsony power within U.S. labor markets and chronicles its rise in recent years (Berger, Herkenhoff and Mongey, 2022; Yeh, Macaluso and Hershbein, 2022; Azar, Marinescu and Steinbaum, 2022; Jarosch, Nimczik and Sorkin, 2024). These papers generally argue that concentrating employment within a small number of firms reduces

worker earnings by limiting the scope for finding outside offers. Our paper suggests that large firms with many establishments may have the offsetting benefit to workers of making jobs at distant locations more accessible. Such access may be particularly valuable if workers need insurance against negative local labor market shocks (consistent with Huttunen, Møen and Salvanes (2011)'s plant closings evidence) or if their optimal residential locations evolve through the life cycle.

Several papers provide theoretical mechanisms and/or empirical evidence to explain why establishment transitions happen within firms. One reason for a firm to initiate establishment transitions is that relative product demand across its establishment network shifts, changing the profit-maximizing allocation of labor across establishments. Giroud and Mueller (2019) formalize this mechanism and demonstrate that shocks to a particular establishment location meaningfully affect employment at other, distant establishments. Similarly, retirements, quits, and skill development can also alter the optimal allocation of workers even in the absence of product demand changes. We show that there is sufficient long-distance mobility within firms to suggest that firms may often use employee transitions rather a combination of layoffs and hire to facilitate these establishment-level employment shifts.

A firm may prefer employee transitions in order to reward its best performing workers with promotions to newly vacant management positions as part of a tournament used to incentivize worker effort (Lazear and Rosen, 1981). A second possibility is that the worker has accumulated substantial firm-specific or even task-specific human capital that the firm wishes to retain or better exploit (Becker, 1962; Carmichael, 1983; Lazear, 2009; Gibbons and Waldman, 2004). A third reason is that search costs associated with hiring a new worker of similar quality exceeds the moving costs from transferring a worker (Schmutz and Sidibé, 2019). The models in Papageorgiou (2018) and Lazear (2009) make clear that the latter two explanations are possibly mutually reinforcing, and that search frictions can raise the payoff to retaining a worker whose skills are scarce or partly portable to other firms. These explanations are all consistent with our findings that establishment transitions are more common among higher-paid, moderately-tenured employees.

If employee establishment transitions were desired exclusively by the firm, then the firm might need to offer higher salaries or promotions to induce workers to incur the moving or commuting costs required by the transition. Mulalic, Van Ommeren and Pilegaard (2014) show that firms do pay such compensating differentials when moving entire establishments to new locations. This

scenario helps explain the link we report between greater BEM access and earnings growth, and also suggests that the earnings growth impacts we find could overstate worker utility gains.

Alternatively, some within-firm establishment transitions may be initiated by workers rather than (or in conjunction with) firms, so that our earnings growth estimates might understate utility gains from greater BEM access. For example, workers' location preferences may change due to spousal job opportunities or family care responsibilities (McKinnish, 2008; Compton and Pollak, 2014), or they may request promotions or even lateral transfers to jobs or occupations at other establishments that they have learned they would particularly enjoy, be productive at, or that would provide opportunities for skill development or ability signaling to other firms (Jovanovic, 1979; Waldman, 1984; Papageorgiou, 2014; Pastorino, 2015). Both firm-specific human capital and search frictions might also increase the worker surplus from establishment transitions. After all, workers with substantial firm-specific human capital may struggle to find similar promotion opportunities at other firms, and firms may be able to more efficiently inform existing employees about its other job opportunities that require particular skills or experience (Papageorgiou, 2018).

Finally, models of statistical discrimination (Miller and Schmutte, 2021; Altonji, 2005) also suggest that talented workers from subpopulations who are generally assumed to have low levels of accumulated skill may benefit from seeking jobs within the same firm, since their true productivity has already been revealed. We do not find evidence for this mechanism, as groups thought to suffer from statistical discrimination do not exhibit greater earnings sensitivity to BEM access.

The rest of the paper is organized as follows. Section 2 describes the LEHD data we use, with particular attention paid to which kinds of establishment mobility can and cannot be observed. Section 3 provides a descriptive analysis of U.S. workers' opportunities for and use of between-establishment job mobility within a firm. Section 4 describes our approach to estimating the impact of greater spatial proximity to jobs at other establishments on worker earnings and SEIN mobility. Section 5 presents the main earnings growth and SEIN mobility results, assesses threats from various sources of omitted variable and sorting bias, demonstrates robustness to alternative measures of BEM access, and analyzes worker and firm heterogeneity in sensitivity of earnings growth and mobility to nearby BEM opportunities. Section 6 provides a back of the envelope estimate of the frequency of unobserved establishment transitions. Section 7 concludes.

2 Data

Our analysis relies on matched employer-employee data from a sample of 25 U.S. states representing around 60% of U.S population within the 2014 snapshot of the Census Bureau's Longitudinal Employer Household Dynamics database (LEHD).[4] We focus on the years 2003-2014, for which we have a balanced panel of contributing states. The core of the LEHD consists of quarterly state-level job records reporting the earnings and identification number of each employee as well as the state-specific employer identification number (SEIN). The LEHD augments these job-level records with four additional sources of information: 1) employee demographic information from social security registers; 2) a firm identification number derived from federal tax records that links SEINs sharing the same ownership; 3) the industry, geographic location (census block), and quarterly employment and payroll of each of the SEIN's establishments (called SEINUNITs) from an employer survey (ES202); and 4) a unit-to-worker file that imputes each worker's establishment based on residential information from tax records and establishment employee counts.[5]

A few key aspects of the data are worth emphasizing. First, the combination of features 2), 3) and 4) above allows the construction of the full distribution of existing (filled) jobs across establishments within each worker's firm, which we use to characterize workers' potential future opportunities for between-establishment mobility within firms.[6]

Second, the algorithm used by the Census Bureau to impute workers' current establishments within a SEIN generally assigns each worker to only one establishment throughout a SEIN employment spell to avoid creating spurious job transitions (Vilhuber et al., 2018). This choice essentially suppresses any information about worker transitions across establishments within SEINs. However, all worker transitions within our sample that are between establishments with the same firm ID but different SEINs are observed. In particular, we observe all across-state establishment

[4]States that approved data access for our sample cover all major U.S. regions and most U.S. coastline. The national LEHD covers 96% of U.S. employment, with exclusions for federal, farm, and self-employment, among others (Abowd et al., 2009).

[5]We use the terms "establishment" and "unit" synonymously throughout the paper.

[6]Due to the establishment assignment algorithm's reliance on a worker's initial residential location within a SEIN employment spell, most errors in assignment will occur when two candidate establishments are both near a worker's residence. But then these two establishments will generally feature similar spatial distributions of other-establishment employment within the firm, so that the measures of access to alternative employment opportunities within the firm introduced below should be negligibly affected. Also, remote work was considerably less common during the period we consider, further mitigating the frequency of imputation errors. The conclusion discusses how the rise of remote work might affect the value of and measurement of BEM.

transitions within our 25 state sample (but not outside of it), and we also observe transitions between establishments in different SEINs within the same (in-sample) state.[7] Firms in general and large firms in particular often create many SEINs within the same state, particularly when there is a natural way to group establishments into subsidiaries of the broader business, often for the purpose of limiting their liability. In Appendix Table A.1, we analyze the determinants of firms' SEIN counts, conditional on establishment counts. We find that multiple SEINs are commonly used across all U.S. supersectors, and that a 10% increase in establishment counts predicts a 5% increase in SEIN count, suggesting that SEINs proliferate quickly as firms expand in size and scope. In Section 6, we generate an estimate of the frequency of within-SEIN transitions based on the geographic distribution of establishment locations and the distribution of distances among observed SEIN transitions. These results suggest that as much as 61% of between-establishment transitions within the same state are between SEINs, though this may be somewhat overstated if establishments in different SEINs differ more in job composition than establishments in the same SEIN.

Third, because a firm's federal EIN can change over time, we use a longitudinally consistent firm ID designed by the Census Bureau that reflects mergers, spinoffs, and other reorganizations (Chow et al., 2021). Thus, we expect to miss very few worker establishment changes due to contemporaneous changes in firm ID by the parent firm. We also remove small shares of within-firm SEIN transitions in which (1) a worker's new and old SEIN are in the same census block, since these are likely to reflect cases in which the worker's work location did not change, or (2) the new and old SEINs are linked by the Census Bureau's success-predecessor file, since these generally reflect cases in which the firm moved the physical location of the establishment for all workers rather than changing the transitioning worker's tasks and co-workers.

Fourth, while the LEHD records all of a worker's jobs with nonzero pay, we select a primary SEIN (and accompanying firm ID and SEINUNIT assignment) for each worker in each year, defined as the SEIN responsible for the largest share of total worker earnings. This procedure avoids excessive focus on secondary jobs that account for little worker pay, but may cause us to miss changes in SEIN within a firm that are either temporary or quickly superseded by a firm separation. To capture a worker's annual salary rather than the share of the year he/she worked, we

[7] Note that initial establishments need not be imputed and between-establishment mobility among our sample states is perfectly observed for the 24.6% of workers and 38.7% of workers at multi-establishment firms that have only a single establishment in their SEIN.

construct "annualized" earnings for each worker by prorating earnings from full quarters only. All earnings are adjusted for inflation using the CPI series and expressed in 2017 dollars.

3 Descriptive Analysis of SEIN Mobility

Figure 1 shows the pooled distribution of employment among all worker-years in our 2003-2014 sample across bins defined by the firm's number of establishments and number of distinct SEINs. We see that 59.3% of workers' primary firms operate multiple establishments among our sample of states. About 90.5% of these firms group their establishments into multiple SEINs, accounting for 53.7% of all worker-years. Moreover, 23.4% and 11.0% of all employment is concentrated at firms with at least 100 and 500 establishments, respectively, while 9.5% is concentrated at firms with at least 100 SEINs. Thus, a sizable minority of U.S. workers have many potential destination establishments within their firms.[8]

Furthermore, Figure 2 shows that there is a consistent upward trend in BEM opportunities. Specifically, the overall multi-establishment and multi-SEIN shares of employment increased from 57.3% and 52.8% in 2003 to 62.1% and 57.6% in 2013, and the shares of workers at multi-establishment (multi-SEIN) firms with more than 100 establishments (SEINs) increased from 22.4% to 24.8% (8.6% to 10.8%). Given that the share of firms with multiple establishments barely changed over this time span, these shifts seems to be primarily driven by increased concentration of employment among already large firms.

The first row of Table 1 reports statistics for the subsample of worker-years in which the worker was employed within our sample states both in the chosen and subsequent year, so that movers' destination establishments can be observed. Imposing this condition slightly increases the multi-establishment and multi-SEIN shares to 63.5% and 56.8%, respectively. About 43% of workers at multi-SEIN firms work in a single-establishment SEIN (24.6% of the sample workforce), so that their subsequent between-establishment mobility is perfectly observed within our sample states.

The next five rows of column 2 display the share of the firm's employment outside the worker's own establishment that is located in establishments within 10 miles, 10-25 miles, 25-50 miles, 50-100 miles, 100-500 miles, and over 500 miles, respectively. Because many multi-unit firms are

[8] Because many of these firms presumably have additional establishments in the remaining 25 states outside of our sample, each of these shares should be treated as a lower bound estimate of the true share.

national in scope, the average worker at such firms is more than 500 miles away from 46.7% of the jobs at their firm's other establishments and 100-500 miles away from another 22.6%. Nonetheless, on average about 12.7% of jobs at other establishments are within 10 miles and 19.5% are within 25 miles. These shares vary widely among workers, however, reflecting the mix of local, regional, and national companies in the data. For example, the share of other-establishment employment within 10 miles has a standard deviation of 0.265, while the share over 500 miles has a standard deviation of 0.361. The distribution of shares of employment across distance bins is considerably more locally concentrated for the subset of multi-unit firms that only operate one SEIN, with about 24.1% (30.4%) of jobs at other establishments located with 10 miles (25 miles).

The yellow curve in Figure 3 displays the CDF of the distribution across workers at multi-establishment firms of the distance to the nearest other establishment within the firm. Over 40% work within 4 miles of another establishment and over 50% work within 10 miles, confirming that most of these workers could potentially switch establishments without making a residential move. The blue curve displays the analogous CDF for the distance to the nearest establishment in a different SEIN within the same firm among workers at multi-SEIN firms. About 25% and 35% of workers at multi-SEIN firms are within 4 and 10 miles of an establishment. This suggests that other establishments within the same SEIN are generally closer on average than those in other SEINs. However, the distribution of potential establishment transition distances that would be observable in our data is fairly similar to the true distribution among all establishments, and contains substantial support at short distances. We exploit these distributions when generating an estimate of the frequency of unobserved within-SEIN establishment transitions in Section 6.

The first row in Panel B of Table 1 shows that 1.4% of workers at multi-SEIN firms make transitions to one of their firms' establishments in other SEINs within our sample in the typical year. Since multi-SEIN firms account for nearly 90% of employment at multi-unit firms, this also implies a lower bound between-establishment mobility rate for workers at multi-unit firms of 1.2%. The rates of SEIN mobility are similar for workers with and without other establishments within their own SEIN (columns labeled "MUMS" and "SUMS") , suggesting that availability of within-SEIN establishment "substitutes" is not unduly suppressing between-SEIN mobility.

The next six rows of column 3 of Panel B provide the shares of observed SEIN transitions whose distance between origin and destination establishment falls into each of six distance bins. Frictions

that deter long-distance transitions clearly exist: even though only 12.4% of jobs at other same-firm establishments are within 10 miles, 26.5% of SEIN transitions involve establishments less than 10 miles away. By contrast, only 20.6% of between-SEIN transitions involve establishments over 500 miles away even though 47.3% percent of other-establishment employment at the firm is at least 500 miles away. We exploit this differential propensity to make short- and long-distance moves in Section 5 to estimate the earnings effects of better spatial access to BEM options.

The first row of Panel C reveals that 12.5% of all workers and 12.8% of workers at multi-SEIN firms who remain employed in our sample states switch firms in a typical year, so that firm-to-firm transitions are about 10 times as common as SEIN-to-SEIN transitions within firms. However, firm transitions feature a much more locally concentrated mix of destinations than SEIN transitions within a firm. Distances of over 500 miles and over 100 miles account for only 5.5% and 23.6% of firm transitions but account for 20.6% and 41.9% of SEIN transitions, respectively. This is despite the fact that a much larger share of other-firm jobs are over 500 miles away than other-SEIN jobs within the same firm. Thus, there must be some additional value or source of surplus to either workers or firms that causes a worker to be willing to make long-distance job transitions within a firm that they would not be willing to make for a job at a different firm.

If this surplus stems primarily from workers preferring to live or work in alternative locations, worker pay need not rise when their requests for transfers are granted. However, if the surplus stems primarily from lower firm recruiting costs or greater firm productivity from better allocation of talent or experience, one would expect workers to be paid a premium to facilitate the transfer.

Table 2 characterizes SEIN mobility rates for a variety of subpopulations defined by categories of various worker and firm characteristics. Specifically, for each subpopulation we display its share of all sample workers, the share of the subpopulation that is in a multi-SEIN firm, the (conditional) annual SEIN mobility rate among those at risk in the subpopulation, and the subpopulation's unconditional SEIN mobility rate.

Starting with firm employment size categories, we see that SEIN mobility rates are much higher at the largest firms. The annual share of workers who change SEINs within a firm are 1.7% at firms with over 5,000 workers compared with 0.1%, 0.3%, 0.5%, and 0.9% among those at firms with $<$ 100, 101-500, 500-1,000, and 1,000-5,000 workers, respectively. 68% of all SEIN transitions are concentrated among the 27.5% of workers at firms with more than 5,000 workers. These

vast differences are primarily driven by differences across firm size categories in whether workers are at risk of changing SEINs. Only 10.5% and 43.9% of workers are in multi-SEIN firms among those in firms with 1-100 workers or 101-500 workers, versus 84.1% and 94.6% among those at firms with between 1,000 and 5,000 workers and over 5,000 workers, respectively. However, rates of SEIN mobility conditional on working at a multi-SEIN firm are also higher at large employers, despite greater shares of more distant positions (Table 3): among multi-SEIN workers, 1.8% of those at firms with over 5 thousand workers change SEINs each year relative to between 0.7% and 1.1% of those in smaller firm size categories. This partly reflects the fact that there are simply more alternative jobs within such firms at other establishments, but may also suggest that large firms have more developed establishment transfer procedures or firm-wide promotion ladders.

SEIN mobility is also more common (1.4%) among workers at the highest paying (worker-weighted) quintile of firms relative to lower-paying quintiles (between 0.6% and 0.8%). Again, these differences are primarily driven by differences in the probability of working in a multi-SEIN firm, which increases from 38.6% for the lowest paying quintile to 78.3% for the highest paying quintile. Conditional SEIN mobility rates are meaningfully higher, however, for workers at the highest-paying quintile of firms (1.8%) than at other quintiles (1.2-1.5%). This is consistent with the idea that retaining and properly allocating talented workers might be particularly valuable for such firms. Wide variation in the share of workers at risk of making a SEIN transition also drives the large differences in SEIN mobility rates across industry supersectors, with the share of workers in multi-SEIN firms varying from 26% in construction and other-services to around 71% in manufacturing and finance and 85% in information. Finance and information also have high rates of SEIN mobility conditional on their multi-SEIN share, in keeping with their reputations as industries that prize individual productivity and reward it via strong corporate ladders. Information's high rate occurs despite having the largest mean share of other-establishment jobs over 500 miles away (64.4%), reflecting the national scope of many of its largest firms.

Moving to worker characteristics, we find monotonic increases with worker's initial earnings for both multi-SEIN shares (44.2% to 69.7%, reflecting assortative matching to larger and higher-paying firms) and conditional SEIN mobility rates (1.0% to 1.9%), despite monotonically increasing shares of other-establishment jobs over 500 miles away (43.1% to 52.3%). The higher conditional rates in particular suggest that the surplus from retaining worker-firm matches is most

valuable among the most skilled workers, perhaps because of greater firm-specific human capital and/or larger search costs of finding appropriate matches for workers offering or firms seeking specialized skill sets. Putting the two together, unconditional SEIN mobility rates are over three times as high for the highest earnings quintile (1.3%) relative to the lowest (0.4%), and the 20% of workers in the top earnings quintile account for 36% of all SEIN transitions. We also see that conditional and unconditional SEIN mobility are common at all ages, but peak for the 30-39 year old age group at 1.6% and 0.9% before declining to 1.1% and 0.6%, respectively, for workers over 55 years old. Note that this mid-career peak contrasts with the generally monotonically decreasing age profile of firm mobility rates (Bosler and Petrosky-Nadeau, 2016; Gittleman, 2019), again consistent with an important role for firm-specific human capital. We observe limited heterogeneity in SEIN mobility rates by gender, race/ethnicity, or firm tenure, though the panel is not long enough to evaluate mobility rates for workers with more than 10 years of firm tenure.

Taken together, our descriptive statistics suggest that mobility between establishments within firms is fairly common across all types of workers and firms. They also suggest that such mobility is sensitive to the distance between worker's own and other establishments, though less so than for transitions between firms. We now seek to leverage variation across workers in the spatial distribution of other establishments at their firm to better understand how superior access to BEM opportunities affects their earnings paths.

4 Regression Methodology

Our baseline specification relates the average percent change in earnings relative to base year t over the following p years for worker i at establishment $e(i,t)$, denoted $\%\Delta Earnings^p_{it}$, to the worker's year t access to opportunities to change establishments within their current firm $f(i,t)$[9]:

$$\%\Delta Earnings^p_{it} = BEM\ Access_{et}\beta + X_{it}\delta + X_{et}\lambda + \gamma^F_{ft} + \gamma^C_{ct} + \gamma^N_{nst} + \varepsilon_{it} \tag{1}$$

where we have dropped the dependence of e, f, c, n, and s on (i,t) to simplify notation. We choose as our outcome the average percent change in earnings relative to a single base year rather than

[9]For example, a worker who earns \$20,000 in the base year and \$25,000, \$30,000, and \$35,000 in each of the next three years would have an average percent change in earnings over the three-year window of $\%\Delta Earnings^3_{it} = \frac{25{,}000+30{,}000+35{,}000}{3*20{,}000} - 1 = .5$, or 50% growth.

an average of year-to-year annual growth because low earnings in a single year makes annual growth extremely volatile, such that the same cumulative income can be associated with very different average year-to-year growth. Since most workers' annual earnings grows over time, the outcome mean grows with the length of the window p.

Our regression sample for this earnings outcome consists of all worker-years in which the worker is initially employed and whose subsequent annual earnings we observe at least twice for a 3-year window, three times for a 5-year window, and five times for a 7-year window. The latter restrictions are intended to ensure sufficiently large samples and reasonably precise measurement of the individual's outcome while limiting the selection problem created by dropping those that experience years of nonemployment.

Our preferred measure of access to BEM opportunities, $BEM\ Access_{et}$, consists of a vector of shares of employment at other establishments in the same firm that fall into each of the distance bins from Table 1. Since a worker's origin location is based on an assigned establishment rather than his/her residence, our measure varies at the establishment-year level. Because the employment shares constituting $BEM\ Access_{et}$ sum to one for each worker, we normalize to zero the coefficient for the share of other-establishment employment that is more than 500 miles away.

By relying on shares of workers in each distance bin, we focus on how mobility costs that may be non-linear in distance mediate opportunities for establishment mobility. However, this access measure imposes that the same distance share distribution will predict the same rate of mobility and the same earnings growth impacts regardless of the overall employment count of the firm. If every job opportunity at the firm within a given distance bin were equally likely to spawn an establishment transition, one should use the position count rather than the share of positions in each bin. However, firms with many large establishments may also have a wider array of occupations, perhaps because they are more vertically integrated. And larger firms also offer more within-firm competitors for available vacancies. Thus, the number of relevant and obtainable job opportunities need not grow linearly with overall firm size. We investigate alternative measures of access that incorporate the scale of employment in each bin in Section 5.

One reason for our focus on spatial distributions rather than scale is that we wish to isolate variation in exposure among workers from different establishments within the same firm-year, so as to remove any endogeneity bias stemming from more or less geographically concentrated firms

tending to either share faster revenue growth with workers or hire workers with greater earnings growth potential. We do this by including a full set of firm-year fixed effects, represented by γ_{ft}^{F}. But this choice naturally eliminates differential earnings gains from BEM options that operate purely through variation in the firm-wide scale of employment opportunities.

Note that we isolate for identification exclusively within-firm variation in access only to minimize scope for omitted variable bias; we expect the coefficients β capturing the importance of better BEM access to be relevant for analyzing differences in BEM opportunities between firms as well, and we exploit between-firm variation in predicted values when seeking to quantify the overall importance of superior geographic access to opportunities for worker earnings growth below. That said, our proximity-based access measures only permits us to place a lower bound on the importance of access to a multi-establishment internal labor market, since they do not allow us to capture the difference in value between having all other same-firm establishments be over 500 miles away and having no other same-firm establishments to which to move. This difference in value is likely to be substantial given that we estimate that the origin-destination distance is greater than 500 miles for at least 15% of establishment transitions within multi-SEIN firms.

X_{it} is a vector of individual controls consisting of categorical indicators for sex, race, ethnicity, age, highest level of education (including a flag for imputed education status), bins of tenure at firm f, and earnings decile in (initial) year t. These controls mitigate selection bias from non-random selection into centrally located establishments within firms of individuals likely to experience inferior or superior earnings growth regardless of their establishment's geographic centrality.

X_{et} is a vector of establishment-level controls associated with worker i's establishment in year t. It consists of annual growth rates of employment, payroll and average pay, as well as indicators for bins of the levels of these variables. These establishment controls address selection bias from the possibility that more geographically central establishments may tend to be higher-performing and thus cause their workers to experience higher earnings growth for reasons unrelated to the quality of these workers or their BEM opportunities. This might occur if the firm tries to create new establishments in the same area as its most successful branch.

Finally, γ_{ct}^{C} and γ_{nst}^{N} denote county-by-year and 4-digit industry-by-state-by-year fixed effects that absorb the impact of labor market trends or shocks that are specific to particular geographic areas and/or industries that may both drive differential earnings growth and be correlated with

the employment distance distributions of establishments.

Our goal is to isolate random variation in which workers sort to establishments that are near versus far from other establishments within the same firm. As discussed in the introduction, such random variation might be created by naturally occurring turnover that leads different establishments within a firm to hire at different times, and thus match with particular workers among the qualified pool who happen to be searching at the same time. The inclusion of county-by-year and industry-by-state-by-year fixed effects exploits the fact that different firms have concentrations of employment in different regions and different counties within regions.

To see this, suppose that Wells Fargo (highly concentrated within San Francisco) and Citizen's Bank (highly concentrated in Boston) each post vacancies in March and in April, but Wells Fargo's March and April vacancies are in San Francisco and Boston, respectively, while Citizen's Bank's are in Boston and San Francisco. Suppose further that two pairs of similar job applicants from Boston and from San Francisco sort into the particular positions within their cities based on their slightly different job search timings. Then the share of Wells Fargo employment that is within 10 miles will be high for its Boston worker relative to its San Francisco worker, and the opposite will be true for the Citizen's Bank pair, thus providing exogenous identifying variation in the impact of greater BEM access conditional on both firm-by-year and location-by-year fixed effects.

Note that we are explicitly trying to capture the causal effect of expanding potential opportunities to switch establishments rather than the causal effect of actually making such a transition. There are three reasons for this. First, we do not fully observe the correct (endogenous) treatment variable, an indicator for making an establishment switch, because we only observe changes in establishments if they also involve a SEIN change. This precludes a standard instrumental variable approach, since greater geographic proximity to potential job opportunities could also affect earnings via establishment switches within a SEIN.

Second, even if we observed all establishment mobility within firms, the IV exclusion restriction would be invalid if within-firm opportunities affected earnings growth through altered bargaining power with outside firms even in the absence of actual between-establishment transitions.

Finally, the "reduced form" effect of greater access to opportunities that we do estimate is arguably at least as practically relevant as the effect of transitions themselves. Many policy levers might affect which workers sort to initial jobs with greater BEM access, such as requiring or fa-

cilitating better dissemination of information about vacancies at firms with a national reach. And early-career workers may benefit from learning that a multi-establishment firm might provide a more streamlined promotion path or better insurance against adverse local demand shocks.

Even though we do not seek to recover an estimate of the causal effect of between-SEIN mobility on earnings, we do wish to demonstrate that the earnings effects we find could plausibly be generated via better access to BEM opportunities. Thus, we also investigate the "first stage" impact of our measure of geographic access to BEM opportunities on SEIN mobility.

A few adjustments to the estimating equation are necessary when the outcome is an indicator for making a between-SEIN transition within a firm:

$$\begin{aligned} SEIN\ Transition_{it}^{p} =& BEM\ Access_{SEINt}^{X\text{-}SN}\theta + BEM\ Access_{SEINt}^{W/in\text{-}SN}\zeta + X_{it}\mu + X_{et}\nu \\ &+ \pi_{ft}^{F} + \pi_{ct}^{C} + \pi_{nst}^{N} + \omega_{it} \end{aligned} \tag{2}$$

First, our regression sample only includes workers at multi-SEIN firms, since only these workers are at risk for making a between-SEIN transition. Second, to properly capture options for SEIN transitions, we only include between-SEIN employment when constructing shares of employment at various distance bins in our SEIN-level access measure, $BEM\ Access_{SEINt}^{X\text{-}SN}$. Third, we replace indicators for bins of total employment at other establishments within the firm (an element of X_{et}) with bins of employment at other SEINs. Fourth, we add an additional vector of controls for the shares of within-SEIN positions at other establishments that are in each of our distance bins, which we denote $BEM\ Access_{SEINt}^{W/in\text{-}SN}$. These additional controls address the possibility that a high share of jobs within one's SEIN that are nearby indicates a more appealing set of outside options that reduce the impact of between-SEIN opportunities on SEIN mobility.

We cluster standard errors at the worker and firm levels to capture likely dependence across observations due to persistent shocks to workers and firms.

5 Main Results

5.1 Earnings Effects

The first three columns of Table 4 display the results of our baseline specification for earnings windows of 3, 5 and 7 years. We find very strong evidence that greater geographic concentration of within-firm employment increases workers' future earnings. For all three windows, expected earnings gains increase monotonically as employment at other establishments within the worker's firm shifts to closer and closer distance bins relative to the worker's current establishment. The average annual effects increase in magnitude with the length of the window considered. This is consistent with the arrival of better earnings opportunities from within-firm job transitions accumulating over time. Focusing on the 5-year window, we find that a worker with 100% of out-of-establishment employment within 10 miles can expect to earn an average of 2.7% more per year for the next 5 years than a comparable worker at an otherwise comparable establishment that is more than 500 miles away from all other establishments at the firm. Relative to this same hypothetical worker in the most remote establishment, a worker with 100% of other-establishment employment 10-25, 25-50, 50-100, and 100-500 miles away can expect to enjoy 1.7%, 1.5%, 1.0%, and 0.6% higher per year earnings.

Of course, very few workers have 100% of other-establishment employment in one particular distance bin, so we use three other approaches to gauge the economic importance of these findings. First, we evaluate the earnings impact of a one standard deviation increase in the share of employment at a given distance bin (at the expense of the 500+ category). For the 5 year window, a one SD shift for 0-10 miles increases average per-year earnings by 0.7%, with corresponding values of 0.5%, 0.2%, 0.2%, and 0.2% for the 10-25, 25-50, 50-100, and 100-500 mile bins.

Second, we evaluate the predicted contribution of BEM access to earnings growth for a worker with the sample mean employment share for each distance bin compared to a worker with all BEM opportunities over 500 miles away. These values are 0.4%, 0.7%, and 0.9% for 3-year, 5-year, and 7-year windows, respectively, which would represent 17%, 19%, and 21% of the median earnings growth in the sample for these windows.

Such comparisons with workers facing exclusively long-distance options represent the tightest lower bounds one can recover with a distance-based identification approach for the effects of

typical BEM access at multi-establishment firms relative to workers at single-establishment firms who have no option for switching establishments within the same firm.

However, we also wish to characterize the importance of heterogeneity in proximity to other establishments among workers at multi-establishment firms. Thus, our third approach examines the person-level distribution of predicted BEM access contributions to earnings among such workers. Column 1 of Table 5 reports selected vingtile cutoffs of this distribution for the 5-year window. While BEM access generates less than 0.1% additional growth for about 20% of workers at multi-establishment firms, 45% of workers gain more than 0.5% in earnings, 25% of workers gain more than 1%, and there is a tail of 10% of workers who gain more than 2%.

These predicted values combine the within-firm and between-firm variation in distance bin shares, which assumes that the coefficients identified from within-firm variation are externally valid for variation across firms. If we instead remove the firm-specific mean from each earnings prediction, we can consider the contribution of greater proximity to other jobs at the firm relative to other workers at the same firm. This distribution is far more concentrated, with a 90-to-10 percentile difference among employees from the same firm only accounting for a 0.4% per-year difference in earnings over 5 years. Thus, the bulk of the variation in value of BEM access comes from comparisons between firms.

5.2 SEIN Mobility Effects

Columns 4-7 of Table 4 report the results of our "first stage" regression specification (2) that relates employment shares by distance bin among jobs in other SEINs to indicators for making at least one SEIN transition within 1, 3, 5, or 7 years, respectively, for the sample of workers at multi-SEIN firms. As with the earnings outcome, we find very strong evidence of sensitivity of SEIN mobility to the distance distribution of employment at other SEINs. For each time window, expected SEIN mobility rates also increase monotonically as other-SEIN employment within the worker's firm shifts to closer and closer distance bins. This again is suggestive evidence in favor of potential opportunities for establishment mobility serving as the causal mechanism producing the reduced-form earnings gains described above.

Specifically, a worker with 100% of other-SEIN employment within 10 miles has a 0.039 higher

probability of making a SEIN transition within the year than a comparable worker at an otherwise comparable establishment that is more than 500 miles away from all of the firm's establishments in other SEINs. The corresponding increases for the 10-25, 25-50, 50-100, and 100-500 mile categories are 0.036, 0.029, 0.019, and 0.010, respectively. These probability increases naturally become larger as the time window expands, since more workers have had sufficient time to find a suitable opportunity at another establishment. For example, a worker whose SEIN transition opportunities are all within 10 miles is a full 10 percentage points more likely to switch SEINs at least once within 5 years than one whose SEIN transition opportunities are all over 500 miles away.

As with our earnings results, we gauge the economic importance of these distance profiles by evaluating the predicted contribution of access to other-SEIN BEM opportunities to the probability of making a SEIN transition for a worker with the sample mean employment share for each distance bin compared to one of the $\sim$10% workers with all of their out-of-SEIN opportunities over 500 miles away. These predicted contributions at the mean are 0.8% for annual transition rates and 1.6%, 1.9%, and 1.9% for rates of making at least one SEIN transition within 3, 5, and 7 years, respectively. The 90th-to-10th percentile difference in predicted contributions of access to annual SEIN transition rates is 4.5 percentage points. Note that these values understate the degree to which differences in proximity to other establishments drive establishment mobility, since we do not include within-SEIN establishments when computing our distance bin shares (because we cannot observe those transitions), and such establishments tend to be closer to the worker's own establishment. Thus, there is a sizable population of workers for whom a large share of employment at nearby establishments within the same firm is substantially increasing their job mobility.

5.3 Evaluating the Magnitude of Sorting and Selection Biases

The validity of our estimates of earnings sensitivity to more proximate BEM access requires that, conditional on controls, other determinants of worker earnings growth are orthogonal to the vector of other-establishment employment shares in each distance bin. In this subsection, we investigate several sources of potential bias.

As discussed earlier, we include a full set of firm-year fixed effects in all our estimating equations to eliminate any bias from unobservably greater earnings contributions at firms with more

or less geographically concentrated employment distributions, either because they are attracting unobservably superior workers or because they are sharing some of the rents from faster productivity growth that is causing both geographic expansion and earnings growth. Because the lion's share of variation in employment shares by distance bin is between firms or (to a lesser extent) between years within firm, the firm-year fixed effects remove considerable identifying variation.

Thus, column 1 of Table 6 uses firm rather than firm-year fixed effects, so that identifying variation in average earnings gains across years within firm is included. The $BEM\ Access$ coefficients continue to monotonically increase as one considers closer distance bins, but are now generally about 25% smaller than before, suggesting that firms that are geographically expanding within the sample are delivering faster earnings growth in later sample years. Column 2 removes the firm fixed effects and replaces them with controls for observed firm characteristics (bins of total employment and interactions between average pay bins and firm's international trade engagement status).[10] The coefficients on all of the employment shares by distance bin become small and statistically insignificant, suggesting that other sources of greater earnings growth that are correlated with firms' geographic scope would hide any effects of differential access to BEM opportunities in the absence of firm-year and particularly firm fixed effects.

The potential sources of bias that remain relate to non-random sorting of workers to current establishments within their firms and differential establishment-specific and location-specific components of earnings growth that are correlated with the position of workers' establishments in their firms' establishment networks.

We already include a set of controls that effectively exhaust the information contained in the few worker and establishment characteristics available in the LEHD: categories of worker pay, age, SEIN tenure, race, gender, education (with a flag for imputed education status), establishment employment and average pay bins and past midpoint growth rates for payroll, employment, and average pay. However, we can explore the degree of selection on these observable characteristics as a rough guide to the possible correlation between earnings-relevant unobserved establishment and worker characteristics and distance bin employment shares (Altonji et al., 2005; Oster, 2019).

Column 3 of Table 6 displays coefficients from a simplified version of our baseline earnings

[10] International trade engagement status has 6 categories that reflect whether the firms export, import, and their relationship with their trade partners.

specification that omits observed establishment and worker characteristics, but retains firm-year fixed effects, state-year-industry effects and county-year fixed effects. Coefficients on all distance bins are statistically significantly different from 0 (relative to the employment share at establishments more than 500 miles away), but the effects are much smaller and not perfectly monotonically increasing as one considers closer bins. Adding the establishment controls (column 4) barely changes the estimates, even though the past employment and average pay growth rate controls in particular are strong predictors of earnings growth. This insensitivity is consistent with the idea that unobserved establishment level factors are not major drivers of endogeneity bias. In column 5, we further add indicators for individual initial earnings deciles. Since greater baseline earnings strongly negatively predicts earnings growth (there is less scope for large growth rates from a higher base), selection of higher earnings workers into more centrally located establishments has the greatest potential to dampen the distance profile of coefficients. Sure enough, controlling for initial earnings decile restores monotonicity in coefficients with the proximity of the distance bin. Finally, comparing column 5 to our baseline specification from Table 4 isolates the impact of controlling for our other demographic characteristics. All $BEM\ Access$ coefficient magnitudes increase by about 50%, creating a much steeper profile in distance.

On one hand, these results suggest that selection into centrally located establishments is related to worker characteristics that predict future earnings gains, so that distance shares of employment at other establishments may not be fully exogenous, even conditional on firm-year and county-year fixed effects and the other controls. On the other hand, suppose the signs of the correlations are the same between shares in closer distance bins and regression indices of observed and unobserved worker characteristics, respectively, as one might expect if firms make establishment allocation decisions based on worker evaluations that reflect a mix of characteristics from both sets. Then the true profile of coefficients would feature even greater sensitivity of earnings to closer proximity of BEM opportunities than we have estimated. This suggests that our estimates may even understate true contribution to earnings differences of differential BEM access.

As an additional assessment of the scope for further selection bias from worker sorting conditional on our controls, we run a placebo test for whether the current set of distance shares of other-establishment employment predicts the average percent change in earnings over the previous 5 years (relative to a baseline from 6 years earlier) for newly hired workers. The idea beyond

the test is that current firm-specific BEM options should not predict earnings growth prior to the worker's arrival at the firm unless workers with a persistent unobserved ability to be promoted faster are systematically being assigned to more or less central establishments within their new firm. To implement this placebo test, we include the full sample of workers with sufficiently long prior earnings histories in order to estimate reasonable firm-year fixed effect values, but we interact the coefficients on distance bin shares with an indicator for whether the worker is a new hire to isolate the relevant subpopulation for the test. The results of this exercise are displayed in column 6 of Table 6. The coefficients are generally small, inconsistent in sign, and statistically insignificant at the 5% level except for the 0-10 distance bin. This coefficient is negative, which suggests that, if anything, the strength of our distance profile is understated, since past earnings growth is a positive predictor of future growth conditional on our other controls. Thus, we do not find evidence of selection of workers with persistent ability to garner larger raises into establishments with more proximate BEM opportunities. Note that the absence of a pattern here is not driven by focusing on new firm-switchers (i.e. zero-tenure workers). Running our baseline specification with our original earnings outcome on the same sample with the same interaction with a firm-switcher indicator (column 7) produces nearly the same pattern as our original results.

Finally, we examine whether our estimates suffer from bias due to omitted location-specific trends or shocks to earnings that are common to all workers and establishments in the area. For example, a firm's remote establishments may be more likely to be in rural areas or isolated cities that have different average earnings growth trajectories. Our baseline specification already includes county-by-year fixed effects, so any remaining concerns stem from systematic relationships between within-county establishment location, distance bin shares, and earnings growth.

We address this possibility by constructing a second placebo in which we replace the worker's own distribution of employment shares by distance bin with the distribution of another, randomly chosen worker at a different multi-establishment firm within the same census tract. Any correlation between a different firm's distance distribution and the worker's own earnings growth would be driven by a common geographic component of both distance shares and earnings growth. Column 8 of Table 6 shows that all of the $BEM\ Access$ coefficients are tiny in magnitude, providing reassurance that common location shocks are not a meaningful source of bias.[11]

[11]Note that the standard errors on these coefficients are an order of magnitude smaller, so that the coefficients are

5.3.1 Assessing Robustness to Alternative Exposure Measures

The distance bin employment shares that we use as measures of access to BEM opportunities impose that the creation of a large nearby establishment at a large firm is equivalent to the creation of a small nearby establishment at a small firm. However, one might imagine that a worker might benefit more from the creation of a greater number of local jobs for the worker to apply to even if it represents the same shift in the local share of firm-wide employment.

Thus, in column 1 of Table 7 we report results from a specification featuring logs of within-firm job counts at other establishments within each distance bin rather than employment shares.[12] While there is a bit of evidence that a greater number of local jobs increases expected growth, the distance profile is much weaker and less consistent in pattern than for the baseline specification. Column 2 presents results from a "horse-race" specification in which both log counts and firm-wide employment shares are included for each distance bin. The log counts have almost no predictive power conditional on the shares, while the shares still show a strong pattern of greater earnings growth for higher shares of geographically proximate jobs. Columns 3 and 4 consider the same two specifications with the SEIN transition indicator as the outcome. Here we do see some evidence that the distribution of log job counts predicts SEIN mobility, but again the relationship gets weaker once we control for shares, which retain nearly the same coefficient pattern as our baseline SEIN mobility specification. One possible explanation for the weak predictive power of the distance distribution of job counts is that as firms grow and establishments get bigger, they become more occupationally differentiated, so that a smaller share of jobs at each establishment is relevant for any given worker.

Thus, in an effort to better capture access to relevant jobs at other firms, in column 5 we consider a specification in which we construct the shares of other-establishment employment in each distance bin only among jobs that pay at least as much as the worker's current job (i.e. the same earnings decile or higher). The coefficients on each distance bin are quite similar to our baseline coefficients. The main reason for the similarity is that the share of higher-paying jobs in each

often statistically significantly different from zero despite their economic unimportance. This is because there is far more residual variation in distance bins with which to identify these coefficients due to the weak correlation between the firm-year fixed effect of the worker's actual firm and the geographic employment distribution within their tract neighbor's firm.

[12] Using levels of job counts rather than logs causes the vast majority of variation to come from a few extremely large firms. Even when these firms are removed, the leverage of the largest remaining firms in the regression is substantial.

distance bin is very highly correlated with the share of all jobs in each distance bin, since different establishments often have very similar earnings distributions to each other. This collinearity undermines our ability to assess which job opportunities are the relevant ones.

We also consider a specification that uses the share of establishments rather than the share of employment in each distance bin. This specification shows remarkably similar patterns of coefficients by distance bin to the employment share specification for both the earnings and SEIN mobility outcomes (columns 6 and 7). Again, the fact that different establishments of the same firm tend to have similar sizes prevents us from distinguishing between these two access measures.

5.4 Heterogeneous Effects

Rather than treating job counts and job shares at different distance bins as competing access measures, another approach is to examine whether the sensitivity of earnings gains and SEIN mobility to the shares of other-establishment workers at different distance bins varies with the overall size of the firm. To this end, the blue bars in the top panel of Figure 4 display coefficients from a specification that interacts the distance bin shares with a vector of indicators for five firm size categories: 0-100, 101-500, 501-1,000, 1,001-5,000, and over 5,000 workers. The two smallest categories do not exhibit a consistent pattern of statistically significant, monotonically increasing coefficients. This partly reflects the fact that the smallest firms naturally do not have many establishments distributed widely across space, which leads to larger standard errors. However, the pattern of increasing coefficients with closer distance bins emerges for 501-1,000 employee firms and becomes stronger and stronger as one considers 1,001-5,000 employee firms and firms with over 5,000 employees. This is consistent with the idea that a greater and more diverse set of options increases a worker's probability of finding a sufficiently good job match at another establishment.

Interestingly, despite the steeper distance profile for the largest firms, the predicted earnings growth gain at the mean firm-size specific employment distribution across distance bins for a 5000+ employee firm relative to all BEM opportunities being 500+ miles away is 0.7%, while the same predicted gain for a typical worker at a 501-100 employee firm is 0.8%. This is because the largest firms tend to be national in scope, and thus have substantially larger mean shares of positions over 500 miles away (Table 3), so that the large coefficients associated with nearby

distance bins are given little weight when generating mean predicted values. As discussed earlier, this finding reflects the fact that the need to normalize to zero the coefficient on the 500+ mile employment share precludes the ability to value access to very distant BEM opportunities, which are particularly plentiful and frequently exploited at the largest firms.

The same basic pattern of increasing distance sensitivity with greater firm size emerges when we use a SEIN transition indicator as the outcome variable in Figure 4 (yellow bars), albeit with a more consistent profile among smaller firms and a particularly pronounced profile among the largest firms. This may indicate that larger firms are more likely to have well-established procedures for advertising vacancies internally and facilitating establishment transfers.

More generally, the various panels of Figure 4 and the various columns of Tables 8-11 explore how the sensitivity of earnings gains and SEIN mobility to more proximate BEM access varies across categories of several other firm and worker characteristics.

The second panel shows that the steepness of the distance profile increases as one moves from the lowest to the second-highest paying quintile of firms, consistent with the idea that higher productivity firms may place greater value on optimal assignment of workers and limiting vacancy duration in high-value positions. There is a slight reversal for the highest paying firms, perhaps because firms employing almost exclusively high-paid workers tend to be smaller. SEIN mobility rates are sensitive to distance bins' employment shares across all average pay categories.

Industry-specific distance profiles (bottom panels of Tables 8 and 9) are a bit noisy, particularly for supersectors with small shares of at-risk multi-establishment workers. However, the manufacturing, trade/transportation/utilities, information, and finance & real estate sectors all exhibit clear profiles of increasing coefficients with closer distance bins, both for earnings and for SEIN mobility. The predicted earnings contributions at the mean distance bin shares for these industries (relative to full employment concentration at 500+ miles) are 0.7%, 0.5%, 0.8%, and 1.1% versus only 0.3% for leisure and hospitality. Despite having a fairly shallow profile of rising coefficients with closer distance bins, the predicted earnings contribution at its mean shares is among the highest for the education & health supersector (0.8%). This is due to its extraordinarily high share of other-establishment employment within 10 miles among its multi-establishment employers (34.6%), perhaps reflecting school districts operating several schools or medical practices operating several clinics within the same local area.

Moving to worker characteristics (Tables 10 and 11), we find that sensitivity of earnings changes to the distance distribution of BEM opportunities is concentrated among the three highest quintiles of worker baseline earnings. These quintiles also exhibit strong relationships between SEIN mobility and the distance distribution of BEM opportunities. The predicted mean 5-year earnings growth contribution (relative to having only distant BEM opportunities) for the top two quintiles is 1.0% versus only 0.1% for the second lowest quintile. This reinforces the idea that firms particularly price the ability to reallocate their most skilled workers to the highest value location. The presence of a strong distance profile for SEIN transitions but not for earnings growth for initially low-paid workers suggests that these workers may be more likely than their firms to value and initiate establishment transitions, so that no increase in pay is necessary to induce the transition.

Among age groups, the distance profile of earnings coefficients is strongest for 30-39 year old workers, with distance share coefficients generally shrinking by 10% or so for workers under 30, 25% for workers between 40 and 54, and by 50% or more for workers over 55. The age pattern of coefficients for SEIN mobility is quite similar. Smaller earnings effects for older workers are consistent with their lower SEIN mobility rates, so that potential opportunities are less likely to translate into realized transitions or earnings gains. Indeed, workers under 40 reap an expected 0.9% higher per-year earnings from the average distance distribution of other-establishment employment relative to exclusively long-distance jobs, compared to just 0.2% for workers over 55. However, since older workers are less likely to generate earnings growth through firm switching, BEM access constitutes a larger share of median (or average) earnings growth at later ages.

The earnings and SEIN mobility distance profiles are fairly similar for men versus women. However, a closer look suggests somewhat greater sensitivity among women for both outcomes to BEM opportunities at the closest distance bins, 0-10 miles, 10-25 miles, and 25-50 miles. This is consistent with existing work (Abraham et al., 2019) showing that couples less frequently make long-distance moves to pursue opportunities for the wife than the husband, so that opportunities within current commuting range are particularly valuable for women. Because women also tend to be closer to BEM opportunities at their firms, the predicted earnings growth contribution for them at their average distance bin shares is meaningfully higher (0.9%) than for men (0.6%).

We see relatively similar distance profiles of SEIN mobility coefficients across race/ethnicity categories, but the earnings gains from greater shares of nearby within-firm jobs accrue primarily

to non-Hispanic white workers and Asian workers, with a less pronounced profile for black workers and no discernible pattern at all for Hispanic white workers. Thus, we do not find evidence that historically underprivileged workers disproportionately rely on within-firm promotion opportunities due to statistical discrimination in the broader labor market. Instead, smaller gains from nearby jobs may partly reflect the fact that black and Hispanic white workers are underrepresented in the baseline earnings and industry categories where within-firm promotion ladders are most prominent and lucrative.

Finally, we see limited heterogeneity by categories of tenure at the firm, with slightly larger earnings and SEIN mobility payoffs to greater shares of nearby jobs for workers with 3-5 years of tenure relative to those with less or more tenure, consistent with the idea that one needs some degree firm-specific human capital and a sufficient remaining length of career to generate sufficient value from switching establishments.

More broadly, a glance from afar at Figure 4 reveals that larger shares of jobs at closer establishments within the firm predict both larger earnings increases and greater probabilities of switching SEINs for the vast majority of worker and firm subpopulations we consider. This demonstrates that responses to greater access to BEM opportunities are widespread throughout the economy and that our baseline results are not driven by unrealistically steep distance profiles for one small group. Furthermore, although not perfectly aligned, subpopulations that exhibit greater earnings sensitivity to the proximity of BEM opportunities also tend to show greater sensitivity for SEIN mobility. This provides further evidence, albeit suggestive, that the mechanism generating the earnings gains is in fact establishment transitions rather than other earnings-relevant unobserved worker, establishment, or location attributes correlated with distance bin shares of employment at other establishments. It also suggests that BEM is generating considerable value for firms, since they seem to be willing to pay more to facilitate these transfers.

6 Estimating National Between-Establishment Mobility Rates

In this section, we summarize how we construct a conservative estimate of the overall share of U.S. workers who make between-establishment moves within the same firm each year. A complete description of our procedure is provided in Appendix A.1.

Our goal is to estimate the frequency of two kinds of unobserved job transitions: 1) transitions between establishments within the same SEIN, and 2) SEIN transitions from states within our sample to states outside our sample. Table 12 presents a decomposition of the contributions to our final establishment mobility estimate of each of the steps taken to generate these predictions.

Starting with 1), we exploit the fact that we observe the universe of establishment locations and sizes in our sample states, regardless of SEIN, and we have estimates capturing how changes in the scale and geographic distribution of within-firm employment drive within-firm job mobility. Because we find marked heterogeneity in SEIN mobility rates by firm size category, we use as our starting point predicted values from the version of our SEIN mobility regression reported in Table 9 that features separate distance bin profiles for each out-of-SEIN employment bin.

These naive predicted values contain four sources of mismeasurement when used to capture predicted rates of all between-establishment mobility (not just between-SEIN mobility). First, our access measures for the SEIN mobility outcome consist of the shares of the firm's employment in other SEINs besides the worker's own that fell into each distance bin. Since we now wish to measure all BEM opportunities, not just between-SEIN opportunities, we include employment at other within-SEIN establishments when constructing these shares. This requires assuming that the parameters relating SEIN mobility rates to out-of-SEIN employment shares by distance bin also correctly capture the corresponding relationship between establishment mobility rates and firm-wide employment shares by distance bin. This is arguably a conservative assumption, since the distance profile may be steeper for within-SEIN opportunities if jobs are more similar to workers' current jobs at establishments within the same SEIN than in other SEINS.

Second, to capture the scale of firmwide BEM opportunities rather than SEIN transition opportunities, we use total other-establishment employment rather than other-SEIN employment when constructing the indicators for the size category of employment that interact with the distance bin shares (with the same category cutoffs). These swaps assume that the heterogeneity in sensitivity of SEIN mobility to the distance distribution across different out-of-SEIN size classes captured in the original regression translates to the relationship between any establishment mobility and out-of-establishment size classes.

Taken together, these adjustments increase the predicted share of workers at multi-SEIN firms who remain in the sample that make within-firm establishment transitions from 1.36% to 1.64%.

Third, the component of the naive predicted values contributed by the other control variables has a mean that is scaled to fit observed SEIN rather than establishment mobility rates. To re-scale this component, we regress this component on the same controls except for the firm-year fixed effects, which we replace with indicators for categories of both within-SEIN and out-of-SEIN employment. These indicators' coefficients capture the (conditional) relationship between Efirm scale and SEIN mobility that was previously absorbed by the firm-year fixed effects.

As before, we replace the out-of-SEIN employment categories with out-of-establishment employment categories and impose that the coefficients capturing the relationship between SEIN mobility and out-of-SEIN employment bins apply also to the relationship between establishment mobility and out-of-establishment employment bins. We also zero out all of the within-SEIN employment indicators, since these captured the role of unobservable "outside options" for SEIN mobility that are now reflected in the out-of-establishment size categories. Adding the change in this auxiliary regression's predicted values created by these adjustments yields a predicted annual rate of establishment mobility for workers at multi-SEIN firms of 1.81%.

Fourth, we use the same procedure to generate predicted establishment mobility rates for workers at multi-unit, single SEIN firms that were previously excluded from the regression sample, since we observe all the variables necessary to form their predicted values: distance bin employment shares, out-of-establishment size bins, and other worker, establishment, and location controls. This produces an annual establishment transition rate for such workers of 1.58%.

For workers at multi-SEIN firms, we must add to the predicted values an estimate of the rate of between SEIN transitions to out-of-sample states. Here, we use the fact that the LEHD reports an indicator for whether a worker is employed in some U.S. state even if that state did not grant us data access. This allows us to estimate the share of all job transitions from our sample states whose destinations are outside the sample: 9.6%. Next, we assume that the share of within-firm transitions is the same for between-state transitions to out-of-sample states as for other in-sample states: 26.8%.[13]. Multiply these two shares, we estimate that 2.6% of all job transitions involve within-firm transitions to an out-of-sample state. Multiplying this by the job transition rate (17.7%) and adding to our previous totals suggests that 2.24% of multi-SEIN workers switch establishments

[13]Note that since any within-firm transition across states requires a SEIN change, both the numerator and denominator of the latter share are fully observed

within their firms each year. Since the multi-SEIN and multi-unit-single-SEIN populations account for 56.8% and 6.6% of U.S. workers, respectively, this implies an annual within-firm transition rate of 1.4% among all U.S. workers in our sample states, and that 7.8% of all establishment transitions occur within the same firm. Since our sample states are scattered throughout the U.S., we assume that these rates would also hold among workers initially in the out-of-sample states, so that as many as 2.3 million workers switch establishments within their firm in each year.

Finally, because SEIN transition rates vary so strongly with firm size, we perform the same set of adjustments separately by firm size category. The adjustments are trivial for workers at the smallest firms, but are substantial for workers at the largest firms. We find that within-firm establishment transition rates are 2.9% among the 27.5% of workers at firms with over 5,000 employees, and are 1.5% among the 10.5% of workers at 1001-5000 employee firms. Establishment transitions within firms account for 18.2% and 7.7% of all employment location changes among these categories of workers, respectively, and 33.8% and 13.2% of employment location changes crossing state lines. Thus, this exercise reinforces the finding that internal labor markets within large firms are driving a large share of the establishment mobility observed in publicly reported statistics for nearly a third of the workforce, particularly among long distance transitions.

7 Conclusion

This paper analyzes an overlooked but important aspect of U.S. labor markets: changes in workers' primary establishments within firms. We provide novel measurements showing that at least 0.8% and likely around 1.4 % of U.S. workers switch establishment locations within the same firm each year, accounting for 7.8% percent of all worker changes in employment location. We show that within-firm establishment transitions are far more likely than between-firm transitions to exhibit a long distance between origin and destination establishments, suggesting that sufficient value is created by reallocating workers to overcome mobility frictions that would preclude analogous transitions for firm-switchers. Nonetheless, remaining geographic mobility frictions are substantial enough to exploit by using variation among same-firm workers in their establishments' distribution of distances to other within-firm positions to estimate the effect of greater access to potential establishment-switching opportunities on earnings growth. We find that a worker at

the 90th percentile of our proximity- based measure of access can expect to earn about 2% more per-year over five years relative to a 10th percentile worker with the same base year pay.

The fact that firms are generally paying a premium to facilitate worker reallocations suggests that increased firm productivity or lower recruiting costs rather than worker preferences likely accounts for most of the underlying surplus created by such transitions. We show that establishment mobility is concentrated among early- to mid-career workers with higher initial pay and among large and higher-paying firms, and that these types of workers and firms also exhibit stronger earnings growth responses to greater access to potential establishment switching opportunities.

These findings are consistent with models suggesting that high skill workers and high productivity firms face greater returns to finding optimal matches (e.g. Teulings and Gautier (2004)). However, further research is necessary to determine whether the gains from establishment reallocation of such workers are driven by high payoffs to efficient allocation of firm-specific human capital or instead by high payoffs to avoiding recruiting costs for hard-to-fill positions. In particular, additional insight might be gleaned using data that reports workers' titles or tasks performed before and after establishment transitions to analyze whether workers' past experience is being better leveraged at new positions.

Finally, analysis of the interplay between establishment mobility and increased use of remote work is a particularly compelling extension of this paper's research. Remote work dramatically reduces costs of re-allocating workers when their most desired or highest productivity task changes, which may increase the value of working at a large firm that operates many teams with many projects in many markets. At the same time, such remote work makes recorded assignments to physical establishment locations less reliable (to the extent such physical locations exist at all). This may undermine researchers' ability to detect such mobility across tasks, teams, and markets in large-scale administrative data.

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8 Tables and Figures

Table 1: SEIN and Firm Mobility Rates and Distance Distributions among Workers Classified by Scope for Between Establishment Mobility

		Overall	Multi-Unit	Multi-SEIN	SUMS	MUMS
			Population			
Worker Share	Total	1	0.635	0.568	0.246	0.322
Share by Distance	0-10		12.7%	12.4%	8.2%	15.6%
	10-25		6.8%	6.6%	4.1%	8.5%
	25-50		5.2%	5.0%	3.3%	6.3%
	50-100		6.1%	6.0%	4.3%	7.3%
	100-500		22.6%	22.7%	22.9%	22.5%
	500+		46.7%	47.3%	57.2%	39.8%
			SEIN Mobility			
Rate	Total	0.008	0.012	0.014	0.013	0.014
Share by Distance	0-10			26.5%	27.3%	25.4%
	10-25			14.7%	13.3%	15.5%
	25-50			8.8%	7.0%	9.9%
	50-100			8.1%	6.3%	9.9%
	100-500			21.3%	21.9%	21.1%
	500+			20.6%	24.2%	18.3%
			Firm Mobility			
Rate	Total	0.125	0.127	0.128	0.137	0.121
Share by Distance	0-10	35.4%	32.3%	32.3%	36.0%	28.1%
	10-25	22.0%	22.0%	22.0%	21.6%	22.3%
	25-50	11.8%	11.8%	11.8%	10.1%	13.2%
	50-100	9.4%	10.2%	10.2%	7.9%	13.2%
	100-500	15.7%	18.1%	18.1%	18.0%	18.2%
	500+	5.5%	5.5%	5.5%	6.5%	5.0%

Source: LEHD 2014 snapshot.
Notes: "Worker Share": Share of all worker-year observations in the baseline sample whose primary firm belongs to the subpopulation defined by the column-label. "SEIN Mobility Rate": Share of worker-years in which the worker transitions to a different primary SEIN within the same firm by the following year. "Firm Mobility Rate": Share of worker-years in which the worker transitions to a different primary firm by the following year. "Multi-Unit" and "Multi-SEIN": Set of workers whose firms feature multiple establishments (units) and SEINs (State Employer Identification Numbers), respectively. "SUMS": Set of workers in multi-SEIN firms who are in the sole establishment within their SEIN. "MUMS": Set of workers in multi-SEIN firms with multiple establishments within their SEIN. "Share of Other-Establishment Employment by Distance Bin": Average share of employment at other within-firm establishments at the same firm whose distance from the worker's own establishment falls into the row's distance bin within the column's subpopulation. "Share of SEIN Transitions by Distance Bin": Share of all within-firm SEIN transitions within the column's subpopulation whose distance between the worker's baseline and new establishment falls into the row's distance bin . "Share of Firm Transitions by Distance Bin": Share of all transitions between primary firms within the column's subpopulation whose distance between the worker's baseline and new establishment falls into the row's distance bin.

Table 2: Heterogeneity in Scope for and Frequency of SEIN Mobility within Firms across Worker and Firm Subpopulations

	Firm Characteristics					Worker Characteristics				
	Firm Size					Earnings				
	1-100	**101-500**	**501-1K**	**1K-5K**	**>5K**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Full Sample Share	0.376	0.176	0.068	0.105	0.275	0.20	0.20	0.20	0.20	0.20
Prob(Multi-SEIN)	0.105	0.439	0.676	0.841	0.946	0.442	0.481	0.531	0.601	0.697
SEIN Mobility-Cond.	0.011	0.007	0.008	0.010	0.018	0.010	0.011	0.012	0.014	0.019
SEIN Mobility-All	0.001	0.003	0.005	0.009	0.017	0.004	0.005	0.006	0.008	0.013
	Firm Average Pay					**Tenure**				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Hires**	**1-2 yrs**	**3-5 yrs**	**>5 yrs**	
Full Sample Share	0.20	0.20	0.20	0.20	0.20	0.243	0.109	0.219	0.429	
Prob(Multi-SEIN)	0.386	0.464	0.539	0.644	0.783	0.570	0.569	0.584	0.562	
SEIN Mobility-Cond.	0.015	0.013	0.012	0.012	0.018	0.013	0.015	0.015	0.013	
SEIN Mobility-All	0.006	0.006	0.006	0.008	0.014	0.008	0.009	0.009	0.007	
	Industry					**Age**				**Sex**
	Min.	**Const.**	**Manuf.**	**Trade & Trans.**	**Infor.**	**< 30**	**30-39**	**40-54**	**55 +**	**M**	**F**
Full Sample Share	0.008	0.046	0.087	0.211	0.026	0.261	0.230	0.343	0.166	0.474	0.526
Prob(Multi-SEIN)	0.573	0.260	0.709	0.648	0.846	0.569	0.588	0.575	0.504	0.563	0.577
SEIN Mobility-Cond.	0.019	0.020	0.009	0.015	0.021	0.015	0.016	0.013	0.011	0.014	0.015
SEIN Mobility-All	0.011	0.005	0.006	0.010	0.018	0.009	0.009	0.008	0.006	0.008	0.008
	Industry (Cont)					**Race**				
	Fin. & Real Estate	**Prof. Bus. Serv.**	**Educ. & Health**	**Leis. & Hosp.**	**Other Serv.**	**White N-Hisp**	**White Hisp**	**Black**	**Asian/ Pac. Is**	**Other**
Full Sample Share	0.067	0.166	0.234	0.111	0.043	0.650	0.148	0.104	0.069	0.029
Prob(Multi-SEIN)	0.698	0.610	0.414	0.425	0.259	0.564	0.543	0.648	0.593	0.566
SEIN Mobility-Cond.	0.018	0.016	0.010	0.015	0.012	0.015	0.012	0.014	0.014	0.014
SEIN Mobility-All	0.013	0.010	0.004	0.007	0.003	0.008	0.006	0.009	0.009	0.008

Source: LEHD 2014 snapshot.

Notes: "Full Sample Share": Share of all worker-year observations from the baseline sample whofalls into the category defined by the column label. "Prob(Multi-SEIN)": Worker-year-weighted share of firms in the subpouplation defined by the column label who operate multiple SEINs. "SEIN Mobility-Cond.": Annual SEIN mobility rate among workers at multi-SEIN firms within the firm category defined by the column label. "SEIN Mobility-Cond.": Annual SEIN mobility rate among workers at any firm within the firm category defined by the column label (including those in single-SEIN firms not at risk of changing SEINs). "Tenure": Years since the worker was hired by their current firm. "Q1"-"Q5" = Quintiles of the relevant worker-year-weighted distribution (Worker Earnings or Firm-Average Pay). Supersector labels: "Min."- Natural Resources and Mining; "Const."- Construction; "Manuf."- Manufacturing; "Trade & Trans"- Retail/Wholesale Trade, Transportation, and Utilities; "Infor."- Information; Fin. & Real Eststate - Finance and Real Estate; "Prof. Bus. Serv."- Professional and Business Services; "Leis. & Hosp." - Leisure and Hospitality; "Other Serv." - Other Services. "N-Hisp"-Not Hispanic; "Hisp": Hispanic.

Table 3: Heterogeneity in the Distance Distribution of Employment at Other Establishments within the Firm across Worker and Firm Subpopulations

	Firm Heterogeneity					Worker Heterogeneity				
Distance Share	**Firm Size**					**Earnings**				
	1-100	**101-500**	**501-1K**	**1K-5K**	**>5K**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
500+ miles	0.431	0.344	0.366	0.435	0.533	0.431	0.435	0.437	0.462	0.523
100-500 miles	0.241	0.218	0.228	0.224	0.228	0.231	0.230	0.235	0.236	0.208
50-100 miles	0.069	0.081	0.075	0.060	0.053	0.070	0.066	0.064	0.062	0.052
25-50 miles	0.062	0.076	0.069	0.056	0.039	0.065	0.059	0.054	0.050	0.043
10-25 miles	0.082	0.101	0.097	0.074	0.050	0.081	0.074	0.070	0.064	0.061
0-10 miles	0.115	0.180	0.166	0.151	0.097	0.123	0.136	0.138	0.125	0.113
	Firm Average Pay					**Tenure**				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**0**	**1-2 yrs**	**3-5 yrs**	**>5 yrs**	
500+ miles	0.440	0.453	0.394	0.430	0.579	0.496	0.488	0.465	0.432	
100-500 miles	0.237	0.234	0.240	0.245	0.190	0.228	0.224	0.229	0.226	
50-100 miles	0.071	0.065	0.071	0.060	0.046	0.057	0.058	0.060	0.066	
25-50 miles	0.065	0.059	0.060	0.048	0.037	0.048	0.049	0.050	0.057	
10-25 miles	0.080	0.071	0.073	0.071	0.053	0.064	0.066	0.067	0.073	
0-10 miles	0.107	0.117	0.162	0.146	0.096	0.107	0.116	0.128	0.146	
	Industry					**Age**				**Sex**
	Min.	**Const.**	**Manuf.**	**Trade & Trans.**	**Infor.**	**< 30**	**30-39**	**40-54**	**55 +**	**F**	**M**
500+ miles	0.344	0.388	0.566	0.546	0.644	0.486	0.483	0.453	0.421	0.428	0.500
100-500 miles	0.373	0.344	0.236	0.238	0.191	0.224	0.223	0.230	0.228	0.212	0.238
50-100 miles	0.084	0.087	0.049	0.059	0.037	0.059	0.058	0.063	0.066	0.063	0.059
25-50 miles	0.057	0.061	0.038	0.045	0.028	0.050	0.049	0.053	0.058	0.057	0.047
10-25 miles	0.071	0.059	0.042	0.052	0.038	0.066	0.064	0.069	0.078	0.079	0.058
0-10 miles	0.071	0.061	0.068	0.061	0.062	0.115	0.123	0.132	0.148	0.161	0.097
	Industry (Cont)					**Race**				
	Fin. & Real Estate	**Prof. Bus. Serv.**	**Educ. & Health**	**Leis. & Hosp.**	**Other Serv.**	**White**		**Black**	**Asian/ Pac. Is**	**Other**
						N-Hisp	**Hisp**			
500+ miles	0.516	0.589	0.159	0.404	0.452	0.458	0.499	0.446	0.524	0.486
100-500 miles	0.210	0.211	0.194	0.199	0.201	0.235	0.221	0.211	0.175	0.223
50-100 miles	0.052	0.049	0.081	0.064	0.056	0.065	0.051	0.054	0.046	0.058
25-50 miles	0.042	0.039	0.087	0.065	0.057	0.053	0.048	0.052	0.044	0.049
10-25 miles	0.064	0.051	0.133	0.086	0.089	0.066	0.066	0.082	0.070	0.064
0-10 miles	0.114	0.061	0.346	0.183	0.146	0.123	0.115	0.155	0.141	0.120

Source: LEHD 2014 snapshot.

Notes: Each entry in the table provides the mean share of employment at the worker's firm (excluding employment at the worker's own establishment) that is concentrated at establishments whose distance from the worker's establishment falls within the distance bin defined by the row label among all worker-year observations in the subpopulation defined by the category of the worker or firm characteristic in the column label. See Table 2 for full names of the abbreviated column labels for characteristic categories.

Table 4: Effects on Average Percent Change in Earnings and SEIN Transition Rates of Greater Distance-Based Access to Opportunities for Between-Establishment Mobility over Various Time Windows

	Mean %Δ(Earnings)			𝕀(SEIN Transition)			
Distance Share	**3 yrs**	**5 yrs**	**7 yrs**	**1 yr**	**3 yrs**	**5 yrs**	**7 yrs**
500+ miles	–	–	–	–	–	–	–
(s.d.= 0.381)							
100-500 miles	0.003†	0.006°	0.007°	0.010‡	0.018‡	0.021‡	0.025‡
(s.d.= 0.270)	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.004)
50-100 miles	0.005°	0.010‡	0.009†	0.019‡	0.038‡	0.044‡	0.050‡
(s.d.= 0.150)	(0.002)	(0.003)	(0.004)	(0.002)	(0.004)	(0.005)	(0.006)
25-50 miles	0.008‡	0.015‡	0.020‡	0.029‡	0.059‡	0.071‡	0.080‡
(s.d.= 0.142)	(0.002)	(0.003)	(0.004)	(0.002)	(0.004)	(0.006)	(0.007)
10-25 miles	0.011‡	0.017‡	0.026‡	0.036‡	0.077‡	0.091‡	0.100‡
(s.d.= 0.150)	(0.002)	(0.003)	(0.004)	(0.002)	(0.005)	(0.006)	(0.007)
0-10 miles	0.017‡	0.027‡	0.036‡	0.039‡	0.083‡	0.100‡	0.109‡
(s.d.= 0.265)	(0.002)	(0.003)	(0.004)	(0.002)	(0.005)	(0.006)	(0.007)
Controls							
Demographics	X	X	X	X	X	X	X
Establish. Charact.	X	X	X	X	X	X	X
Firm-Year FE	X	X	X	X	X	X	X
Sector-State-Year FE	X	X	X	X	X	X	X
County-Year FE	X	X	X	X	X	X	X
Predicted Effects							
Pred. Eff. at $\bar{X}$	0.004	0.007	0.009	0.008	0.016	0.019	0.019
Pred. Eff. at $\bar{X}$/med(Y)	0.166	0.192	0.205				
Median Outcome	0.025	0.038	0.046	–	–	–	–
Mean Outcome	0.078	0.102	0.125	0.014	0.035	0.053	0.066
Obs.	43.1M	34.4M	26.6M	27.4M	24.8M	19.6M	15.0M
R-squared	0.3825	0.4108	0.4206	0.1148	0.1282	0.1303	0.1267

Source: LEHD 2014 snapshot.

Notes: The sample in a given column consists of all worker-years in which the worker is employed in a sample state in the base year and is observed with positive earnings at a firm in a sufficient share of the subsequent years within the outcome window given by the column label (next year for the 1 year outcome window, 2 of 3 years for the 3 year window, 3 of 5 years for the 5 year window, 5 of 7 years for the 7 year window. "Mean %Δ(Earnings)": Mean percent change in the worker's earnings across the years in the outcome window given by the column label relative to the baseline year. "𝕀(SEIN Transition)": An indicator for whether the worker changed primary SEIN affiliation within the same firm between the observation year and the subsequent year. Control categories: "Demographics"- Indicators for categories of race (5), ethnicity (2), gender (2), firm tenure (4), age (4), and worker baseline earnings (9); "Establish. Charact.": Indicators for establishment size (5) and average pay categories (5), midpoint growth rates over prior 3 years of establishment employment and average pay. "Firm-Year FE": indicator variables for each firm×year combination. "Sector-State-Year FE": Indicators for each combination of 4-digit NAICS code, U.S. State, and year. "County-Year FE": Indicators for each combination of county and year. The share of workers in establishments over 500 miles is the reference category. Clustered two-way standard errors by firm and work in parenthesis.

‡, †, and ° denote statistical significance at the 1%, 5%, and 10% levels.

Table 5: Percentiles of the Worker-Level Distributions of Predicted Contributions to 5-Year Earnings Growth and Annual SEIN Transition Rates of Access to Between-Establishment Mobility Opportunities

	Mean %Δ(Earnings)		𝕀(SEIN Transition)	
Percentile	**Overall**	**Within-Firm**	**Overall**	**Within-Firm**
0.10	0.000	-0.002	0.000	-0.007
0.20	0.001	-0.001	0.001	0.000
0.30	0.002	0.000	0.001	0.005
0.40	0.003	0.000	0.002	0.008
0.50	0.004	0.000	0.004	0.012
0.60	0.006	0.000	0.005	0.016
0.70	0.009	0.001	0.009	0.020
0.75	0.010	0.001	0.010	0.023
0.80	0.014	0.001	0.012	0.027
0.85	0.017	0.002	0.018	0.032
0.90	0.021	0.002	0.027	0.039
0.95	0.026	0.003	0.036	0.052

Source: LEHD 2014 snapshot.

Notes: Each entry in the column entitled "Mean %Δ(Earnings) - Overall" provides the percentile associated with the row label from the worker-level distribution of predicted contributions ($BEM\ Access_{it}\hat{\beta}$) to average 5-year earnings as a share of baseline-year earnings from the worker's access to between-establishment mobility (BEM) opportunities (as measured by distance bin shares of other-establishment employment within the firm), relative to a worker whose establishment is more than 500 miles away from all others in the same firm (whose contribution has been normalized to 0). The column "Mean %Δ(Earnings) - Within-firm" reports percentiles from an analogous distribution of predicted contributions from workers' BEM access relative to the mean BEM access contribution at the worker's firm. "𝕀(SEIN Transition) - Overall" and "𝕀(SEIN Transition) - Within-firm" report the analogous percentiles of the distributions of predicted contributions of BEM access to annual SEIN transition rates ($BEM\ Access_{it}^{X-SN}\hat{\beta}$).

Table 6: Assessing Endogeneity Threats to the Validity of Causal Effect Estimates of Distance-Based Access to Opportunities for Between Establishment Mobility on the Average Percent Change in Worker's Earnings Across the Following 5 Years

Distance Share	Alternative FEs		Alternative Controls			Placebos		
	Firm FE	Firm Charact.	Min.	Min. + Estab	Min.+ Inc. + Estab	Firm Switchers Placebo	Firm Switchers Baseline	Tract Placebo
500+ miles	–	–	–	–	–			
100-500 miles	0.004°	0.000	0.008‡	0.007‡	0.004	0.000	0.002	-0.001†
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.001)
50-100 miles	0.007†	0.001	0.012‡	0.011‡	0.006°	0.001	0.000	-0.002‡
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.001)
25-50 miles	0.013‡	-0.002	0.013‡	0.013‡	0.010†	-0.008	0.007	0.000
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.001)
10-25 miles	0.015‡	-0.003	0.007°	0.007°	0.010‡	-0.002	0.014‡	-0.002†
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.001)
0-10 miles	0.023‡	0.001	0.013‡	0.015‡	0.019‡	-0.011†	0.025‡	0.000
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.001)
Controls								
Demographics	X	X				X	X	X
Income	X	X			X	X	X	X
Establish. Charact.	X	X		X	X	X	X	X
Firm Charact.		X						
Firm FE	X							
Firm-Year FE			X	X	X	X	X	X
Sector-State-Year FE	X	X	X	X	X	X	X	X
County-Year FE	X	X	X	X	X	X	X	X
Obs.	34.4M	34.4M	34.4M	34.4M	34.4M	21.6M	34.4M	20.1M
R-squared	0.322	0.191	0.300	0.300	0.388	0.340	0.411	0.258

Source: LEHD 2014 snapshot.

Notes: Specification Labels: "Firm FE"- Replaces firm×year fixed effects with firm fixed effects; "Firm Charact."- Replaces firm×year fixed effects with indicators for firm size categories and for combinations of firm average pay category and firm trade status category (non-trader, arms-length importer only, arms-length exporter only, arms-length importer and exporter, related-party importer or exporter, related-party importer and exporter); "Min."- Minimal controls consisting of fixed effects as noted. "Min + Estab"- Minimal controls plus indicators for establishment size and average pay categories and midpoint growth rate over prior 3 years of establishment size and average pay. "Min + Inc. + Estab"- Minimal controls, establishment controls, and indicators for a worker's initial earnings decile. "Tract Placebo": a worker's actual within-firm employment shares by distance bin are replaced with those of another randomly chosen worker from a different multi-unit firm within the same census tract. "Firm Switchers Placebo": the outcome is the worker's average percent change in earnings over the previous 5 years relative to a baseline from 6 years ago, the worker's within-firm employment shares by distance bin are interacted with an indicator for whether the worker is a new hire at the firm, and the sample consists of workers who worked in both the current year and 6 years earlier and 3 of the 5 intervening years. "Firm Switchers Baseline": Same sample years and interactions with employment distance shares as the "Firm Switchers Placebo", but using the worker's forward-looking earnings as the outcome rather than their earnings growth at the previous firm. The share of workers in establishments over 500 miles away is the reference category. Clustered two-way standard errors by firm and work in parenthesis.

‡, †, and ° denote statistical significance at the 1%, 5%, and 10% levels.

Table 7: Exploring Alternative Measures of Distance-Based Access to Opportunities for Between Establishment Mobility

	Mean %△(Earnings)		𝕀(SEIN Transition)		Mean %△(Earnings)		𝕀(SEIN Transition)
Distance	**Log-Level**	**Both**	**Log-Level**	**Both**	**Worker Exposure**	**Establish. Exposure**	**Establish. Exposure**
Log(Count)							
500+ miles	7.66e-5	-0.0002	0.0005‡	0.0004°			
	(0.0002)	(0.0003)	(0.0002)	(0.0002)			
100-500 miles	0.0002	0.0002	0.0003†	0.0003			
	(0.0002)	(0.0002)	(0.0001)	(0.0001)			
50-100 miles	0.0002	5.15e-5	0.0006‡	0.0005‡			
	(0.0001)	(0.0001)	(0.0001)	(0.0001)			
25-50 miles	0.0003†	0.0003	0.0011‡	0.0009‡			
	(0.0001)	(0.0001)	(0.0001)	(0.0001)			
10-25 miles	0.0010‡	0.0007‡	0.0014‡	0.00012‡			
	(0.0001)	(0.0001)	(0.0001)	(0.0001)			
0-10 miles	-0.0006	8.18e-5	7.88e-5	0.0008			
	(0.0004)	(0.0003)	(0.0004)	(0.0008)			
Shares							
500+ miles		–		–	–	–	–
100-500 miles		0.006°		0.005°	0.006‡	0.003	0.011‡
		(0.003)		(0.003)	(0.002)	(0.002)	(0.003)
50-100 miles		0.006		0.011‡	0.007†	0.007°	0.020‡
		(0.003)		(0.003)	(0.002)	(0.003)	(0.003)
25-50 miles		0.012†		0.015‡	0.013‡	0.015‡	0.030‡
		(0.004)		(0.003)	(0.002)	(0.004)	(0.003)
10-25 miles		0.011†		0.018‡	0.015‡	0.016‡	0.038‡
		(0.004)		(0.003)	(0.002)	(0.003)	(0.004)
0-10 miles		0.017‡		0.019‡	0.020‡	0.028‡	0.038‡
		(0.004)		(0.003)	(0.003)	(0.004)	(0.003)
Controls							
Baseline Controls	X	X	X	X	X	X	X
Baseline FEs	X	X	X	X	X	X	X
Obs.	34.4M	34.4M	27.4M	27.4M	34.4M	34.4M	27.4M
R-squared	0.411	0.411	0.115	0.115	0.411	0.411	0.114

Source: LEHD 2014 snapshot.

Notes: See Table 1 notes for outcome definitions. Column Specifications: "Log-Level"- Measures access to between-establishment mobility (BEM) opportunities via the logarithm of the count of employees at other establishments (in any of the firm's SEIN for the earnings outcome, in other SEINs within the firm for the SEIN mobility outcome) within each of the distance bins defined by row labels (relative to the worker's own establishment); "Both"- Includes both the share of workers and the log count of workers at other establishments within each distance bin as measures of access to BEM opportunities. "Worker Exposure"- Restricts the shares of other-establishment workers in each distance bin to be calculated only among workers in an earnings decile at least as high as the worker's own. "Establish. Exposure"- Replace the share of other-establishment employment in each distance bin with the share of other establishments within each distance bin. "Baseline Controls" and "Baseline FEs": See Table 1 notes. Clustered two-way standard errors by firm and work in parenthesis.

‡, †, and ° denote statistical significance at the 1%, 5%, and 10% levels.

Table 8: Heterogeneity across Firm Subpopulations in the Effects of Distance-Based Access to Opportunities for Between Establishment Mobility on Workers' Earnings over the Following 5 Years

	Mean %Δ(Earnings)									
Distance	**Firm Size**					**Firm Average Pay**				
(mi.)	**1-100**	**101-500**	**501-1K**	**1K-5K**	**>5K**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
100-500	-0.004	0.000	0.007	0.007†	0.007°	0.000	0.001	0.004	0.010‡	0.010°
	(0.0060)	(0.0030)	(0.0036)	(0.0026)	(0.0033)	(0.0042)	(0.0036)	(0.0033)	(0.0029)	(0.0038)
50-100	-0.001	-0.001	0.010	0.010°	0.012°	-0.001	-0.003	0.010°	0.020‡	0.015°
	(0.0091)	(0.0042)	(0.0052)	(0.0041)	(0.0049)	(0.0063)	(0.0057)	(0.0042)	(0.0045)	(0.0065)
25-50	0.016	0.001	0.014°	0.016‡	0.018†	0.007	0.012°	0.011°	0.025‡	0.018°
	(0.0097)	(0.0043)	(0.0054)	(0.0042)	(0.0057)	(0.0064)	(0.0052)	(0.0048)	(0.0055)	(0.0071)
10-25	0.012	0.001	0.016†	0.021‡	0.019‡	0.012	0.022‡	0.015‡	0.023‡	0.011
	(0.0094)	(0.0041)	(0.0051)	(0.0040)	(0.0051)	(0.0063)	(0.0050)	(0.0046)	(0.0046)	(0.0057)
0-10	0.022°	0.005	0.022‡	0.027‡	0.035‡	0.008	0.027‡	0.031‡	0.034‡	0.027‡
	(0.0093)	(0.0039)	(0.0048)	(0.0041)	(0.0056)	(0.0060)	(0.0061)	(0.0050)	(0.0044)	(0.0067)
Predicted Effects										
Pred. Eff. at $\bar{X}$	0.003	0.001	0.008	0.009	0.007	0.002	0.006	0.008	0.011	0.006
Mean	0.106	0.090	0.093	0.092	0.109	0.167	0.103	0.079	0.077	0.096
Median	0.029	0.034	0.037	0.038	0.047	0.058	0.033	0.027	0.033	0.048

	Industry									
Distance (mi.)	**Min.**	**Const.**	**Manuf.**	**Trade & Trans.**	**Infor.**	**Fin. & Real Estate**	**Prof. Bus. Serv.**	**Educ. & Health**	**Leis. & Hosp.**	**Other Serv.**
100-500	-0.025°	0.006	0.006	0.003	0.016	0.015°	0.009°	0.000	-0.003	0.033‡
	(0.0122)	(0.0065)	(0.0043)	(0.0033)	(0.0089)	(0.0061)	(0.0037)	(0.0065)	(0.0072)	(0.0090)
50-100	-0.023	0.036‡	0.011	0.014°	0.014	0.007	0.004	0.007	-0.017	0.045†
	(0.0251)	(0.0105)	(0.0070)	(0.0054)	(0.0117)	(0.0092)	(0.0059)	(0.0070)	(0.0122)	(0.0155)
25-50	-0.016	0.021	0.026‡	0.014°	0.018	0.027†	0.011	0.006	0.006	0.045†
	(0.0189)	(0.0122)	(0.0062)	(0.0055)	(0.0242)	(0.0097)	(0.0063)	(0.0071)	(0.0105)	(0.0167)
10-25	-0.056°	-0.002	0.032‡	0.022‡	0.022	0.030‡	0.010	0.006	0.007	0.042°
	(0.0234)	(0.0142)	(0.0065)	(0.0053)	(0.0126)	(0.0087)	(0.0065)	(0.0076)	(0.0089)	(0.0180)
0-10	-0.004	0.009	0.035‡	0.030‡	0.048‡	0.035‡	0.018†	0.019°	0.021	0.039°
	(0.0185)	(0.0108)	(0.0060)	(0.0055)	(0.0136)	(0.0106)	(0.0061)	(0.0078)	(0.0122)	(0.0156)
Predicted Effects										
Pred. Eff. at $\bar{X}$	-0.016	0.007	0.007	0.005	0.008	0.011	0.004	0.008	0.003	0.021
Mean	0.132	0.085	0.048	0.104	0.092	0.113	0.129	0.110	0.154	0.102
Median	0.067	0.018	0.017	0.033	0.037	0.052	0.057	0.044	0.048	0.032

Source: LEHD 2014 snapshot.

Notes: The coefficients reported in this table are interactions between shares of other-establishment employment within the firm that fall into the distance bin given by the row label and indicators for the firm subpopulation defined by the characteristic category in the column label. The outcome is the average percent change in a worker's earnings across the subsequent five years relative to the baseline year. Interactions featuring all the characteristic categories in a given panel are included in the same regression, but different panels featuring different characteristics represent different regressions. See the Table 2 notes for definitions of the categories defined by the column labels. Clustered two-way standard errors by firm and work in parenthesis.

‡, †, and ° denote statistical significance at the 1%, 5%, and 10% levels.

Table 9: Heterogeneity across Firm Subpopulations in the Effects of Distance-Based Access to Opportunities for Between Establishment Mobility on Workers' Annual SEIN Transition Rates

	𝕀(SEIN Transition)									
Distance	**Firm Size**					**Firm Average Pay**				
(mi.)	**1-100**	**101-500**	**501-1K**	**1K-5K**	**>5K**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
100-500	0.007‡	0.006‡	0.006‡	0.007‡	0.013‡	0.012‡	0.017†	0.006†	0.005°	0.010‡
	(0.0015)	(0.0009)	(0.0011)	(0.0010)	(0.0026)	(0.0021)	(0.0056)	(0.0022)	(0.0021)	(0.0019)
50-100	0.009‡	0.010‡	0.009‡	0.013‡	0.027‡	0.018‡	0.022†	0.015‡	0.014‡	0.024‡
	(0.0026)	(0.0012)	(0.0014)	(0.0015)	(0.0035)	(0.0025)	(0.0068)	(0.0032)	(0.0033)	(0.0035)
25-50	0.020‡	0.014‡	0.015‡	0.022‡	0.038‡	0.027‡	0.031‡	0.021‡	0.023‡	0.038‡
	(0.0035)	(0.0015)	(0.0020)	(0.0018)	(0.0040)	(0.0031)	(0.0072)	(0.0038)	(0.0043)	(0.0039)
10-25	0.025‡	0.020‡	0.019‡	0.027‡	0.047‡	0.033‡	0.036‡	0.026‡	0.029‡	0.049‡
	(0.0038)	(0.0017)	(0.0022)	(0.0018)	(0.0045)	(0.0031)	(0.0066)	(0.0042)	(0.0039)	(0.0056)
0-10	0.031‡	0.020‡	0.021‡	0.029‡	0.050‡	0.035‡	0.034‡	0.029‡	0.033‡	0.056‡
	(0.0040)	(0.0017)	(0.0020)	(0.0021)	(0.0040)	(0.0031)	(0.0057)	(0.0040)	(0.0039)	(0.0047)
Predicted Effects										
Pred. Eff. at $\bar{X}$	0.009	0.009	0.008	0.010	0.013	0.012	0.014	0.010	0.010	0.012
Mean	0.001	0.003	0.005	0.009	0.017	0.006	0.006	0.006	0.008	0.014
	Industry									
Distance	**Min.**	**Const.**	**Manuf.**	**Trade & Trans.**	**Infor.**	**Fin. & Real Estate**	**Prof. Bus. Serv.**	**Educ. & Health**	**Leis. & Hosp.**	**Other Serv.**
(mi.)										
100-500	0.015	0.002	0.006†	0.016‡	0.005	0.011‡	0.010‡	-0.001	0.007	0.008
	(0.0084)	(0.0039)	(0.0018)	(0.0032)	(0.0032)	(0.0025)	(0.0022)	(0.0059)	(0.0033)	(0.0042)
50-100	0.006	-0.003	0.017‡	0.023‡	0.018°	0.027‡	0.023‡	0.006	0.012‡	0.011°
	(0.0109)	(0.0056)	(0.0028)	(0.0037)	(0.0077)	(0.0042)	(0.0042)	(0.0076)	(0.0036)	(0.0051)
25-50	0.015	0.013	0.025‡	0.031‡	0.056‡	0.042‡	0.029‡	0.011	0.024‡	0.020°
	(0.0103)	(0.0076)	(0.0035)	(0.0045)	(0.0124)	(0.0065)	(0.0036)	(0.0071)	(0.0047)	(0.0086)
10-25	0.035°	0.033†	0.042‡	0.036‡	0.080‡	0.042‡	0.038‡	0.019†	0.025‡	0.024†
	(0.0140)	(0.0113)	(0.0066)	(0.0047)	(0.0223)	(0.0058)	(0.0044)	(0.0071)	(0.0038)	(0.0074)
0-10	0.040°	0.015°	0.048‡	0.042‡	0.065‡	0.046‡	0.044‡	0.022‡	0.022‡	0.017†
	(0.0157)	(0.0075)	(0.0061)	(0.0044)	(0.0108)	(0.0055)	(0.0050)	(0.0065)	(0.0040)	(0.0062)
Predicted Effects										
Pred. Eff. at $\bar{X}$	0.012	0.004	0.008	0.011	0.010	0.013	0.009	0.011	0.010	0.008
Mean	0.011	0.005	0.006	0.010	0.018	0.013	0.010	0.004	0.007	0.003

Source: LEHD 2014 snapshot.

Notes: The coefficients reported in this table are interactions between shares of other-establishment employment within the firm that fall into the distance bin given by the row label and indicators for the firm subpopulation defined by the characteristic category in the column label. The outcome is an indicator for whether the worker changed its primary SEIN within the same firm between the baseline and subsequent year. Interactions featuring all the characteristic categories in a given panel are included in the same regression, but different panels featuring different characteristics represent different regressions. See the Table 2 notes for definitions of the categories defined by the column labels. Clustered two-way standard errors by firm and work in parenthesis.

‡, †, and ° denote statistical significance at the 1%, 5%, and 10% levels.

Table 10: Heterogeneity across Worker Subpopulations in the Effects of Distance-Based Access to Opportunities for Between Establishment Mobility on the Average Percent Change in Workers' Earnings Across the Following 5 Years

	Mean %Δ(Earnings)									
	Earnings					Race				
Distance	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**White**		**Black**	**Asian/**	**Other**
(mi.)						**N-Hisp**	**Hisp**		**Pac. Is**	
100-500	-0.026†	-0.004	0.008†	0.009†	0.012‡	0.007‡	-0.002	0.008	0.003	0.009
	(0.0087)	(0.0038)	(0.0027)	(0.0028)	(0.0034)	(0.0020)	(0.0038)	(0.0043)	(0.0069)	(0.0061)
50-100	-0.041‡	-0.011°	0.016‡	0.016‡	0.021‡	0.012‡	-0.001	0.012	0.007	0.009
	(0.0117)	(0.0053)	(0.0035)	(0.0040)	(0.0054)	(0.0029)	(0.0061)	(0.0063)	(0.0108)	(0.0098)
25-50	-0.037†	0.001	0.017‡	0.020‡	0.028‡	0.017‡	-0.001	0.023‡	0.019	0.018
	(0.0118)	(0.0053)	(0.0038)	(0.0044)	(0.0069)	(0.0032)	(0.0058)	(0.0070)	(0.0108)	(0.0111)
10-25	-0.031°	0.005	0.021‡	0.019‡	0.026‡	0.020‡	0.004	0.016°	0.018°	0.007
	(0.0122)	(0.0053)	(0.0036)	(0.0043)	(0.0052)	(0.0031)	(0.0050)	(0.0063)	(0.0092)	(0.0102)
0-10	-0.035†	0.015°	0.024‡	0.039‡	0.037‡	0.033‡	0.013°	0.011	0.030‡	0.027†
	(0.0135)	(0.0060)	(0.0035)	(0.0047)	(0.0061)	(0.0033)	(0.0056)	(0.0064)	(0.0085)	(0.0094)
Predicted Effects										
Pred. Eff. at $\bar{X}$	-0.018	0.001	0.008	0.010	0.010	0.009	0.001	0.006	0.007	0.007
Mean	0.446	0.155	0.062	0.041	0.037	0.100	0.099	0.091	0.138	0.114
Median	0.268	0.069	0.025	0.017	0.019	0.037	0.037	0.034	0.055	0.044

Distance	**Age**				**Sex**		**Tenure**			
(mi.)	**< 30**	**30-39**	**40-54**	**55 +**	**M**	**F**	**0**	**1-2 yrs**	**3-5 yrs**	**>5 yrs**
100-500	0.010†	0.008†	0.005°	-0.007	0.005°	0.007†	0.005	0.007†	0.007†	0.005
	(0.0034)	(0.0026)	(0.0023)	(0.0038)	(0.0025)	(0.0022)	(0.0030)	(0.0025)	(0.0027)	(0.0033)
50-100	0.013†	0.012†	0.007°	0.003	0.011†	0.009†	0.003	0.009°	0.010†	0.014‡
	(0.0052)	(0.0040)	(0.0033)	(0.0057)	(0.0033)	(0.0034)	(0.0045)	(0.0039)	(0.0039)	(0.0044)
25-50	0.019‡	0.021‡	0.013‡	-0.005	0.019‡	0.012†	0.011°	0.014‡	0.020‡	0.016‡
	(0.0052)	(0.0041)	(0.0037)	(0.0060)	(0.0035)	(0.0037)	(0.0049)	(0.0041)	(0.0045)	(0.0049)
10-25	0.014†	0.020‡	0.018‡	0.011°	0.022‡	0.012‡	0.012†	0.015‡	0.022‡	0.019‡
	(0.0050)	(0.0040)	(0.0034)	(0.0052)	(0.0033)	(0.0034)	(0.0044)	(0.0039)	(0.0041)	(0.0043)
0-10	0.032‡	0.032‡	0.023‡	0.017†	0.028‡	0.028‡	0.021‡	0.029‡	0.031‡	0.027‡
	(0.0058)	(0.0041)	(0.0034)	(0.0056)	(0.0033)	(0.0039)	(0.0046)	(0.0045)	(0.0043)	(0.0043)
Predicted Effects										
Pred. Eff. at $\bar{X}$	0.009	0.009	0.006	0.002	0.006	0.009	0.005	0.007	0.009	0.008
Mean	0.224	0.099	0.047	-0.006	0.100	0.104	0.161	0.151	0.087	0.032
Median	0.124	0.046	0.015	-0.016	0.041	0.035	0.071	0.070	0.036	0.010

Source: LEHD 2014 snapshot.

Notes: The coefficients reported in this table are interactions between shares of other-establishment employment within the firm that fall into the distance bin given by the row label and indicators for the worker subpopulation defined by the characteristic category in the column label. The outcome is the average percent change in a worker's earnings across the subsequent five years relative to the baseline year. Interactions featuring all the characteristic categories in a given panel are included in the same regression, but different panels featuring different characteristics represent different regressions. See the Table 2 notes for definitions of the categories defined by the column labels. Clustered two-way standard errors by firm and work in parenthesis.

‡, †, and ° denote statistical significance at the 1%, 5%, and 10% levels.

Table 11: Heterogeneity across Worker Subpopulations in the Effects of Distance-Based Access to Opportunities for Between Establishment Mobility on Workers' Annual SEIN Transition Rates

	𝕀(**SEIN Transition**)									
	Earnings					**Race**				
Distance	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**White**		**Black**	**Asian/**	**Other**
(mi.)						**N-Hisp**	**Hisp**		**Pac. Is**	
100-500	0.011‡	0.010‡	0.008‡	0.009‡	0.011‡	0.010‡	0.009‡	0.010‡	0.016‡	0.011‡
	(0.0023)	(0.0020)	(0.0016)	(0.0014)	(0.0015)	(0.0012)	(0.0020)	(0.0021)	(0.0034)	(0.0019)
50-100	0.017‡	0.017‡	0.017‡	0.019‡	0.021‡	0.020‡	0.017‡	0.017‡	0.025‡	0.014‡
	(0.0027)	(0.0023)	(0.0022)	(0.0022)	(0.0026)	(0.0016)	(0.0028)	(0.0031)	(0.0044)	(0.0027)
25-50	0.021‡	0.022‡	0.027‡	0.028‡	0.037‡	0.028‡	0.027‡	0.034‡	0.039‡	0.023‡
	(0.0030)	(0.0026)	(0.0025)	(0.0026)	(0.0032)	(0.0019)	(0.0033)	(0.0034)	(0.0054)	(0.0032)
10-25	0.025‡	0.028‡	0.032‡	0.036‡	0.046‡	0.035‡	0.033‡	0.040‡	0.046‡	0.029‡
	(0.0029)	(0.0026)	(0.0026)	(0.0026)	(0.0046)	(0.0022)	(0.0033)	(0.0037)	(0.0059)	(0.0035)
0-10	0.027‡	0.031‡	0.033‡	0.040‡	0.050‡	0.039‡	0.033‡	0.040‡	0.050‡	0.033‡
	(0.0027)	(0.0025)	(0.0024)	(0.0026)	(0.0040)	(0.0022)	(0.0030)	(0.0034)	(0.0066)	(0.0033)
Predicted Effects										
Pred. Eff. at $\bar{X}$	0.010	0.011	0.011	0.012	0.013	0.012	0.010	0.014	0.016	0.010
Mean	0.004	0.005	0.006	0.008	0.013	0.008	0.006	0.009	0.009	0.008

	Age				**Sex**		**Tenure**			
	< 30	**30-39**	**40-54**	**55 +**	**M**	**F**	**0**	**1-2 yrs**	**3-5 yrs**	**>5 yrs**
100-500	0.012‡	0.010‡	0.010‡	0.008‡	0.011‡	0.010‡	0.011‡	0.010‡	0.011‡	0.008‡
	(0.0015)	(0.0014)	(0.0014)	(0.0015)	(0.0019)	(0.0011)	(0.0015)	(0.0013)	(0.0026)	(0.0018)
50-100	0.019‡	0.021‡	0.020‡	0.016‡	0.021‡	0.018‡	0.019‡	0.018‡	0.022‡	0.018‡
	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0024)	(0.0016)	(0.0021)	(0.0020)	(0.0031)	(0.0023)
25-50	0.028‡	0.034‡	0.029‡	0.020‡	0.031‡	0.027‡	0.030‡	0.029‡	0.031‡	0.026‡
	(0.0023)	(0.0024)	(0.0023)	(0.0023)	(0.0027)	(0.0019)	(0.0024)	(0.0022)	(0.0032)	(0.0029)
10-25	0.036‡	0.043‡	0.036‡	0.024‡	0.038‡	0.035‡	0.038‡	0.039‡	0.037‡	0.031‡
	(0.0025)	(0.0027)	(0.0026)	(0.0023)	(0.0028)	(0.0023)	(0.0032)	(0.0027)	(0.0030)	(0.0031)
0-10	0.040‡	0.045‡	0.038‡	0.027‡	0.040‡	0.038‡	0.041‡	0.040‡	0.039‡	0.036‡
	(0.0024)	(0.0026)	(0.0025)	(0.0024)	(0.0025)	(0.0024)	(0.0032)	(0.0025)	(0.0030)	(0.0035)
Predicted Effects										
Pred. Eff. at $\bar{X}$	0.012	0.013	0.012	0.010	0.010	0.015	0.012	0.012	0.013	0.012
Mean	0.009	0.009	0.008	0.006	0.008	0.008	0.008	0.009	0.009	0.007

Source: LEHD 2014 snapshot.

Notes: The coefficients reported in this table are interactions between shares of other-establishment employment within the firm that fall into the distance bin given by the row label and indicators for the worker subpopulation defined by the characteristic category in the column label. The outcome is an indicator for whether the worker changed its primary SEIN within the same firm between the baseline and subsequent year. Interactions featuring all the characteristic categories in a given panel are included in the same regression, but different panels featuring different characteristics represent different regressions. See the Table 2 notes for definitions of the categories defined by the column labels. Clustered two-way standard errors by firm and work in parenthesis.

‡, †, and ° denote statistical significance at the 1%, 5%, and 10% levels.

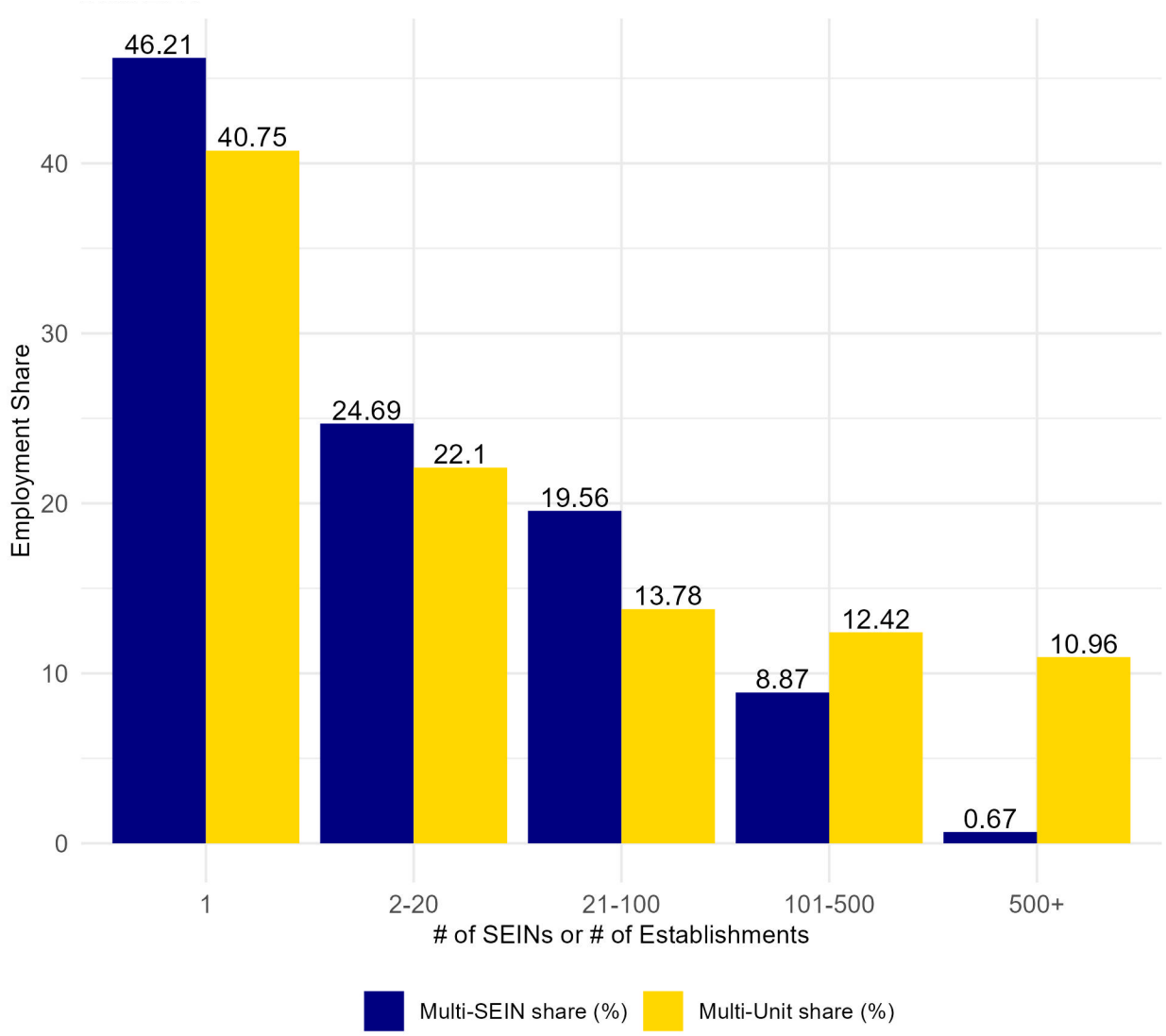
Table 12: Estimates of the Annual Rate of Establishment Mobility within Firms, Overall and by Initial Firm Size Category

SEIN Mobility	Overall	Firm Size				
		1-100	101-500	501-1K	1K-5K	>5K
Observed	1.362%	0.848%	0.682%	0.770%	0.994%	1.773%
Controls adjustment						
Employment distance shares	+0.165%	+0.007%	+0.052%	+0.097%	+0.152%	+0.220%
Employment size bins	+0.109%	+0.000%	+0.080%	+0.121%	+0.149%	+0.111%
Firm-Year FE adjustment						
Employment size bins	+0.035%	+0.000%	+0.004%	+0.012%	+0.029%	+0.050%
In-SEIN employment	+0.141%	+0.000%	+0.005%	+0.021%	+0.072%	+0.226%
Out-of-Sample adjustment						
State transitions	+0.426%	+0.022%	+0.090%	+0.158%	+0.253 %	+0.534%
Adjusted Estimate						
Multi-SEIN Firms	2.237%	0.876%	0.913%	1.179%	1.650%	2.913%
Multi-Unit-Single-SEIN Firms	1.591%	0.658%	1.144%	1.487%	1.894%	2.852%
All Multi-Unit Firms	2.169%	0.829%	0.976%	1.237%	1.670%	2.911%
All Firms	1.378%	0.110%	0.588%	1.031%	1.534%	2.882%
Movers	7.755%	0.436%	2.728%	5.177%	7.700%	18.184%
State Movers	26.855%	1.878%	5.617%	8.389%	13.21%	33.78%

Source: LEHD 2014 snapshot.

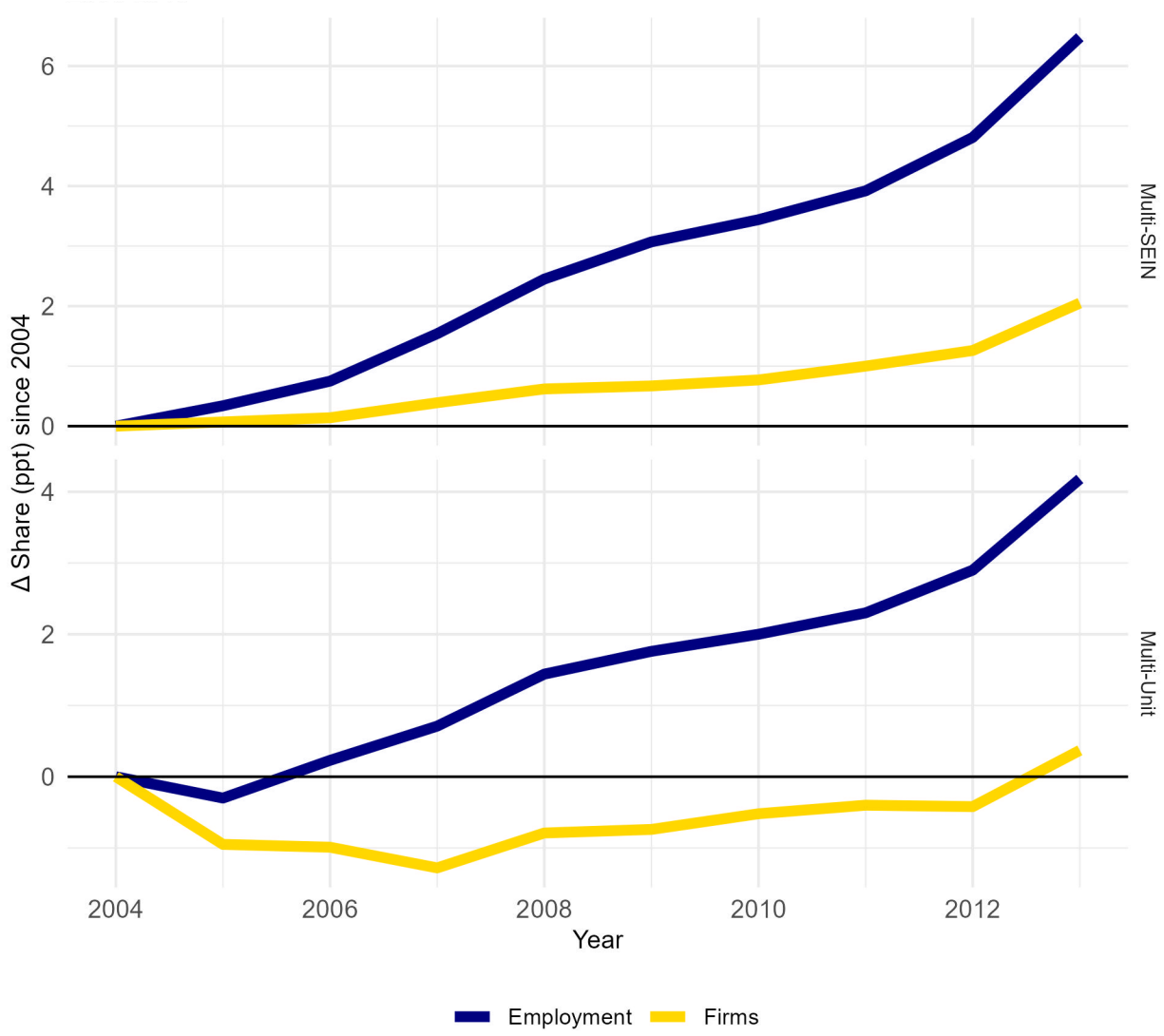
Notes: Each row in the top panel captures the increase in predicted within-firm establishment mobility rate from a different adjustment to the prediction methodology. See sections 6 and A.1 for details about each adjustment. "Controls adjustment - Employment distance shares": uses employment at all other establishments rather than only at establishments in other SEINs when forming distance shares of BEM options. "Controls adjustment - Employment size bins": uses employment at all other establishments rather than only at establishments in other SEINs when assigning workers to the employment size bins that are interacted with distance shares of BEM options. "Firm-Year FE adjustment - Employment size bins": uses employment at all other establishments rather than only at establishments in other SEINs when assigning workers to the employment size bins used to predict firm-year fixed effect values and other firm-level components of the original predicted value. "Firm-Year FE adjustment - In-SEIN employment": Sets to zero the indicators for categories of total within-SEIN employment when predicting firm-year fixed effect values, since within-SEIN transitions are not an outside option when predicting all establishment transitions rather than only between-SEIN transitions. "Out-of-Sample adjustment": includes the predicted probability of making a between-SEIN transition within the firm to a destination state outside of the 25 states observed in the data. "Adjusted Estimate - Multi-SEIN Firms": Estimated annual within-firmestablishment mobility rate among workers at Multi-SEIN firms after making the adjustments in the top panel to account for unobserved within-SEIN transitions and between-SEIN transitions to out-of-sample states. "Multi-Unit-Single-SEIN firms", "All Multi-Unit Firms", and "All Firms" provide analogous adjusted estimates among workers in these subpopulations. "Movers" estimates the share of all establishment transitions that are within the same firm, while "State Movers" estimates the share of all between-state establishments transitions that are within the same firm.

Figure 1: Employment Shares by Bins of Number of Establishments and Number of SEINs



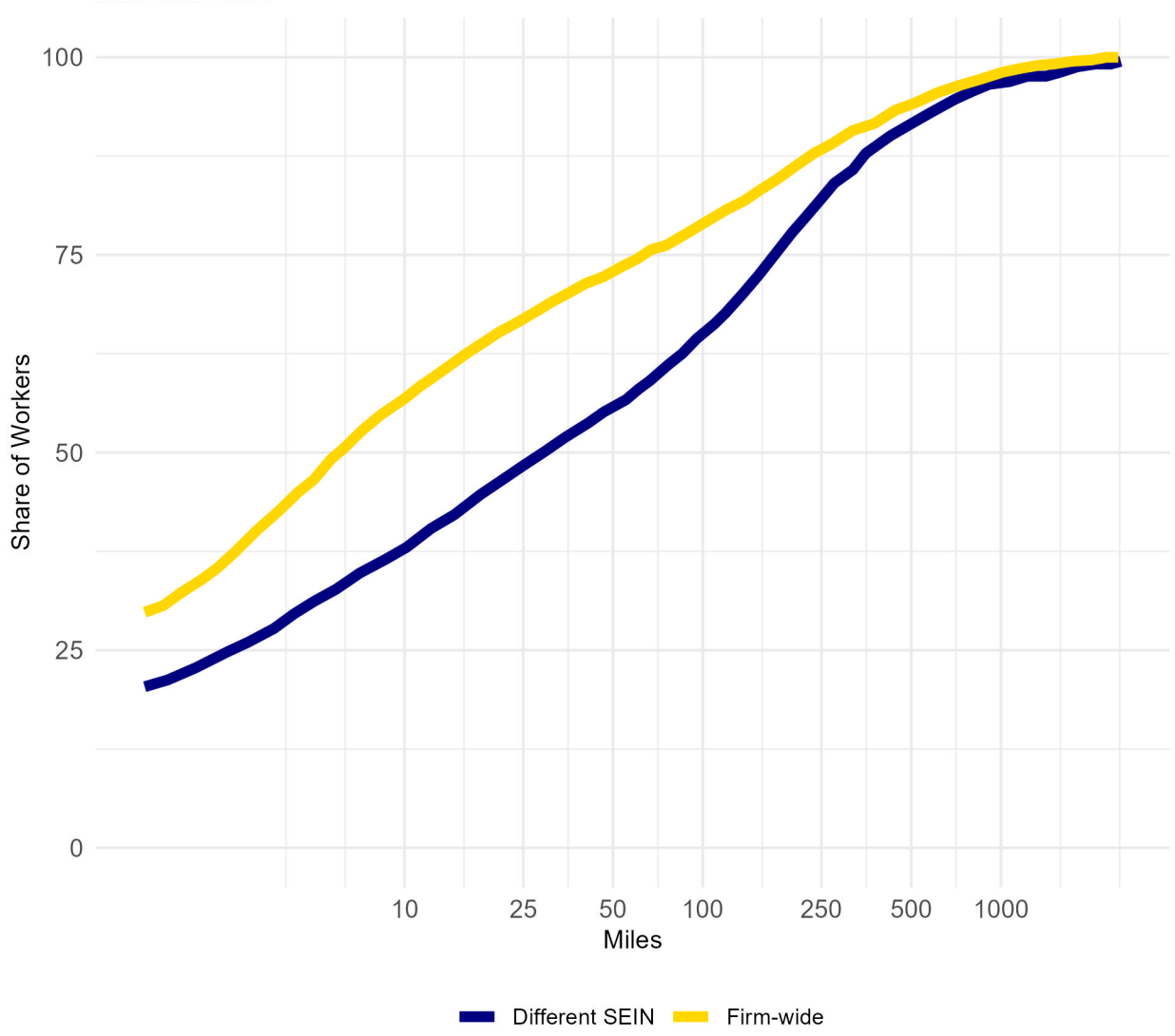
Source: LEHD 2014 snapshot
Notes: Blue bar heights capture the share of all worker-years in the baseline sample whose primary employer operates a number of establishments that falls within the range given by the bar label. Yellow bar heights capture the analogous shares for bins based on number of SEINs rather than number of establishments.

Figure 2: 2004-2013 Changes in the Multi-SEIN and Multi-Unit Shares of Employment and Firms



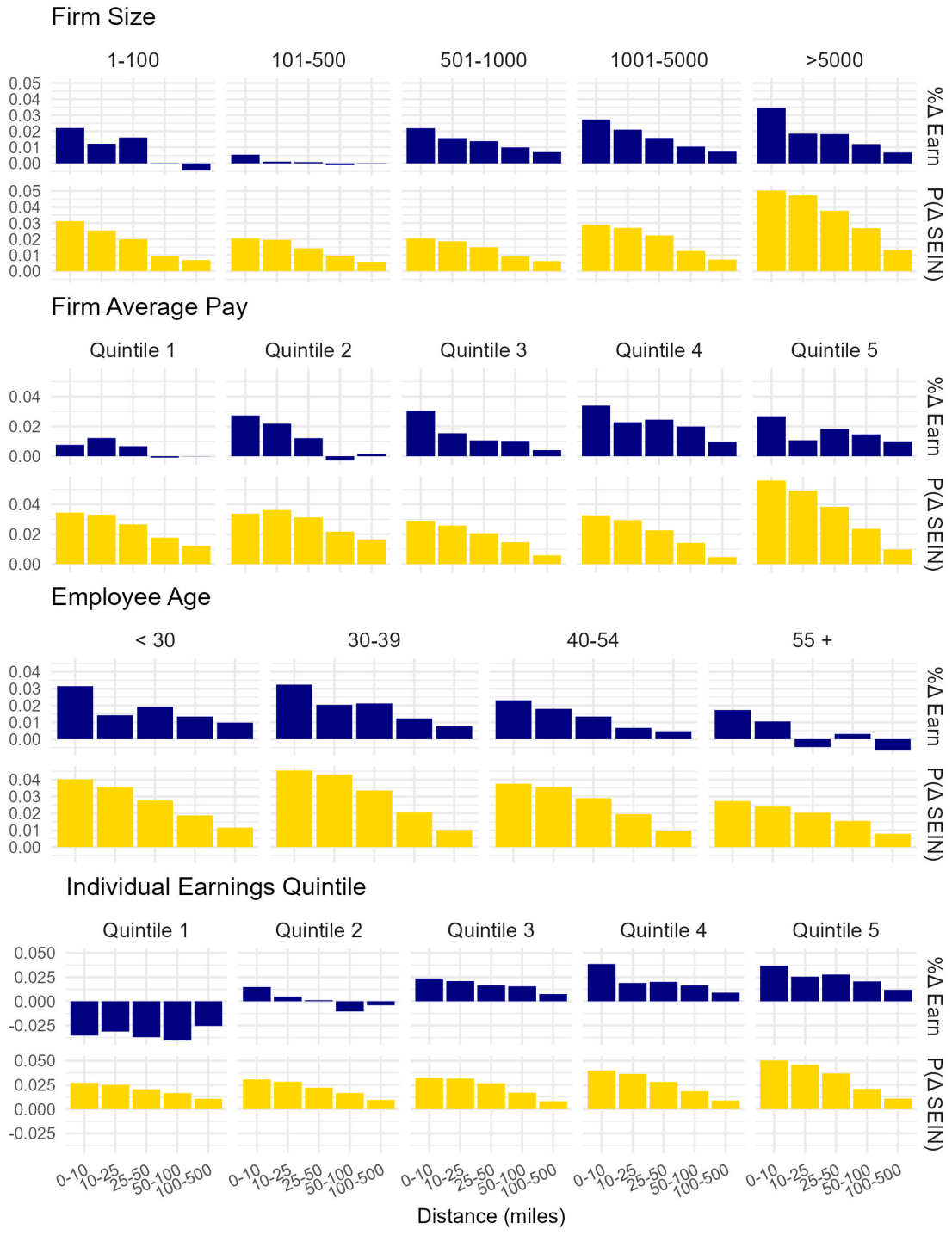
Source: LEHD 2014 snapshot
Notes: The blue line in the top (bottom) panel displays the change in the share of workers working at firms operating multiple SEINs (establishments) between 2004 and 2013. The yellow line in the top (bottom) panel displays the corresponding change in the share of firms who operate multiple SEINs (establishments).

Figure 3: The Cumulative Distribution Functions for the Distance from a Worker's Current Establishment to the Next Closest Establishments among All the Firm's Establishments and among Establishments in the Firm's other SEINs



Source: LEHD 2014 snapshot
Notes: The sample consists of all worker-years in which the worker works in a multi-unit (i.e. multi-establishment) firm. The X-axis measures miles of distance between establishments on a log (base 10) scale. The blue curve displays the CDF across worker-years of the distance from the worker's current establishment to the next closest establishment within the same firm. The yellow curve displays the CDF across worker-years of the distance from the worker's current establishment to the next closest establishment within other SEINs at the same firm.

Figure 4: Heterogeneity Across Worker and Firm Subpopulations in the Profile of Effects of Shares of Other-Establishment Employment in Various Distance Bins on SEIN Transition Rates and Average Percent Gains in Earnings over 5 years



Notes: Each group of bars displays coefficients on interactions between the share of other-establishment workers in a given distance bin (relative to the worker's own establishment) and an indicator for belonging to the category of the firm characteristic given by the group label. The share of workers in establishments over 500 miles away is treated as the reference category, so its coefficient normalized to 0. Yellow bars correspond to the SEIN mobility outcome and blue bars correspond to the 5-year earnings growth outcome.

Appendix

A.1 Methodology for Estimating the National Rate of Establishment Mobility within Firms

In this appendix, we provide a more complete description of how we construct our estimate of the overall share of U.S. workers who switch establishments within the same firm each year.

Because we find marked heterogeneity in SEIN mobility rates by firm size category, we use as our starting point the predicted values from the version of our SEIN mobility regression reported in Table 9 that features separate distance bin profiles by out-of-SEIN employment bin:

$$\begin{aligned} SEIN\ Transition_{it}^{p} = & \ Size\ Cat_{SEINt}^{SN} \times BEM\ Access_{SEINt}^{X\text{-}SN}\kappa \\ & + Size\ Cat_{SEINt}^{SN} \times BEM\ Access_{SEINt}^{In\text{-}SN}\psi \\ & + X_{it}\chi + X_{et}\eta + \rho_{ft}^{F} + \rho_{ct}^{C} + \rho_{nst}^{N} + \varsigma_{it} \end{aligned} \tag{3}$$

These naive predicted values contain four sources of mismeasurement when used to capture predicted rates of all between-establishment mobility (not just between-SEIN mobility). First, we adjust our exposure measures for the SEIN mobility outcome, $BEM\ Access_{SEINt}^{X\text{-}SN}$, so that they capture shares of the firm's employment in any other establishments besides the worker's own that fell into each distance bin, including those within the worker's SEIN. This step assumes that the parameters κ that govern the relationship between SEIN mobility rates and out-of-SEIN employment shares by distance bin also correctly capture the corresponding relationship between establishment mobility rates and firm-wide employment shares by distance bin.

Second, we replace the indicators for the size category of employment at other SEINs that interact with the distance bin shares, $Size\ Cat_{SEINt}^{SN}$ with corresponding size category indicators for employment among all the firm's other establishments (with the same category cutoffs), so as to capture the relevant measure of the scale of establishment transition opportunities within the firm. These swaps assume that the heterogeneity in sensitivity of SEIN mobility to the distance distribution across different out-of-SEIN size classes captured in the original regression translates to the relationship between any establishment mobility and out-of-establishment size classes.

Third, the components of the naive predicted values contributed by the other control variables also have a mean that is scaled to fit observed SEIN mobility rates rather than overall establishment mobility rates. To estimate an appropriate re-scaling of these components, we isolate this predicted value component from the component related to distance bin shares of employment:

$$\hat{Y}_{it}^{controls} = X_{it}\hat{\chi} + X_{et}'\hat{\eta} + \hat{\rho}_{ft}^{F} + \hat{\rho}_{ct}^{C} + \hat{\rho}_{nst}^{N}$$

We then run an auxiliary regression of $\hat{Y}_{it}^{controls}$ on the same set controls except for the firm-year fixed effects, which we replace with indicators for categories of both within-SEIN and out-of-SEIN employment, $Size\ Cat_{SEIN,t}^{X\text{-}SN}$ and $Size\ Cat_{SEIN,t}^{In\text{-}SN}$:

$$\begin{aligned}\hat{Y}_{it}^{controls} =& Size\ Cat_{SEIN,t}^{X\text{-}SN}\phi^{X\text{-}SN} + Size\ Cat_{SEINt}^{In\text{-}SN}\phi^{In\text{-}SN} + X_{et}'\tilde{\eta} \\ &+ \tilde{\rho}_{ct}^{C} + \tilde{\rho}_{nst}^{N} + \upsilon_{it}\end{aligned} \tag{4}$$

These estimates capture the (conditional) relationship between firm scale and SEIN mobility that was previously absorbed by the firm-year fixed effects. As before, we replace the out-of-SEIN employment categories with out-of-establishment employment categories, and impose that the coefficients capturing the relationship between SEIN mobility and out-of-SEIN employment also apply to the relationship between establishment mobility and out-of-establishment employment. We also set to zero all of the within-SEIN employment indicators, since these captured the role of unobservable "outside options" for establishment mobility that are now reflected in the out-of-establishment size categories. We then add the change in the auxiliary regression's predicted values created by these adjustments, $\left(Size\ Cat_{et}^{X\text{-}Estab} - Size\ Cat_{SEINt}^{X\text{-}SN}\right)\hat{\phi}^{X\text{-}SN} - Size\ Cat_{SEINt}^{In\text{-}SN}\hat{\phi}^{In\text{-}SN}$, to the predicted rate of establishment mobility for multi-SEIN workers.

Fourth, we use the same procedure to generate predicted establishment mobility rates for workers at multi-unit, single SEIN firms that were previously excluded from the regression sample, since we observe all variables needed to form their predicted values: distance bin employment shares, out-of-establishment size bins, and other worker, establishment, and location controls.

Finally, we add to these values an estimate of the rate of between SEIN transitions to out-of-sample states. Our goal is compute annual rates of within-firm establishment mobility among workers initially at multi-SEIN firms, $P(Estab.trans.|Multi\text{-}SEIN)$, among those at multi-establishment

firms, $P(Estab.\ trans|Multi\text{-}unit)$, and among all initially employed workers $P(Estab.\ trans.|Employed)$.

We start by decomposing $P(Estab.\ trans.|Multi\text{-}SEIN)$ using the law of total probability:

$$\begin{aligned} &P(Estab.\ trans.|Multi\text{-}SEIN) = \\ &\quad P(Estab.\ trans.|In\ sample, Multi\text{-}SEIN) * P(In\ sample|Multi\text{-}SEIN) \\ &+ P(Estab.\ trans.|Out\ of\ sample, Multi\text{-}SEIN) * P(Out\ of\ sample|Multi\text{-}SEIN) \end{aligned} \tag{5}$$

The four steps above generate an estimate of $P(Estab.\ trans.|In\ sample, Multi\text{-}SEIN)$, the annual within-firm establishment transition rate among workers from multi-SEIN firms whose origin and destination establishments (regardless of firm) are within our sample states.

Next, we use the fact that the LEHD reports an indicator for whether a worker is employed in some U.S. state even if that state does not grant data access to our project. This allows us to estimate the share of all workers in multi-SEIN firms originating in our sample states whose destination establishment is inside (or outside) of our sample states, $P(In\ sample|Multi\text{-}SEIN)$ and $P(Out\ of\ sample|Multi\text{-}SEIN)$.

To estimate $P(Estab.\ trans.|Out\ of\ sample, Multi\text{-}SEIN)$, we assume that the share job transitions that are within-firm is the same for transitions to out-of-sample states as for transitions to other in-sample states: $P(Estab.\ trans.|Out\ of\ sample, Multi\text{-}SEIN) \approx P(Estab.\ trans.|Change\ state, In\ sample, Multi\text{-}SEIN)$. Since any within-firm transition across states requires a SEIN change, we can correctly measure the latter share. Combining the terms in equation 5 generates our estimate of the rate of establishment transitions among multi-SEIN workers. To compute the analogous rate among workers at multi-unit firms, we replace "Multi-SEIN" with "Multi-Unit" in 5, and use the fact that $P(Estab.\ trans.|Out\ of\ sample,\ Multi\text{-}unit) = P(Estab.\ trans.|Out\ of\ sample,\ Multi\text{-}SEIN) * P(Multi\text{-}SEIN|Multi\text{-}unit)$ under the assumption that firms that operate only a single SEIN within our sample do not operate any SEINs in states outside our sample. To compute the rate of establishment mobility among all initially employed workers, we use the fact that $P(Estab.\ trans.|Employed) = P(Estab.\ trans.|Multi\text{-}unit) * P(Multi\text{-}unit|Employed)$.

Finally, because within-firm establishment transition rates vary so strongly by firm size category, we perform the same set of adjustments separately by initial size category.

A.2 Tables

Table A.1: Determinants of the Number of State Employer Identification Numbers (SEINs) Operated by a Firm

Log(# of SEINs)			
Firm Size		**Industry**	
Log(# of Estabs)	0.505‡	**Mining**	-0.252‡
	(0.041)		(0.04)
Employees: 1-100	–	**Construction**	-0.174‡
			(0.024)
Employees: 101-500	-0.022	**Manufacturing**	0.230‡
	(0.024)		(0.027)
Employees: 501-1K	0.158†	**Trade & Transport**	-0.362‡
	(0.055)		(0.062)
Employees: 1K-5K	0.481‡	**Information**	0.230†
	(0.089)		(0.083)
Employees: >5K	0.739‡	**Prof. Business Serv.**	–
	(0.118)		
		Finance and Real Estate	-0.192†
			(0.062)
Firm Average Pay		**Education and Health**	-0.649‡
Q1	–		(0.118)
		Leisure and Hospitality	-0.234‡
Q2	0.032		(0.046)
	(0.034)	**Other Services**	-0.203‡
Q3	0.180‡		(0.021)
	(0.026)		
Q4	0.199°		
	(0.079)		
Q5	0.417‡		
	(0.027)		
Controls			
Demographics		X	
State FE		X	
Multi-Unit		X	
Obs.		34.4M	
R-squared		0.849	

LEHD 2014 snapshot.

Notes: Each entry in this table provides the coefficient and standard error (in parenthesis) associated with the variable in the row label from a regression that predicts the logarithm of the number of SEINs operated by a worker's firm. All worker observations using our baseline sample. See Table 2 for a more complete description of the characteristic categories referred by by the row labels. ‡, †, and ° denote statistical significance at the 1%, 5%, and 10% levels.