VERTICAL AND HORIZONTAL WAGE DISPERSION AND MOBILITY OUTCOMES: EVIDENCE FROM THE SWEDISH MICRODATA

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INTRODUCTION

Wage dispersion inside a firm, or variation in monetary rewards created by a firm's pay structure, has long been considered a potent predictor of employee cross-firm mobility (e.g., Bloom and Michel 2002; Carnahan et al, 2012; Gerhart and Rynes 2003; Pfeffer and Langton 1988). Despite the ample evidence, however, the relationship between dispersed wages and mobility continues to be poorly understood. The predominant view in this research focuses on the *downsides* of pay variance and the resulting *mobility-inducing* effects. For example, scholars have argued that intra-firm variance in pay inclines employees to switch employers (e.g., Bloom and Michel, 2002; Pfeffer and Davis-Blake, 1990; Messersmith, 2011) because it triggers the perception of inequity and the feeling of relative deprivation (e.g., Glandon and Glandon, 2001; Messersmith et al., 2011; Wade et al., 2006). Yet, contrary to this perspective, a large body of work in strategy and economics associates wage dispersion with significant *upsides* (Bloom and Michel 2002; Castanias and Helfat 1991). For example, some studies posit that dispersed wages increase employee motivation and productivity because employees tend to exert greater effort in expectation of attractive future rewards (Gerhart and Rynes 2003). Although these perspectives imply that wage dispersion will *reduce* the rates of inter-firm mobility, few studies have attempted to reconcile this view with the findings prevalent in the mobility research.

In this study, we address this shortcoming by turning our attention to the *upsides* of dispersed wages and identifying the conditions under which variance in pay might *suppress* inter-firm mobility. We argue that past research has masked this mobility-reducing effect of unequal pay because, in examining mobility outcomes, studies have paid little attention to the organizational level at which pay is dispersed. Most mobility scholars have considered the overall dispersion in wages, even though there exists significant heterogeneity in the dispersion level: pay variance may be vertical, when wages vary across organizational levels, or horizontal, when wages vary within an organizational level (see Conroy et al., 2014 for a review). Given that they arise at different job levels, vertical and horizontal dispersion have therefore distinct bases: the former reflects the internal and external worth of jobs, and organizational policies on the relative value of jobs; the latter reflects differences across individuals holding same-level jobs (i.e., in qualifications, performance, or political connections) (Milkovich, Newman, and Gerhart,

2014; Baron and Pfeffer; 1994; Bloom, 1999; Shaw, Delery, and Gupta, 2002). We leverage this distinction between vertical and horizontal wage dispersion to identify the *mobility-reducing* effect of unequal pay and to separate it cleanly from the *mobility-inducing* effect, well-established in the literature.[2] We propose that pay dispersion suppresses inter-firm mobility when wage differentials are vertical. These differences in pay are likely to reduce inter-firm mobility because vertical dispersion is associated with beneficial employee outcomes, such as opportunities for internal advancement and aspirational comparisons. Conversely, pay dispersion will increase inter-firm mobility when such differentials are horizontal. Because these differences in pay are associated with harmful employee outcomes, such as negative social comparisons, fairness concerns, and limited advancement prospects, they will motivate workers to switch employers, generating the "mobility-inducing effect," frequently seen in past research.

We take advantage of the numerous empirical benefits of the large Swedish employee-employer matched panel data for the period 2001–2008 to test our arguments. Whereas many organizations observe policies of pay secrecy (Belogolovsky and Bamberger, 2014; Collela, et al., 2007), Sweden has had a long history of financial transparency since 1903, when tax returns became public. The Swedish sample merges data from the Firm Financial Statistics Database (Foretagens ekonomi [FEK]), containing the annual accounts of all limited liability firms in Sweden, acquired from the Swedish Companies Registrations Office, and the Longitudinal Integrated Database for Medical Insurance and Labor Studies (LISA), which draws on several different individual-level statistics obtained from registry databases for the entire Swedish population. Using these fine-grained population data on all firms, employees, and their occupational information, we identify all instances of mobility, including remaining in current employment, advancing internally, or moving externally to another employer. We further compute detailed and precise measures of horizontal and vertical dispersion in wages, based on hierarchical occupational classification (Tåg, Åstebro and Thompson, 2016).

We find systematic evidence that the effect of wage dispersion on inter-firm mobility critically depends on the organizational level at which wages are dispersed: vertical variance in pay *reduces*

[2] Although bases for vertical and horizontal pay dispersion are not comparable, past studies have treated the two as equivalent, and scholars linked the two with similar mechanisms and similar mobility outcomes (Carnahan et al, 2012; Glandon and Glandon, 2001; Pfeffer and Davis-Blake, 1990; Tsou and Lui, 2005).

external-mobility rates, whereas horizontal variance in pay *induces* external-mobility rates. Additional findings indicate that these opposite effects reflect different mechanisms attached to vertical and horizontal pay structures. First, consistent with the claim that vertical wage dispersion signals internal career advancement, bottom earners within the firm pay distribution who are, by default, furthest from the vertical wage ceiling and thus find the prospect of vertical advancement most appealing, will be the least likely to switch employers when wages are vertically dispersed. Top earners, by contrast, are the least sensitive to the mobility-reducing effect of vertical wage differentials because further advancement prospects are limited for these workers, motivating them to switch employers. Moreover, consistent with the claim that horizontal wage dispersion triggers negative consequences such as inequity, the mobility-inducing effect of horizontal pay variance is strongest for bottom earners within an organizational level because these employees are most subject to the negative consequences of such pay structure. Conversely, the effect is weakest for top earners within each hierarchical level because these workers benefit from such pay variance the most.

Overall, our results contribute to the understanding of how wage dispersion influences inter-firm mobility (Bloom and Michel, 2002; Carnahan et al, 2012; Pfeffer and Davis-Blake, 1990; Messersmith, 2011), by elucidating the critical role of organizational rank in driving the opposing forces associated with wage dispersion. Finally, our theory helps reconcile wage-dispersion downsides, associated with the feeling of relative deprivation and inequity, with wage-dispersion upsides, associated with stronger motivation to reap lucrative rewards.

THEORY AND HYPOTHESES

Wage Dispersion and Inter-Firm Mobility: Past Research

There is a general agreement that pay dispersion is a potent predictor of job switching (e.g., Bloom and Michel 2002; Gerhart and Rynes 2003; Pfeffer and Langton 1988) and that a firm's pay structure affects employee decision to leave current employment (Gupta et al., 2012; Gupta and Shaw 2014). However, despite the rich research inquiry into pay dispersion, in general, we still know relatively little about the effects of unequal pay on cross-firm mobility, in particular (see Shaw and Gupta, 2007, for review). A frequent finding in the literature is that wage dispersion induces higher rates of inter-firm mobility (e.g.,

Nickerson and Zenger 2008; Hyll and Stark 2011; Sheppard, Lewicki, and Minton 1992) and that, consequently, variance in wages triggers considerable, negative consequences for employees (Pfeffer and Davis-Blake, 1990; Messersmith et al., 2011; Levine, 1993). For example, scholars have linked pay differentials with negative social comparisons, the feeling of relative deprivation (e.g., Nickerson and Zenger, 2008), inequity concerns (Lazear, 1989), and job dissatisfaction (Nickerson and Zenger 2008; Hyll and Stark 2011), more generally.

Despite these important insights, however, past studies remain incomplete because little attention has been devoted to the benefits of unequal pay and the implications for mobility outcomes. This neglect is surprising given that other research has long emphasized the productivity upsides of unequal pay and the beneficial influence of wage dispersion on employee effort and motivation (Bloom and Michel 2002; Castanias and Helfat 1991; Pfeffer and Langton 1988). Although this line of work suggests that pay dispersion may benefit workers and thus reduce external mobility, this view has not been reconciled with the findings prevalent in the mobility research. Except for a small number of studies that have linked wage dispersion with lower mobility rates among top performers (Carnahan et al., 2014; Shaw and Gupta, 2007), little is known about when workers may find unequal pay attractive and when these wage structures will discourage individuals from job switching. In this study, we therefore turn our attention to the conditions under which dispersed wages might suppress the rates of inter-firm mobility.

Wage Dispersion Within and Across Levels

In examining the influence of wage dispersion on cross-firm mobility, scholars have frequently neglected the organizational rank at which wage dispersion arises. This neglect has obscured the possibility that variance in pay may trigger distinct mechanisms and lead to different mobility outcomes, depending on whether pay variance arises within (i.e., horizontal) or across (i.e., vertical) organizational levels.

Although some scholars have distinguished between vertical and horizontal inequality in pay (see Conroy et al., 2014 for a review), an implicit assumption in past research has been that unequal wages trigger equivalent processes regardless of the level at which they occur. For example, the majority of studies have not conceptualized vertical and horizontal dispersion as distinct; rather, scholars have often

modeled an overall dispersion in pay (Carnahan et al, 2012; Glandon and Glandon, 2001; Pfeffer and Davis-Blake, 1990; Tsou and Lui, 2005). And, even in rare cases, when studies have separated these pay structures, scholars have neither compared them directly nor did they associate these two with distinct causal outcomes (Levine, 1993; Powell et al., 2010; Shaw and Gupta, 2007). Finally, important measurement challenges have plagued past studies, as scholars have frequently limited their analyses to top management teams when modeling vertical pay dispersion (Messersmith et al., 2011; Shen et al., 2010; Wade et al., 2006), or relied on specialized contexts (i.e., sport teams and universities) when modeling horizontal pay dispersion (e.g., Becker and Huselid, 1992; Berri and Jewell, 2004; Mondello and Maxcy, 2009; Trevor et al., 2012; Cowherd and Levine 1992; Messersmith et al., 2011; Shen et al., 2010). Recognizing these conceptual and empirical limitations, recent studies have noted that "research on pay variation has obscured the differences between vertical and horizontal pay by generalizing and extrapolating freely from one type to another" (Conroy et al., 2014: 3), and that "researchers theorized at one level but operationalized variables at another, even though the specification of levels is critical and requires 'care and precision'" (Klein 1999: 244). Finally, Shaw (2014) has emphasized the need to compare the consequences of vertical and horizontal wage dispersion, noting that the causal pathways for the two types of structures might be different (Shaw 2014: 534). It is precisely this observation that motivates our assessment of the association between dispersed wages and external mobility, for vertical and horizontal inequality separately.

The Mobility-Reducing Effect: Vertical Dispersion

There is a strong rationale to expect that the propensity to make external moves decreases when wages are dispersed vertically and variance in pay is attributable to job levels (Devaro, 2006; Milkovich, Newman, Gerhart, 2014). We propose that vertical dispersion will reduce the rates of external mobility because it is associated with outcomes that employees consider beneficial, such as attractive advancement prospects or aspirational comparisons.

First, because vertical differences are tied to upward moves within an organizational hierarchy, employees will perceive such dispersion in pay through an internal career-ladder lens (Doeringer and Piore, 1971). This pay structure implies that, workers can, in principle, make sequential moves up the hierarchy

and incur pay raises each time they climb the promotional ladder because wages are attached to career ladders (White 1970; Spilerman 1977; Sørensen 1977). Importantly, in settings with developed internal-labor markets, vertical advancement is more predictable and therefore more enticing. For example, average performance is often sufficient for continued retention (Lazear and Oyer, 2003; Kalleberg and Sørensen 1979), suggesting that the majority of workers will eventually climb the hierarchical ladder. Similarly, the threat of termination is low because employees need only to meet a minimum performance standard to keep their employment. Hence, workers will, on average, develop an expectation of climbing the hierarchical ladder and earning the rewards attached to higher-level jobs (Sørensen, 1977).

Advancement through internal ranks may be further appealing because climbing organizational levels tends to be associated with sizable rewards. Scholars have established, for example, that pay increments tend to be greater when workers move across job levels than within a job level, since advancing in the hierarchy involves more significant increases in responsibility, qualifications, and prestige (e.g., Bidwell and Mollick, 2015). Empirical evidence corroborates this claim, with studies documenting that internal promotion ladders result in considerable monetary rewards (Doeringer and Piore, 1985; Lazear, 1989) and that upward movements within the hierarchy are associated with steep wage increases (Doeringer and Piore, 1971; Sørensen, 1977; Bidwell and Mollick, 2015). There is a further rationale to expect that these steeper, more predictable increases in pay will enhance the attractiveness of advancement options available in current employment. The tournament theory, for example, has long indicated that competition for higher-level jobs is especially likely to induce effort and motivation when prize increases are greater at each level of competition (Ehrenberg and Bognanno, 1990; Lazear and Rosen, 1981), or when winning rewards is more predicable (Ehrenberg and Bognanno, 1990; Rosen, 1986).

The prospects of internal advancement have important implications for the rates of external mobility. As opportunities to progress inside the firm become more appealing due to steeper pay increments and more predictable attainment, an employee propensity to switch employers will decrease. Opportunities to win rewards internally will motivate workers to preserve their attachment to current employer and to exert stronger efforts in expectation of future gains. It may even be that similar rewards

are difficult to achieve through external-mobility paths, or once an employee separates from the current job. For example, Bidwell and Mollick (2015) find that vertical attainment, as indicated by moves to jobs with greater responsibility and higher pay, is more likely to occur through internal than external mobility. Similarly, Groysberg (2010) finds that even star employees tend to underperform when they switch employers partly because equivalent advancement opportunities are difficult to replicate once an employee decides to leave. These studies collectively imply that potential payoffs associated with vertical wage dispersion are most attractive when workers continue advancing through internal ranks; conversely, these prospects of vertical attainment may become more tenuous once an employee makes an external move.

Not only will vertical variance in pay signal attractive internal-advancement prospects but these upsides will likely outweigh any potential downsides (e.g., job dissatisfaction or inequity concerns) that vertically-dispersed wage may trigger. First, employees rarely rely on higher-level referents to evaluate fairness of their own pay because these referents might not be physically close or directly comparable to a focal employee. Rather, the primary goal of higher-level comparisons is to form expectations about career prospects and future performance (Gibson and Lawrence 2010; Heckert et al. 2002; Lockwood and Kunda 1997); for example, workers rely on higher-level others when evaluating future pay (Heckert et al. 2002; Gibson and Lawrence 2010), and upper-level referents occupy the kinds of organizational positions to which an employee aspires (Buunk and Ybema 1997). Although many of these studies have recognized that higher-level referents may also induce the feeling of inadequacy and failure (Wheeler and Miyake 1992; Wood 1989), such negative consequences only arise when comparisons are made with respect to highest- rather than next-higher-level referents (Wood 1989). This aspirational role of vertical referents is especially important when future career prospects are within an employee's reach (e.g. Cowherd and Levine, 1992), because workers can form expectations for similar achievement and use information provided by higher-level peers on how to improve in order to receive a future promotion (Lockwood and Kunda 1997; Steil and Hay 1997). Only in extreme cases, when the distance from the social referent is high, does the perceived probability of attainment decrease and are individuals unlikely to identify with

upper-level referents (Nosanchuk and Erickson 1985).[3] Overall, we therefore expect vertical wage dispersion to primarily signal internal career prospects and to consequently reduce workers' inclination and willingness to switch jobs:

H1: *An increase in vertical wage dispersion will reduce the likelihood that an employee makes an external move.*

The Mobility-Inducing Effect: Horizontal Dispersion

By contrast, horizontal wage dispersion, which arises across employees holding same-level jobs (e.g., Shaw, Delery, and Gupta, 2002; Yanadori and Cui, 2013), will lead to higher rates of external mobility, generating the frequent finding in past research. To the extent that dispersed wages give rise to costly comparisons or signal limited advancement prospects (Castanias and Helfat, 1991, 2001; Elfenbein *et al*., 2010; Zenger, 1992), which might incline an employee to seek more favorable employment destinations (Hyll and Stark 2011; Adams and Freedman 1976), we expect these processes to be primarily triggered when dispersion in pay is horizontal.

First, the reference group theory posits that, when making comparisons in order to derive information and identity signals, individuals rely on socially and spatially proximate referents (Adams 1963; Blanton and Christie 2003; Festinger, Schachter, and Back 1950; Kelley 1952; Merton 1957). Same-level peers are particularly likely to serve as social referents because they are functionally equivalent (e.g., performing similar tasks and functions), physically proximate (e.g., co-located), and socially comparable (e.g., similar in age or tenure). There is further evidence that workers use these same-level peers when evaluating pay fairness or assessing their own performance (Feldman and Ruble 1981; Gibson and Lawrence 2010), and that they prioritize these comparisons over higher-level comparisons (Heckert et al. 2002; Jackson et al. 1992; Lawrence 2006; Major and Konar 1984). This further implies that it is horizontal rather than vertical differences in pay that spur the perceptions of dispersion, envy, and feelings of relative deprivation, even when wage differences reflect differences in productivity.

We further expect the downsides of horizontal dispersion to dominate any upsides that such variance in pay may generate. Although same-level wage differentials may motivate employees to exert

[3] Consistent with this claim, a number of studies indicated that the feeling of relative deprivation might arise when comparisons are made vis-à-vis CEO positions (Wade et al., 2006).

effort in pursuit of attractive rewards, the majority of employees will find these attainment prospects less attractive because same-level differences do not indicate an internal career ladder. Rather, firms adopt such practices to select talent (Rosenbaum, 1979) and to sort higher performers from average and lower performers (Bloom and Michel, 2002; Blyler and Coff, 2003; Lazear and Rosen, 1981; Rasmusen and Zenger, 1990). Although top performers are attracted to such high-pay rewards (Caranahan et al., 2012), many workers will be unable to meet the requirements necessary to earn higher rents, while performing same-level jobs. This logic further implies that average and lower performers will face higher termination threats and form weak expectations of future rewards. Because horizontal differences in pay signal less certain and less predictable career opportunities, workers will be more likely to separate from current employer due to either voluntary or involuntary turnover. For example, horizontal variance in pay may prompt most employees to seek more attractive, better-matched opportunities, given that prospects within current employment appear limited. Overall, we expect external-mobility rates to increase when wages are dispersed horizontally because same-level dispersion generates significant downsides, triggering negative social comparisons or signaling limited advancement prospects.

H2: *An increase in horizontal wage dispersion will increase the likelihood that an employee makes an external move.*

Cross-Sectional Heterogeneity: Individual Pay Position

Our core argument suggests that vertical and horizontal dispersions in wages affect cross-firm mobility in opposite ways because these pay structures trigger distinct processes. In what follows below, we probe these processes in greater depth. If our supposition is plausible, the predicted relationships should be amplified (dampened) for workers most (least) subject to the mechanisms we theorize.

First, if vertical dispersion in pay reduces mobility rates by signaling attractive employment options, bottom earners within the firm will be the most subject to this effect. These workers are the most motivated by the prospects of vertical attainment because potential gains from pay differentials are highest for those who capture the least value. Studies in strategy and economics, for example, have long argued that effort and motivation are directly proportional to the magnitude of gains that a worker expects to derive: when promotion is associated with greater rewards, an employee will exert commensurate

effort to achieve the expected pay (e.g., Lazear, 1999; Lazear and Rosen, 1981; Trevor and Watzeter, 2006). Others have similarly suggested that firms with greater pay dispersion offer more room for advancement and are therefore most appealing to those at the bottom of the performance distribution (Sørensen and Sharkey, 2014). Because the prospects of climbing the promotion ladder will appeal to bottom earners the most (Bloom and Michel, 2002; Frank, 1985; Shaw and Gupta, 2007), these workers will be the least likely to separate from current employment in pursuit of alternative employment.

Conversely, our argument implies that the mobility-reducing effect of vertical variance in pay will be weaker for top earners in the firm. A number of studies document that employees are more likely to leave in pursuit of alternative options, including switching jobs or entering self-employment, when room for future advancement is limited or when prospective opportunities are blocked (e.g., Kacperczyk and Marx, 2016; Sørensen 1977; Sørensen and Sharkey, 2014). Because top earners have already arrived at the most attractive opportunities in the firm, room for future advancement is, by default, limited. And though these top earners may derive the highest possible returns to their human capital (Canrahan et al., 2012; Bloom and Michel, 2002; Blyler and Coff, 2003; Castanias and Helfat, 1991; Coff, 1999), opportunities for further attainment inside the firm tend to decline for these workers, weakening their attachment to their current employer. In the context of wage dispersion, this logic implies that the mobility-reducing impact of vertical dispersion will be weaker for these top earners, who are most likely to pursue alternative opportunities, either through other routes in paid employment or through self-employment as a way to get ahead (Canrahan et al., 2012; Sørensen and Sharkey, 2014).

H3a: *The negative effect of vertical wage dispersion on the likelihood that an employee makes an external move will be amplified (mitigated) for bottom (top) wage earners between levels in the firm.*

Moreover, if horizontal wage dispersion increases mobility rates by triggering negative consequences, including relative deprivation and envy, bottom earners within a given hierarchy will be most subject to this effect. Studies on inequity and pay suggest that wage dispersion generates negative feelings proportionate with the inequity that workers perceive (Adams, 1963; Lazear, 1989; Stark and Hyll, 2011): the more unfair an outcome appears to be, the stronger the perception of inequity, envy, and discontentment. When these negative feelings intensify, employees become more willing and more

motivated to leave current employment and to rectify the perceived inequity (Pfeffer and Davis-Blake, 1992; Pfeffer and Langton, 1993; Trevor and Wazeter, 2006). Bottom earners within a given level will view horizontal variance in pay as unfair because the downsides of such wage structure are most acute for those who capture the least value due to the current pay structure. Similarly, these bottom earners might also associate horizontal dispersion with limited opportunities because their low pay position relative to workers within the same job level signals a potential mismatch with the firm (Jovanovic, 1979; 1982), or indicates the firm's inability to properly gauge the true value or fit of those employees. Because these negative consequences of horizontal pay are most pertinent to those who earn the lowest wages at their job level, these employees will be the most likely to leave current employment in search of a more favorable work environment.

Conversely, top earners within a given hierarchy will be the least sensitive to such negative consequences of horizontal dispersion in pay. Because these workers benefit most from horizontal variance in wages, as they extract the highest surplus within their job rank, they are less likely to experience the feeling of relative deprivation or inequity. Similarly, for those who earn the most within their job level, horizontal dispersion in pay will be unlikely to signal limited career options or indicate a potential mismatch with the employer. It might even be that these top earners will experience some benefits of horizontal pay dispersion, consistent with studies documenting that employees are unlikely to separate from current employment when they perceive returns to their human capital to be relatively high (Bloom and Michel, 2002; Blyler and Coff, 2003; Castanias and Helfat, 1991; Coff, 1999). Together, these studies imply that the negative outcomes associated with horizontal dispersion in pay will be the least pertinent to top same-level earners. These workers, therefore, will be the least likely to quit in pursuit of alternative opportunities in the labor market.

H3b: *The positive effect of horizontal wage dispersion on the likelihood that an employee makes an external move will be amplified (mitigated) for bottom (top) wage earners within the same hierarchical level.*

METHODS

Empirical Setting and Data

Properly estimating the effects of horizontal and vertical wage dispersion requires detailed data on wages

within and across *all* hierarchical levels, as well as the corresponding information on employee mobility. Lacking comprehensive information, prior studies have often modeled an overall wage dispersion, without taking variance in organizational rank into consideration (e.g., Tsou and Liu, 2005; Glandon and Glandon, 2001). Our study overcomes these challenges by taking advantage of two matched, longitudinal data sources from Sweden: LISA and the FEK. LISA includes records on the entire population of Swedish individuals and is maintained by Statistics Sweden. The data are constructed by pooling multiple governmental registers and by linking individuals to families, businesses, and workplaces. Information available in LISA can be aggregated to obtain data at the population level. LISA currently contains vintages from 1990 to 2008 and includes all individuals aged 16 and older who were registered in Sweden by December 31 of each year. The longitudinal nature of these data allows for a single person to be linked together for all years the individual has been registered in Sweden. We supplement LISA with FEK, a database that contains firm-level financial information based on the survey of all businesses in Sweden for tax purposes. FEK is conducted annually, and complete information is available from 1997 onwards. Firms in FEK are identified with a unique identification number, allowing for linking it with other databases, such as LISA. This integration allows us to match employees with firms and to connect individual information with firm-level information.

Sample Selection and Variables

We use panels from 2001 to 2007 for which we have occupational codes for nearly all Swedish workers. Several measures were calculated based on the information on prior panels, such as the number of past jobs or tenure. We chose to end the panel in 2007 in order to observe the employee inter-firm mobility at the panel's end. We restrict our sample to firms with at least seven employees and at least two hierarchical levels, to ensure a meaningful measure of wage dispersion.[4] We focus on individuals age 20 to 59 during the sample period to avoid non-random attrition due to retirement. Our final sample contains 7,057,819 individual-year observations.

Dependent Variable. Our key dependent variable is an external move—defined as an instance of an employee's change of jobs across organizations. We censor employees who exit current employment

[4] We conducted additional sensitivity analyses and found the results to be also robust to a lower number of workers.

but do not take another job, because such exits may reflect other life-cycle processes, including retirement or death. We construct a dummy variable that takes a value of 1 when an employee switches to another employer in a subsequent year, and 0 otherwise.

Independent Variables. To construct hierarchical levels in the firm, we follow prior studies (Caliendo, Monte, and Rossi-Hansberg 2012, Tag 2013, Tag, Åstebro, and Thompson 2016) and classify detailed occupational codes into four hierarchical groups: (1) manager, (2) professional, (3) associated professional, and (4) workers and operators. This classification procedure is consistent with the International Standard Classification of Occupations (ISCO)-88 adopted by the International Labor Organization (ILO), which Statistics Sweden also rely on to classify occupations.[5] For example, manager category includes designations such as CEO, Director, Regional Manager, Rector, Fund Manager; professional category includes designations such as Statistician, Civil Engineer, Doctor, Business Analyst, Economist; associated professional category includes designations such as Laboratory Technician, Pharmaceutical Assistant, Bookkeeper, Occupational Therapist; worker and operator category includes Clerk, Cashier, Office Secretary, Machine Operator, Sales Person. These levels are hierarchical: wages across different occupations are ranked and the typical worker in a higher rank earns more (Tag, 2013).

Consistent with the literature on wage dispersion (e.g., Bloom 1999; Bloom and Michel 2002; Carnahan et al. 2012; Sørensen and Sharkey 2014), we use the Gini coefficient to measure intra-firm variance within and across job levels. We begin by computing horizontal wage dispersion. The following formula is used to calculate the Gini coefficient for each level of firm-hierarchy-year:

$$G = \frac{2\sum_{i=1}^{m} iw_i}{m\sum_{i=1}^{m} w_i} - \frac{m+1}{m} \qquad (1)$$

where w_i is the raw wage of the ith ranked individual in a given hierarchy within a firm and is indexed in non-decreasing order, and m is the number of workers within a given organizational rank. The Gini

[5] First, in the payroll tax filings to the tax agency, employers provide a brief description of the professional tasks a focal employee is performing. The professional task description of roughly 80-85% of employees is covered in this procedure. Whenever this information is missing, relevant information is collected from industry associations, mostly occupational classifications as defined by the specific associations. This information is then synced with the classification methodology adopted by ISCO-88 (International Standard Classification of Occupations, 1988) of ILO, to ensure comparability to international standards (http://www.ilo.org/public/english/bureau/stat/isco/isco08/index.htm). Details of occupational task descriptions are available at: https://www.h5.scb.se/yreg/ssyk2012.asp

coefficient ranges from 0 (absolute equality) to 1 (absolute dispersion).

To ensure consistency between the measures of wage dispersion, we further implemented the Gini coefficient as our primary measure of vertical wage dispersion, or variance in wages across hierarchical levels. Following Siegel and Hambrick (2005) who measured vertical wage differentials within top management teams, we began by using individual data to compute mean wages at each hierarchical level in the firm.[6] We further followed well established research (e.g., Cowell, 2011; Gastwirth, 1972; Ohtake 2008) and used these grouped data (i.e., wage averages reported by group) as an input into computing the Gini coefficient across hierarchical groups within each firm. Our empirical approach implies that we consider a relatively small number of groups to reflect the hierarchical levels in the firm. However, scholars have emphasized that, when estimating the Gini coefficient without individual observations, it is of crucial importance to properly group the data, even at the expense of the number of groups considered (e.g., Aghevli and Mehran 1981; Davies, 1989). In our case, the optimal grouping strategy is achieved when using four hierarchical levels because these levels demarcate vertical wage differences in our data (Tag, 2013). Nevertheless, to reduce any potential measurement error that might arise due to grouped data, we conduct a number of robustness checks, implementing three alternative measures of vertical wage dispersion. As it will be later discussed, our results are robust to these alternative measures.

Control Variables. We control for a vector of firm-level and individual-level characteristics that may affect inter-firm mobility. We control for workers' wage and tenure in the firm because they affect turnover directly (e.g., Carnahan et al. 2012, Jovanovic 1979, Topel and Ward 1992). Tenure is the cumulative employment duration of employees at the firm each year. We control for employee age, gender, and educational attainment, shown to be negatively associated with turnover (Viscusi 1979, 1980, Loprest 1992). Finally, we account for firm-level attributes: firm size (employee headcount), firm age, number of establishments, operating profit, and operating profit growth.

Pay Positions. Employees are top (bottom) wage earners, when they rank above (below) the 90th (10th) percentile of the distribution of the absolute wage within their firm in any given year (Carnahan et al. 2012). We compute separate measures to indicate top and bottom earners within vertical and horizontal

[6] Our results are also robust when we use median, minimum, and maximum value of the Gini coefficient.

wage distributions.[7] We interact those measures with the corresponding measures of vertical and horizontal wage dispersion.

Identification Strategy

The individual-firm-year is our unit of analysis. We include a firm-fixed effect to absorb any time-invariant characteristics not captured by standard control variables. Specifically, we estimate the following regression:

$$y_{ilstk} = \alpha_i + \alpha_t + \alpha_l + \alpha_k + \beta_1 \times \textit{Horizontal Wage Dispersion} + \beta_2 \times \textit{Vertical Wage Dispersion} + \boldsymbol{\gamma' X_{ilst}} + \varepsilon_{ilst}, \quad (2)$$

where *i* indexes firms; *t* indexes years; *l* indexes industry; *s* indexes individuals; *k* indexes municipalities; and α_i, α_t, α_l and α_k are firm, year, and industry and municipality fixed effects, respectively. The dependent variable of interest is *y*, a dummy variable that indicates an instance of an employee's switching to another job; **X** is the vector of control variables measured in the year preceding separation; and ε is the error term. The regression is estimated with ordinary least squares (OLS). We cluster standard errors at the firm level for models estimated with firm fixed effects and at the individual level for models estimated with individual fixed effects. Finally, in models with individual and fixed effects, we cluster standard errors at these two levels.

An important concern pertains to potential endogeneity: the relationship between wage variance and inter-firm mobility could be spurious if both are driven by a third, difficult-to-observe variable. For example, high-human-capital employees might systematically sort into organizations with higher horizontal wage dispersion (or lower vertical wage dispersion) as well as to switch employers. We mitigate this concern in three ways. First, we re-estimate the baseline specifications with an individual fixed-effect estimator and firm-fixed estimator, which account for time-invariant heterogeneity of firms and employees. Second, we simulate treatment conditions for horizontal and vertical wage dispersion by implementing coarsened exact matching (CEM; Iacus et al. 2009), a nonparametric technique that allows matching on blocks, and has been found to perform better than the propensity score matching (Iacus et al. 2011). Finally, we examine an association between wage dispersion in the origin and the destination firm.

[7] While these measures are computed using an absolute wage, our results are also robust to using wage residual.

RESULTS

Descriptive statistics is shown in Table 1. The average rate of cross-firm mobility in Sweden during the period of our study is 14.7%. Although one concern might be that findings in the Swedish context might not be easily generalizable to other settings, the external mobility rate in our sample is comparable to rates in samples from other countries, including the U.S. (11%, as reported by Baker, Gibbs and Holmstrom (1994) and 8%, as reported by Carnahan et al., 2012)), and the U.K. (10.5%, as reported by Treble et al., (2001)).[8]

The correlation is reported in Table A1 in the on-line Appendix. Table A2 in the Appendix reports the wage distribution across the firm's occupational categories, as applied to the Swedish data. The mean, median, and variance of wages at upper hierarchical levels (e.g., level 1) are higher than those at lower hierarchical levels, consistent with our classification of occupations into hierarchical levels that are rank-based. In addition, this table reports descriptive statistics on differences in gender, age, firm tenure, and education across job levels. Tables 2A and 2B report the count and the rate of internal and external mobility within the period of one year. As can be seen in Table 2A, opportunities for upward movements are substantial in our data, with 18 percent of all moves being made to upper positions within the firm. In contrast, 77 percent of all external moves reported in Table 2B are observed between lateral positions.

******* Insert Tables 1, 2A and 2B about here *******

The main results are presented in Table 3. All regressions are variants of the linear probability model in equation (1) with cross-firm mobility as the dependent variable. The specifications in all Columns include year, industry, hierarchy, and municipality fixed effects. As shown in Columns (1) and (2), the coefficients on horizontal and vertical wage dispersion are remarkably stable across specifications with firm or individual fixed effects. For vertical dispersion, the coefficient is negative and lies between 0.0627 and 0.0476, indicating that the probability of cross-firm moves decreases by 6.3 percent to 4.8 percent, as vertical wage dispersion in the firm decreases by one standard deviation. These findings are in

[8] Another concern might be that opportunities for internal promotion are richer in Sweden than elsewhere, limiting the external validity of our findings. However, this concern is mitigated because the average internal promotion rate in our sample is relatively low: 2.5 percent.

line with H1, indicating that vertical wage dispersion is associated with a decrease in the likelihood of external moves. For horizontal variance, the coefficient is positive and lies between 0.106 and 0.233, indicating that the likelihood of a cross-firm move increases by 10 percent to 23 percent, as horizontal pay variance increases by one standard deviation. These findings are in line with H2, indicating that horizontal wage dispersion is associated with an increase in the likelihood of an external move. Column (2) is estimated with individual-fixed effects, mitigating the concern that our results reflect time-invariant characteristics of employees. In Columns (3)-(4), we exploit cross-sectional heterogeneity in the worker's pay position within the firm for horizontal and vertical dispersion in pay, respectively. Column (3) shows that, in response to horizontal dispersion, top earners within the hierarchy are less likely to separate from the firm, whereas bottom earners are more likely to do so, consistent with the posited mechanism: bottom earners are most subject to the negative consequences of horizontal dispersion, whereas top earners benefit from such dispersion the most. Column (4) shows that the mobility-reducing effect of vertical pay dispersion is amplified for bottom earners in the firm, consistent with the notion that those who earn the least have the most to gain from vertical pay variance. Conversely, the vertical dispersion effect is mitigated for top earners in the firm because opportunities for further advancement are limited for these workers (e.g., Carnahan et al., 2012). In Column (5), we re-estimate the baseline specification with all interaction terms jointly included and find that our results continue to persist. In Column (6), we re-estimate the baseline specifications in Column (5) but now include both individual and firm-fixed effect. Although the direction and the statistical significance of the coefficients are recovered, the coefficient size changes: for horizontal pay dispersion, the probability of cross-firm mobility increases by 2 percent and for vertical pay dispersion the probability of cross-firm mobility decreases by 2.6 percent. Finally, in additional analyses (see the on-line Appendix in Table A3), we assess whether the moderating effects of pay position continue to persist when vertically dispersed wages are interacted with same-level pay position and vice versa. As can be seen, these estimates are similar to our prior findings: the effect of vertical wage dispersion continues being amplified (mitigated) for bottom (top) earners, even when pay position is operationalized within a job level. Similarly, the effect of horizontal wage dispersion is mitigated (amplified) for top (bottom) earners, even when pay position is operationalized across job levels.

These estimates suggest that our findings are not sensitive to whether pay position is specified within or across job levels.

****** Insert Table 3 about here *******

Assumptions

Internal Advancement and Social Comparisons. Our argument makes two assumptions. The first assumption we make is that vertical wage dispersion signals attractive career prospects in the firm because workers can expect to climb job ladders and in doing so extract greater rewards. Horizontal wage dispersion, by contrast, is not tied to career ladders; instead, it aims to sort out high performers from average and lower performers, motivating many workers to switch employers. The second assumption we make is that employees engage in wage comparisons. When wage is dispersed horizontally, these comparisons tend to be negative, because employees rely on same-level workers to evaluate pay fairness. But, when wage is dispersed vertically, these comparisons serve an aspirational function because workers view upper-level referents as a source of information and aspiration about future advancement.

In what follows below, we formally test these two assumptions in additional analyses. First, we examine the relationship between pay dispersion and internal mobility, defined as an employee's promotion to the next level within an organizational hierarchy. If our first assumption is plausible, vertical dispersion in pay will be positively associated with the odds of an employee's advancement to the next level. Internal advancement is a dummy variable that takes a value of "1" if an employee moves from a lower- to a higher-level position within a firm at time $t + 1$, and 0 otherwise.

The results for linear probability models with internal mobility as an outcome are reported in Table 4. A one standard deviation increase in vertical wage dispersion is associated with a 0.4 percent increase in the probability of climbing an internal job ladder. Conversely, a one standard deviation increase in horizontal wage dispersion is associated with a 2 percent decrease in the probability of climbing an internal job ladder. These results not only continue to persist when individual-fixed effects and individual- and firm-fixed effects are included in the model, but also are strengthened, as presented in Column (2) and in Column (3). Overall, these analyses verify our assumption that employees in firms with higher vertical wage dispersion are more likely to advance in internal ranks.

We test our second assumption, about social comparisons, indirectly by assessing the heterogeneous effects based on social similarity. Social comparisons are enhanced when individuals exhibit interpersonal proximity (Festinger 1954) and studies have found that social influence flows through individuals who share core demographics, such as gender, ethnicity, or age (e.g., Festinger et al. 1950, Lawrence 2006; Kacperczyk, 2013). If such comparisons underlie our findings, the mobility-reducing (mobility-inducing) influence of vertical (horizontal) wage dispersion will be amplified when employees are socially proximate. Social proximity will amplify the horizontal-dispersion effect because job concerns will be enhanced with social proximity of same-level peers; the more proximate the same-level referents, the stronger the perception of inequity, unfairness, and limited job opportunities. Similarly, social proximity will amplify the vertical-dispersion effect because the aspirational function of higher-level referents will be stronger when referents are socially similar and therefore easier to identify with.

In the main analyses, we consider interpersonal proximity with respect to an employee's age and tenure. Age and tenure are the key cues about expected career progress and rewards (Lawrence 1984), and employees compare themselves with others similar with respect to these dimensions (e.g., Zenger and Lawrence 1989). Age (and tenure) proximity is an absolute distance between an employee's age (tenure) and the median age (tenure) of relevant peers—that is, peers either within or across job levels. We take an inverse of these measures such that higher values indicate greater social similarity. In Table 5, Columns (1)-(5), we report the results for key demographic (i.e., age) and functional (i.e., tenure) dimensions. Column (1) presents the baseline estimates of the social proximity variables in the probability of cross-firm moves: both coefficients are consistent with those presented in the baseline analyses in Table 3. We first estimate the joint effect of wage dispersion and age similarity in Columns (2)-(3). Figures A1-A2 in Online Appendix plot the interaction of vertical and horizontal dispersion with the mean of age similarity as well as 2 standard deviations above and below the mean of age similarity. As predicted, a decrease in the association between cross-firm mobility and vertical dispersion is greater when age similarity is higher across hierarchy levels, suggesting that social similarity across hierarchy levels serves an aspirational function, amplifying the negative effect of vertical pay dispersion on mobility. On the other hand, the positive effect of horizontal dispersion on mobility is amplified as age similarity increases within the

hierarchy level, providing further evidence for the social comparison effect of wage dispersion. In Columns (4) through (5), we replace age similarity with tenure similarity and obtain similar results. Figures A3-A4 in Online Appendix illustrate the interaction effect with similar patterns. Whereas these main dimensions of social similarity support our prediction, we consider gender and ethnicity as additional similarity dimensions. In Table A4 (online appendix), we conduct similar analyses for other similarity dimensions, including gender and ethnicity. Columns (1)-(2) report the joint effect of wage dispersion and gender similarity. In line with our expectation, gender similarity amplifies the negative effect of vertical wage dispersion, as indicated in Column (1) of Table A4 and illustrated in Figure A5 in Online Appendix. However, as suggested by the coefficients (Column 2) and the interaction graph (Figure A6, Online Appendix), gender similarity within the hierarchy level negatively moderates the positive effect of horizontal wage dispersion on cross-firm moves. One interpretation of these results is that horizontal, same-gender comparisons differ across gender and the observed negative effect reflects the coefficient of comparison among men, who are over-represented in our sample. Women's career referents tend to be at lower or the same levels in their career accomplishments (Gibson and Lawrence 2010, Major and Konar 1984). It may also be that vertical, same-gender comparisons are stronger for men than for women because men's career referents tend to occupy higher levels than those of women and women are less likely than men to rely on same-gender referents in higher positions (e.g., Gibson and Lawrence 2010). This could be because gender distribution in upper hierarchical levels is skewed in organizations and fewer same-gender career referents are available to women than to men (see Kanter 1977, Lyness and Thompson 2000). Alternatively, men identify with upward social referents because of higher self-confidence (Gastorf et al. 1980, Gibson and Lawrence 2010, Ibarra 1992).[9] To investigate these mechanisms, we re-estimate the baseline analyses for males and females separately. These additional results reported in Table A5 in the Appendix lead to several conclusions. First, same-gender comparisons amplify the horizontal-wage dispersion effect for women but not for men: the interaction of horizontal wage dispersion with gender

[9] It may also be that women compete with other women for similar job opportunities. To assess this possibility, we re-estimated Columns (5)-(6) of Table A4 with a control the potential female competition for similar jobs. We proxied for the level of competition with a share of women in top positions in the firm: higher value indicates lower level of competition among female workers because more advancement opportunities are available for women in a given firm. Our results (available upon request) were recovered when the models were re-estimated with this covariate.

similarity increases the probability of cross-firm mobility for female workers but reduces for male workers. Second, same-gender comparisons amplify the vertical-wage dispersion effect for men but not women. Same-gender comparisons for vertical dispersion decrease the probability of cross-firm moves for men, indicating that the mobility-suppressing effect of vertical dispersion is observed for men. Together, these results provide a more nuanced view of how same-gender comparisons might moderate the wage dispersion effect on inter-firm mobility. In Columns (3)-(4) of Table A4, we estimate the joint effect of wage dispersion and ethnic similarity. Consistent with the cohesive implications of ethnic homogeneity, we find the effect of wage dispersion to be amplified by ethnic homogeneity, for both horizontal (Column 3) and vertical variance in pay (Column 4). These patterns are similarly reflected in the interaction graphs, as shown in Figures A7-A8. Evidence presented here suggests that the association between cross-firm mobility and wage dispersion is generally stronger across employees who are socially proximate and thus more likely to engage in social comparisons.

******* Insert Table 4 and Table 5 about here *******

Alternative Explanations

Unobserved Sorting. An important concern might be that employees inclined to job-hop may sort differentially across firms, if they exhibit preference for firms with high-horizontal or low-vertical dispersion. Sorting processes could spuriously generate an association between unequal wage across and within hierarchies and cross-firm mobility. A standard method to account for such sorting is to estimate our models with fixed-effects estimators for an individual, firm, and spell (all our findings are robust to these specifications). However, the fixed-effect estimator only mitigates this concern if sorting arises due to time-invariant factors. To rule out the concern that our results reflect time-varying heterogeneity, we conduct a number of analyses.

CEM Matching. First, we re-estimate the baseline specifications in Table 3, while matching employees on the key observables. We construct *Horizontal Treatment* dummy equal to "1" when horizontal wage dispersion falls above the median among firms in a given year, and *Vertical Treatment* dummy equal to "1" when vertical wage dispersion falls above the median among firms in the given year. Using these measures, we matched individuals on age, gender, country of birth (regionally grouped),

education level (low, medium, high), firm tenure and college GPA scores in a coarsened exact matching (CEM) model framework to generate separate samples to test horizontal and vertical treatment effect (King, Lucas and Nielsen, 2016). We used quartiles to coarse the data for continuous variables (age, firm tenure and GPA) and exact matching for categorical variables (gender, country of birth and educational level).[10] In additional tests (available upon request), we verified that covariates were balanced between treatment and control groups, confirming the conditional independence assumption of coarsened exact matching.

Table 6 re-estimates the main models in Table 3 with horizontal and vertical treatment dummies in separate samples created with matching procedure and with the inclusion of firm-fixed and individual-fixed effects. Columns (1)-(2) confirm that the association between horizontal wage dispersion and cross-firm mobility continues being positive, when employees are matched on key observables across firms with higher and lower horizontal wage dispersion. Similarly, Columns (3)-(4) show that the association between vertical wage dispersion and cross-firm mobility continues being negative and highly significant, when employees are matched on key observables across firms with higher and lower vertical wage dispersion.

******* Insert Table 6 about here *******

Destination Firm. Second, we assess wage dispersion patterns in the destination firm relative to current employment. If our findings reflect unobserved preferences that incline employees to sort into certain types of firms, we would expect wage dispersion in the origin and the destination firm to be similar, as employees with stable preferences sort into similar kinds of firms in different time periods. By contrast, if wage dispersion has a causal effect, then we would expect wage dispersion in the origin and the destination firm to differ, as employees seek to find an environment with a more favorable pay structure. Specifically, employees most subject to the downsides triggered by horizontal pay variance (i.e., bottom earners) will seek more-equitable firms relative to past employment. Conversely, employees who benefit from horizontal dispersion the most (i.e., top earners) will seek less-equitable firms. We measure wage dispersion at the destination firm at time *t* (before an employee's move) because, in choosing future

[10] Our results are robust to matching around alternative cutoff points.

employment, employees consider the characteristics thereof prior to the move.[11] Horizontal wage dispersion at the destination firm is measured at the level the worker joins.

Table 7 presents OLS regressions to estimate the association between horizontal and vertical wage dispersion at the origin and the destination firm, conditional on mobility. We include a firm fixed-effect estimator at the destination firm to mitigate the concern that unobserved heterogeneity at the destination firm might confound our estimates.[12] Estimates in Column (1) show that bottom earners tend to move to more-equitable positions relative to positions at the origin firm: the coefficient on the interaction between *Bottom Earner* and *Horizontal Wage Dispersion* is negative and statistically significant. Top earners tend to move to less-equitable positions relative to their past employment, as indicated by the positive interaction term of *Top Earner* and *Horizontal Wage Dispersion*. In Column (2), we re-estimate the baseline specification from Column (1) but focus on vertical wage dispersion. We measure vertical wage dispersion at the destination firm at time *t*. To the extent that vertical wage dispersion offers attractive advancement opportunities, we would expect workers to move to firms with similar or higher vertical wage dispersion, relative to past employment. The results indicate that bottom earners within the vertical pay distribution tend to move to organizations with higher vertical wage dispersion relative to past employer, consistent with the claim that workers seek employers with more attractive career ladders, conditional on mobility. Moreover, there is no significant difference in the level of vertical dispersion between the origin and the destination firm for top earners in the vertical pay distribution. This might be because it is difficult for these top workers to find more attractive advancement opportunities or that they are less motivated to do so. Together, these additional findings are consistent with our argument: horizontal pay dispersion motivates workers to join employers with comparatively lower levels of such variance in pay, most likely because workers seek to mitigate the negative consequences they experienced during past employment spell.

******* Insert Table 7 about here *******

[11] As a robustness check, we develop an *ex-post* measure of wage dispersion at time *t* +1 (i.e., after an employee's move) and find similar results.

[12] As a robustness check, we re-estimate these models with parent-firm fixed effect or individual fixed effect. The results are quantitatively and qualitatively similar.

Employee Ability. Despite the analyses above, one might still be concerned that unobserved differences in employee ability drive our results: for example, bottom horizontal earners may switch employers because they are of low ability, whereas top horizontal earners may switch employers because they are of high ability. However, this explanation is unlikely given that our results are robust to a battery of tests: the effect is amplified when workers are socially proximate, or when models are estimated "within individual," or when workers are matched on observables. Nevertheless, we conduct additional analyses to probe this possibility.

College GPA. We first examine cross-sectional heterogeneity in individual ability. For a subsample of employees in our data,[13] we use an individual's college GPA score to proxy for individual ability. In doing so, we follow a well-established line of work that uses school performance and achievement to account for unobserved differences in ability (e.g., Wise, 1975; Black and Lynch, 1996). To the extent that our results reflect low ability, the relation between wage dispersion and cross-firm mobility should be amplified for individuals with low GPA. We compute a "high-ability" indicator equal to 1, if an individual's college GPA fell within the top 10 percent, and 0 otherwise. Similarly, we compute a "low-ability" indicator equal to 1, if an individual's college GPA fell within the bottom 10 percent, and 0 otherwise.

In Table 8, the main results for vertical and horizontal wage dispersion remain similar, even when we include a control for college GPA (Column 1). In Column (2), we find that the propensity to leave in response to horizontal wage dispersion is not driven by low college GPA; rather, the effect is amplified for high-GPA workers. In Column (3), we interact vertical wage dispersion with the GPA measures and find that college GPA does not change the propensity to leave when vertical wage dispersion is high. Finally, in Column (4), we re-estimate the interaction terms jointly in one model: the results are consistent with those in Columns (2)-(3). Collectively, these additional tests suggest that our findings are unlikely to be driven by low-ability workers.

Wage Transparency. Our argument implies that workers make mobility decisions in response to

[13] In additional analyses, we assessed whether workers with non-missing GPA data were systematically different from workers with non-missing data. However, we found no statistical differences across the main observables.

information about others' wages, as opposed to inherent observable or unobservable characteristics. We verify this claim by assessing the sensitivity of our findings to changes in wage transparency: our expectation is that the wage-dispersion effect should be amplified when wage transparency increases and more information about pay is available. We examine this possibility by assessing whether an exogenous change in wage transparency moderates our main effects. Although wage information has long been possible to access in Sweden, wages became even more transparent when a private firm named Ratsit launched a website in 2006 (followed by other firms), enabling anyone to access the tax records on the click of mouse and free of charge, in the comfort and anonymity of home.[14] If workers react to information about others' pay, we would expect the mobility effect of horizontal and vertical wage dispersion to be amplified, following an increase in wage transparency.

To conduct this test, we compute an indicator variable *Ratsit Launch* equal to 1, if the year is 2006 or greater, and 0 otherwise. The results presented in Table 9 lend support to our prediction. Column (1) presents the baseline effect of Ratsit launch on cross-firm mobility. Column (2) shows that, when interacted with *Ratsit Launch*, horizontal wage dispersion has a positive and statistically significant coefficient. This indicates that the mobility-inducing effect of horizontal wage dispersion increased following an increase in wage transparency. However, an interaction term between *Ratsit Launch* and *Vertical Wage Dispersion* is not statistically significant at conventional levels. Columns (3)-(4) re-estimate the same specifications but include an individual-fixed effect, as well. The interaction between *Ratsit Launch* and *Horizontal (Vertical) Wage Dispersion* continues being amplified (mitigated) and the coefficients are statistically significant in both cases. These results provide additional evidence that our effects reflect workers' response to information about pay.

******* Insert Tables 8 and 9 about here *******

Unemployment Transition. In another test, we rely on transition into unemployment, given that workers with low ability are at a higher risk of unemployment spell. In Table A6 and Table A7 (see on-

[14] Ratsit.com handled an average of 50,000 online credit checks a day (Nordstrom, 2007). As described by the Swedish Data Inspection Board lawyer, "Your neighbor knows what you're making, your brother-in-law knows what you're making, and people around you can know whether you're on any records for outstanding payments. It's private and a bit embarrassing." (Nordstrom, 2007).

line Appendix), we re-estimate models in Tables (3) and Table (5) but censor workers with unemployment gaps, most likely to have entered unemployment. Although the sample size decreases by 6 percent, we obtain similar estimates across both of these tables. As an additional test, we estimate a multinomial logit model with unemployment and cross-firm mobility as competing risks. In Table A8 (on-line Appendix), Column (1), our results continue to persist (except for the interaction between vertical wage dispersion and bottom earners where the coefficient is not significant). Finally, in Column (2), neither vertical nor horizontal wage dispersion is significantly associated with unemployment, mitigating a concern that low-ability workers might drive our findings.

Other Robustness Checks

In Table A9 (on-line Appendix), we report additional robustness checks. First, an important concern is that our analyses may include multi-establishment firms in which social comparisons are weaker due to geographic distance. Although this would bias our results against significant findings, we re-estimate our baseline specification excluding multi-establishment firms. Doing so reduces the sample size by 53 percent. However, as shown in Column (1), our results are robust to this exclusion. Second, in Column (2), we re-estimate our baseline specification using a logistic model to address the concern that our main analyses use a linear probability model. Although the usual out-of-sample prediction concerns with linear probability models are not present in our estimations because of the large sample size, we additionally show that our results are robust to logitistic model specification. Further, in Columns (3)-(4), we re-estimate baseline specifications with alternative measures of horizontal and vertical wage dispersion. First, following prior studies (e.g., Siegel and Hambrick 2005), we compute an alternative measure of vertical wage dispersion as the difference between the average level of pay in the focal individual's hierarchy and the average level of pay in the hierarchy immediately above. By default, this measure takes a value of zero for those occupying the highest hierarchical positions because these individuals face no further growth prospects. The greater the value of our measure, the higher the differential in average compensation between the pay of those at the next level in the hierarchy. As can be seen, the results remain robust, with a negative coefficient indicating that the likelihood of inter-firm mobility decreases, as vertical wage dispersion increases. As another robustness check, we operationalize horizontal and vertical

wage dispersion as the distance between a focal employee's pay and the average pay in the relevant referent group. Horizontal wage distance is the difference between a focal employee's pay and the average pay of same-level peers. Vertical wage distance is the difference between a focal employee's pay and the average pay at the next hierarchical level. Similar to our previous measure, this measure equals zero for individuals occupying the top hierarchy levels. As shown in Column (4), the results are robust, with a positive coefficient on horizontal wage distance and a negative coefficient on vertical wage distance. As another robustness check, we use the Theil index (Theil 1967) in lieu of the Gini coefficient. The Theil index is derived as a particular case of a more general entropy and is often used to measure dispersion (Theil 1967). Because it is possible to decompose the Theil index to estimate the components of wage dispersion *across* and *within* groups, we use this measure for robustness. As shown in Column (5), the main effect of horizontal and vertical wage dispersion is similar to before. In unreported analyses, we include an individual fixed effect to rule out the concern that unobserved time-invariant characteristics of employees might drive our findings (available upon request). The coefficients on the Theil index are qualitatively and quantitatively similar to before, suggesting that the results are robust across different measures of wage dispersion. As another robustness check, we constructed measures of horizontal and vertical wage dispersion but collapsed "associate professionals" and "professionals" categories. The results reported in Column (6) are similar to our previous findings, suggesting that the estimates are not sensitive to the distinction between these two categories.[15] Finally, we re-estimated the baseline analyses splitting the sample by the organizational level, to assess whether the effects of vertical wage dispersion differed at each level of the organizational hierarchy. These estimates were largely consistent with our earlier analyses on wages: the association between vertical pay dispersion and mobility was strongest for employees at the bottom level of the organizational hierarchy. By contrast, the effect was weakest for workers at the top level of the organizational hierarchy. These results (unreported and available upon request) are consistent with the cross-heterogeneity in wages that we explored in Table 3.

DISCUSSION

The analyses we present here make a number of contributions. First, we contribute to the growing

[15] The results are robust to including individual-fixed effects and firm-firm fixed effects.

literature on employee movements across organizations (Bidwell 2011; Bidwell and Mollick 2015; Cappelli 1999) by shedding light on the antecedents of cross-firm mobility. To date, research on wage dispersion and mobility has predominantly focused on the downsides of unequal pay and scholars have documented the mobility-inducing effect of wage dispersion. However, this view has not been reconciled with the alternative perspective, which emphasizes the incentive and productivity benefits of dispersed pay (Bloom and Michel 2002; Castanias and Helfat 1991).

In this study, we address this shortcoming by turning our attention to these positive consequences of dispersed and identifying the conditions under which wage dispersion suppresses cross-firm mobility. We propose that the wage-dispersion effect is contingent on the organizational rank: whether wages vary within or across levels in the firm. Specifically, building on the literature on employment relationship and internal labor markets, we argue that vertical wage dispersion suppresses cross-firm mobility because employees view such variance as beneficial. Further, these benefits dominate any negative consequences of vertical dispersion, such as negative social comparisons or limited career opportunities. By contrast, horizontal wage dispersion increases cross-firm mobility because it is primarily associated with negative consequences, which increase an individual's propensity to switch employers, either because of voluntary or involuntary separation. Consistent with this claim, we find that horizontal wage dispersion leads to an increase in inter-firm mobility, while vertical wage dispersion leads to a decrease in inter-firm mobility. More generally, by shedding light on organizational rank, our study reconciles two different theoretical perspectives on the effects of wage dispersion: one rooted in the psychological literature and focused on the downsides of social comparisons associated with dispersed pay, and one rooted in economics and strategy, and focused on the upsides of incentives and productivity of wage dispersion.

Our analyses probed deeper into other mechanisms we theorized. First, we found that a worker's position in the pay distribution moderates the main effects, consistent with our argument that vertical and horizontal pay dispersion trigger different causal processes, leading to different outcomes. The association between horizontal wage dispersion and cross-firm mobility is amplified for bottom earners within each hierarchy because these workers are most subject to the downsides of pay dispersion. Conversely, the effect of horizontal wage dispersion is mitigated for top earners because these workers benefit from

unequal pay the most. Finally, the vertical-wage dispersion effect is amplified for bottom earners across hierarchies because these workers find internal career ladder most enticing. In contrast, the effect is mitigated for top earners because further career prospects appear to be limited for those who are already at the top.

Moreover, in additional analyses, we verified our theoretical assumptions. First, consistent with the theories of internal labor markets and employment relationship (Doeringer and Piore, 1971; 1985; Lazear and Oyer, 2003; Kalleberg and Sørensen 1979), we found that vertical (horizontal) wage dispersion is associated with a higher (lower) likelihood of climbing the next level in the firm. These findings confirm that vertical wage dispersion is more likely than horizontal wage dispersion to signal attractive advancement options. Moreover, consistent with the theories of social comparisons underlying the mobility effects of dispersed wages, our findings are amplified when peers are proximate with respect to age, gender, ethnicity, and experience. Our findings also revealed complex dynamics for same-gender comparisons: horizontal wage comparisons increase inter-firm mobility when made by women, but not by men. Conversely, vertical wage comparisons reduce inter-firm mobility when made by men, but not by women. Similarly, past research has documented that same-gender comparisons differ within and across hierarchical levels (Gibson and Lawrence 2010).

Yet more research on vertical and horizontal wage dispersion is needed. We have theorized the conditions under which wage dispersion suppresses cross-firm mobility. But researchers can also profitably address the potential trade-off between relative and absolute pay and their relation with mobility decisions. For example, an intriguing path of inquiry is to examine whether employees are willing to exchange a higher absolute salary (and lower relative salary) in one organization with a lower absolute salary (and higher relative salary) in another organization. This possibility is consistent with Frank's argument about being a big fish in a small pond (Frank, 1985), which suggests that decision makers are more concerned with their internal status than their global status. Whether this logic applies to wage dispersion and mobility is an area scholars might want to investigate in the future. Another implication or our findings is that combining high vertical and low horizontal pay dispersion might be optimal for firms and workers. As an initial step, we assessed firms with these characteristics in our sample. Preliminary

analyses reveal that firms which combine high levels of vertical wage dispersion and low levels of horizontal wage dispersion might be characterized by longer employee tenure, a larger proportion of educated employees, higher absolute wages, and higher operating profits, relative to other firms in our sample. Given these intriguing descriptives, future research should examine whether and how firms benefit from the combination of vertical and horizontal pay and under what conditions they tend to do so. A fruitful research avenue would be to investigate the impact of wage dispersion on transition to entrepreneurship. Specifically, more attention is required to understand how perceptions of fairness and expectations of future pay influence the decision to become an entrepreneur. Relatedly, Shah, Agarwal and Echambadi (2016) find that the perceived dispersion not only for one's own compensation, but also in how the organization treated others was a critical push factor for the "ringleader" founders. Finally, although our findings suggest that vertical wage dispersion is associated with significant benefits for workers, encouraging them to remain in current employment, further research should investigate whether vertical wage dispersion also triggers job concerns, such as the perception of inequity or lower product quality (Cowherd and Levine, 1993). Whether and when the benefits of vertical wage dispersions might be outweighed by the possible downsides should be subject of further scholarly inquiry.

Methodologically, our setting offered key advantages with respect to wage transparency and social comparisons. Because wages are transparent in Sweden, this setting offers a significant advantage of quantifying the effects of horizontal and vertical wage dispersion more precisely. But our findings are likely to generalize to other contexts, where pay differentials are less transparent. In particular, wage comparison may still take place via informal channels that transmit information about peer wages. However, our results are less applicable to firms with flat structures, in which hierarchical distinctions are absent. For example, in entrepreneurial firms in which wages are unlikely to be dispersed across levels, the decision to switch jobs may be determined by wages dispersed horizontally (Zenger 1992). Additional research on the relationship between wage dispersion and mobility in such organizations is warranted. Relatedly, future studies may want to investigate the effects we document here in other settings. Although the rates of external mobility in Sweden are fairly comparable to those in other countries, it is nevertheless important to assess whether our findings generalize to other labor markets, with different institutional

settings and different organizational structures. It might be fruitful, for example, to examine whether vertical wage dispersion continues to exert an equally significant role in countries with less hierarchical organizations and less well-developed internal labor markets.

Overall, this study revisits the well-established association between wage dispersion and cross-firm mobility, and we demonstrate different antecedents of external moves. Although the majority of studies have documented the mobility-inducing effect of wage dispersion, our study illuminates the conditions under which wage dispersion suppresses cross-firm mobility. We find that the likelihood of job-hopping is negatively associated with vertically dispersed wages, because such wage differences are tied to different job levels, influencing one's expectations about future attainment. At the same time, our results provide strong evidence that the likelihood of job-hopping is positively associated with horizontally dispersed wages, because such dispersion triggers significant downsides for employees —which tend to push workers out of an organization. Together, these insights indicate that although wage dispersion within the firm is important for understanding individual mobility, so too is the firm's internal structure.

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Table 1. Descriptive Statistics

Variables	Mean	S.D.	Min	Max
External move	0.147	0.354	0.000	1.000
Top earner (90th quartile of firm-hierarchy-year)	0.115	0.319	0.000	1.000
Bottom earner (10th quartile of firm-hierarchy-year)	0.097	0.297	0.000	1.000
Top earner (90th quartile of firm-year)	0.096	0.294	0.000	1.000
Bottom earner (10th quartile of firm-year)	0.094	0.292	0.000	1.000
Female	1.353	0.478	1.000	2.000
Swedish	0.858	0.349	0.000	1.000
Age	39.513	10.704	20.000	59.000
Age squared	1675.892	862.571	400.000	3481.000
Wage (in thousands)	287.882	199.265	1.001	27642.646
Wage squared (in millions)	122582.63	1361999.716	1.002	7.641e+08
Tenure	7.030	5.769	1.000	22.000
Tenure squared	82.701	114.634	1.000	484.000
Education < 12 years	0.459	0.498	0.000	1.000
Education = 12 years	0.256	0.437	0.000	1.000
Education >12, <=15 years	0.278	0.448	0.000	1.000
Education >=16 years	0.006	0.080	0.000	1.000
Hierarchy level 1	0.047	0.211	0.000	1.000
Hierarchy level 2	0.131	0.337	0.000	1.000
Hierarchy level 3	0.198	0.398	0.000	1.000
Hierarchy level 4	0.624	0.484	0.000	1.000

No. of hierarchies	3.653	0.654	2.000	4.000
Operating profit	285776.573	2140791.325	-2.072e+07	24220000.000
Annual operating profit growth	18.173	13418.209	-5923446.000	24220000.000
Firm age	12.634	6.380	1.000	22.000
Nr. of establishments	47.629	150.918	1.000	1257.000
Nr. of employees	2283.041	4810.706	7.000	31764.000
Horizontal wage dispersion	0.185	0.062	0.000	0.958
Vertical wage dispersion	0.096	0.053	0.000	0.704
Observations	7,057,819			

Table 2A: Internal movements between hierarchical positions

	Subsequent Position in the Same Firm				
Origin Position	**Manager**	**Professional**	**Assoc. Professional**	**Technical Worker**	**Total**
Manager	N/A	8,585	11,004	5,893	25,482
%	N/A	*33.7*	*43.2*	*23.1*	*100%*
Professional	14,137	N/A	30,454	4,835	49,426
%	*28.6*	N/A	*61.6*	*9.8*	*100%*
Associate Professional	16,080	40,443	N/A	43,513	100,036
%	*16.1*	*40.4*	N/A	*43.5*	*100%*
Technical Worker	13,890	10,247	55,475	N/A	79,612
%	*17.4*	*12.9*	*69.7*	N/A	*100%*
Total	44,107	59,275	96,933	54,241	254,556

Table 2B: External movements between firms and hierarchical positions

	Subsequent Position in the New Firm				
Origin Position	**Manager**	**Professional**	**Assoc. Professional**	**Technical Worker**	**Total**
Manager	16,934	2,929	3,285	2,465	25,613
%	*66.1*	*11.4*	*12.8*	*9.6*	*100%*
Professional	14,137	4,276	69,817	11,404	2,831
%	*4.8*	*79.0*	*12.9*	*3.2*	*100%*
Associate Professional	4,117	12,942	74,784	14,827	106,670
%	*3.9*	*12.1*	*70.1*	*13.9*	*100%*
Technical Worker	3,521	6,031	21,032	309,674	340,258
%	*1.0*	*1.8*	*6.2*	*91.0*	100%
Total	44,107	91,719	110,505	329,797	560,869

Table 3. OLS Regressions of Cross-Firm Mobility

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Horizontal Wage Dispersion	0.106***	0.233***	0.113***	—	0.106***	0.0208***
	(0.00358)	(0.00372)	(0.00369)	—	(0.00370)	(0.00416)
Vertical Wage Dispersion	-0.0627***	-0.0476***	—	-0.0414***	-0.0551***	-0.0258***
	(0.00706)	(0.00463)	—	(0.00712)	(0.00713)	(0.00593)
Horiz. wage dispersion × Top earner (horiz.)	—	—	-0.0551***	—	-0.0636***	-0.0324***
	—	—	(0.00564)	—	(0.00564)	(0.00733)
Horiz. wage dispersion × Bottom earner (horiz.)	—	—	0.107***	—	0.120***	0.0576***
	—	—	(0.00655)	—	(0.00666)	(0.00810)
Vert. wage dispersion × Top earner (vert.)	—	—	—	0.0236**	0.0333***	0.0302**
	—	—	—	(0.00729)	(0.00745)	(0.0114)
Vert. wage dispersion × Bottom earner (vert.)	—	—	—	-0.0483***	-0.0579***	-0.0371***
	—	—	—	(0.00764)	(0.00781)	(0.00984)
Top earner (horizontal)	0.000432	0.00567***	0.0180***	—	0.0152***	-0.00321*
	(0.000610)	(0.000757)	(0.00104)	—	(0.00106)	(0.00135)
Bottom earner (horizontal)	0.0177***	0.0135***	0.0187***	—	-0.00731***	-0.00346*
	(0.000717)	(0.000860)	(0.00120)	—	(0.00134)	(0.00158)
Top earner (vertical)	-0.00236***	0.000311	—	0.0126***	0.00995***	-0.00124
	(0.000637)	(0.000794)	—	(0.000738)	(0.000810)	(0.00117)
Bottom earner (vertical)	0.0243***	0.0119***	—	0.0453***	0.0356***	0.0140***
	(0.000750)	(0.000909)	—	(0.000832)	(0.00104)	(0.00126)
Age	-0.00553***	—	-0.00501***	-0.00491***	-0.00493***	—
	(0.0000922)	—	(0.0000906)	(0.0000906)	(0.0000907)	—
Age Squared	0.0000410***	0.0000324***	0.0000357***	0.0000343***	0.0000346***	-0.000384***
	(0.00000110)	(0.00000328)	(0.00000109)	(0.00000109)	(0.00000109)	(0.00000462)
Tenure	-0.0149***	0.0409***	-0.0147***	-0.0146***	-0.0146***	0.0956***
	(0.0000794)	(0.000113)	(0.0000793)	(0.0000793)	(0.0000793)	(0.000332)
Tenure Squared	0.000518***	-0.000794***	0.000513***	0.000512***	0.000511***	-0.00191***
	(0.00000385)	(0.00000602)	(0.00000384)	(0.00000384)	(0.00000384)	(0.00000817)
Education =12	-0.00286***	0.0117***	-0.00167***	-0.00196***	-0.00198***	0.0148***
	(0.000306)	(0.00309)	(0.000305)	(0.000305)	(0.000305)	(0.00359)
Education >12,<=15	0.00928***	0.00928***	0.0104***	0.0102***	0.00970***	0.0505***
	(0.000347)	(0.000347)	(0.000345)	(0.000345)	(0.000346)	(0.00384)
Education >15	0.00339*	0.00339*	0.00563***	0.00445**	0.00328*	0.0252*
	(0.00149)	(0.00149)	(0.00148)	(0.00148)	(0.00148)	—
Female	-0.0141***	-0.0141***	-0.0174***	-0.0175***	-0.0178***	—
	(0.000291)	(0.000291)	(0.000277)	(0.000276)	(0.000277)	—
Swedish	0.00940***	0.00940***	0.0105***	0.0103***	0.0103***	—
	(0.000334)	(0.000334)	(0.000332)	(0.000332)	(0.000332)	—
Wage	-0.0000115***	-0.0000115***	-0.0000275***	-0.0000358***	-0.0000333***	-0.0000148***
	(0.00000126)	(0.00000126)	(0.00000124)	(0.00000124)	(0.00000135)	(0.00000230)
Wage squared	1.22e-09***	1.22e-09***	2.38e-09***	2.87e-09***	2.66e-09***	5.52e-10***
	(1.45e-10)	(1.45e-10)	(1.43e-10)	(1.43e-10)	(1.46e-10)	(1.05e-10)
Operating Profit	-7.63e-10***	-7.63e-10***	-7.89e-10***	-7.26e-10***	-7.39e-10***	-1.53e-09***
	(9.06e-11)	(9.06e-11)	(9.05e-11)	(9.06e-11)	(9.06e-11)	(6.77e-11)
Annual Operating Profit Growth	-7.41e-10	-7.41e-10	-9.12e-10	-1.03e-09	-1.04e-09	7.90e-09
	(7.85e-09)	(7.85e-09)	(7.85e-09)	(7.85e-09)	(7.84e-09)	(8.73e-09)
Nr. of Establishments	0.000503***	0.000503***	0.000499***	0.000505***	0.000501***	0.000153***
	(0.0000168)	(0.0000168)	(0.0000168)	(0.0000168)	(0.0000168)	(0.0000151)
Nr. of Employees	-0.000000284	-0.000000284	1.32e-08	-0.000000259	-0.000000252	-0.0000138***
	(0.000000379)	(0.000000379)	(0.000000378)	(0.000000379)	(0.000000379)	(0.000000348)
Clustered Standard Errors	Firm	Individual	Firm	Firm	Firm	Firm and Ind.
Firm fixed effect	Yes	No	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Hierarchy Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Municipality fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effect	No	Yes	No	No	No	Yes
Observations	7,057,819	7,057,819	7,057,819	7,057,819	7,057,819	7,057,819
R^2	0.313	0.313	0.313	0.313	0.314	0.737

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4. OLS Regressions of Internal Mobility

Variables	(1)	(2)	(3)
Horizontal wage dispersion	-0.0150***	-0.0728***	-0.0942***
	(0.00131)	(0.00213)	(0.00328)
Vertical wage dispersion	0.0104***	0.0285***	0.0326***
	(0.00115)	(0.00124)	(0.00173)
Age	0.00183***	-	-
	(0.0000318)		
Age Squared	-0.0000238***	-0.0000589***	-0.0000253***
	(0.000000381)	(0.00000152)	(0.00000210)
Tenure	-0.000724***	-0.00326***	-0.00428***
	(0.0000359)	(0.0000576)	(0.000103)
Tenure Squared	0.0000400***	0.000143***	0.000165***
	(0.00000221)	(0.00000418)	(0.00000500)
Education=12	0.00330***	0.00226	-
	(0.000122)	(0.00125)	
Education>12;<=15	0.0120***	0.0218***	-
	(0.000159)	(0.00137)	
Education>15	0.0120***	0.00938***	-
	(0.000563)	(0.00267)	
Female	0.00239***	-	-
	(0.000125)		
Swedish	0.00538***	-	-
	(0.000130)		
Wage	0.00206***	-0.00313***	-0.00564***
	(0.0000800)	(0.000122)	(0.000207)
Wage squared	-0.0000196***	0.0000157***	0.0000288***
	(0.00000321)	(0.00000210)	(0.00000503)
Profit	-0.000000594***	-0.000000603***	-0.00000101***
	(0.000000127)	(0.000000159)	(0.000000192)
Profit growth	-0.000000424***	-0.000000336	-0.000000684***
	(0.000000119)	(0.000000172)	(0.000000187)
Firm Age	-	0.000145***	-
		(0.0000227)	
Nr. of Establishments	0.0000696***	0.0000131***	0.0000618***
	(0.00000566)	(0.00000213)	(0.00000913)
Nr. of Employees	-0.00000288***	-0.000000664***	-0.00000266***
	(0.000000155)	(6.02e-08)	(0.000000229)
Clustered Standard Errors	Firm	Individual	Firm and Ind.
Firm fixed effect	Yes	No	Yes
Individual fixed effect	No	Yes	Yes
Industry fixed effect	Yes	Yes	Yes
Hierarchy Dummies	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Municipality fixed effect	Yes	Yes	Yes
Observations	7,057,819	7,057,819	7,057,819
R^2	0.036	0.264	0.327

Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5. OLS Regressions of Cross-Firm Mobility: Social Proximity

Variables	(1)	(2)	(3)	(4)	(5)
Horizontal wage dispersion × Age similarity (horizontal)	—	0.00126***			
	—	(0.000319)			
Vertical wage dispersion × Age similarity (vertical)	—	—	-0.00143***	—	—
	—	—	(0.000363)	—	—
Horizontal wage dispersion × Tenure similarity (horizontal)	—	—	—	0.00431***	—
	—	—	—	(0.000563)	—
Vertical wage dispersion × Tenure similarity (vertical)	—	—	—	—	-0.00409***
	—	—	—	—	(0.000645)
Horizontal wage dispersion	0.112***	0.129***	0.120***	0.134***	0.120***
	(0.00469)	(0.00421)	(0.00356)	(0.00403)	(0.00356)
Vertical wage dispersion	-0.113***	-0.0666***	-0.0768***	-0.0663***	-0.0782***
	(0.00909)	(0.00707)	(0.00753)	(0.00707)	(0.00732)
Age similarity (horizontal)	0.112***	0.000470***	—	—	—
	(0.00469)	(0.0000629)	—	—	—
Age similarity (vertical)	-0.113***	—	0.000831***	—	—
	(0.00909)	—	(0.0000408)	—	—
Tenure similarity (horizontal)	0.000144	—	—	-0.000451***	—
	(0.000091)	—	—	(0.000103)	—
Tenure similarity (vertical)	-0.0000591	—	—	—	0.000666***
	(0.000095)	—	—	—	(0.0000693)
Clustered Standard Errors	Firm	Firm	Firm	Firm	Firm
Controls in Table 3	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes
Hierarchy Dummies	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes
Municipality fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	7,057,819	7,057,819	7,057,819	7,057,819	7,057,819
R^2	0.316	0.313	0.313	0.313	0.313

Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6 OLS Regressions of Cross-Firm Mobility using Coarsened Exact Matching (CEM)

Variables	(1)	(2)	(4)	(5)
Horizontal Treatment	0.00610***	0.00817***	—	—
	(0.00139)	(0.00126)		
Vertical Treatment	—	—	-0.00821***	-0.0103***
			(0.00111)	(0.00115)
Clustered Standard Error	Firm	Individual	Firm	Individual
Controls in Table 3	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	No	Yes	No
Industry fixed effect	Yes	Yes	Yes	Yes
Hierarchy fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Municipality fixed effect	Yes	Yes	Yes	Yes
Individual fixed effect	No	Yes	No	Yes
Observations	1,519,172	1,519,172	1,519,172	1,519,172
R^2	0.163	0.618	0.163	0.618

Standard errors in parentheses * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 7 OLS Regressions of Cross-Firm Mobility: Destination Firm (Conditional on Mobility)

Variables	Horizontal wage dispersion at destination (1)	Vertical wage dispersion at destination (2)
Horizontal wage dispersion × Top earner (horizontal)	0.0101***	—
	(0.00259)	—
Horizontal wage dispersion × Bottom earner (horizontal)	−0.0107***	—
	(0.00274)	—
Vertical wage dispersion × Top earner (vertical)	—	0.00214
	—	(0.00152)
Vertical wage dispersion × Bottom earner (vertical)	—	0.00319*
	—	(0.00150)
Top earner (horizontal)	0.000663	—
	(0.000525)	—
Bottom earner (horizontal)	0.00161**	—
	(0.000554)	—
Top earner (vertical)	—	−0.000125
	—	(0.000161)
Bottom earner (vertical)	—	−0.000313
	—	(0.000169)
Horizontal wage dispersion	0.0303***	0.000707
	(0.00123)	(0.000535)
Vertical wage dispersion	0.00221	−0.00728***
	(0.00123)	(0.000642)
Clustered Standard Errors	Firm	Firm
Firm fixed effect (Destination)	Yes	Yes
Industry fixed effect	Yes	Yes
Hierarchy Dummies	Yes	Yes
Year fixed effect	Yes	Yes
Municipality fixed effect	Yes	Yes
Controls in Table 3	Yes	Yes
Observations	378,463	378,463
R^2	0.803	0.946

Standard errors in parentheses * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 8 **Logistic Regressions of Mobility: Individual Ability (GPA)**

Variables	(1)	(2)	(3)	(4)
Horizontal wage dispersion	0.131***	0.126***	—	0.127***
	(0.00490)	(0.00519)	—	(0.00521)
Vertical wage dispersion	-0.0559***	—	-0.0445***	-0.0570***
	(0.00975)	—	(0.00989)	(0.00991)
Horizontal wage dispersion × High GPA (horizontal)	—	0.0311***	—	0.0303***
	—	(0.00774)	—	(0.00792)
Horizontal wage dispersion × Low GPA (horizontal)	—	-0.00535	—	-0.00618
	—	(0.00758)	—	(0.00773)
Vertical wage dispersion × High GPA (vertical)	—	—	0.0102	-0.00101
	—	—	(0.00929)	(0.00954)
Vertical wage dispersion × Low GPA (vertical)	—	—	0.00299	0.00829
	—	—	(0.00901)	(0.00921)
High GPA (horizontal)	—	-0.00380*	—	-0.00519**
	—	(0.00148)	—	(0.00159)
Low GPA (horizontal)	—	0.00406**	—	0.00337*
	—	(0.00146)	—	(0.00164)
High GPA (vertical)	—	—	0.00150	0.00233
	—	—	(0.00108)	(0.00127)
Low GPA (vertical)	—	—	0.00257*	0.000233
	—	—	(0.00105)	(0.00129)
Employee GPA	-0.0000307	—	—	—
	(0.0000665)	—	—	—
Clustered Standard Errors	Firm	Firm	Firm	Firm
Controls in Table 3	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes
Hierarchy Dummies	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Municipality fixed effect	Yes	Yes	Yes	Yes
Observations	4,027,115	4,027,115	4,027,115	4,027,115
R^2	0.304	0.304	0.304	0.304

Standard errors in parentheses * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Data on college GPA is available for 57% of our sample.

Table 9 **Logistic Regressions of Mobility: Wage Transparency**

	(1)	(2)	(3)	(4)
Horizontal Wage Dispersion	0.153***	0.129***	0.0475***	-0.0407***
	(0.00324)	(0.00361)	(0.00377)	(0.00407)
Vertical Wage Dispersion	-0.0102***	-0.00917**	-0.0108***	0.00283
	(0.00303)	(0.00340)	(0.00280)	(0.00311)
Ratsit	0.0720***	0.0600***	0.292***	0.249***
	(0.000458)	(0.00102)	(0.00195)	(0.00216)
Horizontal Dispersion x Ratsit	-	0.0682***	-	0.262***
		(0.00453)		(0.00455)
Vertical Dispersion x Ratsit	-	-0.00160	-	-0.0365***
		(0.00427)		(0.00396)
Clustered Standard Errors	Firm	Firm	Firm and Ind.	Firm and Ind.
Controls in Table 3	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes
Individual fixed effect	No	No	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes
Hierarchy fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Municipality fixed effect	Yes	Yes	Yes	Yes
Observations	7,057,819	7,057,819	7,057,819	7,057,819
R^2	0.131	0.131	0.701	0.701

Standard errors in parentheses * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.