Drivers of Effort: Evidence from Employee Absenteeism *

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Abstract

We analyze determinants of employee effort. We use detailed information on absent spells of all employees in 2,600 firms in Denmark as a proxy for effort in specifications in which we control for important determinants of absenteeism like age, gender and health status. Using movers we decompose absent days into an individual component (e.g., motivation, work ethic) and a firm component (e.g., incentives, corporate culture). We find the firm component to be significant in explaning difference in absenteeism across firms. Moreover, we find the firm component to be correlated with family firm status with family firms causing a decrease in absenteeism. Finally, we analyze the mechanisms behind this effect.

Keywords: family firms; organizational structure; employee effort

JEL Classification:

1 Introduction

Using a novel measure we document large differences in employee effort provision across firms. The measure of effort we propose is based on employee abstenteeism. We use an administrative survey of firms that contains precise information on absent spells of all employees in 2,600 firms in Denmark from 2007 to 2012. We use this measure as a proxy for effort in specifications in which we control for important determinants of absenteeism like age, gender and health status. This measure has the advantage that it can be consistently computed for employees in all firms. In addition to being a proxy for effort, workplace absenteeism is important in its own right since it is the single most influential determinant of labor supply.

We start by showing large differences in days absent across firms. The difference between firms in the top and bottom decile, is 15 days which corresponds to 6% of annual working days. Importantly, this variation persist within industry. Indeed, average absent days computed at the industry level is remarkably stable, suggesting that common industry factors (e.g., type of work or vacation policy which, in Denmark, is negotiated by unions at the industry level) are not important drivers of employee's absence decisions.

We first analyze the role played by two broad set of explanations. On the one hand firms can affect effort of its existing labor force with their compensation, promotion, and dismissal policies and by the type of environment they offer workers. For exampple, worker effort provision is affected when their compensation is tied to their own output (Lazear (1986); Lazear (2000)), when they compete with peers for a promotion (Lazear & Rosen (1981)), when they are monitored more intensely, when they work in the presence of people they are socially tied to (Bandiera et al. (2010)), among others. On the other hand, firms can pursue policies that seek to atract employees who are instrinsically highly motivated.

To asses the relative contribution of each of these two sets of theories in explanaing variation in effort we first use an event study methodology around the time of employees move. Consider an employee who moves from a firm with high average days absent to a firm with low absenteeism. If the main driver of the absence differential is the first set of theories (e.g. incentives, monitoring, environment), we would expect the mover's absence to drop immediately to a level close to that of the employees of the destination firm. If, on the contrary, the absence differential is driven primarily by individual characteristics (e.g., employee loyalty or work ethic), we would expect the mover's absence to remain constant after the move. We find that prior to a move, an employee absence is close to that of his

co-workers at his origin firm. After the move, there is discontinuous jump in mover behavior with employee days absent moving 60% of the way towards the average days absent of his new co-workers at the destination firm.

Moving to a more general setting, we estimate a model of employee effort based on employee and firm fixed effects following the methodology of Abowd et al. (1999) (henceforth AKM). The firm fixed effect in this model captures the effect of all firm policies and its environemnt that equally affects all employees. The individual fixed effect and other time-varying individual covariates capture the effect of individual traits on effort provision regardless of the firm at which the employee is working. By aggregate these two effect to the firm level, we are able to measure the contribution to average effecor of policies/environment on the one hand and selection on the other. When we compare firms with above the median average days absent with firms that are below the median, we find that 53% of the difference in average days absent is driven by firm policies/environment with the rest explained by employee selection.

While the firm fixed effects computed from the above methodology are informative about the effect of firm policies/envrionment that affects all employees (controlling for employee selectio to firms), it is silent about the precise policies or features of the environment that contribute to effects. Hence we turn to studying firm attributes that correlate with these firm fixed effects.

First we find that family firms have a more negative firm fixed effect than non-family firms, suggesting that they provide incentives and/or an environment that promotes less worker absenteeism. Interestingly there is large body of academic and anecdotal evidence suggesting that family firm status affect employee behavior. The direction of the effect is, however, ambiguous. On the one hand, employees of family firms might exert less effort. Family firms might have a more difficult time motivating non-family employees as these workers might be concerned that nepotism, rather than meritocracy, would determine promotions. Non-family employees might also be discouraged if they end up having to spend time embroiled in family conflicts (Poza (2013)). On the other hand, family firm status could boost employee motivation. It is possible that family owners, due to their long-term horizons, have a comparative advantage at sustaining implicit labor contracts, which might be reciprocated by workers with cooperative behavior (Sraer & Thesmar (2007), Ellul et al. (2014)). It could also be that their large ownership stakes motivates family owners to monitor more or be tougher with labor (Mueller & Philippon (2011)), leading to higher effort provision. Our results are consistent with the second set of explanations.

Consistent with the role of incentives, we also find that firms with more aggresive incentives (i.e., firms in which absences translate to a lower probability of a wage increase or a promotion) exhbits more negative firm fixed effects. Also, consistent with the role of monitoring, we find that single-owned firms have more negative firm fixed effects.

Interestingly, we find no effect of product market competition for the average employee. However, when we re-estimate the firm fixed effects using subsamples of employees by seniority, we find a strong discipling role of competion for managers but not for lower level workers. In addition, the sensitivity of wage increases and promotion continue to be important for lower level employees but not for managers. Finally, the effect of family control is concentated in lower level employees.

The paper relates to several strands of literature. First, we relate to literature that examines factors that affect effort provision in firms (i.e. Lazear (1986); Lazear (2000); Lazear & Rosen (1981);Bandiera et al. (2010). The empirical studies in this area typically focus on a single firm. This approach has the advantage that employee performance and incentives can be measured accurately. Moreover, in some cases, researchers find exogenous changes in incentives that helps with the intrepretation of the results. In contrast we use a cruder measures of effort, but one that can be computed for large set of employees in different firm. The advantage of having more than a single firm is that it allows us study the effect of firm characterictics (control, ownership, competition) on employee effort. Second, the paper contributes to a recent literature that explores the role of labor in family firms (Sraer & Thesmar (2007); Mueller & Philippon (2011); Ellul et al. (2014)). We contribute to this literature by showing the positive impact on family ownership on employee effort provision. Finally the paper contributes both to the academic literature and policy debate on how to reduce absenteeism in the workplace. Absenteeism is an economically important factor on its own. The European Commission estimated in 2011 that work related ill health can cost EU member states anything from 2.6% to 3.8% of their GDP (European Commission (2011)). This has lead to a large research on how to reduce absenteeism in firms where the focus to a large extent has been on incentives and specifically how to design and distribute the burden of sick leave pays on employees, employers and governments (see e.g. Scheil-Adlung & Sandner (2010)). There has also been intensive research into how to structure workplaces and empower managers to reduce absenteeism in firms (see Porter & Steers (1973) and Nicholson & Johns (1985)).

2 Data and Descriptive Statistics

2.1 Data sources

Survey of employees' absences. Our main data source is the survey of days absent collected by Statistics Denmark. Statistics Denmark collects absence data for all employees in the central government, local government, and for a selected sample of private firms. The survey of private firms covers firms with more than 10 employees: a representative sample of firms with 10 to 250 employees and all firms with more than 250 employees.

The data covers 2,600 unique firms from 2007 to 2012 (not all firms are included in every year). The data reports each spell of absence for each employee in the sample firms. For each spell, the data contains the employee national identification number (CPR number), firm identifier, workplace identifier, start day, end day, and absence category. There are four absence categories: "Own Sickness", "Child Sickness", "Work Accident" and "Maternity/Paternity related absence". In the analysis below we focus on the category "Own Sickness" since the reporting of other categories is rare.[1]

Matched employer-employee data. We also use the matched employer-employee dataset from the "Integrated Database for Labour Market Research" (IDA database) at Statistics Denmark. In addition to the employer's identification number (CVR), the IDA dataset contains employee's demographic information such as age and gender and the employee's position in the organization. The position in the firm is based on the Danish occupational code that is defined based on the international standard classification of occupations (ISCO). We have access to this dataset for every year in the period 1995 - 2013.

Hospitalization data. Data on hospitalizations is from the National Patient Registry (NPR) at Statistics Denmark. This dataset records all public hospital interactions in the country and contains the individual national identification number, the number of hospitalization days per calendar year, and the primary medical diagnosis of patients based on the classification of diseases of the World Health Organization[2].

Firm financial information. Financial data are from *Experian*, which is a private data provider in Denmark. *Experian* provides us with a dataset that covers financial statements for all firms that are incorporated in Denmark. The data set includes all information that every limited (and public traded) firm is required to file to the Ministry of Economics and Business Affairs. Firms are required

1. Our results do not change when we include the other absence categories as well.
2. http://www.who.int/classifications/icd/

to disclose the value of total assets, as well as the value of their operating and net income. Even though most of the firms in *Experian* are privately held, external accountants audit firm financials in compliance with Danish corporate law. The *Experian* dataset includes a firm identifier (CVR number) which allow us to link the Absence data with the *Experian* data.

2.2 Days absent

In this section we describe the days absent variable from the surveys conducted by Statistics Denmark as well as the relevant regulatory and institutional environment.

First, we present suggestive evidence that the days absent variable contains valid information. In Figure 1a, we plot the number of days absent as a function of hospitalization days. Since these two variables come from different sources (absent days comes from a survey of firms and hospitalization days from administrative data collected from hospitals), it is reassuring to observe the high positive correlation between them. Most employees have zero hospitalization days in a year, however, among those who are hospitalized there is a significant variation in the length of their stay. The effect of hospitalization on days absent is large. For example, employees who spend more than 20 days in hospital are absent 2-3 months.

A different approach to check the validity of the days absent variable is to observe the effect of age on the number of days absent. In Figure 1b we split our sample into young (20 to 45 years old) and old (45 to 65 years old) employees but keep the focus on the relationship between hospitalization days and days absent. As expected, the figure shows that throughout the distribution of hospitalization days, older employees have longer absences relative to younger employees, perhaps due to a longer recovery period.

Second, we show preliminary evidence of a discretionary component in the number of days absent. Figure 1c focuses on the relationship between hospitalization days and days absent for employees in different positions in the firm. To the extent that there is a discretionary component in days absent, we would expect employees with more responsibility to return to work sooner. Throughout the distribution of hospitalization days, employees with high position in the organization have shorter absences than employees in lower positions. The difference disappears for long hospitalization. This could be because our sample is very limited in this part of the distribution or because incentives play a small role for extremely sick employees.

Third, we note that variation in days absent across firms is unlikely to be the result of different firm

vacation policies. In Denmark the number of employee vacation days is almost entirely determined by a combination of the law and collective bargaining. The law specifies that all employees have the right to 5 weeks (25 days) of holidays every year. Furthermore, collective bargaining between the central employer and employee organizations for specific industries can adjust this general vacation rule. However, importantly for our study, these adjustments are negotiated with the unions and not at the firm level.

Fourth, is also unlikely for days absent to vary across firms due to differential reporting. The reimbursement policy of sickness benefits provide firms with incentives to report employees' absences as soon as they start. This is because the firm is required to pay sickness benefits the first 30 days with the Danish government paying only after this initial period.

Finally, we present suggestive evidence that employees' absences matter for the firm. While some studies take this as a given (Flabbi & Ichino (2001) state "workers who are more often and for longer periods absent are less productive for the firm..."), this is not necessarily the case. Although absences reduce contemporaneous labor provision, it is possible that employees compensate the lost time by working more efficiently or by working overtime when they return to the workplace.

To perform the analysis we estimate the following model:

$$OROA_{jt} = \gamma_j + \mu_t + \eta absence_{jt} + x_{it}\theta + \zeta_{jt}\delta + e_{ijt} \ , \tag{1}$$

where $OROA_{jt}$ is each firm-year observation of operating return on assets. γ_j is firm fixed effect, μ_t is year fixed effect, and ζ_{jt} are firm controls. The variable $\mathrm{absence}_{\mathrm{jt}}$ is the mean days absent over all employees in firm j at time t.

The results are presented in Table A1. Columns 1, 2 and 3 presents results for firms with less than 100 employees, more than 100 employees, and above 300 employees, respectively. All columns include firm controls and firm fixed effects. In Columns 2 and 3, the coefficient on average days absent, η, is negative and significant indicating a negative correlation between the average days absent and performance. We do not find a correlation for firms with less than 100 firms. Smaller firms though have noisier data on performance. These results are only preliminary evidence of the effect of days absent on performance, but they are not conclusive as it is difficult to interpret η in a causal way. For example, it could well be that employees decide to take more days off in response to poor firm performance. Since estimating this relation is not the purpose of this paper, we leave this task for future work. We note however that in a different setting, Herrmann and Rockoff (2010) find large

causal effect of teacher absence on productivity.

2.3 Descriptive Firm and Employee Statistics

Table 1 Columns 1 present summary statistics for the universe of Danish firms and Column 2 reports information for firms in our sample. Column 3 presents differences between our sample and the population of firms in Denmark.

To assess firm performance in the absence of stock price information, we use operating return on assets (OROA). The average OROA of limited liability firms in Denmark for the years 2007-2012 is 7.6%. Firms in our sample have lower OROA than those in the population and the difference is 2.7 percentage points, which is statistically significant at any conventional level. We find a similar pattern when we study Net Income/Assets as reported in the second row of Table 1. Row 3 reports firm size measured by assets. Due to the survey selection criteria, our sample consists of larger firms. The significant size differences are confirmed in Row 4, which reports the natural logarithm of asset size, and in Row 5, which reports the average number of employees. Row 6 reports the mean age of firms. Firms in our sample are 13 years older than the average private company in Denmark and this difference is statistically significant. In sum, Table 1 confirms that the absence sample consists of larger and older firms than the average firm in Denmark.

Table 2 presents summary statistics for the employees in all Danish firms (Column 1) as well as for firms in our sample (Column 2). Column 3 presents differences between these two groups. We report the average over the sample years, from 2007 to 2012. Row 1 reports the wage level. The average wage level for all employees is 306,750 Danish Kroner which is approximately 41,229 EUR [3]. For our sample firms the average wage level is higher, at 425,184 DKR or 57,148 EUR. The second row reports that the average employee age for population of firms is 38.52 years. Workers in our sample are on average 41.3 years old. The difference of 3.3 years is statistically significant on a 5% level. The third row reports gender composition of the workforce. On average almost 2/3 of the employees are males. There are 5% more female workers in the absence sample. The fourth row reports average hospitalization days for employees per year. Since most employees have zero hospitalization days, the average is low (0.25) in the population and in our sample (0.20). The last row reports average number of absence per year due to "Own Sickness" as reported in the absence data. The average employee is absent 7.6 days a year.

3. The average exchange rate in the period 2007 to 2012 was approximately 7.44 Danish Kroner to one Euro.

2.4 Variation in Days Absent Across Firms

Table 3 shows the difference in average days absent for different classifications of firms. The difference in average days absent between firms above and below the median is 6.3 days while between firms in the top and bottom quartile is 10.4 days. This difference widens to 15 days, which corresponds to 6% of annual working days, when we compare firms at the top and bottom decile of the distribution.

Furthermore these differences persist within industries as Figure 2 shows. The industry classification is based on NACE 1 digit code. Each box plot presents the minimum, first quartile, median, third quartile and maximum days absent for each industry. The median days absent across industries is remarkly stable and there is considerable variation within all industries. [4].

Similar information as in Figure 2 is conveyed in Table 3. The Table presents the difference in average days absent for different classifications of firms for the different industries in our sample. The difference in average days absent between manufacturing firms above and below the median is 5.4 days, while in construction is 6.2 days. The same difference is 10.7 days for public and personal services. The differences in average days absent of firms within industry are even larger (range from 8.8 to 18 days) when we compare the top and bottom quartile and they range from 13.4 to 29.6 days when we compare the top and bottom decile. Overall Figure 2 and Tables 3 show that there is substantial variation in days absent across firms, even within the same industry.

3 Main results

3.1 Decomposition of employees' days absent

Our main goal is to study the determinants of employees' absenteeism. We assume that days absent can be described by the following model:

$$y_{ijt} = \alpha_i + \beta x_{it} + \gamma_j + \mu_t + e_{ijt}, \tag{2}$$

where each observation is a person i employed by firm j in year t. y is annual number of days absent. The terms $\alpha_i + \beta x_{it}$ capture the employee contribution to days absent. This component is the same regardless of the firm at which the individual works. It contains an employee fixed effect (α_i) that captures observable and unobservable time-invariant characteristics such as loyalty, motivation, etc.

4. Public and personal services has higher median than the rest as this contains healthcare and education

It also contains the effect of time-varying observable individual characteristics (βx_{it}) such as age and health status. The term γ_j is the firm fixed effect which captures the effect of firm policies (incentives, monitoring) or its environment (corporate culture) on the days absent. This effect is the assumed to be the same for all employees in the firm. μ_t is the year fixed effect.

We estimate this model using OLS. Computationally we use the algorithm in Abowd et al. (1999) (AKM) to estimate this three-way fixed effect model. In order to separately identify the firm fixed effects γ_j from employee fixed effect α_i in equation (2) the sample needs to include employees who switch firms. However, the existance of movers does not guarantee identification of all fixed effects. AKM provides an algorithm based on these moves to construct sets of firms and employees whose fixed effects are indentifiable (the "connected set"). In our case, the largest connected set includes 98.7% of employees and 82.6% of firms. [5] effects of high dimension.

There is, of course, no guarantee that employee moves are random. One concern is that employees with a negative shock to their motivation move to firms with high absenteeism and vice versa. In this case the firm fixed effect would capture some of the effect of reduced motivation. In the next section we use the event study method to address this concern. In a nutshell, in the years before the move we do not observe employee days absent becoming similar to the average days absent of employees the destination firm. This largely mitigates the concern.

Another potential concern is that there could be a matching component to all moves, i.e., when employees move they always move to firms where they enjoy more working. This will cause a reduction in absences after all moves. If there was a matching component we would expect the absenteeism increases for employees moving from firm j to firm j' to be different from absenteeism decreases for those who make the opposite transition. We test this potential concern using Figure 3. Figure 3 plots the change in days absent against the difference in absenteeism between the destination and origin firm. The relationship is symmetric above and below zero and linear and shows that the increase in days absent when employees move from j to j' is equal with the decrease in days absent when an employee moves from j' to j. Furthermore the slope of the line is 0.60 suggesting an average firm fixed effect of 0.60 (which is consistent with our decomposition results).[6].

5. Graham et al. (2012) and Ewens & Rhodes-Kropf (2015) offer more detail on the methodology, its strengths and its limitations

6. If all variation in absenteeism was due to firm effects we would expect this plot to have slope of one, and if it was all due to employees the slope would be zero

3.2 From employee to firm level difference in days absent

Equation (2) allows us to assess the importance of employee characteristics vis-a-vis firm determinants in explaining individual behavior. However, our goal in this paper is to study drivers of differences *across firms*. While employee characteristics play a major role in explaining behavior at the individual level, this result might not translate to the firm level. If, for example, the distribution of employee characteristics is the similar across firms, the majority of the difference across firms would be explained by firm factors.

In this section we follow closely Finkelstein et al. (2014) in estimating the fraction of the difference in days absent across firms that is due to employees and the fraction that is due to firm policies/environment.

We let c_{it} be the individual contribution to days absent. Specifically:

$$c_{it} = \alpha_i + \beta x_{it} \tag{3}$$

We also define the average days absent for a firm, $\bar{y}_j$, by taking the average days absent of all its employee in a given year and then averaging across time. We define $\bar{c}_j$ analogously. Also, when we define $y_J = \frac{1}{\#J} \sum_{j \in J} \bar{y}_j$ to refer to the average across a group of firms J. We define $\bar{c}_J$ and γ_J analogously.

The difference in average absence between any two firms j and j' is the sum of the differences of the firm and the employee components:

$$\bar{y}_j - \bar{y}_{j'} = \gamma_j - \gamma_{j'} + \bar{c}_j - \bar{c}_{j'}. \tag{4}$$

Similarly, to compare the days absent in two different groups of firms, M and N, we note that

$$\bar{y}_M - \bar{y}_N = \gamma_M - \gamma_N + \bar{c}_M - \bar{c}_N. \tag{5}$$

Finally the share of difference in absence between groups of firms M and N attributable to the firm policies/environment is

$$S_{firm} = \frac{\gamma_M - \gamma_N}{\bar{y}_M - \bar{y}_N} \tag{6}$$

and the share attributable to employees is:

$$S_{firm} = \frac{\bar{c}_M - \bar{c}_N}{\bar{y}_M - \bar{y}_N} \tag{7}$$

Table 4 presents the results of these shares for different classification of firms. Panel A presents the results when the shares are constructed using parameter estimated of Equation (2) without including time varying employee characteristics. Column (1) decomposes the difference in average absence between above-median and below median firms. The overall difference is 6.29 days. We find that 53 percent of the difference in average absence is due to firms, while 46 percent of the difference is due to the effect of employee characteristics. The estimate is quite precise. Columns (2)-(5) present different partitions of firms and show that the results on firm share remain similar. Firm factors account for 58 percent of the difference between top and bottom quartile (Column (2)), 60 percent of the difference between the top and bottom decile(Column (3)), and 65 percent of the difference between the top and bottom 5 percent(Column (4)). Panel B shows that the results are similar when we also control time varying employee characteristics, specifically age and hospitalization. The firm share ranges from 53 to 64 percent.

We repeat this analysis using days absent in spells that start on Monday or Friday or spells that start within two days around a national holiday. This measure is more likely to capture the discretionary component of days absent. Table A2 presents the results. Both the results based on the basic model (Panel A) and the results using employee time-varying controls, show that the firm share ranges from 57 to 70 percent, consistent with our main results in Table 4.

3.3 Event study

In Figure 7 we visualize event study around an employee move to present a simple and clear visual of the contribution of the firm and individual effect to employee absence. Borrowed from Finkelstein et al. (2014), this method derives from a regression model and can be considered as an improved version of common event study design using sample averages.

We normalize the days absent variable, y_{it}, as follows:

$$y_{it}^{share} = \frac{y_{it} - \bar{y}_{o(i)}}{\bar{y}_{d(i)} - \bar{y}_{o(i)}} \tag{8}$$

where $\bar{y}_{d(i)}$ ($\bar{y}_{o(i)}$) is the average days absent of employees in the destination (origin) firm. The measure

y_{it}^{share} is exactly zero when days absent of the mover is at the average days absent of employees at the origin firm and it takes the value of one when days absent of the mover are at the average of his peers at the destination firm.

The behavior of y_{it}^{share} around a move is informative about the share of the variation in days absent that is due to the employee and to the firm. In the extreme case in which days absent is unrelated to firm policies/environment, we should see no change in employee behavior around a move. On the other extreme, if individual characteristics do not affect employee attendance, then y_{it}^{share} should be close to zero before the move (all employees in the origin firm including the mover should exhibit similar behavior) and close to one after it. In all other cases in which both employee and firm characteristics affect employee behavior, a larger increase in y_{it}^{share} would indicate a bigger role played by the firm policies/environment.

However, several problems need to be dealt with the indicator. Variance of y_{it} might be large due to influence of individual characteristics or time effect and can obscure the real trend if not well controlled. Thus, time fixed effect μ_t and individual characteristics x_{it} that might change across years should be included for control. Furthermore, entry and exit in the dataset can cause pre- and post-trends and may change the distribution of population. Individual fixed effect can be introduced to control the bias. Finally, variance of y_{it}^{share} could be unnecessarily large when employee faces a very small influence of move, referring to small difference between $\bar{y}_{d(i)}$ and $\bar{y}_{o(i)}$. Thus, we use a regression based method to avoid these problems, which is implemented upon our two-way fixed effect model.

Note that Equation (2) without time-varying controls can be rewritten as

$$y_{ijt} = \alpha_i + \gamma_{o(i)} + (\gamma_{d(i,t)} - \gamma_{o(i)}) + \mu_t + x_{it}\beta + e_{ijt} \tag{9}$$

where $o(i)$ is mover i's original employer and $d(i,t)$ is mover i's employer at time t. If at time t mover i is still in his old position, $d(i,t) = o(i)$.

$$\gamma_{d(i,t)} - \gamma_{o(i)} = \begin{cases} 0 & \text{if } d(i,t) = o(i) \\ S_\gamma(\bar{y}_{d(i,t)} - \bar{y}_{o(i)}) & \text{if } d(i,t) \neq o(i) \end{cases} \tag{10}$$

Thus,

$$y_{ijt} = \tilde{\alpha}_i + S_\gamma \cdot (\bar{y}_{d(i,t)} - \bar{y}_{o(i)}) 1\{r(i,t) > 0\} + \mu_t + x_{it}\beta + e_{ijt} \tag{11}$$

Person fixed effect and original firm fixed effect are combined as one $\tilde{\alpha}_i$. S_γ is share of firm we have defined. If we know the true mean of absent days for origin firm and destination firm we can estimate this model and check if S_γ is significantly different from 0 and, if so, what the value of S_γ is. We use sample mean as approximate for $\bar{y}_{d(i,t)}$ and $\bar{y}_{o(i)}$ and estimate the following model instead

$$y_{ijt} = \tilde{\alpha}_i + \lambda_{r(i,t)} \cdot (\hat{y}_{d(i,t)} - \hat{y}_{o(i)}) + \mu_t + x_{it}\beta + e_{ijt} \tag{12}$$

This is the model that we use for event study. $\hat{\lambda}_{r(i,t)}$ is plotted against relative year $r(i,t)$ to show complete trend before and after move. The figure shows a sharp, discontinuous jump at the time of the move, from 0 to approximately 0.6. As discussed above, the size of this jump can also be interpreted as an estimate of a weighted average of firm share S. Under the assumptions of our model, the plot should be flat in the years before and after the move. In practice, the plot shows no post trend and a small downward pre-trend.

3.4 Absence Variation due to Firms and Firm Characteristics

Table 4 showed that a large part of the variation in average days absent is attributable to firms. Our goal in this section is to examine observable firm characteristics that correlate with the firm fixed effects, $\gamma_j's$ in order to shed light on the potential mechanisms that drive the firm component of days absent. A caveat is in order. Our results in this section are not driven by selection as we have effectively controlled for it in estimating the firm fixed efffects.[7] However, it is likely that an unobseved firm characterestic that affects the fixed effect and is correlated with the observable variables we include.

We first focus on variables related to incentives at the workplace. We investigate the role of debt (Jensen & Meckling (1976) and Jensen (1986)) on improving effort. We also develop firm-level proxies for the sensitivity of wage increases, separations[8], and promotions to days absent. To create such proxies, for each firm we regress the indicator variable wage increase (that takes the value 1 if the employee received a wage increase and 0 otherwise) on employee's days absent. The estimate coefficient is our measure of the strenght of the incentives. We follow a simila procedure for promotions and separations.

7. We would have this problem had we directly estimated a regression of employee effort on a firm characteristic, say size. In such a regression it would be difficult to conlcude whether size causes high effort or whether higly motivated employees work for large firms.

8. We cannot separate whether the employee was fired or departed willingly

Next, we investigate how market forces relate to the firm fixed effects. Prior literature suggests that managers of firms in competitive industries have strong incentives to reduce slack (e.g. Hart (2008), Schmidt (1997)). Our main measure of product market competition is the HHI. The HHI is computed as the sum of squared market shares,

$$HHI_{jt} = \sum_{i=1}^{N_j} s_{ijt}^2 \tag{13}$$

where sijt is the market share of firm i in industry j in year t. The HHI is a commonly used measure for competition literature and is well grounded in theory (see Tirole (1988), pp. 221-223). We also use the four-firm concentration ratio, which is the sum of market shares of the four largest firms in an industry (Competition9_4).

We furthermore investigate the role of organizational characteristics of the firm. We proxy size by the logarithm of assetsa and develop two measures to capture how hierarchical the firm is. Our measure "Middle to low Employees" captures the fraction of middle level employees to low employees, while our measure "Manager to middle employees" captures the ratio of manages to middle level employees. One benefit of hierarchies is that they provide incentives (Lazear (1998) summarizes the related literature). Furthermore hierarchies can provide a mechanism for monitoring employees directly(e.g. Lucas (1996), Manne (1965)).

Finally we focus on measures of firm ownership and control. A large body of academic and anecdotal evidence suggest that employee behavior is shaped by the ownership structure of the firm. We first examine how ownership by Private Equity correlated with the firm fixed effects. Jensen (1989) argues that leveraged buyouts are a superior governance form leading to better managed companies. Specifically, PE firms mitigate management agency conflicts through the disciplinary role of debt and concentrated and active ownership. To identify firms that have PE ownership which match the data on firm ownership with the database of all PE firms operating in Denmark.

We also study the role of family firm status. The direction of the effect of the family presence, however is ambiguous. On the one hand, employees of family firms might exert less effort. Family firms might have a more difficult time motivating non-family employees as these workers might be concerned that nepotism, rather than meritocracy, would determine promotions. Non-family employees might also be discouraged if they end up having to spend time embroiled in family conflicts (Poza (2013)). On the other hand, family firm status could boost employee motivation. It is possible that family owners,

due to their long-term horizons, have a comparative advantage at sustaining implicit labor contracts, which might be reciprocated by workers with cooperative behavior (Sraer & Thesmar (2007), Ellul et al. (2014)). It could also be that their large ownership stakes motivates family owners to monitor more or be tougher with labor (Mueller & Philippon (2011)), leading to higher effort provision. To identify family firms we use the information on family trees of managers and board members and we identify family ties among them. Using these ties, we define firms as family controlled if 1) two board members are related with the CEO by blood or marriage or 2) any three board members are related (even if none of them is a CEO).[9]Finally, we investigate single owned firms as the concentrated ownership could lead to greater monitoring.

Figure 4 presents how observables correlated with the estimated firm fixed effects $\gamma_j's$. Each row represents a different variable. The points are coefficients from separate bivariate OLS regressions. All covariates have been standardized to have mean zero and standard deviation one, thus the coefficients report the relationship between a one standard deviation change in the covariate and the respective outcome. All regressions except with those using competition as covariate include industry fixed effects. Horizontal bars show 95 percent confidence intervals.

Figure 4 shows that firms with higher of incentives in terms of promotions, wage increases or separations have lower firm effects. Competition, size and hierarchy do not seem to relate with days absent. Finally family control and concentrated ownership are associated with statistically significant lower firm effects.

3.5 Variation between Managers and non-Managerial Employees

In the previous sections we show that firm effects explain a large part of the variation of days absent across firms. Furthermore these firm effects correlate with incentives, as well as ownership and control on the firm. In this section we studt whether the effect of policies/environment is different for employees at different levels of the organization. .

In Table 5 we repeat the analysis of Section 3.1 separately for managers (Panel A) and for non-managerial employees (Panel B). Focusing on Panel A, Column (1) decomposes the difference in average absence of managers between above-median and below median firms. The overall difference is 4.49 days. We find that 58.6 percent of the difference in average absence is due to firms, while 41 percent of the difference is due to the effect of manager characteristics. The estimate is quite precise.

9. Although our definition of family firms is based on family control, the family control highly correlates with family ownership in the firm.

Columns (2)-(5) present different partitions of firms and show that the results on firm share remain similar. Firm factors account for 65 percent of the difference in managers' days absent between top and bottom quartile (Column (2)), 63 percent of the difference between the top and bottom decile(Column (3)), and 80 percent of the difference between the top and bottom 5 percent(Column (4)).

Panel B presents the same analysis for non-managerial employees. We also observe that firm effects account for a substantial part of the variation in non-managerial employees days absent across firms, but overall the firm shares are lower compared to the firm shares for managers. The firm share ranges from 51 to 68 percent.

Overall, Table 5 presents a similar picture to our main results: firm effects account for a large part of the variation in days absent across firms, and this holds both for managers and non-managerial employees.

We also repeat the covariate analysis for managers and non-managerial employees and report the results in Figure 5 and Figure 6. We observe that for managers the estimated firm fixed effect relate negatively to competition, while competition does not correlate with the non-managerial employees firm effects. This is consistent with theoretical models that product market competition gives incentives to managers to reduce slack. Furthermore we find that although incentives in terms of promotion, separation and wage increases correlate with firm effects for non-managerial employees, the effect is muted for managers. Finally, the effect if family firm status and concentrated ownership seems to be different for managers and non-managerial employees. In a recent paper Bandiera et al. (2013) study differences in CEO behavior in family and non-family firms and find that family CEOs record 8% fewer working hours relative to professional CEOs. Figure 5 and Figure 6 show that our results are not inconsitent with theirs since the negative correlation of family status with the estimated firm effects is driven by non-managerial employees.

4 Conclusion

We propose a new measure of employee effort that can we calculate for all employees in a large panel of firms in Denmark. We find significant variation in the average effort across firms. Using employees who move, we are able to calculate the contribution to the overall variation of effort of two broad sets of theories. We find that a large fraction of the variation is explained by policies/environment (e.g., incentives, corporate culture) of the firm that affects all its employees. A lower fraction, althouhgh still considerable, is attibuted to selection of employees. We also find suggestive evidence that the firm

policis/environment that matter are stong incentives and family control.

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Figure 1a: Hospitalization and Absence Days

This figure presents the average absence days per year for different days of hospitalization that year.

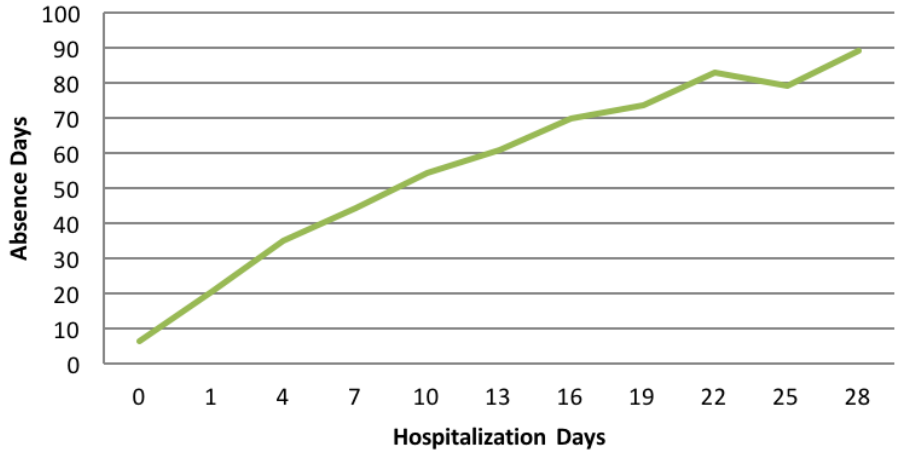

Figure 1b: Hospitalization and Absence Days by Age Groups

This figure presents the average absence days per year for different days of hospitalization that year for employees 20 to 45 years old (full line)and employees 45 to 65 years old (dashed line).

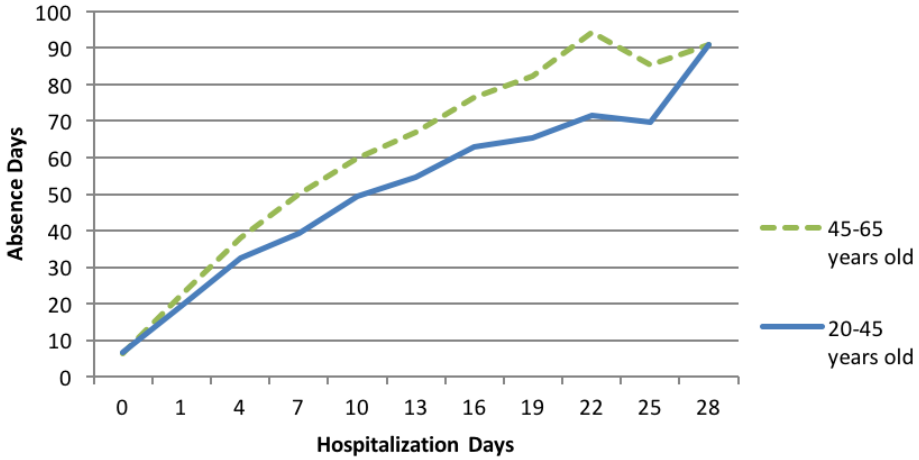

Figure 1c: Hospitalization and Absence Days by Position in Organization

This figure presents the average absence days per year for different days of hospitalization that year for employees with high position in the organization (dashed line) and intermediate and low position in the organization (full line).

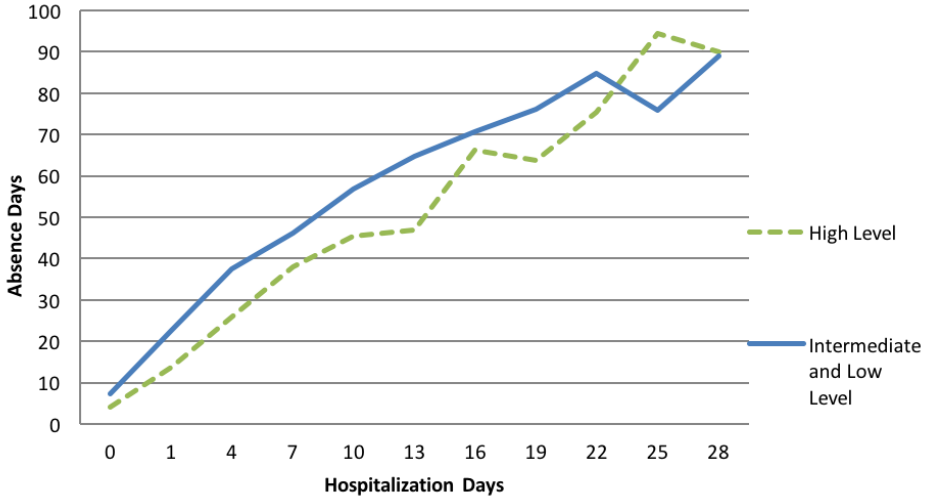

FIGURE 2: DISTRIBUTION IF DAYS ABSENT BY INDUSTRY

This figure presents boxplots of days absent for the different industries. Industries are classified based on NACE 1 digit classification. Each boxplot presents the minimum, first quartile, median, third quartile, and maximum of days absent for each industry.

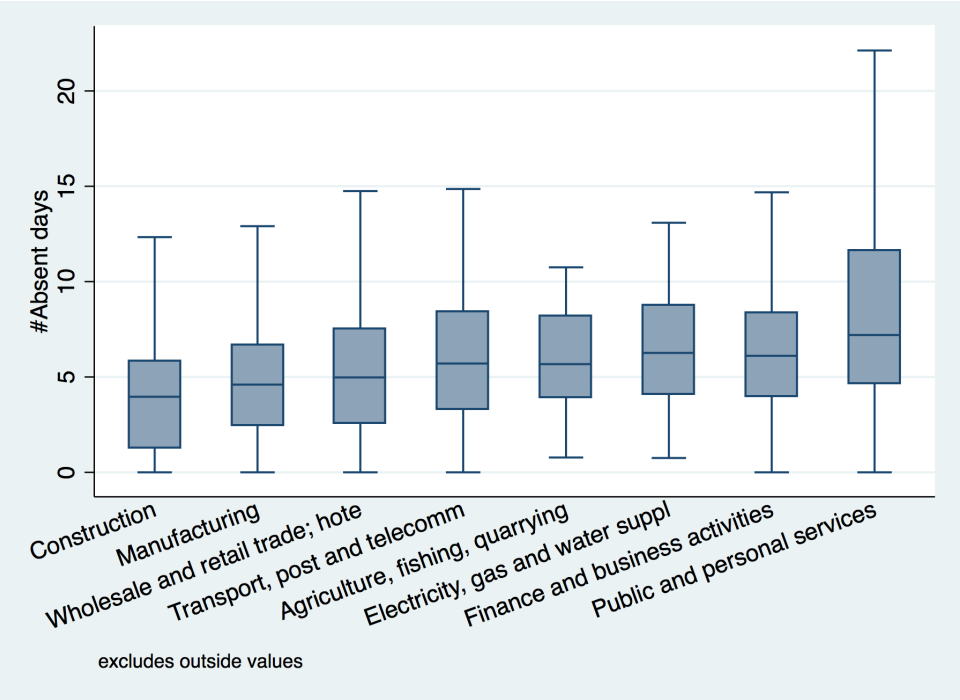

FIGURE 3: CHANGE IN ABSENCE DAYS BY SIZE OF MOVE

Figure shows the change in absence days before and after the move. For each mover, we calculate the difference δ in average absence between their origin and destination firms, and then group the difference into ventiles. The x-axis displays the mean of δ for movers in each ventile. The y-axis shows, for each ventile, average absence post-move minus average absence pre-move. The line of best fit is obtained from simple OLS regression using the 20 data points corresponding to movers, and its slope is reported on the graph. For comparison, we also compute the average change in absence for a sample of matched non-movers, which we show we the X marker on the graph.

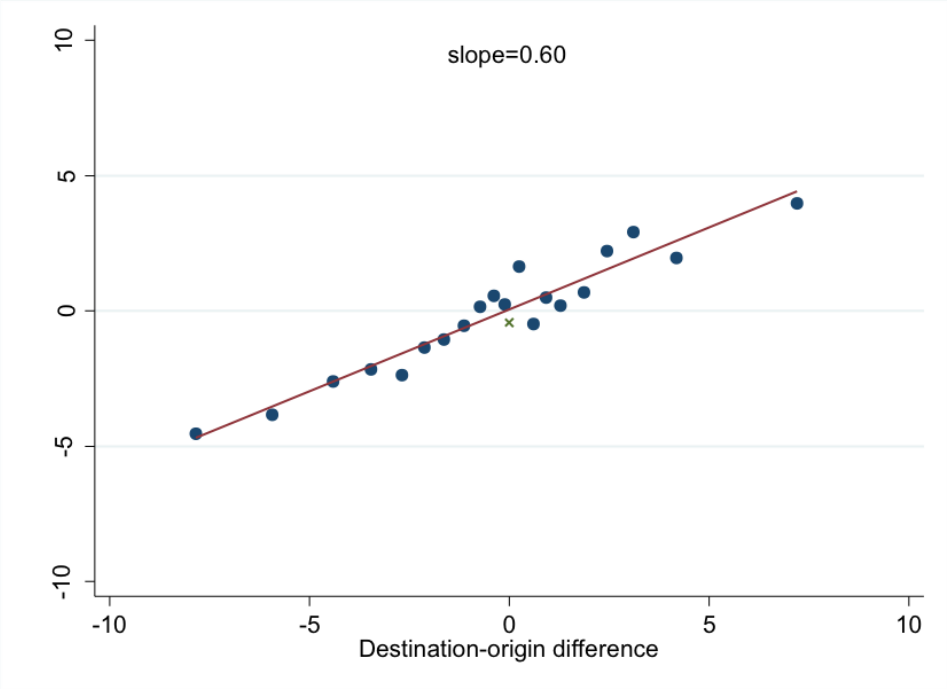

FIGURE 4: FIRM CHARACTERISTICS THAT CORRELATE WITH AVERAGE FIRM EFFECTS

The Figure presents bivariate OLS regressions results of firm fixed effects on a set of firm and industry level characteristics. All covariates have been standardized to have mean zero and standard deviation one. All regressions except with those using competition as covariate include industry fixed effects. Horizontal bars show 95 percent confidence intervals.

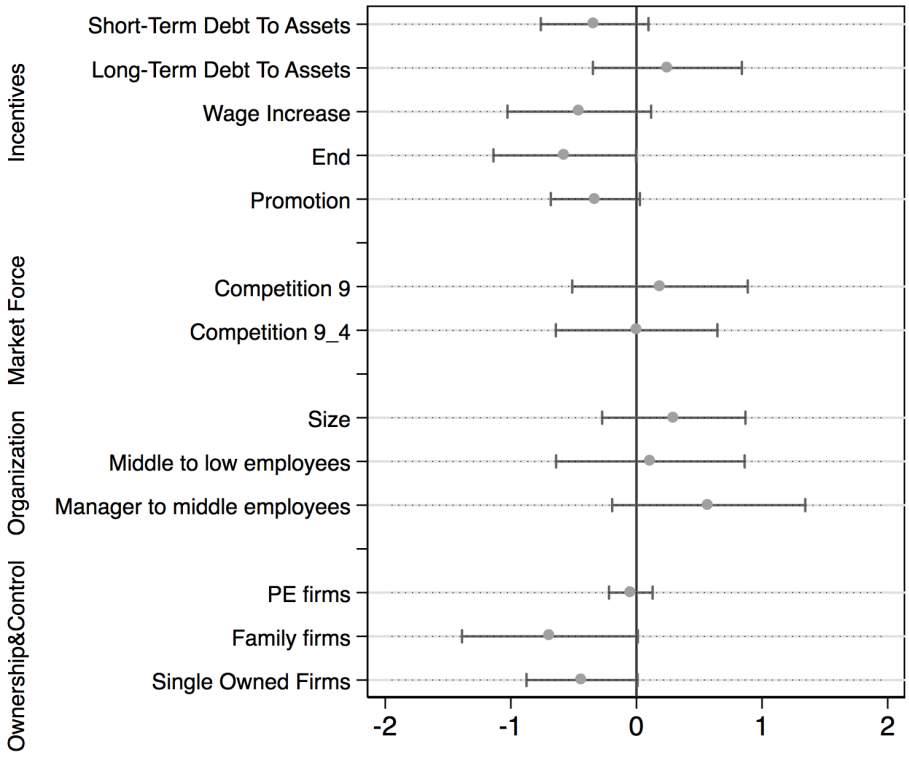

FIGURE 5: FIRM CHARACTERISTICS THAT CORRELATE WITH AVERAGE FIRM EFFECTS. ANALYSIS BASED ON MANAGERS

The Figure presents bivariate OLS regressions results of firm fixed effects (based on the managers sample) on a set of firm and industry level characteristics. All covariates have been standardized to have mean zero and standard deviation one. All regressions except with those using competition as covariate include industry fixed effects. Horizontal bars show 95 percent confidence intervals.

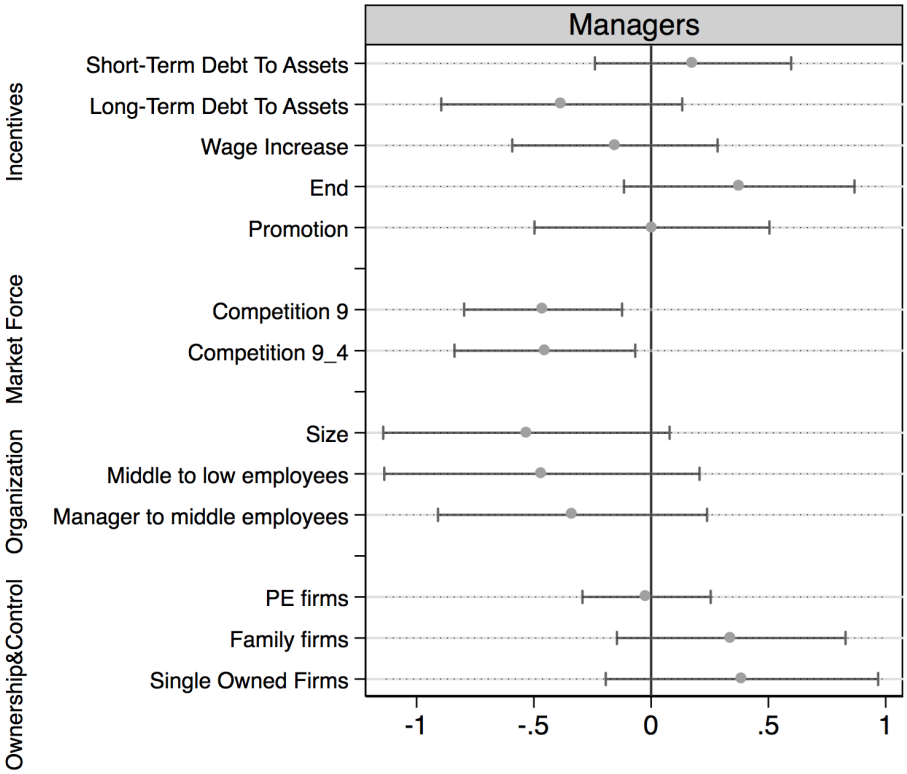

FIGURE 6: FIRM CHARACTERISTICS THAT CORRELATE WITH AVERAGE FIRM EFFECTS. ANALYSIS BASED ON NON-MANAGERIAL EMPLOYEES

The Figure presents bivariate OLS regressions results of firm fixed effects (based on the non-managerial employees sample)on a set of firm and industry level characteristics. All covariates have been standardized to have mean zero and standard deviation one. All regressions except with those using competition as covariate include industry fixed effects. Horizontal bars show 95 percent confidence intervals.

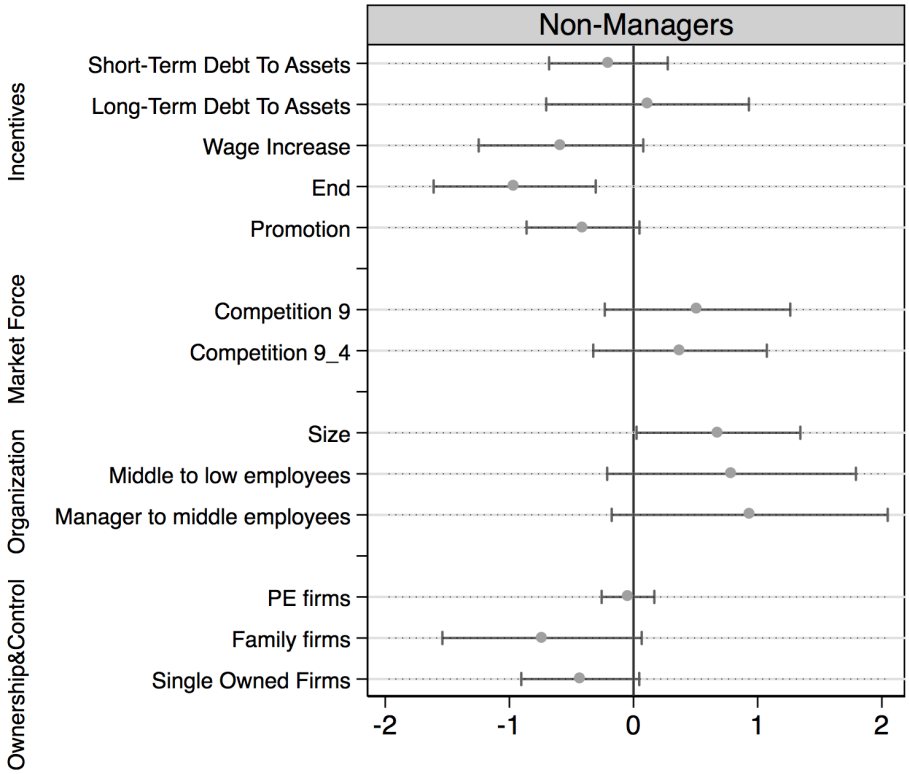

FIGURE 7: EVENT STUDY

Figure shows the coefficient $\hat{\lambda}_{r(i,t)}$ estimated from Equation (12) in Appendix C. The dashed lines are upper and lower bounds at the 95% confidence interval. Appendix C contains details on the graph construction.

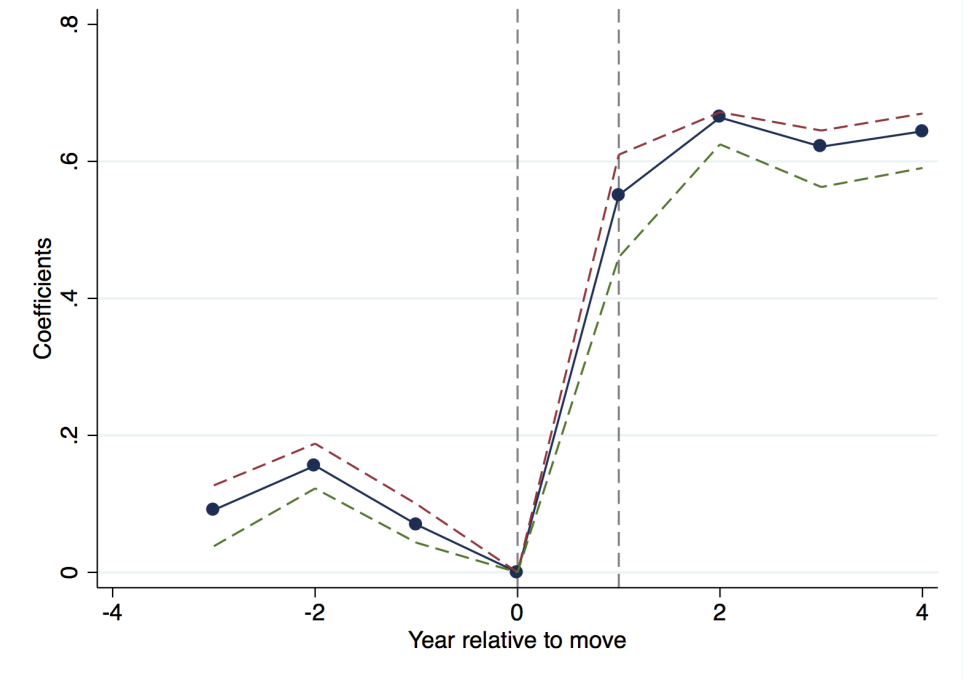

TABLE 1: SUMMARY STATISTICS FOR FAMILY VS NON-FAMILY FIRMS

This table presents firm characteristics for all limited liability firms in Denmark during 2007-2012 (column 1) as well as firm characteristics for our sample firms (columns 2). Column 3 presents differences.

	All	All -sample firms	Diff All vs Sample
OROA	0.0757	0.0599	-0.0267***
	(0.0007)	(0.0025)	(0.0026)
	[257,397]	[7,678]	[257,397]
Net Income/assets	0.0433	0.0349	-0.0087***
	(0.0005)	(0.0022)	(0.0023)
	[257,392]	[7,673]	[257,392]
Assets	51.8463	364.1203	321.9191***
	(0.8400)	(9.7585)	(9.7870)
	[257,432]	[7,713]	[257,432]
Ln(Assets)	2.8465	4.9601	2.1789***
	(0.0082)	(0.0340)	(0.0349)
	[257,431]	[7,712]	[257,431]
No. of employees	38.5082	179.0560	145.0036***
	(0.3553)	(3.5823)	(3.5965)
	[257,636]	[7,917]	[257,636]
Firm age	22.9027	35.0215	12.5025***
	(0.1416)	(0.5679)	(0.5860)
	[256,356]	[7,867]	[256,356]

TABLE 2

This table presents employee characteristics for all limited liability firms in Denmark during 2007-2012 (column 1) as well as for firm characteristics for our sample firms (columns 2). Column 3 presents differences.

	All	All -sample firms	Diff All vs Sample
Employee wage	306,750	425,184	147,087***
	(3143.6150)	(8458.332)	(8864.1990)
Employee age	38.5200	41.1428	3.2780***
	(.1747)	(.2802)	(.3381)
Male	0.6625	0.6207	-0.0523***
	(.0041)	(.0089)	(.0100)
Hospitalization Days	0.2512	0.2095	-.0520***
	(.0017)	(.0038)	(.0042)
Sickness Absence	.	7.6321	.
	.	(.3042)	.
No. of Children	1.3843	1.2647	-.1488***
	(.0093)	(.0170)	(.0200)

TABLE 3

	Above/below Median	Top/bottom 25%	Top/bottom 10%	Top/bottom 5%
	(1)	(2)	(3)	(4)
Difference in absence				
All	6.295	10.372	15.696	20.08
Manufacturing	5.453	8.894	13.455	17.729
Construction	6.206	10.03	15.225	20.277
Whole and retail trade; hotels & restaurants	6.280	10.089	14.689	18.391
Transport, post and telecomm	6.473	10.749	16.751	23.007
Finance and business activities	6.734	11.260	18.514	26.554
Public and personal services	10.701	18.099	29.638	41.286

Table 4: Decomposition of employee absence

The dependent variable is annual number of absent days. The sample is movers and non-movers. Panel A is based on estimation of equation (2) without including the employee time-varying controls and panel B is based on estimation of equation (2) which includes controls for age and hospitalization. The adjusted R-squared from estimated equation is 0.488. Each column defines a set of firms R and R'based on percentiles of average absence. The first row reports the difference in average days absent overall between the two groups $y_R - y_{R'}$; the second row reports the difference due to firms $\gamma_R - \gamma_{R'}$; the third row reports the difference due to employees $\alpha_R - \alpha_{R'}$; the fourth row reports the share of the difference in average absence between two set of firms that is due to firm $S_{firm}(R; R')$. The last row reports the share of the difference in average absence between two set of firms that is due to employees $S_{employee}(R; R')$. Standard error of the share is calculated by bootstrap of 50 repetitions.

Panel A: base

	Above/below Median	Top/bottom 25%	Top/bottom 10%	Top/bottom 5%
	(1)	(2)	(3)	(4)
Difference in absence				
Overall	6.2948	10.3718	15.6956	20.0801
Due to firm	3.3922	6.0216	9.4964	13.1734
Due to individual	2.9026	4.3502	6.1992	6.9067
Share of difference				
Due to firm	0.5389	0.5806	0.6050	0.6560
	(0.0614)	(0.0524)	(0.0765)	(0.0951)
Due to person	0.4611	0.4194	0.3950	0.3440

Panel B: person control

	Above/below Median	Top/bottom 25%	Top/bottom 10%	Top/bottom 5%
	(1)	(2)	(3)	(4)
Difference in absence				
Overall	6.2881	10.3535	15.6565	20.0462
Due to firm	3.3613	5.9583	9.4164	12.9796
Due to individual	2.9268	4.3952	6.2401	7.0666
Share of difference				
Due to firm	0.5345	0.5755	0.6014	0.6475
	(0.0582)	(0.0507)	(0.0791)	(0.0978)
Due to person	0.4655	0.4245	0.3986	0.3525

Table 5: Decomposition of absence of managers and non-managers

The dependent variable is annual number of absent days. The sample is movers and non-movers. Both Panels are based on estimation of equation (2) which includes controls for age and hospitalization. Panel A is based on managers while Panel B is based on non-managerial employees. Each column defines a set of firms R and R'based on percentiles of average absence. The first row reports the difference in average days absent overall between the two groups $y_R - y_{R'}$; the second row reports the difference due to firms $\gamma_R - \gamma_{R'}$; the third row reports the difference due to employees $\alpha_R - \alpha_{R'}$; the fourth row reports the share of the difference in average absence between two set of firms that is due to firm $S_{firm}(R; R')$. The last row reports the share of the difference in average absence between two set of firms that is due to employees $S_{employee}(R; R')$. Standard error of the share is calculated by bootstrap of 50 repetitions.

Panel A: managers

	Above/below Median	Top/bottom 25%	Top/bottom 10%	Top/bottom 5%
	(1)	(2)	(3)	(4)
Difference in absence				
Overall	4.4991	7.4119	11.0616	14.3781
Due to firm	2.6365	4.8521	7.0343	11.5621
Due to individual	1.8626	2.5598	4.0273	2.816
Share of difference				
Due to firm	0.5860	0.6546	0.6359	0.8041
	(0.1066)	(0.0955)	(0.0911)	(0.1274)
Due to person	0.4140	0.3454	0.3641	0.1959

Panel B: non-managers

	Above/below Median	Top/bottom 25%	Top/bottom 10%	Top/bottom 5%
	(1)	(2)	(3)	(4)
Difference in absence				
Overall	6.8551	11.3225	17.1227	22.1998
Due to firm	3.5217	6.2083	10.6866	15.1222
Due to individual	3.3334	5.1142	6.4361	7.0776
Share of difference				
Due to firm	0.5137	0.5483	0.6241	0.6812
	(0.0582)	(0.0507)	(0.0791)	(0.0978)
Due to person	0.4863	0.4517	0.3759	0.3188

Appendix A Additional Analysis and Robustness Tables

Table A1: Employee Absence and Firm Performance

This table presents the effect of employee absence on firm performance. We estimate the following regression: $OROA_{jt} = \gamma_j + \mu_t + \eta absence_{jt} + x_{it}\theta + \zeta_{jt}\delta + e_{ijt}$, where $OROA_{jt}$ is each firm-year observation of operating return on assets, defined as the ratio of operating income to total assets. γ_j is firm fixed effect, μ_t is year fixed effect, and ζ_{jt} are firm controls. Absence_{jt} , is the mean absence days at the firm-year level. Column 1 presents results for firms with less than 100 employees, Column 2 presents results for firms with more than 100 employees and in Column 3 for firms above 300 employees. In each column, we report estimated coefficients and their standard errors. Heteroscedasticity-robust standard errors (in parentheses)are clustered at the firm level. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable: OROA	< 100 employees	100 > employees	300 > employees
Absence	0.0000	-0.0008**	-0.0011*
	(0.0007)	(0.0004)	(0.0006)
Firm Age	-0.0079***	-0.0079***	-0.0065***
	(0.0030)	(0.0015)	(0.0020)
Assets	0.0004	-0.0000	-0.0000
	(0.0029)	(0.0000)	(0.0000)
Constant	0.3120***	0.3740***	0.3228***
	(0.0935)	(0.0586)	(0.0815)
Observations	3,499	4,078	1,932
R-squared	0.8058	0.7127	0.7035
Year FE	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
No.firms	1,652	1,236	550

Table A2: Decomposition of employee absence on Monday, Friday and around holiday

The dependent variable is the annual number of absent days from absence spells that start on Monday or Friday or around a national holiday. The sample is movers and non-movers. Panel A is based on estimation of equation (2) without including the employee time-varying controls and panel B is based on estimation of equation (2) which includes controls for age and hospitalization. Each column defines a set of firms R and R'based on percentiles of average absence. The first row reports the difference in average absent days overall between the two set of firms $y_R - y_{R'}$; the second row reports the difference due to firms $\gamma_R - \gamma_{R'}$; the third row reports the difference due to employees $\alpha_R - \alpha_{R'}$; the fourth row reports the share of the difference in average absence between two set of firms that is due to firm $S_{firm}(R; R')$. The last row reports the share of the difference in average absence between two set of firms that is due to employees $S_{employee}(R; R')$. Standard error of the share is calculated by bootstrap of 50 repetitions.

Panel A: base

	Above/below Median	Top/bottom 25%	Top/bottom 10%	Top/bottom 5%
	(1)	(2)	(3)	(4)
Difference in absence				
Overall	3.0089	4.965	7.5295	9.7189
Due to firm	1.7393	3.0919	5.0956	6.8686
Due to individual	1.2696	1.8731	2.4339	2.8503
Share of difference				
Due to firm	0.5781	0.6227	0.6768	0.7067
	(0.0571)	(0.0544)	(0.0672)	(0.0928)
Due to person	0.4219	0.3773	0.3232	0.2933

Panel B: person control

	Above/below Median	Top/bottom 25%	Top/bottom 10%	Top/bottom 5%
	(1)	(2)	(3)	(4)
Difference in absence				
Overall	3.0023	4.9497	7.4964	9.6809
Due to firm	1.7279	3.0922	5.0937	6.8265
Due to individual	1.2744	1.8575	2.4027	2.8544
Share of difference				
Due to firm	0.5755	0.6247	0.6795	0.7052
	(0.0563)	(0.0535)	(0.0702)	(0.0978)
Due to person	0.4245	0.3753	0.3205	0.2948

Appendix B

Table B1: Definitions of variables

Variable	Definition
Firm Level Variables	
Family	An indicator variable that takes the value 1 if the firm is a family firm and 0 otherwise.
Assets	Measured in real DKK. The source is KOB.
OROA	Source is KOB.
Firm Age	Firm age based on the firm foundation date. The information source is the business registry.
Employee Level Variables	
Male	An indicator variable that takes the value 1 if the person is male and 0 otherwise. The source is the Danish Civil Registration System.
Age	Employee Age. The source is the Danish Civil Registration System.
No Children	The number of living children the employee has. The source is the Danish Civil Registration System.
Wage	Total annual wage of the employee. The information comes from the administrative matched employer-employee dataset (IDA).
College Degree	An indicator variable that takes the value 1 if an employee has completed a bachelor degree. The variable is constructed based on information on the official Danish registry.
Promotion	An indicator variable that takes the value 1 if the employee got a promotion that year and 0 otherwise. The promotion variable is constructed based on information of employee position from IDA.
Separation	An indicator variable that takes the value 1 if the employee left the company that year and 0 otherwise. The separation variable is constructed based on information from IDA.
Legacy Employees	An indicator variable that takes the value 1 if the employee is a legacy employee. We define legacy employees as employees that have family members who are current or past employees in the firm. We require that their family members were employees at the firm for at least 3 years.
Family20pc	Is a dummy variable that takes the value 1 if the firm has at least 20 percent family ownership.