Employee health and firm performance*

Daniel A. Rettl
University of Georgia

Alexander Schandlbauer
University of Southern Denmark

Mircea Trandafir
ROCKWOOL Foundation and IZA

April 2026

Abstract

Using administrative data on the universe of firms in Denmark, we find that even temporary and small health shocks to employee health like seasonal influenza can significantly reduce firm profitability. The effects are driven by labor-intensive firms and decrease in firm size and financial flexibility, suggesting that firms that are better able to shift resources can insulate themselves better. Our results indicate that employees are shielded from these negative effects, while owners (especially of small firms) see reduced dividends. Back-of-the-envelope calculations propose that all but the largest firms may benefit from subsidizing vaccination programs for their employees.

Keywords: firm performance, health shock, employee health, seasonal influenza
JEL Classifications: L25, I12, G30, J31

*Rettl: Department of Finance, University of Georgia, 600 S Lumpkin St, Athens, GA 30605, USA (email: daniel.rettl@uga.edu); Schandlbauer: Department of Business and Management, University of Southern Denmark, Campusvej 55, 5230 Odense, Denmark (email: alsc@sam.sdu.dk); Trandafir: ROCKWOOL Foundation, Ny Kongensgade 6 DK 1472, Copenhagen, Denmark, and IZA@LISER (email: mt@rff.dk). Schandlbauer is affiliated with the Danish Finance Institute (DFI) which financially supports researchers in Finance. Funding from the Independent Research Fund Denmark, Grant 2033-00195B, is gratefully acknowledged. We thank Jérôme Adda, Morten Bennedsen, Sonia Bhalotra, Thuy Duong Dang (discussant), András Danis, Sara Holland, Yi-Hsin Lo (discussant), Hannes Schwandt, Fei Su (discussant), and seminar participants at the 2023 New Zealand Finance Meeting, 2023 FMA European Conference, 2022 NFA Workshop on Working Environment Economics, 2022 Annual Conference of the German Finance Association (DGF), 2021 Annual Conference of the European Association of Labour Economists, Victoria University Wellington, Oslo Met, Vienna University of Business and Economics, Goethe University Frankfurt, Humboldt University Berlin, ROCKWOOL Foundation, and the University of Georgia for helpful comments.

1 Introduction

Despite the well-established decline in labor share over the past four decades (e.g., Karabarbounis and Neiman, 2014), recent work demonstrates the importance of labor characteristics and workforce frictions for firm performance. Shocks to key personnel, such as CEO hospitalization or divorce, adversely affect firm outcomes (Kleindienst et al., 2022; Bennedsen et al., 2020), as do disruptions related to the mobility or misallocation of skilled labor (Fedyk and Hodson, 2023; Shen, 2021). Relatedly, Bennedsen et al. (2019) show that absenteeism among rank-and-file employees, partly driven by firm-level incentives and organizational features, reduces productivity and operating returns. These findings highlight that labor disruptions, of which employee health represents a particularly important and underexplored source, have a broad influence on firm performance. Consistent with this, survey-based evidence suggests that illness-related productivity losses account for a substantial share of aggregate output, with estimates reaching up to 2.5% of GDP (Edwards and Greasley, 2010).

Building on this research, we examine how employee health shocks affect firm performance, using influenza infections as a source of temporary, plausibly exogenous disruptions to workforce productivity. These disruptions operate through two channels: absenteeism, i.e., workers missing work due to illness, and presenteeism, i.e., workers remaining on the job but performing at reduced capacity. Our empirical setting captures the combined impact of both channels, and while our data do not allow us to separately identify their relative contributions, the evidence suggests that absenteeism alone does not fully account for the observed effects, consistent with a role for reduced on-the-job productivity. Leveraging a comprehensive register-based panel dataset from Denmark covering the period 1999–2016, we show that these health shocks have economically meaningful negative effects on firm performance, with smaller firms being particularly vulnerable. We further document substantial heterogeneity across firms and workforce characteristics, indicating differences in firms' ability to absorb these disruptions.

Denmark represents an ideal setting for our study. First, the richness of the administrative data allows us to link employee health to the performance of their employers, an exercise that is typically impossible with publicly available data. Second, the Danish labor market is characterized by "flexicurity," a system in which employers have the flexibility to hire and fire workers who are in turn protected by a generous safety net that provides income security (Humlum and Munch, 2023; Kreiner and Svarer, 2022). Finally, all Danish residents are covered by comprehensive public health insurance. These features of the Danish labor and healthcare markets ensure that firm decisions and employment relations are not confounded by other considerations, such as firing costs or the need for employer-provided health insurance.

Simple correlations between firm performance and employee health can be misleading. For instance, employees often choose employers with policies or work environments that match their health needs and are willing to accept wages that reflect the cost of these benefits to their employers. Simultaneously, firms may tailor their policies and work environments to attract employees with particular health profiles. These sorting patterns can lead to a spurious correlation between worker health and firm performance. To uncover the causal effect of employee health on their employers, we focus on a change in employee health that is likely independent of firm policies: seasonal influenza, commonly known as the flu.

The seasonal influenza is an excellent candidate for a health shock in our framework. First, it affects a reasonably large share of the population, estimated at around 9% among working-age adults (Tokars et al., 2018). Second, a severe influenza season generally occurs during the winter months and, except for rare cases (usually among the very young or the very old), the flu typically has symptoms and complications that amount to a transitory health shock, impairing worker productivity (Eccles, 2005). Third, this transitory nature allows us to abstract from longer-term workforce adjustments, such as replacement hiring, and the associated costs that firms incur when replacing workers lost due to severe health shocks such as work accidents, cancer diagnoses, or death (e.g., Jäger et al., Forthcoming). Finally, although influenza vaccines exist, widespread resistance remains difficult to achieve due to the virus's annual mutations and the challenges health organizations face in predicting the predominant strain. More importantly for our study, even if the virus strain could be accurately predicted, vaccination rates vary significantly and are generally low among the working-age population in most countries, including Denmark, where they range from 5%–10%, with programs typically neither mandatory nor free.

To measure the impact of influenza on employee health, and through it on both absenteeism and on-the-job productivity, we use detailed data on general practitioner (GP) visits. In particular, we take advantage of the fact that a specific type of blood test, the C-reactive protein (CRP) test, is commonly used in the Nordic countries to determine the appropriate course of treatment in patients with (severe) respiratory tract infections (e.g., Lykkegaard et al., 2021). This allows us to construct a proxy for the severity of the flu season at the firm-year level: the rate of CRP tests administered during the typical flu season, which captures variation in employee health affecting both absenteeism and on-the-job productivity. We find that firms whose employees are more affected by the flu experience a reduction in their performance in that specific year: a one standard deviation increase in the CRP rate lowers the average operating return on assets and net income by 0.15 percentage points. This translates into a reduction of 68,835 DKK (USD 10,949) in operating profits and of 65,731 DKK (USD 10,456) in net income for the average firm in our sample. These findings are confirmed when we conduct our analysis within firms at the establishment level, an approach that allows us to eliminate time-varying unobserved firm characteristics that may be correlated with both firm-level profitability and local influenza seasons.

We can gauge the magnitude of these effects by comparing them to previous studies on the impact of various events and policies on firm performance. A severe flu season, defined as a one standard deviation increase in the CRP rate, is equivalent to a two- to three-day increase in the average number of days of absence among all employees (Bennedsen et al., 2019), a three-day hospital stay of the CEO (Bennedsen et al., 2020), or one tenth of the effect of either adding one more board member to the firm (Jenter et al., 2023) or of replacing a CEO of median talent with the most talented CEO (Falato et al., 2015).[1] These magnitudes suggest that the average firm in our sample is affected by a severe flu season in a non-trivial way.

We interpret these disruptions as reducing effective labor input through both absenteeism and presenteeism. While our data do not allow us to separately identify their relative contributions, we provide two pieces of suggestive evidence. We first show that a higher CRP rate is associated with increased sick leave, consistent with absenteeism being an important channel. At the same time, controlling for variation in absence rates leaves the estimated impact of the flu on firm performance largely unchanged, suggesting that absenteeism alone does not fully account for the observed effects, consistent with a role for reduced on-the-job productivity (Blanchet Zumofen et al., 2023; Romanelli et al., 2023). If health-related disruptions operate through reductions in effective labor input, two empirical patterns should emerge. First, a severe flu season should have a stronger impact on firms in which human contact is more prevalent, such as more labor-intensive firms. Second, firms that can more easily reallocate resources to cover for sick employees should be better insulated from

[1]The standard deviation of the CRP rate is approximately equal to half of the difference in the average CRP rate between the most severe and the mildest years during our sample period. For ease of exposition, in the rest of the paper we will refer to a one standard deviation increase in the CRP rate as a "severe flu (influenza) season".

these shocks. Consistent with these predictions, we find that our results are concentrated among labor-intensive firms and that the impact of the flu on firm profitability declines monotonically with financial flexibility and firm size. We further show that firms producing durable goods, particularly in manufacturing and construction, are more strongly affected, indicating that our estimates are not driven by changes in local demand. We also show that these effects are driven by health shocks to rank-and-file employees rather than to senior management, exploiting within-firm variation across the wage distribution and between headquarters and other establishments. Finally, we estimate instrumental variable models that address the concern that the healthcare-seeking behavior of employees may be endogenous to firm performance and confirm that firm profitability is lower for firms more affected by the flu.

Given our finding that severe flu seasons negatively affect firm profitability, particularly among smaller firms, a natural question is how this shock is transmitted to two of the firms' most important stakeholders: employees and shareholders. We estimate economically insignificant reductions in wages and employment in small firms, suggesting that even they can shield their workforce from the temporary shock they experience during a severe flu season. On the other hand, these firms increase their cash holdings, are more inclined to hire temporary workers, and reduce their dividend payments. Hence, our results suggest that firms pass through some of the negative consequences of seasonal influenza to shareholders, but not to employees.

Our paper contributes to several strands of literature, including the growing research on employee absenteeism. Recent studies examine the determinants of absenteeism (Bennedsen et al., 2019) and its effects on productivity (Grinza and Rycx, 2020), while Bennedsen et al. (2020) document the consequences of CEO absenteeism, driven by hospitalization, for firm performance. Our results extend this literature by showing that plausibly exogenous health shocks among rank-and-file employees have economically meaningful effects on firm profitability, reflecting both increased absences and reductions in on-the-job productivity.

Our paper further contributes to a newer literature in finance that examines the implications of labor market frictions on firm behavior, performance, and stock market outcomes. Several studies highlight the importance of employment decisions and labor frictions in driving firm outcomes. Belo et al. (2017) show that hiring rates predict future stock returns, with higher rates linked to lower returns, especially in high-skill industries. Similarly, Agrawal et al. (2021) find that employee decisions convey valuable information that affects stock prices, often before investors fully incorporate it. In addition, Caggese et al. (2019) show how financial constraints lead firms to inefficiently fire high-potential workers, while Ghaly et al. (2017) demonstrate that firms with more heterogeneous workforces hold larger cash reserves to manage labor adjustment costs. Jäger et al. (Forthcoming) emphasize the challenge of replacing firm-specific human capital, which directly affects firm productivity. In contrast to these studies, we examine how temporary health shocks among rank-and-file employees affect firm performance in the absence of workforce adjustments, with effects that are particularly pronounced among smaller firms.

Another line of research we contribute to studies corporate risk management. Firms usually have an incentive to hedge against a variety of risks as they could otherwise face additional costs, constraints, or even bankruptcy (Stulz, 1996). Previous literature finds that firms hedge against e.g., exchange rate fluctuations (Allayannis et al., 2001), weather conditions (Pérez-González and Yun, 2013), CO_2 permit prices (Schopp and Neuhoff, 2013), input prices (Almeida et al., 2017), or supply chain disruptions (Kulchania and Thomas, 2017). Firms are also increasingly aware of the need to hedge against adverse employee health shocks, which they typically do through investments in employee health. However, these investments are typically made only by large firms and take the form of workplace wellness programs, which are designed to improve the health and general well-being of employees, with a particular focus on reducing the chances of an "extreme health shock" such as the onset of disability or cancer diagnosis (see the review in Baicker et al., 2010).[2] Our results suggest that smaller firms also have incentives to hedge against shocks to employee health, even if small and transitory.

A small but emerging part of the literature examines the impact of seasonal influenza on firm-level outcomes, and our study also contributes to this area of research. Morris and Hoitash (2019) and Chen et al. (2023) investigate flu infections in the context of accounting audits and disclosure policies in the US. Exploiting variation in flu spread and severity at the state level, these studies find that audit quality suffers during the flu season due to its overlap with the busy audit period, and that firms in areas with higher flu activity shift from short-run to long-run earnings forecasts. Similarly, Dorner and Haller (2020) analyze regional respiratory infection data and firm-level survey evidence from Germany (2003–2009), showing that longer flu seasons are associated with lower total factor productivity in affected municipalities. While these studies focus on specific operational and productivity outcomes, our analysis extends this literature by examining the broader implications of health shocks on firm profitability. We differ from prior work in several key dimensions: First, we use comprehensive administrative data covering the entire population of Danish firms and residents, enabling us to calculate a firm-specific measure of flu severity and incorporate extensive control variables, including the number of sick days taken by top executives. Second, we directly analyze the impact of the flu on firm profitability and provide evidence consistent with the mechanisms underlying these effects. Finally, the use of establishment-level balance sheet data allows us to control

[2] Much of the literature documents that these programs improve workers' health, increase their productivity, and reduce absenteeism. Yet, recent evidence suggests that these findings are entirely driven by the selection of healthy employees into wellness programs (Jones et al., 2019).

for unobservable characteristics that vary at the firm-year level.

Finally, our paper also contributes to the literature on the macroeconomic impact of seasonal influenza, which has documented a significant cost burden (e.g., Peasah et al., 2013). Most studies quantify these costs by combining direct medical expenses with indirect costs, such as reduced earnings due to illness and loss of life from influenza (e.g. Putri et al., 2018). These estimates are however based on data from the US, where vaccination rates are higher compared to many other developed countries, including Denmark. Our analysis quantifies the effect of severe seasonal influenza seasons on firm profitability, an important component of annual indirect costs.[3]

The remainder of the paper is organized as follows. Section 2 provides some background on the seasonal influenza. Sections 3 and 4 describe the empirical strategy and data. Section 5 presents the main results and, last, Section 6 concludes.

2 Background

2.1 Sickness benefits and health insurance in Denmark

Employees in Denmark qualify for sickness benefits if they cannot work because of illness. According to the Act on Salaried Employees, they are entitled as a general rule to full pay during sick leave. The wage compensation in sickness is a short-term benefit with a maximum eligibility duration of 52 weeks over 18 calendar months (until 2014) or 22 weeks over 9 calendar months (after 2014).[4]

[3]We also add to the large literature on the consequences of worker health for the individuals themselves. These papers focus almost exclusively on outcomes such as labor force participation, employment, welfare dependence, and income (e.g., García-Gómez et al., 2013; Bradley et al., 2005; Smith, 1999). They typically rely on variation in worker health due to "extreme events" (e.g., Autor et al., 2019; Bradley et al., 2002). The only other related paper that we are aware of documenting the negative consequences of indirect exposure to the flu is by Schwandt (2019), who focuses on maternal influenza infections during pregnancy.

[4]Employers are required to pay the sickness benefits for the first 30 calendar days of a sickness spell. Firms can get reimbursed for their sick pay expenses during this period if they are insured or if the sick leave is covered by an agreement

In addition, while there is no general rule, most collective labor agreements and most employment contracts include the right to one or two days of paid leave per sickness spell of a child.

The majority of health care in Denmark is publicly organized and funded. All Danish residents are assigned a GP who provides their primary care free of charge (Pedersen et al., 2005). GPs are the first line of diagnosis and treatment for non-emergent conditions and act as a gatekeeper to specialized care.[5] In addition, more than 45 percent of the population enrolls in voluntary health insurance plans offered by private health insurance companies that reimburse fully or partially the cost of services not included in the national health insurance (Kristensen and Olsen, 2021).

2.2 Seasonal influenza

Seasonal influenza is an acute and contagious respiratory illness caused by influenza viruses. The virus mutates while circulating around the world so previously-obtained immunity is largely lost. Annual flu seasons typically occur during the winter months, when transmission is easier because of low humidity and low temperatures. As a result, the flu is the leading infectious disease in the developed world. Each year, 3–11% of the population are affected with symptoms (Tokars et al., 2018), between 5% and 20% have an asymptomatic version, and 3–5 million cases are severe (e.g., Adda, 2016). In general, the severity of influenza seasons varies across years and locations.[6]

Common influenza symptoms are fever, runny nose, cough, headache, muscle and joint pain, and fatigue. Low energy, sleep problems, and reduced ability to concentrate can last for several weeks,

with the local authority (municipal government). After the 30th day of sick leave, local authorities cover the payments that relate to the sickness benefits.

[5]GPs are self-employed and contract with the publicly-funded Danish health regions. Their income comes from a mix of fee-for-service (about two thirds) and capitation (one third). The inclusion of capitation as part of GP remuneration reduces their incentives to provide unnecessary treatments.

[6]Temporal variation is often attributed to changes in virus subtype, vaccine effectiveness, and antiviral treatment. Geographic differences may relate to environmental factors like humidity, temperature, or air pollution. See Dave and Lee (2019) for a review of the literature on seasonal flu patterns.

leading to substantial absences from work or school as well as reduced productivity among those who continue working. Complications require specialized treatment, but uncomplicated cases typically require only symptom management through care provided by family members. This includes caring for young children, who have the highest risk of contracting the flu and who tend to spread the disease to their caregivers (Jayasundara et al., 2014).

A diagnosis of influenza is made mostly based on symptoms and the likelihood of infection (Krammer et al., 2018). This is complicated by the fact that influenza shares many of its symptoms with other diseases, such as the common cold, and that many patients seek care only when their symptoms are severe. Physicians must then determine if those symptoms result from viral or bacterial infections, typically pneumonia, which requires treatment with antibiotics. A test widely used in primary care in the Nordic countries to distinguish between a viral and a bacterial infection is the C-reactive protein (CRP) test (Melbye et al., 2004).[7] In Denmark, GPs administer CRP tests to more than half of the patients with symptoms of respiratory tract infections during flu seasons (Lykkegaard et al., 2021).[8] As a result, as shown in Appendix Figure A1, the within-year variation in the CRP rate tracks closely the variation in hospital admissions for flu and pneumonia and in the incidence rate of influenza-like illness. In conclusion, a CRP test in primary care can be interpreted as a sign of a severe respiratory tract infection potentially brought on by the flu.[9]

There are two main preventive actions against the flu: good hygiene and vaccination. Flu vac-

[7]CRP is a liver-produced protein involved in the innate immune response, meaning that its blood concentration increases in response to inflammation, infection, or tissue damage. CRP levels are higher in patients with bacterial than with a viral respiratory tract infection (Hopstaken et al., 2003).

[8]The official Danish health authority guidelines recommend that GPs use a CRP test to distinguish between uncomplicated influenza and pneumonia if the patient exhibits (severe) influenza-like symptoms (see `https://www.sundhed.dk`, last accessed on June 15, 2023).

[9]Our identification strategy does not depend on whether employee health deteriorates due to the flu specifically or other influenza-like illnesses. Instead, it is sufficient if poor health, as indicated by the administration of a CRP test, leads to reduced worker productivity. Moreover, it is noteworthy that the severity of the flu season is typically determined based on the incidence of influenza-like illness.

cinations need to be refreshed every year because the virus mutates. Vaccines are on average only 40–60% effective at preventing infection or hospitalization in case of infection among working-age adults (Rondy et al., 2017). In Denmark, vaccinations are free of charge for persons older than 65, people with chronic conditions, and pregnant women in the second or third trimester. The rest of the population needs to pay a fee of about 200 DKK (USD 32) unless they are enrolled in a private health insurance plan, which typically cover 50% of the fee. Despite the relatively low cost, only a small fraction of the population is vaccinated against the flu: According to data from the Danish Ministry of Health, between 2009 and 2015 only around 3% of persons 18–64 years old were vaccinated in each year.[10]

In conclusion, being infected or having a household member infected with the flu generates both absenteeism, by hindering an employee's ability to go to work, and presenteeism, by reducing their ability to perform tasks efficiently while at work. In addition, Danish workers are largely unprotected against severe flu seasons given the very low vaccination rate among the working-age population.

3 Empirical strategy

We are interested in estimating the effect of employee health on firm performance:

$$\pi_{ikt} = \alpha_t + \nu_i + \widetilde{\beta} \times Employee\_Health_{ikt} + \gamma X_{ikt} + \delta Z_{kt} + \epsilon_{ikt}, \quad (1)$$

where π_{ikt} is a measure of firm-level profitability for firm i located in municipality k in calendar year t, α_t are calendar-year fixed effects, ν_i are firm fixed effects, $Employee\_Health_{ikt}$ is a measure of

[10]The data can be found at https://statistik.ssi.dk, last accessed on June 15, 2023.

the general health of the employees in the firm, X_{ikt} denotes firm-level controls, and Z_{kt} denotes municipality-level controls.

The coefficient of interest, $\widetilde{\beta}$, measures the average change in firm performance as a result of a change in the health of its employees. However, it is unlikely that a simple estimation of equation (1) uncovers the causal effect because choices of firms and employees are related to both employee health and firm performance. For example, firms invest in workplace safety when accidents counts are high, which can then reduce their profitability (Cohn and Wardlaw, 2016). At the same time, workers in worse health may choose to work for firms that invest in their employees' health, such as through workplace safety measures. These decisions will result in a spurious positive correlation between the profits of firms and the health of their employees.

To eliminate this potential bias we rely on plausibly exogenous changes in employee health. Large shocks to the health of one or more employees may induce the firm to adjust its workforce, typically by (eventually) replacing the sick employees. The impact of such changes in employee health on firm performance would then be the sum of the direct effect of the health shock and its indirect effect through the workforce adjustment. To isolate the direct effect, we use temporary and relatively small health shocks brought on by the seasonal influenza that do not create incentives for firms to alter their workforce. We measure changes in workforce health, capturing the combined effect on both absenteeism and on-the-job productivity, through a variable that proxies for a respiratory tract infection with severe symptoms, likely brought on by seasonal influenza: the rate of CRP tests performed on the employees and their families during the flu season (*CRP_rate*). The estimating equation is then:

$$\pi_{ikt} = \alpha_t + \nu_i + \beta \times CRP\_rate_{ikt} + \gamma X_{ikt} + \delta Z_{kt} + \epsilon_{ikt}, \qquad (2)$$

The coefficient of interest β represents the effect on firm performance of an increase in the number of infections with severe symptoms among the firm's workforce and their families. We cluster the standard errors at the firm level.

The identifying assumption in this model is that variation in health shocks due to the flu, as captured by the CRP rate, is conditionally exogenous with respect to firm performance. This assumption is plausible given that most influenza infections occur outside the workplace (e.g., Edwards et al., 2016, report that on average only 16.2% of influenza transmission occurs in the workplace), but it would be violated if firms systematically sort into locations with persistently different health environments (e.g., if firms with healthier workforces select into wealthier municipalities with lower baseline influenza exposure). We address this concern in several ways. First, we include firm fixed effects and firm-level controls in our main specification. Firm fixed effects absorb time-invariant firm characteristics, including those related to location choice, while the controls account for observable factors that may vary over time and be correlated with both employee health and firm performance. Second, we estimate specifications with municipality-year fixed effects, which absorb all time-varying local conditions that could jointly affect employee health and firm performance.

These specifications may still yield biased estimates if there are time-varying unobserved firm-level factors correlated with both firm performance and local influenza intensity. To address this concern, we exploit within-firm variation across establishments (workplaces). Specifically, we restrict the sample to firms with at least two establishments and estimate specifications similar to Equation (2) in which firm and year fixed effects are replaced by firm-by-year fixed effects, thereby absorbing all time-varying firm-level shocks and identifying the effect from differential influenza exposure across establishments within the same firm-year. The establishment-level specification is:

$$\pi_{eikt} = \alpha_{it} + \beta \times CRP\_rate_{eikt} + \gamma X_{eikt} + \delta Z_{kt} + \epsilon_{eikt}, \tag{3}$$

where the unit of observation is establishment e located in municipality k and belonging to firm i in calendar year t, and the proxy measure *CRP_rate* is calculated at the establishment level. In addition to the municipality-level control variables included in Equation (2), we also include a set of establishment-level controls X_{eikt} and, most importantly, the firm-year fixed effects α_{it}. These variables capture all the time-varying firm-specific drivers of establishment-level profitability and help address the concern that our results are mainly driven by unobservable characteristics of the firm which may vary over time and are not captured by the firm-level controls in Equation (2). For example, firm-specific demand shocks and other firm-level confounding factors may influence both productivity and health-seeking behavior. Alternatively, the increased cost of taking sick days in periods of high productivity may discourage employees from seeking CRP tests even when they are as unwell as in standard years. Finally, we cluster standard errors at the establishment level.

A second situation in which the identification assumption may be violated is if severe local influenza seasons affect firm performance through changes in local customer demand, which may be the case if ill health reduces personal consumption. We address this in several ways. We include the local unemployment rate or municipality-year fixed effects as control variables in Equations (2) and (3) to capture changes in local customer demand and more generally in local economic activity. We also examine whether firms operating in industries such as manufacturing and construction, which produce durable goods and would arguably not be affected by temporary demand shocks, are impacted less by the temporary health shocks due to the flu.

Finally, a potential concern is that our estimates reflect health shocks among senior management rather than among rank-and-file employees. To address this concern, we restrict the sample to firms with at least three establishments and exclude each firm's headquarter establishment, thereby focusing on variation across non-headquarter establishments within firm-years. To the extent that senior executives are concentrated at headquarters, this design isolates the effect of rank-and-file employee health on firm performance.

4 Data

4.1 Data sources and sample selection

Our data come from several administrative registers provided by Statistics Denmark. Each of these registers includes unique firm and/or individual identifiers, which allow us to create very detailed firm-employee matches. We use several registers over the period 1999–2016. The *Population Register* includes variables such as the date of birth, sex, marital status, partner identification number if applicable, and the identification numbers of the parents for every resident of Denmark. The *Health Insurance Register* records the claims made by privately-practicing health professionals to the national health insurance, including the date of the claim and the service provided (but no diagnosis). Given that the national health insurance covers all visits to the GP to which a person is assigned, the register provides the universe of GP visits in Denmark. The *Integrated Database for Labour Market Research Register (IDA)* combines information on employees, such as socioeconomic status or the position in the organization, with information on employers, such as the address of the headquarters or unique identification numbers and addresses for each establishment. This allows us to match employees and firms and to pinpoint the main establishment of firms with multiple workplaces. The position of an employee in the firm is based on the Danish version of the International Standard Classification of Occupations. Information from balance sheets is available in the *Accounting Statistics Register (FIRE)* for all limited liability and public firms that report to the Danish tax authorities. Limited accounting data at the establishment level also exist in the *FIRA Register*, available only between 2007–2015. Finally, the *Municipality Key Figures* is a publicly-available municipality-level data set including aggregate figures such as the unemployment rate, the overall area, and the total population in each each year.

Our sample consists of both privately held and publicly traded firms in Denmark. We include all limited liability firms with more than 10 employees between 1999 and 2016.[11] Following standard conventions in the literature, we exclude all financial, utility, and government-owned entities. Our final sample includes 21,696 firms with a total of 183,917 firm-year observations. Among these firms, we have establishment-level data on 29,850 establishments with 10 or more employees, operating in 20,760 firms over the period 2007–2015, for a total of 161,458 establishment-year observations. As mentioned earlier, the main advantage of the establishment-level data is that we can include firm-by-year fixed effects in our specifications, in which case we restrict the analysis to firms with at least two establishments of at least 10 employees each in the given year. Our preferred establishment-level sample is based on data from 11,049 establishments of 2,464 firms, with a median number of two establishments per firm, for a total of 49,976 establishment-year observations.

[11] We include firm-years with more than 10 employees so that we have a large enough sample of large enough firms in every year. We also exclude all firms that move headquarters across municipalities at any point during the sample period because this decision might be endogenous to the prevalence of the flu. Our baseline results are robust to not imposing either or both of these constraints.

4.2 Variable construction

Similar to prior studies (e.g., Bennedsen et al., 2020; Kulchina, 2016), our main outcomes are two measures of firm profitability: operating return on assets (OROA), defined as the ratio of operating income to total assets, which is not sensitive to (changes to) the firm's capital structure, and the ratio of net income to total assets (NI). We also construct industry-adjusted versions by subtracting the yearly average at the 4-digit industry level according to the second revision of the Nomenclature of Economic Activities (NACE 2.0), the standard classification of economic activities in the European Community. Data limitations at the establishment level require us to measure profitability through profit per employee, defined as the ratio of establishment gross profit (in million DKK) to the full-time employee equivalent of the establishment.

We construct our proxy measure as:

$$CRP\_rate_{ikt} = \frac{\sum_{j \in i} C_{j(i)t}}{\sum_{j \in i} F_{j(i)t}},$$

where $C_{j(i)t}$ is the number of CRP tests administered in the family of employee j of firm i during the typical flu season in year t, and $F_{j(i)t}$ is the number of family members of employee j including the employees themselves.[12] Our measure takes into account the health of spouses and children because the treatment of the flu requires supportive care provided by family members and because children tend to spread the disease to their caregivers (see Section 2.2), but we also construct measures in which $C_{j(i)t}$ includes only the CRP tests administered to employees.[13] For simplicity, in the rest of

[12]We use billing codes 807120, 81720, 827120, 837120, and 897120 to identify CRP tests performed by GPs. Statens Serum Institut, the Danish equivalent of the Centers for Disease Control and Prevention in the US, monitors the flu between week 40 of a given year and week 20 of the following year. We therefore define the flu season in a given calendar year to include weeks 1–20 and 40–end of the year.

[13]Our main results are virtually identical if we do not include the family members and calculate the CRP rate using only the employees of the firm (see Column (5) in Appendix Table A7).

the paper we will refer to this measure as "the CRP rate in a firm."

The control variables in our firm-level analysis are a measure of firm size (the natural logarithm of the lagged value of total assets), a measure of industry concentration (the Herfindahl-Hirschmann index of the firm's industry), and indicators for every five-year bin of firm age. We also include the average number of hospitalization days among the top-5 highest-paid employees and the average number of hospitalization days among the remaining rank-and-file employees. We include these controls for distinct reasons. First, in the context of top executives, research has quantified the significance of CEO absences (Bennedsen et al., 2020). By controlling for the average number of hospitalization days among the highest-paid employees, our aim is to account for these established effects and shift our focus away from the specific influence of CEO absence. Second, for rank-and-file employees, a significant portion of these hospitalization days involves planned visits, such as surgeries and pregnancies. The structured nature of these scheduled absences enables the firm to proactively plan and adjust, presenting a notable contrast to the unpredictable timing and severity of the influenza infections that we analyze.

In the establishment-level analysis, we control for the natural logarithm of establishment level employment (measured by its full-time employee equivalent) and for the age of the establishment (indicators for every five-year bin). The municipality-level control variables consist of the local unemployment rate and the local population density, both in logarithmic form. We winsorize all variables at the 1% level.

4.3 Descriptive statistics

Table 1 provides the summary statistics. Most of the firms in our sample are small and medium-sized, are spread all over Denmark, and are privately owned. The average (median) firm has 108.0m (14.7m) DKK, or USD 15.8m (2.2m) of total assets, 36 (21) full-time employees, and is 17 (14) years old. Focusing on such smaller firms, which are prevalent in many industrialized countries, implies that our analysis is likely relevant beyond Denmark. Turning to our two measures of firm performance, OROA varies between 0.07% (25th percentile) and 14.1% (75th percentile), with a mean of 6.5%, while NI varies between −2.7% and 9.0% with a mean of 1.9%.

Looking at our measure of flu intensity, we can see that, on average, GPs perform 0.1 CRP tests among the employees of a firm and their family members. Appendix Figure A2 shows that, although there are no CRP tests in about 10% of firm-year observations, there is still substantial variation in the CRP rate in a firm. Appendix Figure A3 plots the distribution of the CRP rate in a firm in each year and shows that this variation is both cross-sectional and over time. We provide more visual evidence in Appendix Figure A4, which maps the municipality-level average of the CRP rate in a firm during a low and high flu year. The Figure shows that, in a given year, firms in some municipalities are hit harder by the flu while others suffer much less, and also that which municipality experiences a more severe flu season changes over time.

Turning to the industry-level characteristics and hospitalization days of employees in Table 1, we can see that the average market concentration in our sample, measured by the Herfindahl-Hirschmann index of the firm's industry sales, is 0.019, indicating that most industries consist of a large number of firms of relatively equal (and small) size. The top-5 employees are hospitalized on average 0.27 days in a year, which is less than rank and file employees (0.40 days) but similar to the number reported by Bennedsen et al. (2020) for a similar sample of Danish firms.

5 Results

5.1 Baseline effects of employee health on firm performance

We start this section by presenting baseline estimates at the firm and establishment levels, exploiting both cross-firm and within-firm variation in employee health to identify the relationship between influenza exposure and firm performance.

5.1.1 Firm-level evidence

Our firm-level estimates are based on the empirical model in Equation (2), in which we regress measures of firm performance on our proxy for the severity of seasonal influenza. Table 2 reports the baseline estimates for our two measures of firm performance: operating return on assets in Panel A and the ratio of net income to total assets in Panel B. Across specifications, we find that higher influenza intensity, as measured by the CRP rate, is associated with economically meaningful reductions in firm profitability.

Columns (1) and (5) report estimates from a specification that includes firm and year fixed effects but no additional controls. We find that both measures of firm profitability are significantly lower when employees are exposed to a more severe influenza season. For example, a one unit increase in the CRP rate reduces operating return on assets by 0.0200. Because the average CRP rate is low, we focus on the effect of a one standard deviation increase (approximately 0.08 tests), which corresponds to a reduction in average OROA of about 0.16 percentage points, or approximately 2.43% of the median OROA. Using net income over total assets as a measure of profitability yields qualitatively similar results. A one standard deviation increase in the CRP rate leads to a 0.16 percentage point decline, or 5.77% of the median net income in our sample.[14]

We next add municipality × year fixed effects in Columns (2) and (6) to control for confounding factors that vary across municipalities over time. In particular, this addresses the concern that our results may reflect local economic conditions correlated with influenza intensity rather than firm-level exposure. The estimated effects remain very similar in magnitude.

Columns (3) and (7) report our preferred specification, which adds firm-level and municipality-level controls to the baseline specification. Including the average number of hospitalization days of managers and rank-and-file employees helps address the concern that our influenza measure may capture CEO hospitalizations, which have been shown to affect firm performance (Bennedsen et al., 2020). Additional controls for population density and unemployment further account for differences in local economic conditions. The estimated effects remain negative, statistically significant, and quantitatively similar: a one standard deviation increase in the CRP rate reduces OROA by approximately 0.15 percentage points and net income by approximately 0.14 percentage points.

In Columns (4) and (8), we replace municipality-level controls with municipality × year fixed effects to account for all local influences on firm performance. The results are unchanged, confirming the robustness of our findings.

Finally, Appendix Table A1 reports results using industry-adjusted profitability measures. The estimated effects are both qualitatively and quantitatively similar to those in Table 2.[15]

We perform a range of additional robustness tests to address potential alternative explanations for

[14]The median of OROA and NI is more informative than their average because both measures can take positive and negative values. Appendix Table A2 shows that our conclusions are robust to alternative normalizations of firm profitability.

[15]Because the industry-adjusted measures have mean zero by construction, we compare the magnitude of the estimated effects to the standard deviation of the original measure. The results are quantitatively similar across both specifications.

our findings. In particular, we examine whether our results are driven by persistent effects of severe influenza seasons, by their coincidence with broader economic downturns, or by specific features of firms located in large and densely populated areas such as Copenhagen. We further assess the role of firm exits and alternative ways of measuring both firm performance and employee health. To address concerns about endogenous healthcare-seeking behavior, we also implement an instrumental variable approach based on leave-one-out rates of CRP tests and hospitalizations for influenza and pneumonia at the municipality level. For brevity, we describe these tests in detail in Appendix Appendix A2 and Appendix Tables A7, A8 and A9. Across all specifications, the negative relationship between influenza exposure and firm profitability persists, indicating that our main conclusions are not driven by these alternative explanations.

5.1.2 Establishment-level evidence

Our establishment-level estimates are based on the empirical model in Equation (3), in which we relate workplace-level profitability, measured as profit per employee, to our proxy for the severity of seasonal influenza. Table 3 reports the corresponding results.

In Column (1), we estimate a specification that includes firm and year fixed effects in the sample of all establishments with at least 10 employees. We find a negative and statistically significant relationship between employee health and establishment-level profitability.

Restricting the sample to firms with at least two establishments allows us to exploit within-firm geographic variation in influenza exposure across workplaces. In this setting, we replace firm and year fixed effects with firm × year fixed effects, thereby absorbing all time-varying firm-level confounders. We first reestimate the specification in Column (1) in the sample of firms with at least two establishments and report the results in Column (2). The estimated effect increases in magnitude and becomes more precisely estimated, suggesting that multi-establishment firms are more vulnerable to the flu, presumably because of less scope for labor reallocation across sites.

Once we exploit within-firm variation and sequentially add more controls in Columns (3)–(6), the estimated coefficients are consistently negative and statistically significant, and lie in a narrow range between approximately -0.09 and -0.10. This stability indicates that the relationship between employee health and establishment-level profitability is tightly identified and robust to the inclusion of additional controls and fixed effects. In our preferred specification in Column (5), a one standard deviation increase in the CRP rate is associated with a decline of approximately 0.82% in establishment-level profitability relative to its median. While this effect is somewhat smaller than the relative effects at the firm level documented in Section 5.1.1, it is similar to the relative effects at the firm level estimated in the sample of firms with multiple establishments over the same period (1.19% for OROA, 7.17% for NI).

Finally, replacing municipality-level controls with municipality $\times$ year fixed effects leaves the estimates virtually unchanged, confirming the robustness of the establishment-level results.

5.2 Rank-and-file vs. managerial health shocks

A key challenge for interpreting our estimates is that the estimated effects may reflect illness among senior managers rather than among the broader workforce. If influenza disproportionately affects senior management, our estimates would capture the effect of managerial illness on firm performance rather than the effect of short-term illness among rank-and-file employees. To address this concern, we exploit within-firm variation in influenza exposure that allows us to distinguish between health shocks affecting rank-and-file employees and those affecting senior management.

We begin by exploiting variation in influenza exposure across the within-firm wage distribution. Because higher-paid employees are more likely to occupy managerial positions, while lower-paid employees primarily represent the operational workforce, this variation allows us to distinguish between health shocks affecting senior management and those affecting rank-and-file workers. Specifically, we construct separate measures of the CRP test rate among employees in the bottom 75% and top 25% of the wage distribution and estimate variations of Equation (2) that include one or both of these measures. As shown in Table 4, we find that the negative relationship between influenza exposure and firm performance is driven by higher CRP test rates among lower-paid employees. For example, a one unit increase in the CRP rate among the bottom 75% employees is associated with a decline in operating return on assets of approximately 0.016. In contrast, the corresponding estimates for the top 25% employees are smaller in magnitude, around 0.007, and statistically weaker. More importantly, when both measures are included the coefficient on the bottom 75% employees remains stable, while the coefficient on the top 25% employees becomes small and statistically insignificant. These results indicate that the effects we document are primarily driven by disruptions among the broader operational workforce rather than by absenteeism among senior management.

Alternatively, we construct measures of employee health that distinguish between rank-and-file workers and the top-5 highest paid employees in the firm and we again estimate specifications including one or both of these measures. In a slight departure to our approach above, we exclude the CEO hospitalization control from the regression because we rely on the CRP rate among top-5 employees to capture the role of CEO health. At both the firm and establishment levels, the negative relationship between employee health and firm performance is driven by rank-and-file workers, while measures based on top earners have little independent explanatory power (see Appendix Tables A17 and A18). These results also indicate that our findings do not rely on the CEO hospitalization proxy.

We further isolate health shocks to the broader workforce by exploiting two additional sources of within-firm variation: differences in influenza exposure across non-headquarter establishments, and a direct comparison of CRP test rates at headquarters versus other locations.

First, we restrict the establishment-level sample to non-headquarter establishments and use Equation (3) to compare outcomes across establishments within firm-years. Because senior executives are typically concentrated at headquarters, this design isolates variation in employee health that is unlikely to reflect managerial illness. Across specifications, the estimated coefficients remain negative and statistically significant, ranging from approximately -0.07 to -0.09 (Appendix Table A15), closely mirroring the baseline estimates in Table 3 and confirming that the results are not driven by managerial absenteeism.

Second, we directly compare the role of influenza exposure at headquarters and at non-headquarter locations on firm-level profitability by constructing separate CRP test rates for each location type and estimating variations of Equation (2) that include one or both of these measures. The results in Appendix Table A16 show that the CRP test rate at non-headquarter locations is negatively and significantly associated with firm performance across both profitability measures, with coefficients of approximately -0.10 for both OROA and NI. In contrast, the CRP test rate at headquarters is smaller in magnitude, around -0.04 to -0.06, and statistically insignificant. When both measures are included simultaneously, the non-headquarter coefficient remains stable while the headquarters coefficient stays small and insignificant. Taken together, these findings indicate that the baseline effects on firm performance are driven by disruptions among rank-and-file employees rather than by absenteeism among senior management.

5.3 Mechanisms: Labor intensity, financial flexibility, firm size

We next examine the mechanisms through which employee health shocks affect firm performance. A natural interpretation of our results is that influenza reduces effective labor input, both through increased absenteeism and through lower on-the-job productivity (presenteeism).

We first provide supporting evidence that our measure of employee health captures meaningful disruptions to labor input (see Appendix A1 for more details). Appendix Table A5 shows that higher CRP test rates are associated with a significant increase in employee absences, using data from an annual survey of employee absences.[16] A one standard deviation increase in the CRP test rate raises the average number of absence days per employee by approximately 0.20 to 0.25 days relative to a mean of about 5 days, indicating economically meaningful effects. While higher CRP test rates are clearly associated with increased employee absences, absenteeism alone does not fully account for the observed effects on firm performance. In Appendix Table A6, we show that controlling for firm-level absence rates does not materially attenuate the estimated effect of CRP rates on profitability. This suggests that our estimates capture a combination of the effects of absenteeism and presenteeism.

We next examine the relationship between CRP test rates and productivity. The results in Appendix Table A3 indicate that the CRP test rate has a negative, but imprecisely estimated, effect on productivity measured as sales per employee. We interpret this as suggestive but not conclusive evidence that employee health shocks may also reflect reductions in on-the-job productivity.

Finally, Appendix Figure A5 shows that the CRP test rate is strongly positively related to hospitalizations for influenza and pneumonia, supporting the interpretation that the CRP test rate captures

[16]The survey covers all publicly owned entities and approximately 2,600 private companies. Merging these data with our analysis sample and restricting to firms with at least two yearly observations in the survey yields an "absence sample" of 1,718 firms observed between 2010–2016, for a total of 6,610 firm-year observations (see Appendix A1 for more details). This is the same data used by Bennedsen et al. (2019), except that their sample begins in 2007.

variation in influenza-related health shocks. Taken together, these results indicate that our measure of employee health is closely linked to absenteeism and reflects underlying illness, and provide suggestive evidence of effects on on-the-job productivity.

Interpreting these findings as reductions in effective labor input, we next examine how the impact of employee health shocks varies with firms' reliance on labor and their ability to adjust to such disruptions. Specifically, we consider labor intensity, financial flexibility, and firm size. We augment the baseline specification in Equation (2) with indicators for these characteristics and their interactions with the CRP test rate. Figure 1 summarizes the implied effects of a one standard deviation increase in the CRP test rate across these firm characteristics, which we examine in turn below.

5.3.1 Labor intensity

If employee health affects firm performance through reductions in effective labor input, we expect labor-intensive firms to be more sensitive to the associated employee health risks than their capital-intensive peers.[17] Confirming our conjecture, the results in Panel A of Figure 1 suggest that our baseline estimate is entirely driven by labor-intensive firms, with capital-intensive firms largely unaffected by the intensity of the flu season. These results are consistent with the interpretation that the effect operates through a reduction in effective labor input.

5.3.2 Financial flexibility

Firms could buffer a temporary shock to effective labor input by hiring temporary workers or by employing more capital until sick employees recover. These strategies require a certain degree of

[17]We classify *labor intensive* firm-years as those with above-median wages to revenues (WtR) and below-median total assets to revenues (AtR) ratios, where we calculate these ratios in each year for each firm in our sample. Similarly, we define *capital intensive* firm-years as those with below-median WtR and above-median AtR ratios.

financial flexibility. The literature indeed finds that more financially constrained firms report larger spending cuts in labor and capital in the wake of liquidity events (Campello et al., 2010). It is plausible to assume that financial constraints also relate to a firm's ability to manage the more temporary disruptions to effective labor input we study in this paper.

We construct a measure of financial constraints following Schauer et al. (2019) and use different cutoffs in the distribution of the measure to define a financially constrained firm, starting from the 50^{th} percentile until the 90^{th} percentile in increments of 5 percentage points.[18] The financial constraints become more binding for the average firm flagged as financially constrained as we increase the threshold.

We report our results in Panel B of Figure 1. If our measure of financial constraints is a good proxy for financial flexibility and such flexibility matters in absorbing health shocks, we would expect the more constrained firms to experience larger effects. Our estimation results support this conjecture: as financial constraints become more binding with higher thresholds in our definition of constrained firms, we observe a more pronounced detrimental effect of employee health shocks on firm performance.

5.3.3 Firm size

Firms may try to mitigate the negative effects of employee sickness by spreading tasks among healthy employees. Health-induced variation in effective labor input is therefore more likely to disrupt smaller firms because they may lack the resources to redistribute tasks or to find the talent needed to cover for absent employees. Using a similar approach as in the previous sections, we define several

[18]Schauer et al. (2019) propose a measure of financial flexibility calculated as: $\text{flexibility}_{i,t} = -0.123 \times \text{size}_{i,t-1} - 0.024 \times \text{interest coverage}_{i,t-1} - 4.404 \times \text{ROA}_{i,t-1} - 1.716 \times \text{cash holdings}_{i,t-1}$. This measure was specifically developed for private firms, which dominate our sample.

size categories based on the distribution of FTE in our sample and estimate the effect of employee health for each of these subgroups. The results are presented in Panel C of Figure 1.

We start with firms with employment below the median (20.7 FTE) but above 10 FTE, the minimum threshold for inclusion in the sample. Consistent with our conjecture, we find a large, negative, and highly significant overall effect of employee health on firm performance for smaller firms. In contrast, we find no effect for firms with above-median employee counts.

We next turn to a finer classification of firms based on terciles of the distribution of FTE in our sample. *Small firms* (the lowest tercile) have fewer than 16 FTE but more than 10 FTE. *Medium-sized firms* have between 16 and 32 FTE. *Large firms* (the highest tercile) have more than 32 FTE and serve as the baseline. We find large, negative, and statistically significant overall effects of the flu on small and medium-sized firms, while large firms are virtually unaffected. Moreover, the relationship between size and the effect of employee health on both measures of profitability is monotonic, with small firms experiencing larger reductions in response to a severe influenza season than medium-sized firms. Overall, these findings are consistent with our conjecture that smaller firms in our sample are particularly sensitive to temporary reductions in effective labor input.

We also exploit variation in influenza shocks across the establishment-size distribution. Specifically, we construct separate measures of CRP test rates among employees working in larger and smaller establishments, based on the yearly number of employees. Appendix Table A13 shows that illness among employees in larger establishments is associated with a more pronounced decline in firm performance, with coefficient estimates of about -0.11 for both OROA and NI, compared to about -0.06 for smaller establishments. These findings support the intuition that shocks to larger workplaces play a more important role for overall firm performance.

Finally, in Appendix A3 and Appendix Table A14 we provide complementary evidence at the establishment level. As with firms, small establishments should be more affected by the flu than larger establishments, but less so when they are part of larger firms that can reallocate resources across workplaces. Indeed, we estimate that the detrimental effect of employee health on firm performance is less pronounced for smaller establishments that are part of larger firms compared to similar establishments in smaller firms. This finding is consistent with the idea of resource reallocation within larger firms and with the effects being driven by reductions in effective labor input.

5.4 Economic magnitude

To assess the economic magnitude of our results, we conduct two complementary exercises. First, we ask what the effect is of a "severe flu season," defined as a one standard deviation increase in the CRP rate in a firm, on the average firm and the economy.[19] Based on this simple approach, the average firm in our sample experiences a decline of 68,835 DKK (USD 10,949) in yearly operating profits for a one standard deviation increase in the CRP rate (see Appendix Table A2). This represents a decline of about 2.33% of average firm profits. With a yearly average of 10,218 firms in our sample, covering only firms in the private sector with more than 10 employees, this translates to a total loss in operating profit of approximately 703 million DKK (USD 112 million), or about 0.035% of Denmark's average GDP from 1999 to 2016. While modest in aggregate, this loss is economically meaningful. For example, it is equivalent to about one tenth of the estimated decline in Denmark's GDP due to Brexit (European Central Bank, 2020).

A second approach is to ask whether it is in the firm's interest to subsidize (and mandate) em-

[19]Since we estimate effects on operating return on assets for our sample firms, we use the average value of assets to convert our estimates into a Danish Kroner value. We use consumer price index data from Statistics Denmark to convert asset values to their 2016 equivalents. We then convert Danish Kroner (DKK) to US Dollars (USD) by applying a single exchange rate of 6.2867 DKK / USD, calculated as the average of yearly average exchange rates (obtained from OFX) between 1999 and 2016.

ployees' out-of-pocket expenses for influenza vaccines.[20] To answer this question, we compare the cost of such a subsidy to the loss reduction that vaccines would provide if every employee receives a vaccination. We thus ask how effective vaccines must be so that the estimated profit losses in our data during our sample period are at least as large as the cost of subsidizing and mandating vaccination for all employees over the same period. To do so, we define the vaccine *efficacy ratio* as the level of protection against the flu that makes the firm indifferent between subsidizing (and mandating) and not subsidizing the vaccine:

$$\textit{profit reduction} \times \textit{efficacy ratio} = \textit{vaccine program cost}, \tag{4}$$

where *profit reduction* is our estimate of a firm's total influenza-related performance reduction per year, and *vaccine program cost* measures the firm's total cost of the vaccine program.[21] We compute efficacy ratios for each firm-year and report averages across our panel and for each of the three size groups.

The average efficacy ratio in our sample is 39%, while the median is much lower at around 18%. Given that the flu vaccine is typically about 40–60% effective (Okoli et al., 2021), our results imply that paying for employee vaccinations would likely be cost-effective for both the average and the median firm (see Appendix Table A19). At the lower threshold of 40%, mandatory employee vaccinations are cost-effective in almost 73% of the firm-years in our sample. Analyzing these efficacy ratios in our size-based subsamples leads to results that are consistent with the conclusions in Sec-

[20] Vaccinations provide numerous positive externalities that extend beyond individual immunity. These include a reduced likelihood of infection and decreased disease severity, making their social benefits likely to outweigh private benefits. Vaccinated individuals are less likely to spread diseases, contributing not only to overall public health improvement but also minimizing economic impacts.

[21] The profit reduction is calculated by multiplying the estimated effect of the CRP rate in a firm by the actual CRP rate and by the value of total assets. The cost is the number of FTEs multiplied by the out-of-pocket cost of a vaccine in Denmark, 200 DKK (USD 32).

tion 5.3.3. The average (median) efficacy ratio in the group of small firms is 31% (13%), and among medium-sized firms it is 38% (17%). As in the full sample, subsidizing the vaccine for all employees is cost-effective for 76% of the firm-years among small firms and 73% among medium-sized firms. Vaccine programs are financially unattractive for the largest firms in our sample.[22]

5.5 What makes firms more economically vulnerable to the flu?

The results in Section 5.3 suggest that a firm's ability to reallocate resources determines how affected it is by a severe influenza season. Among firms that are equally able to shift resources, which characteristics make some more vulnerable when their employees are sick? We address this question along two dimensions, industry and workforce characteristics, by examining how the effect of employee health varies across these settings. We report the corresponding estimates and summarize them in Figure 2, and discuss them along these two dimensions in what follows.

5.5.1 Industry

The nature of job tasks varies across industries and can make workers within a firm more complementary or more substitutable. Worker absences and broader disruptions to effective labor input can have a more pronounced impact in firms and industries where coworkers rely on each other to fulfill their tasks than in settings where workers are more easily substitutable. Previous research also finds that the sensitivity of worker productivity to influenza varies by industry (e.g., Suarthana et al., 2010). We examine whether such differences exist between the retail/wholesale and manufacturing/construction industries. Although employees in retail/wholesale face increased risks for

[22]We reach similar conclusions with an analysis at the firm level, in which case we average the yearly efficacy ratios for each firm. Fully subsidizing and mandating flu vaccines is cost-effective for nearly 61% of the firms in our sample, while the fraction stands at almost 70% among small firms and almost 65% among medium-sized firms.

infection due to their exposure to the general public (Luckhaupt et al., 2012), finding temporary substitutes or compensating for employee absences without significantly affecting output may be more feasible in these industries. In contrast, the nature of manufacturing/construction, with strict schedules and sequential deadlines, may cause projects to fall behind schedule when workers are absent or less productive, thereby affecting firm profitability more (Salehi Sichani et al., 2011). In addition, retail profits may be mostly driven by local demand, while manufacturing profitability is likely driven to a much larger extent by non-local demand. As such, the detrimental effect of a severe flu season on manufacturing/construction firm performance is more likely to reflect disruptions to effective labor input rather than changes in local demand.

To implement our analysis, we categorize firms using the NACE 2.0 classification. We construct indicator variables for firms in wholesale/retail (NACE 45 and 47) and manufacturing/construction (NACE 10–33 and 41–43) and augment the specification in Equation (2) with these indicators and their interactions with the CRP rate. Panel A of Figure 2 reports the estimated effect of a one standard deviation increase in the CRP rate on firm-level profitability measures, similar to Figure 1. We find no meaningful impact of employee health on firm performance in the wholesale/retail industries. In contrast, we find a pronounced negative effect in the manufacturing/construction industries.

Taken together, these results confirm our hypothesis that firms operating in less flexible industries, in which it is more difficult to cover for sick employees, are more affected by shocks to employee health. They also support our interpretation that the effect of the flu operates through disruptions to effective labor input rather than through changes in local demand.

5.5.2 Workforce characteristics

Vulnerability and resilience to health shocks also vary across the population. In the context of our study, we expect stronger effects of the flu on performance among firms with similar reliance on labor when employees are more vulnerable to health shocks. We proxy for vulnerability using several workforce characteristics: wages, skill, education, age, and the presence of children in a household. Employees who earn higher salaries, are employed in high-skill occupations, or have college education may have a higher health stock and thus be more resilient to health shocks. As age affects sensitivity to the flu in a nonlinear way, we form three age groups for our analysis: persons younger than 35, between 35 and 55, and older than 55. We also distinguish between households with and without children under 10, as younger children may require care by an adult when ill. While young children increase exposure to seasonal illnesses, the marginal effect of a severe flu season may be smaller for such households if they are regularly exposed to infections. Finally, we distinguish between "top employees" (the five highest wage earners in the firm) and "rank-and-file" employees. As shown in Section 5.2, this variation separates shocks to senior management from those affecting the broader workforce (Bennedsen et al., 2020). Here, we use the same distinction to assess how workforce composition shapes firms' vulnerability to health shocks.

We construct our proxy for employee health shocks, *CRP_tests*, among employees with these characteristics within a firm and include these variables in our baseline specification.[23] Panel B of Figure 2 reports the estimated effect of a one standard deviation increase in the CRP rate on firm-level profitability measures.

Starting with salary, skill, and education, we find that adverse health shocks primarily reduce firm

[23] We also include industry fixed effects to account for time-invariant sector-specific workforce characteristics, as well as the yearly fraction of each firm's workforce that belongs to each relevant category.

profitability when they affect low-salary, low-skill, and low-education employees. Most negative estimates are larger in magnitude and statistically significant for these groups. Turning to employee age and family status, we find that sickness among employees aged 35–54 exerts the strongest effect on firm profitability. These employees are less likely to require care responsibilities for young children and are also less likely to face severe complications, making them more likely to experience changes in effective labor input during severe flu seasons. This interpretation is reinforced when we distinguish between employees with and without young children. Firm performance is primarily affected by health shocks to employees without young children, who are less exposed to illness in typical seasons but experience larger increases in sickness and related disruptions during severe flu seasons. In contrast, employees with young children are more regularly exposed to seasonal illnesses, leading to smaller changes in effective labor input across seasons. Finally, using the wage-distribution variation from Section 5.2, we find that firms are primarily affected when illness is concentrated among lower-paid, operational employees, while shocks to higher-paid employees have comparatively little impact, indicating that vulnerability is driven by disruptions to the broader workforce.

5.6 Effects on employees and shareholders

In this last section, we examine whether firms fully absorb employee health risks or whether these risks are, at least partially, borne by their employees. To the extent that seasonal influenza constitutes a temporary health shock, standard risk-sharing arguments suggest that firms should shield employees from most of the resulting financial consequences (their Guiso et al., 2005). Given the gradient in the effects of employee health on firm profitability by firm size, we estimate specifications similar to those in Appendix Table A12, interacting the CRP rate with an indicator for below-median firm size.

5.6.1 Effects on firm workforce

We start by verifying that the relationship between firm size and the effect of the flu on firm performance is mediated through worker productivity. As in Appendix A1, and following the previous literature (e.g., Bennedsen et al., 2019; Haltiwanger et al., 1999), we use sales-per-employee as a proxy for employee productivity. Column (1) of Table 5 shows that shocks to employee health do not have a detrimental effect on worker productivity in large firms. In contrast, more CRP tests lead to a statistically significant decline in worker productivity in smaller firms: the total effect of a change in the CRP rate (the sum of the baseline coefficient and the interaction term) is negative and significant. These results are consistent with those on firm-level profitability in Appendix Table A12. It is indeed the smaller firms for which we observe a larger decline in profitability, which can then be traced to a reduction in worker productivity.

Moving to outcomes for workers, we provide similar evidence for employment and wages in Columns (2) and (3).[24] We find no negative effects in large firms but a negative and statistically significant, albeit small, total effect in small firms in both regressions. A one standard deviation increase in the CRP rate in smaller firms results in a reduction in employment of 0.11% or 0.03 FTE and a decline in average wages per worker of 0.01% or DKK 29 (USD 4.50).

Overall, our results suggest that even the smaller firms in our sample shield their workforce from much of the temporary loss in profitability that they experience during a severe influenza season. Although the reductions in employment and wages among smaller firms are statistically significant, they are economically insignificant.

[24] Average wages are calculated based on the set of workers who have been with the firm during the previous year. Thus, the measure is not contaminated by changes in workforce composition.

5.6.2 Effects on firm owners

We next ask how firms absorb the labor risk stemming from variations in employee health. We first examine this question by considering firm-level cash positions. The estimates in Column (4) of Table 5 show that smaller firms do not choose to draw down cash in response to a higher CRP rate. On the contrary, the total effect is positive and significant. On average, we find that smaller firms increase their cash by 0.37% in response to a one standard deviation increase in the CRP rate in a firm. Larger firms, on the other hand, tap into their cash reserves as they experience more influenza cases in their workforce. The estimated coefficient corresponds to a decline in cash of 1.65% for a one standard deviation increase in the CRP rate. This is consistent with large firms, but not small firms, being able to shift resources (from cash to workforce) to cover for sick employees and minimize the effect on firm profitability.

Relatedly, in Column (5), we examine the likelihood of firms incurring expenses for temporary workers. We find that an increase in the CRP rate reduces the likelihood of larger firms to incur expenses for temporary workers. Smaller firms, on the other hand, are more inclined to hire temporary workers (the total effect of an additional CRP test in the firm is positive and significant). One possible interpretation for this pattern is that larger firms are better positioned to apply cost-saving measures such as reducing temporary labor costs when facing a shock to employee health. Smaller firms may need to compensate for the average productivity decline of their employees by hiring temporary workers, which in turn may contribute to the downward pressure on firm-level profitability.

Finally, we examine the effect of employee health on dividends. Large firms do not adjust their dividend payments when the CRP rate in a firm increases, as evidenced by the insignificant baseline coefficient in Column (6). Smaller firms, however, reduce their dividends: the total effect of a one standard deviation increase in the CRP rate in the firm is a cut of 1.44% in dividends.

6 Conclusion

In this paper, we study how changes in employee health resulting from temporary and relatively mild health shocks influence firm operating performance. The specific health shock we exploit is variation in the severity of flu seasons in Denmark. Using detailed administrative data, we rely on medical tests conducted by GPs to identify changes in the number of individuals with symptoms of a severe upper respiratory tract infection, likely reflecting influenza and its main complication, pneumonia, and use this to proxy for the severity of the influenza season.

We find that firms are negatively affected in years in which they experience a particularly severe flu season. A one standard deviation increase in the CRP rate in a firm reduces the median operating return on assets by approximately 2.3%. These effects are more pronounced for labor-intensive, small, and financially constrained firms, consistent with employee health shocks disrupting effective labor input, and are driven by shocks to rank-and-file employees rather than senior management. The level of detail of our data allows us to further study how employee health affects establishment-level operating performance. The advantage of this approach is that we can include firm-by-year fixed effects to account for time-varying unobservable variables at the firm level. We obtain similar results with this alternative regression specification, and our estimates for the impact of employee health on establishment performance are consistently negative and significant.

As a final step, we analyze how these health shocks are absorbed within the firm and how the associated costs are distributed between employees and shareholders. We find that firms do not substantially adjust wages and employment. However, smaller firms increase their cash holdings, are more inclined to hire temporary workers, and reduce dividend payments. Owners of larger firms are not meaningfully affected by deteriorating employee health.

Our back-of-the-envelope calculations suggest that firms, especially smaller ones, may have the incentive to subsidize and mandate influenza vaccinations for their employees. This is a particularly important result given the prevalence of seasonal influenza and the broader policy discussions around vaccination in respiratory viral infections, especially following the COVID-19 pandemic.

References

Adda, Jérôme. 2016. "Economic Activity and the Spread of Viral Diseases: Evidence from High Frequency Data." *Quarterly Journal of Economics* 131 (2): 891–941.

Agrawal, Ashwini, Isaac Hacamo, and Zhongchen Hu. 2021. "Information dispersion across employees and stock returns." *The Review of Financial Studies* 34 (10): 4785–4831.

Allayannis, George, Jane Ihrig, and James P Weston. 2001. "Exchange-Rate Hedging: Financial versus Operational Strategies." *American Economic Review* 91 (2): 391–395.

Almeida, Heitor, Kristine Watson Hankins, and Ryan Williams. 2017. "Risk Management with Supply Contracts." *Review of Financial Studies* 30 (12): 4179–4215.

Autor, David, Andreas Kostøl, Magne Mogstad, and Bradley Setzler. 2019. "Disability Benefits, Consumption Insurance, and Household Labor Supply." *American Economic Review* 109 (7): 2613–54.

Baicker, Katherine, David Cutler, and Zirui Song. 2010. "Workplace Wellness Programs Can Generate Savings." *Health Affairs* 29 (2): 304–311.

Belo, Frederico, Jun Li, Xiaoji Lin, and Xiaofei Zhao. 2017. "Labor-force heterogeneity and asset prices: The importance of skilled labor." *The Review of Financial Studies* 30 (10): 3669–3709.

Bennedsen, Morten, Francisco Pérez-Gonzàlez, and Daniel Wolfenzon. 2020. "Do CEOs Matter? Evidence from Hospitalization Events." *Journal of Finance* 75 (4): 1877–1911.

———. 2019. "Drivers of Effort: Evidence from Employee Absenteeism." *Journal of Financial Economics* 133 (3): 658–684.

Blanchet Zumofen, Marie-Hélène, Jeff Frimpter, and Svenn Alexander Hansen. 2023. "Impact of Influenza and Influenza-like Illness on Work Productivity Outcomes: A Systematic Literature Review." *Pharmacoeconomics* 41 (3): 253–273.

Bradley, Cathy J., Heather L. Bednarek, and David Neumark. 2002. "Breast Cancer Survival, Work, and Earnings." *Journal of Health Economics* 21 (5): 757–779.

———. 2005. "Short-Term Effects of Breast Cancer on Labor Market Attachment: Results from a Longitudinal Study." *Journal of Health Economics* 24 (1): 137–160.

Caggese, Andrea, Vicente Cuñat, and Daniel Metzger. 2019. "Firing the wrong workers: Financing constraints and labor misallocation." *Journal of Financial Economics* 133 (3): 589–607.

Campello, Murillo, John R. Graham, and Campbell R. Harvey. 2010. "The Real Effects of Financial Constraints: Evidence from a Financial Crisis." *Journal of Financial Economics* 97 (3): 470–487.

Chen, Chen, Leonard Leye Li, Louise Yi Lu, and Rencheng Wang. 2023. "Flu Fallout: Information Production Constraints and Corporate Disclosure." *Journal of Accounting Research* 61 (4): 1063–1108.

Cohn, Jonathan B., and Malcolm I. Wardlaw. 2016. "Financing Constraints and Workplace Safety." *Journal of Finance* 71 (5): 2017–2058.

Dave, Kunjal, and Patricia C. Lee. 2019. "Global Geographical and Temporal Patterns of Seasonal Influenza and Associated Climatic Factors." *Epidemiologic Reviews* 41 (1): 51–68.

Dorner, Matthias, and Peter Haller. 2020. "Not Coming in Today — Firm Productivity Differentials and the Epidemiology of the Flu." IAB-Discussion Paper No. 6/2020.

Eccles, Ron. 2005. "Understanding the Symptoms of the Common Cold and Influenza." *Lancet Infectious Diseases* 5 (11): 718–725.

Edwards, Christina H., Gianpaolo S. Tomba, and Birgitte F. de Blasio. 2016. "Influenza in Workplaces: Transmission, Workers' Adherence to Sick Leave Advice and European Sick Leave Recommendations." *European Journal of Public Health* 26 (3): 478–485.

Edwards, Paul, and Kay Greasley. 2010. "Absence from Work." European Foundation for the Improvement of Living and Working Conditions.

European Central Bank. 2020. "A Review of Economic Analyses on the Potential Impact of Brexit." Available: `https://data.europa.eu/doi/10.2866/977526`.

Falato, Antonio, Dan Li, and Todd Milbourn. 2015. "Which Skills Matter in the Market for CEOs? Evidence from Pay for CEO Credentials." *Management Science* 61 (12): 2845–2869.

Fedyk, Anastassia, and James Hodson. 2023. "Trading on talent: Human capital and firm performance." *Review of Finance* 27 (5): 1659–1698.

García-Gómez, Pilar, Hans van Kippersluis, Owen O'Donnell, and Eddy van Doorslaer. 2013. "Long-Term and Spillover Effects of Health Shocks on Employment and Income." *Journal of Human Resources* 48 (4): 873–909.

Ghaly, Mohamed, Viet Anh Dang, and Konstantinos Stathopoulos. 2017. "Cash holdings and labor heterogeneity: The role of skilled labor." *The Review of Financial Studies* 30 (10): 3636–3668.

Grinza, Elena, and François Rycx. 2020. "The Impact of Sickness Absenteeism on Firm Productivity: New Evidence from Belgian Matched Employer-Employee Panel Data." *Industrial Relations: A Journal of Economy and Society* 59 (1): 150–194.

Guiso, Luigi, Luigi Pistaferri, and Fabiano Schivardi. 2005. "Insurance within the Firm." *Journal of Political Economy* 113 (5): 1054–1087.

Haltiwanger, John C, Julia I Lane, and James R Spletzer. 1999. "Productivity differences across employers: The roles of employer size, age, and human capital." *American Economic Review* 89 (2): 94–98.

Hopstaken, R. M., J. W. Muris, J. A. Knottnerus, A. D. Kester, P. E. Rinkens, and G. J. Dinant. 2003. "Contributions of Symptoms, Signs, Erythrocyte Sedimentation Rate, and C-Reactive Protein to a Diagnosis of Pneumonia in Acute Lower Respiratory Tract Infection." *British Journal of General Practice* 53 (490): 358–364.

Humlum, Anders, and Jakob R. Munch. 2023. "Globalization, Flexicurity and Adult Vocational Training in Denmark." Edited by Marc Bacchetta, Emmanuel Milet, and José-Antonio Monteiro. In *Making Globalization More Inclusive: Lessons from Experience with Adjustment Policies*. World Trade Organization.

Jäger, Simon, Jörg Heining, and Nathan Lazarus. Forthcoming. "How Substitutable Are Workers? Evidence from Worker Deaths." *American Economic Review*, Forthcoming.

Jayasundara, Kavisha, Charlene Soobiah, Edward Thommes, Andrea C. Tricco, and Ayman Chit. 2014. "Natural Attack Rate of Influenza in Unvaccinated Children and Adults: A Meta-Regression Analysis." *BMC Infectious Diseases* 14 (1): 670.

Jenter, Dirk, Thomas Schmid, and Daniel Urban. 2023. "Does Board Size Matter?" *European Corporate Governance Institute–Finance Working Paper*, no. 916.

Jones, Damon, David Molitor, and Julian Reif. 2019. "What Do Workplace Wellness Programs Do? Evidence from the Illinois Workplace Wellness Study." *Quarterly Journal of Economics* 134 (4): 1747–1791.

Karabarbounis, Loukas, and Brent Neiman. 2014. "The global decline of the labor share." *Quarterly Journal of Economics* 129 (1): 61–103.

Kleindienst, Ingo, Kaleb Girma Abreha, Denis Schweizer, Juliane Proelss, and Tünde Cserpes. 2022. "CEO divorce and firm operating performance." *Academy of Management Discoveries* 8 (4): 561–584.

Krammer, Florian, Gavin J. D. Smith, Ron A. M. Fouchier, Malik Peiris, Katherine Kedzierska, Peter C. Doherty, Peter Palese, et al. 2018. "Influenza." *Nature Reviews. Disease Primers* 4 (1): 3.

Kreiner, Claus Thustrup, and Michael Svarer. 2022. "Danish Flexicurity: Rights and Duties." *Journal of Economic Perspectives* 36 (4): 81–102.

Kristensen, Søren Rud, and Kim Rose Olsen. 2021. "Sustainable Health Care and Health Care Reforms in Denmark 2000–2020." In *The Sustainability of Health Care Systems in Europe*. Emerald Publishing Limited.

Kulchania, Manoj, and Shawn Thomas. 2017. "Cash Reserves as a Hedge Against Supply-Chain Risk." *Journal of Financial and Quantitative Analysis* 52 (5): 1951–1988.

Kulchina, Elena. 2016. "Personal Preferences, Entrepreneurs' Location Choices, and Firm Performance." *Management Science* 62 (6): 1814–1829.

Luckhaupt, Sara E., Marie Haring Sweeney, Renee Funk, Geoffrey M. Calvert, Mackenzie Nowell, Tiffany D'Mello, Arthur Reingold, James Meek, Kimberly Yousey-Hindes, Kathryn E. Arnold, et al. 2012. "Influenza-Associated Hospitalizations by Industry, 2009–10 Influenza Season, United States." *Emerging Infectious Diseases* 18 (4): 556.

Lykkegaard, Jesper, Jonas Kanstrup Olsen, Rikke Vognbjerg Sydenham, and Malene Plejdrup Hansen. 2021. "C-Reactive Protein Cut-Offs Used for Acute Respiratory Infections in Danish General Practice." *BJGP Open* 5 (1).

Melbye, Hasse, Dag Hvidsten, Arne Holm, Sveine Arne Nordbø, and Jan Brox. 2004. "The Course of C-Reactive Protein Response in Untreated Upper Respiratory Tract Infection." *British Journal of General Practice* 54 (506): 653–658.

Morris, Landi, and Rani Hoitash. 2019. "Working with the flu: The association between auditor health and audit outcomes." *Journal of Accounting and Public Policy* 42 (3).

Okoli, G. N., F. Racovitan, T. Abdulwahid, C. H. Righolt, and S. M. Mahmud. 2021. "Variable Seasonal Influenza Vaccine Effectiveness across Geographical Regions, Age Groups and Levels of Vaccine Antigenic Similarity with Circulating Virus Strains: A Systematic Review and Meta-Analysis of the Evidence from Test-Negative Design Studies after the 2009/10 Influenza Pandemic." *Vaccine* 39 (8): 1225–1240.

Peasah, Samuel K, Eduardo Azziz-Baumgartner, Joseph Breese, Martin I Meltzer, and Marc-Alain Widdowson. 2013. "Influenza Cost and Cost-Effectiveness Studies Globally—A Review." *Vaccine* 31 (46): 5339–5348.

Pedersen, Kjeld Møller, Terkel Christiansen, and Mickael Bech. 2005. "The Danish Health Care System: Evolution - Not Revolution - in a Decentralized System." *Health Economics* 14 (S1): S41–S57.

Pérez-González, Francisco, and Hayong Yun. 2013. "Risk Management and Firm Value: Evidence from Weather Derivatives." *Journal of Finance* 68 (5): 2143–2176.

Putri, Wayan C.W.S., David J. Muscatello, Melissa S. Stockwell, and Anthony T. Newall. 2018. "Economic Burden of Seasonal Influenza in the United States." *Vaccine* 36 (27): 3960–3966.

Romanelli, Robert J, Mark Cabling, Zuzanna Marciniak-Nuqui, Sonja Marjanovic, Stephen Morris, Eliane Dufresne, and Erez Yerushalmi. 2023. *The Societal and Indirect Economic Burden of Seasonal Influenza in the United Kingdom*. Santa Monica, CA: RAND Corporation.

Rondy, Marc, Nathalie El Omeiri, Mark G. Thompson, Alain Levêque, Alain Moren, and Sheena G. Sullivan. 2017. "Effectiveness of Influenza Vaccines in Preventing Severe Influenza Illness among Adults: A Systematic Review and Meta-Analysis of Test-Negative Design Case-Control Studies." *Journal of Infection* 75 (5): 381–394.

Salehi Sichani, Mahdi, SangHyun Lee, and Aminah Robinson Fayek. 2011. "Understanding Construction Workforce Absenteeism in Industrial Construction." *Canadian Journal of Civil Engineering* 38 (8): 849–858.

Schauer, Catharina, Ralf Elsas, and Nikolas Breitkopf. 2019. "A New Measure of Financial Constraints Applicable to Private and Public Firms." *Journal of Banking & Finance* 101:270–295.

Schopp, Anne, and Karsten Neuhoff. 2013. "The Role of Hedging in Carbon Markets." Discussion Papers of DIW Berlin no. 1271.

Schwandt, Hannes. 2019. "The Lasting Legacy of Seasonal Influenza: In-Utero Exposure and Labor Market Outcomes." CEPR Discussion Paper No. 12563.

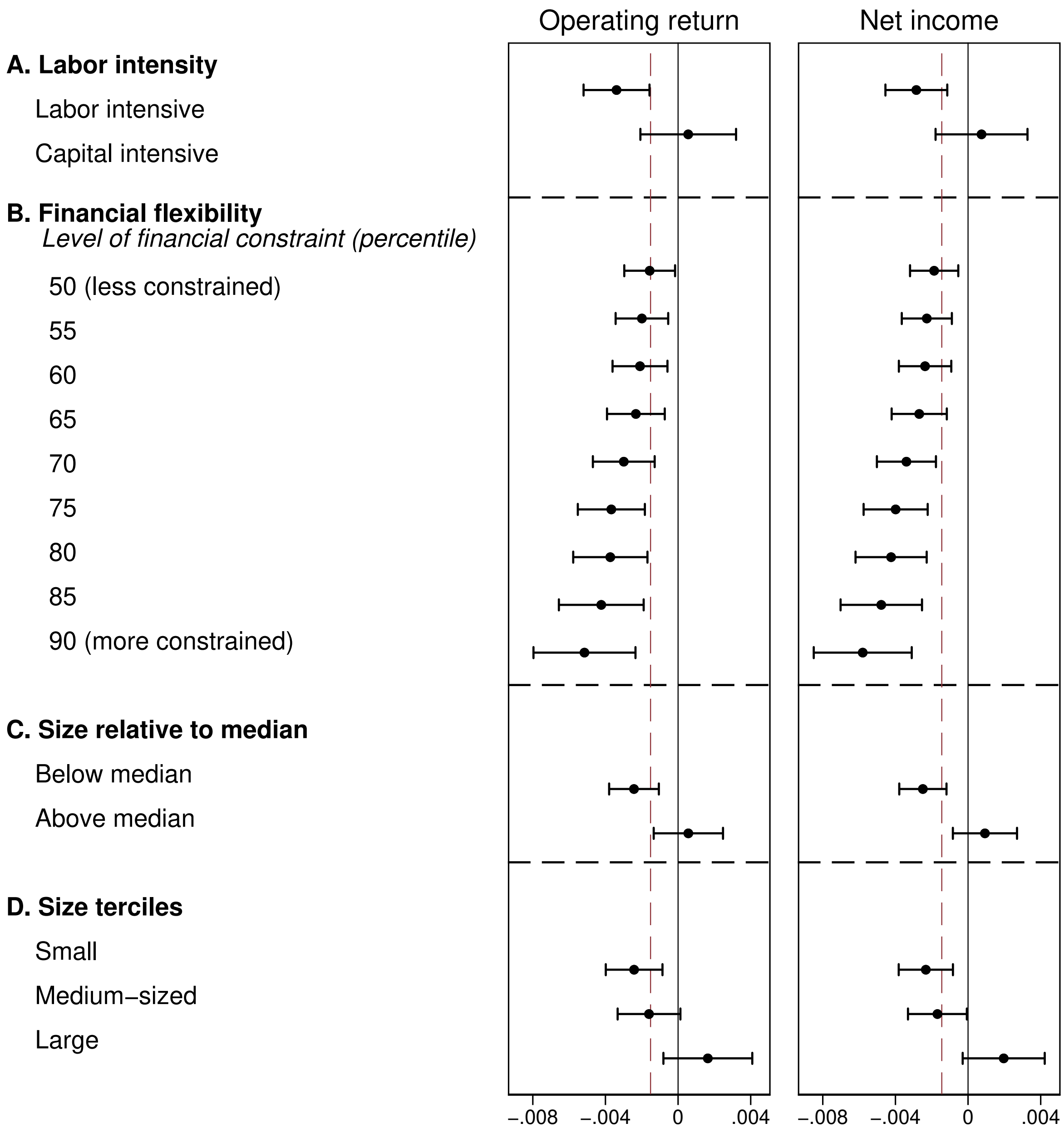
Shen, Mo. 2021. "Skilled labor mobility and firm value: Evidence from green card allocations." *The Review of Financial Studies* 34 (10): 4663–4700.

Smith, James P. 1999. "Healthy Bodies and Thick Wallets: The Dual Relation Between Health and Economic Status." *Journal of Economic Perspectives* 13 (2): 145–166.

Stulz, René M. 1996. "Rethinking Risk Management." *Journal of Applied Corporate Finance* 9 (3): 8–25.

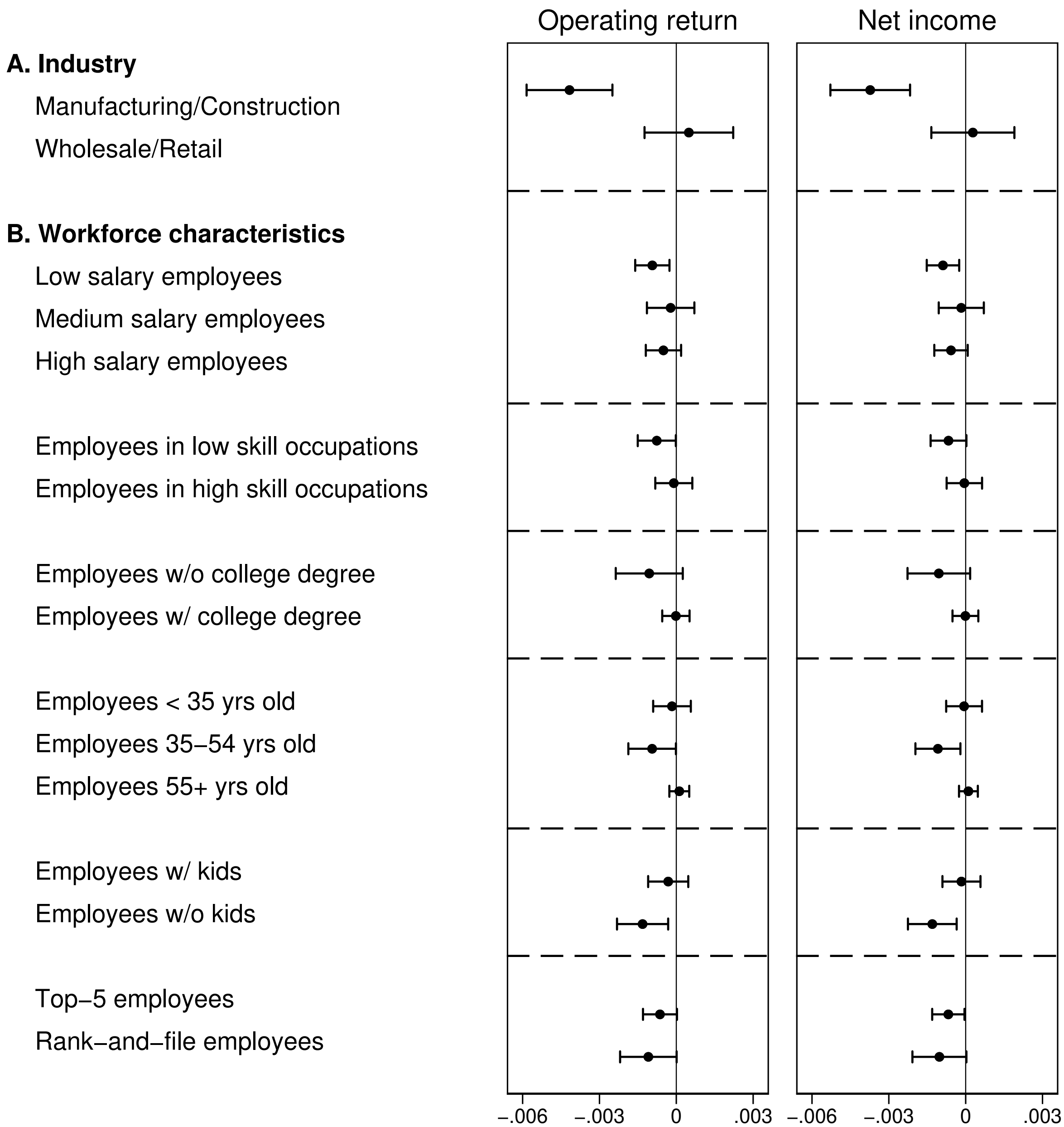
Suarthana, Eva, J.D. McFadden, A.S. Laney, K. Kreiss, H.A. Anderson, D.C. Hunt, D. Neises, K. Goodin, A. Thomas, M. Vandermeer, et al. 2010. "Occupational Distribution of Persons with Confirmed 2009 H1N1 Influenza." *Journal of Occupational and Environmental Medicine* 52 (12): 1212–1216.

Tokars, Jerome I., Sonja J. Olsen, and Carrie Reed. 2018. "Seasonal Incidence of Symptomatic Influenza in the United States." *Clinical Infectious Diseases* 66 (10): 1511–1518.



Notes: Each dot represents the total estimated effect (i.e., the sum of the baseline and eventual interaction coefficients) of a one standard deviation increase in the CRP rate for the firms with the characteristic indicated in the row, while the line segments plot the corresponding 95% confidence intervals. The horizontal dashed lines separate the different specifications, while the vertical red dashed line indicates the baseline effect of a one standard deviation increase in the CRP rate. The estimation results are reported in Appendix Tables A10, A11 and A12.

Figure 1: Heterogeneous Effects by Labor Intensity, Financial Flexibility, and Firm Size



Notes: Each dot represents the total estimated effect (i.e., the sum of the baseline and interaction coefficients) of a one standard deviation increase in the CRP rate for firms with the characteristic indicated in the row or among employees with the characteristic indicated in the row, while the line segments plot the corresponding 95% confidence intervals. The horizontal dashed lines separate the different specifications. The estimation results are reported in Appendix Tables A20 and A21.

Figure 2: Heterogeneous Effects by Industry and Workforce Characteristics

Table 1: Summary Statistics

This table presents the summary statistics for nonfinancial, nonutility, and nongovernment-owned firms in Denmark between 1999 and 2016 with 10 or more employees. Operating return on assets (OROA) is the ratio of operating income to total assets, and net income (NI) is the ratio of income to total assets. CRP rate is the ratio of the number of CRP tests performed on employees and their families during the flu season and the total number of employees and their family members in the firm. Market concentration (HHI), measured by the Herfindahl-Hirschmann index of the firm's industry; N days at hospital (avg)—Top-5 employee / Rank and file employee, is the average number of days a top-5/ non-top-5 employee was hospitalized in a given year; Population density / Unemployment rate, the population density of / unemployment rate in the firm's municipality. All variables are winsorized at the 1% level.

	Mean	Std. dev.	1%	25%	50%	75%	99%
Dependent variables:							
— Operating return on assets (OROA)	0.065	0.183	−0.676	0.007	0.065	0.141	0.534
— Net income (NI)	0.019	0.170	−0.726	−0.027	0.027	0.090	0.409
Main independent variable:							
— CRP rate	0.104	0.079	0.000	0.043	0.091	0.149	0.344
Firm characteristics:							
— Log(Assets)	9.754	1.233	7.382	8.876	9.597	10.472	12.664
— Full-time employees	35.546	36.962	10.080	13.760	20.690	38.040	159.110
— Firm age (years)	17.081	13.490	1.000	7.000	14.000	24.000	68.000
Industry characteristics:							
— Market concentration (HHI)	0.019	0.041	0.002	0.004	0.008	0.017	0.235
Local (municipality) characteristics:							
— Local population density (municipality)	5.480	1.515	3.657	4.278	4.960	6.444	8.901
— Local unemployment rate (municipality)	0.040	0.014	0.012	0.030	0.040	0.050	0.075
Hospital days (avg):							
— Top-5 employee, N days at hospital	0.274	0.743	0.000	0.000	0.000	0.200	4.600
— Rank and file employee, N days at hospital	0.396	0.534	0.000	0.083	0.250	0.494	3.059

Table 2: The Effect of Employee Health on Firm Performance

This table examines the effect of employee health on firm operating performance. In Panel A, the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets. In Panel B, the dependent variable is net income to total assets (NI). To measure employee health, we examine the CRP rate among employees and their families during the flu season. Firm controls include Log(Assets), the natural logarithm of the lagged value of total assets; Market concentration (HHI), measured by the Herfindahl-Hirschmann index of the firm's industry; N days at hospital (avg) — Top-5 employee / Rank and file employee, the average number of days a top-5 / non-top-5 employee was hospitalized in a given year; Local controls (municipality) — Population density / Unemployment rate, the population density of / unemployment rate in the firm's municipality. All variables are winsorized at the 1% level and all specifications focus on firms with at least ten employees and include firm fixed effects. Columns (1) and (3) also include year fixed effects while Columns (2) and (4) use municipality times year fixed effects. Columns (3) and (4) further include firm age dummies for every five-year bin of firm age. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: OROA				Panel B: Net Income			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CRP rate	−0.0200**	−0.0169**	−0.0191**	−0.0167**	−0.0196***	−0.0171**	−0.0182**	−0.0169**
	(0.0078)	(0.0080)	(0.0078)	(0.0080)	(0.0074)	(0.0075)	(0.0074)	(0.0075)
Log(Assets)			−0.0114***	−0.0115***			−0.0098***	−0.0098***
			(0.0013)	(0.0013)			(0.0012)	(0.0012)
Market concentration (HHI)			0.0009	0.0041			0.0092	0.0119
			(0.0137)	(0.0139)			(0.0133)	(0.0133)
Top-5 employee, N days at hospital (avg)			−0.0014***	−0.0015***			−0.0010**	−0.0011**
			(0.0005)	(0.0005)			(0.0005)	(0.0005)
Rank and file employee, N days at hospital (avg)			−0.0010	−0.0010			−0.0010	−0.0010
			(0.0007)	(0.0007)			(0.0007)	(0.0007)
Municipality density			0.0166				0.0269	
			(0.0197)				(0.0183)	
Unemployment rate			−0.3194***				−0.2257***	
			(0.0900)				(0.0834)	
Controls	No	No	Yes	Yes	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year
N	183,917	183,917	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.346	0.346	0.347	0.347	0.326	0.326	0.327	0.327

Table 3: The Effect of Employee Health on Establishment-Level Performance
This table shows the effect of employee health on establishment operating performance. The dependent variable is *Profit per employee*, the ratio of establishment gross profit (in DKK) to the full-time employee equivalent of the establishment. To measure employee health, we examine the CRP rate among employees and their families during the flu season, at the establishment level. Establishment and local controls on the municipality level include *Size*, the natural logarithm of the lagged value of the full-time employee equivalent of the establishment; *Population density* and *Unemployment rate*, the population density of, and unemployment rate in the establishment's municipality, respectively. All variables are winsorized at the 1% level. In Columns (1) and (2), we include firm and year fixed effects. In Columns (3)–(6), we use firm-year fixed effects instead of firm and year fixed effects. In Columns (4) and (5), we add establishment-level age fixed effects for every five-year bin of establishment age. Clustered (establishment) standard errors are in parentheses. The sample in columns (2)–(6) is restricted to firms with more than one establishment. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Profit per employee					
	(1)	(2)	(3)	(4)	(5)	(6)
CRP rate	−0.0428**	−0.1025***	−0.0937**	−0.1013***	−0.0931***	−0.1011***
	(0.0214)	(0.0383)	(0.0367)	(0.0354)	(0.0358)	(0.0353)
Size					0.0021	0.0030
					(0.0053)	(0.0053)
Municipality density					−0.0004	
					(0.0027)	
Unemployment rate					−0.1832	
					(0.4960)	
Controls	No	No	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm x year	Firm x year and muni x year	Firm x year	Firm x year and muni x year
N	161,458	49,976	49,976	49,976	49,976	49,976
R^2	0.656	0.707	0.825	0.826	0.826	0.826

Table 4: The Effect of Employee Health on Firm Profits: Differences Across the Wage Distribution

This table shows the effect of employee health on firm performance. In Columns (1) - (3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets, and in Columns (4) - (6), it is net income to total assets (NI). To measure employee health, we examine the number of CRP tests performed on employees and their families during the flu season (CRP rate) and we construct separate measures of CRP-confirmed influenza cases among employees in the bottom 75% and the top 25% of the within-firm salary distribution. All specifications focus on firms with at least ten employees and include firm and year fixed effects, age dummies for every five-year bin of firm age, and our full set of firm-level and municipality-level controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA			Net Income		
	(1)	(2)	(3)	(4)	(5)	(6)
CRP rate of bottom 75 salary percentile	−0.0162**		−0.0154**	−0.0151**		−0.0143**
	(0.0067)		(0.0067)	(0.0064)		(0.0064)
CRP rate of top 25 salary percentile		−0.0070*	−0.0063		−0.0071*	−0.0064
		(0.0042)	(0.0042)		(0.0040)	(0.0040)
Controls	Yes	Yes	No	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.347	0.347	0.347	0.327	0.327	0.327

Table 5: The Effect of Employee Health on Workforce and Firm Owners

This table shows how employee health affects the firm's workforce and owners. Columns (1) to (3) present results for workers. We measure worker outcomes in several ways. The ratio of log sales over the number of employees is our measure of productivity. We capture total workforce size and salaries with the natural logarithm of full-time equivalent employment and the natural logarithm of average yearly wages. In Column (4), the dependent variable, Cash, is the ratio of cash holdings to total assets, and in Column (5) it is a dummy variable that is equal to one if a firm has expenses for temporary employment, and zero otherwise. In Column (6), Dividends are the ratio of dividends to total assets. All variables are winsorized at the 1% level. We use the distribution of full-time equivalent employment (FTE) to classify firms as above or below the median. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Worker			Firm		Owner
	Productivity	Employment	Wages	Cash	Temp. Labor Dummy	Dividends
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Overall effect						
CRP rate	−0.0018	0.0071	0.0022	−0.0019	0.0241	−0.0050*
	(0.0158)	(0.0142)	(0.0084)	(0.0041)	(0.0236)	(0.0030)
R^2	0.847	0.910	0.873	0.441	0.149	0.323
Panel B. Effect by firm size						
CRP rate	0.1593***	0.1098***	0.0467***	−0.0169**	−0.1188***	0.0031
	(0.0250)	(0.0231)	(0.0138)	(0.0068)	(0.0361)	(0.0050)
CRP rate × below median	−0.2295***	−0.1540***	−0.0642***	0.0216***	0.2067***	−0.0117**
	(0.0289)	(0.0264)	(0.0159)	(0.0075)	(0.0381)	(0.0054)
R^2	0.848	0.935	0.874	0.442	0.155	0.324
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,802	183,918	183,043	183,917	183,918	183,917

Employee health and firm performance

Online Appendix

A1 The relationship between employee health and employee performance

In this section, we confirm that employee health is related to their productivity or work absence, the two potential channels through which firms may be affected. Following previous literature (e.g., Bennedsen et al., 2019), we use the log of sales per employee as a measure of employee productivity and estimate our baseline specification in Equation (2) with this variable as the outcome. The results, shown in Appendix Table A3, suggest that more CRP tests are weakly associated with lower productivity: a one standard deviation increase in the CRP rate in a firm leads to a reduction of approximately 0.01% in sales per worker.

The second channel through which poor employee health might affect their employers is if employees are absent from work. We examine this channel in two ways. First, Statistics Denmark provides data on work absences from an annual survey that covers all publicly owned entities and approximately 2,600 private companies. The sample of private companies includes all firms with more than 250 employees and a random sample of firms with 10–249 employees, resampled yearly. The survey provides information on all absence spells due to sickness or birth, including the start and end date of the spell and the reason for the absence, as well as employee and firm identifiers, starting from 2010.[1] We construct the *absence rate* in the firm as the average number of days of sick leave due to own or child illness during the flu season per full-time employee. Given that our preferred specification includes firm fixed effects, we restrict the sample to firms with at least two yearly observations. This yields a final *absence sample* of 1,718 firms observed between 2010–2016, for a total

[1]These are the same data as in Bennedsen et al. (2019), with the only difference that their data start in 2007 while ours start from 2010.

of 6,610 firm-year observations over the period 2010–2016.

Because these data are not available for the entire analysis period or for the entire sample of firms, Panel B of Appendix Table A4 reports for the absence sample the same set of summary statistics as Table 1. For comparison, we report in Panel A of the Table the same summary statistics for our analysis sample restricted to the period 2010–2016. Not surprisingly, the firms included in the absence sample tend to be larger, both in terms of assets (11.4 vs 10.0) and FTEs (95.6 vs. 37.1), and older (27.2 vs 19.4 years) than the firms in the analysis sample. They also tend to have slightly higher profitability (OROA 0.069 vs 0.066, net income 0.035 vs 0.024) and to operate in somewhat more concentrated markets (Herfindahl index 0.022 vs 0.017). Importantly, the average rate of CRP tests is similar between the absence and the analysis sample during this period.

We then estimate the role of influenza in determining sick leave within a firm. Appendix Table A5 reports the estimation results from our main specifications Table 2 using the absence rate as the outcome. The table shows that the CRP rate in the firm has a positive and statistically significant effect on the number of days of absence per employee. A one–standard deviation increase in the CRP rate leads to approximately 0.2 additional days of absence per employee, which corresponds to an approximately 4% increase relative to the average absence rate. As in our main analysis, adding controls as we move from Column (1) to Column (4) in the Table has only a minimal effect on the estimated coefficient on the CRP rate.

Having verified that influenza leads to more work absence, we next investigate if absenteeism is the only mechanism through which the flu affects firm profitability. We start by verifying that our baseline results hold in the absence sample. The estimated effects of the CRP rate in Columns (1) and (4) of Appendix Table A6 are indeed very similar to our main results in Columns (3) and (7) of Table 2 (-0.0183 vs. -0.0191 for OROA, -0.0132 vs. -0.0169 for net income), although they lose statistical significance due to the much smaller sample size. If the effect of influenza on firm profitability were driven entirely by absenteeism, controlling for the absence rate should substantially attenuate the estimated coefficient on the CRP rate.[2] However, as Columns (2)–(3) and (5)–(6) show, the inclusion of the absence rate leaves the estimated effect of the flu virtually unchanged. This suggests that influenza affects firm performance through channels beyond absenteeism and therefore that our results reflect both presenteeism and absenteeism.

Second, we relate the CRP rate to hospitalizations related to influenza or pneumonia, which can be taken to signal both the health of employees and work absences. We do the following because influenza and pneumonia hospitalizations are rare events: we take the firms in our sample, we divide them in three size bins as in Section 5.3.3, and we calculate for each year the CRP rate and the hospitalization rate (per 1,000 persons) among the employees and family members. As in our baseline approach, we only consider events during the usual flu season. The resulting series are plotted against each other in Appendix Figure A5, which shows a positive relationship between the number of CRP tests and of influenza-related hospitalizations. Indeed, the raw correlation between the two series is 78%. In addition, the figure shows that the relationship between CRP tests and hospitalizations is virtually independent of firm size. This confirms that our finding that the effect of employee health on firm performance depends on firm size is not driven by differences in employee behavior across firm size categories.

Taken together, the evidence in this section suggests that a more severe flu season leads, at the very least, to more absences from work. Firms would then need to make up for the absences (or loss of productivity) of their workers. They can do so by substituting capital for labor, hiring temporary

[2]Note that the absence rate is a "bad control" because it is an outcome in itself. Therefore, this analysis should not be interpreted as causal but rather as providing suggestive evidence on the separate roles of absenteeism and presenteeism.

workers, or shifting healthy workers across tasks. The first two strategies have clear cost implications for firms that rely relatively more on labor inputs, while the last one may be feasible only in firms with a large enough workforce. Therefore, we expect to find that the effects of poor employee health vary across the distribution of firms by labor intensity, financial flexibility, or size.

A2 Robustness analyses

In this section, we check the sensitivity of our results to several alternative specifications. In particular, we address concerns that our findings may be driven by longer-term effects of severe influenza seasons, by years of economic downturn, by firms that are located in the largest and most densely populated municipality in Denmark (Copenhagen), by the specific way we measure how the flu affects employee health, or by the fact that employees might be seeking health care differently during periods of high and low firm performance.

We first examine whether seasonal influenza-induced health shocks last beyond the year of occurrence. We add the lagged CRP rate in a firm to our baseline specification and report the results in Column (1) of Appendix Table A7. The estimated coefficient for the lagged value of the CRP rate in a firm is smaller and statistically insignificant, while the estimated effect of the contemporaneous CRP rate is virtually identical to our baseline estimate in Table 2. This confirms that the health shock and its effects are indeed temporary.

Another potential concern is that the general economic situation might taint our estimates if severe influenza seasons overlap with periods of economic slowdown, resulting in lower firm profitability. For those economic conditions to drive our results, the cross-firm variation in economic slowdown would need to closely mirror the cross-firm variation in the severity of influenza. While we believe that is an unlikely scenario, excluding years of negative and low economic growth from our analysis should help reassure us that our results are not driven by exposure to periods of economic slowdown. There are two such periods during our sample period, 2001–03 and 2008–09, where real annual GDP growth in Denmark fell below 1%. Growth in this period marks a sharp contrast to the average real GDP growth in other years, which exceeds 2%. We exclude these periods from the sample and report the results in Column (2) of Appendix Table A7. Our estimates are very similar to our baseline results. We, therefore, conclude that changes in the state of the economy are unlikely to be driving the findings of our analysis.

Next, we consider the potentially outsized influence of Copenhagen municipality. It is the largest municipality of Denmark, and also the largest of the four municipalities that constitute the City of Copenhagen (the capital). This municipality had a population of more than 600,000 inhabitants in 2016, corresponding to about 9.5% of Denmark's total population, and hosts a number of the largest firms. All these factors suggest that firms in this municipality could react differently when their employees catch the flu. We re-estimate our baseline specification after excluding all the firms located in this municipality. Column (3) shows that this does not alter our main findings.

In column (4) we investigate the role of short-lived firms, i.e., firms that operate for less than 14 years (the average "tenure" of firms in our sample) during our sample period. The estimated effect in the sample excluding these firms is almost identical to our baseline estimate, confirming that firm exits do not influence our results.

We next examine the sensitivity of our findings to the specific way we measure health shocks. We first redefine the CRP rate in a firm based only on employees (i.e., we divide the number of CRP tests taken by firm employees by the number of firm employees). The results, reported in column (5), are similar to our main estimates. In Column (6), we show that the results remain qualitatively similar, though slightly more imprecise if we measure shocks to employee health through an indicator that takes the value of one for all firm years in which the CRP rate in a firm exceeds 80% of the sample mean.

We then construct two measures of employee health based on hospitalizations for influenza and its main complication, pneumonia. The main advantage of using such alternative measures is that we know the exact diagnosis for a hospital visit and are not relying on a proxy for the severity of the influenza season. The main disadvantage is that such hospitalizations are relatively extreme events that occur much less frequently than GP visits. Consequently, we can construct these hospitalization-based measures only at a more aggregate level, such as the municipality. We first calculate the rate of hospitalizations for influenza and pneumonia for every municipality and every year. We then assign this municipality-level rate to each firm year based on firm locations and construct a health shock indicator that takes a value of one for all firm years in which the flu-related hospitalization rate in the firm's municipality is above 80% of the sample mean. Note that we are not able to include municipality fixed effects in this specification because this measure varies at the municipality level. The results listed in Column (7) indicate again that a more severe flu season leads to a decline in firm profitability. The second measure we construct is a firm-specific hospitalization-based measure using the information on the municipality of residence of the firm's employees. For each firm and each year, we calculate a weighted average of municipality-level flu-related hospitalization rates over all municipalities, with weights determined by the fraction of the firm's workforce that resides in that municipality. For example, if in a given year 60% of a firm's workforce resides in the municipality of Copenhagen and 40% in the municipality of Aarhus, our firm-specific flu-related hospitalization rate would assign a weight of 60% to the Copenhagen hospitalization rate, a weight of 40% to the Aarhus hospitalization rate, and a weight of 0% to the hospitalization rates of all the other municipalities in that year. We then create an indicator variable that takes the value of one whenever the number of relevant hospitalizations in a municipality year exceeds an 80% threshold in that distribution. This measure of flu exposure varies by firm within a municipality and thus allows us to include municipality-year fixed effects in our estimation. These will account for all omitted local shocks that can affect firm performance. Column (8) shows that we still find statistically significant negative effects of a severe flu season on firm performance.

In column (9) of Appendix Table A7, we consider a different way to measure firm performance and we rescale operating return and net income by the number of FTE in the firm instead of by assets. We again find statistically significant effects of employee health on firm profitability.

Finally, we turn to the concern that employees might be less likely to seek medical care when the firm is going through a period of high profitability, creating a mechanical negative relationship between the CRP rate in the firm and firm performance. We address this issue through an instrumental variable strategy, with instruments defined as:

$$\overline{HC}_{it} = \sum_{k \in M(i,t)} \omega_{kt} \frac{\sum_{p \neq J(i,k,t)} HC_{pt}}{N_{kt} - \text{card}\{J(i,k,t)\}}, \tag{A2.1}$$

where $\overline{HC}$ is the predicted rate of health care utilization in firm i at time t, $M(i,t)$ is the set of municipalities where the employees of firm i reside during year t, $J(i,k,t)$ is the set of employees in firm i during year t who reside in municipality k during that same year, HC_{pt} is a measure of health care use by person p during year t, N_{kt} is the total population of municipality k in year t, card$\{J(i,k,t)\}$ is the number of employees in firm i during year t who reside in municipality k during that same year, and ω_{kt} is the fraction of the firm's employees who reside in municipality k in year t. We consider two types of health care utilization: the number of CRP tests taken during the flu season, and the number of hospitalizations with main diagnosis of influenza or pneumonia during the flu season.

The instruments are essentially weighted averages at the firm-level of leave-one-out CRP test or hospitalization rates at the municipality level, with weights given by the fraction of firm employees residing in each municipality. These two measures capture the health care seeking behavior of *other* persons residing in the same municipality as the employees of the firm, which should not be affected by the variations in profitability in the specific firm (recall that all our specifications include municipality and year fixed effects, so these variations are within municipalities and within years).

We use these measures one at a time to instrument for the CRP rate in a firm. We choose to not use both at the same time in order to avoid issues related to overidentification and potentially weak instruments. We apply our instrumental variable strategy to our baseline specification, as well as to the specifications including interactions between the CRP rate in the firm and indicators for firm size (relative to the median, or terciles). In models with interactions between the CRP rate in the firm and size indicators, we instrument for these terms with interactions between the instrument and the corresponding size indicators.

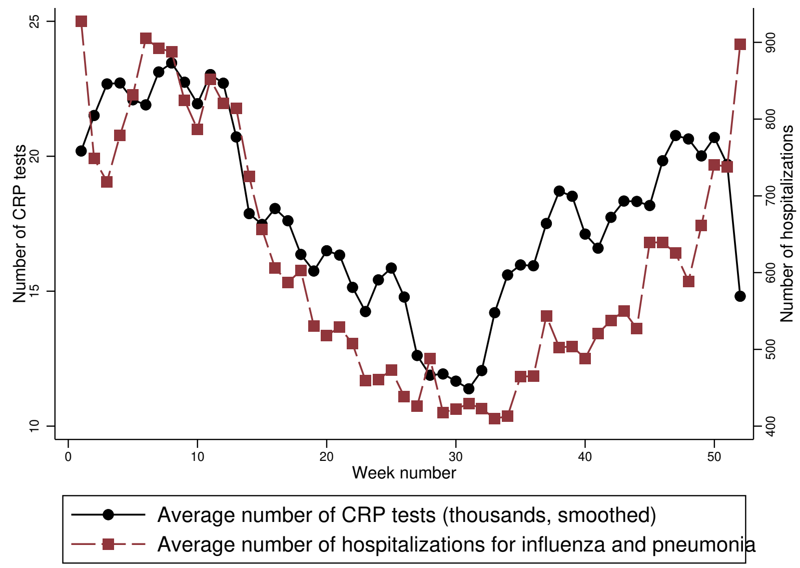
Appendix Table A8 shows that both instruments are predictive of our main measure, the CRP rate at the firm, with the hospitalizations-based measure performing slightly worse. We next move on to the findings from the second stage of the two-stage least squares (2SLS) approach. Columns (1) and (4) in Appendix Table A9 repeat our main results for both of our measures of profitability, while the other columns present the estimated effects of the CRP rate in the firm on firm performance from 2SLS models using our two instruments. Panel A includes our main specification in Equation (2), Panel B the specification in which we allow the effect of the flu to differ for firms of size above or below the median, and Panel C the specification in which the effect of the flu is different for firms in different terciles of the size distribution. In all cases, the estimated 2SLS effects are larger in absolute value than the OLS estimates, in the expected direction, and statistically indistinguishable from the OLS estimates. We interpret these findings to suggest that our main results are not driven by endogenous health-seeking behavior of employees.

A3 Size results at the establishment level

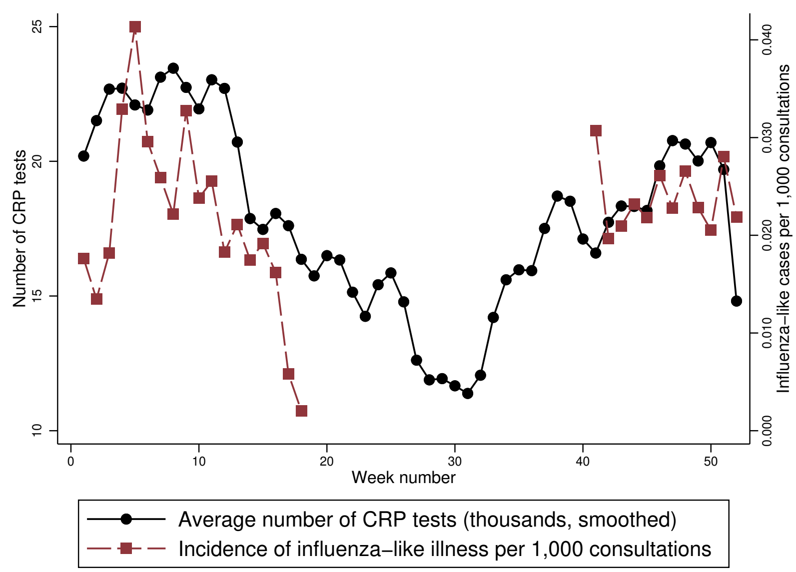
We can leverage our establishment-level data to shed more light on the role firm size may play in modulating the effect of employee health on operating performance. The results discussed thus far are consistent with the notion that larger firms can reallocate resources better than smaller firms and might consequently absorb labor productivity shocks associated with employee health. This mechanism would imply that establishments are impacted differently depending on whether they are part of a larger or a smaller corporation. We test this conjecture in a subset of multi-establishments firms by comparing the effect of employee health on firm performance between similarly sized small establishments owned by firms of different sizes. If the redistribution of resources within firms helps explain our findings, we would expect to find a weaker relationship between health shocks and performance for establishments that are part of a larger firm. We report the results in Appendix Table A14. Two observations emerge. First, across various specifications, we continue to find that health shocks negatively impact firm performance in small establishments. Second, this relationship is insignificant and economically less pronounced when the establishment is part of a larger corporation. In summary, we find that it is not only the size of the establishment that matters for how well it can absorb the detrimental effects of severe influenza seasons but also the size of the parent firm, which makes it plausible that the reallocation of resources by the parent firm may help absorb those shocks.

References

Bennedsen, Morten, Margarita Tsoutsoura, and Daniel Wolfenzon. 2019. "Drivers of Effort: Evidence from Employee Absenteeism." *Journal of Financial Economics* 133 (3): 658–684.



(a) Hospital admissions for influenza and pneumonia (viral or bacterial)



(b) Incidence of influenza-like illness per 1,000 GP consultations

Notes: Each dot represents the weekly number of CRP tests or of hospital admissions for influenza and pneumonia, or the weekly incidence rate of influenza-like illness, averaged across years. The data on CRP tests and hospital admissions come from our sample and cover the entire sample period 1999–2016. The data on influenza-like illness come from InfluenzaNet (available at `https://influenzanet.info`), which is part of the European sentinel surveillance data, and are based on self-reported illness over the period 2014–2016. Because of spikes in certain weeks (typically multiples of 4, likely due to the filing of reimbursement claims at the end of the month), the number of CRP tests reported is smoothed using a local polynomial of degree one and an Epanechnikov kernel.

Figure A1: Average Weekly Number of CRP Tests and Other Indicators of Influenza Severity

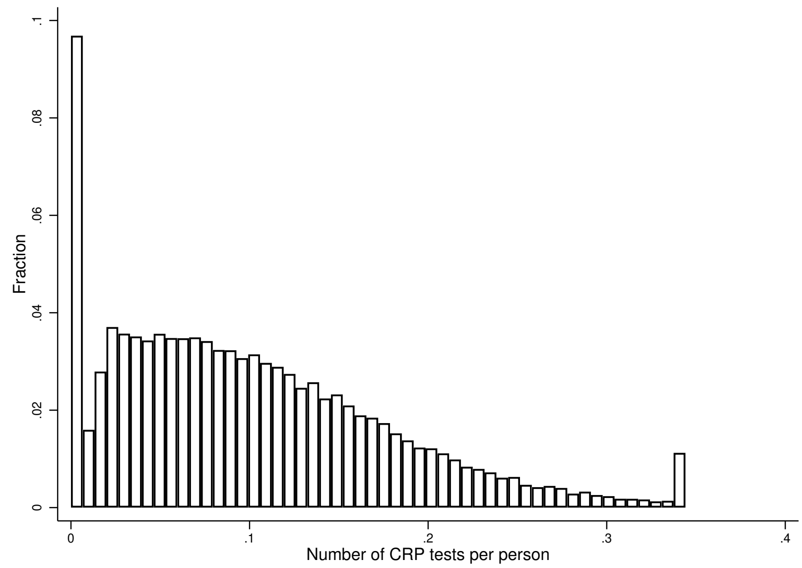


Figure A2: Distribution of the CRP Rate

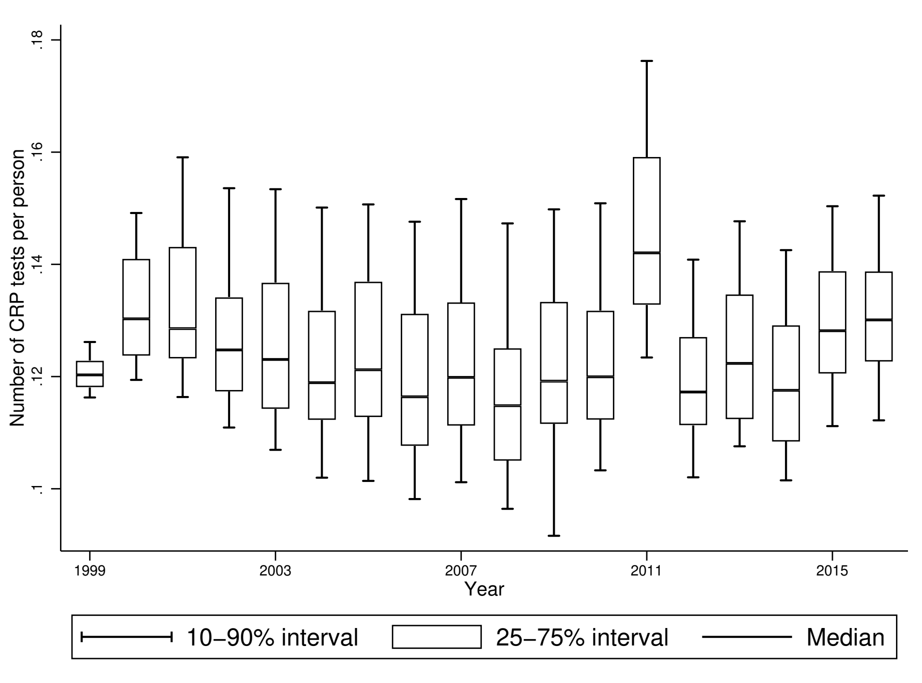
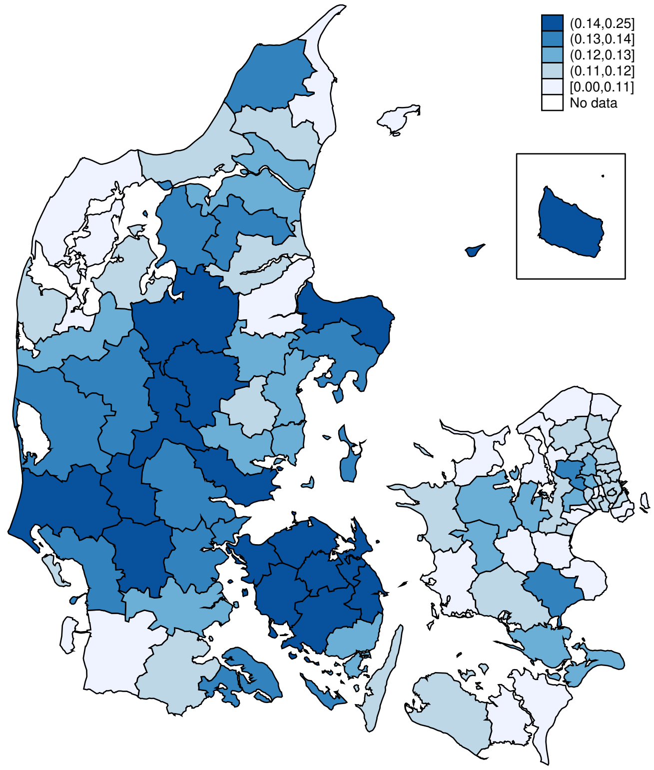
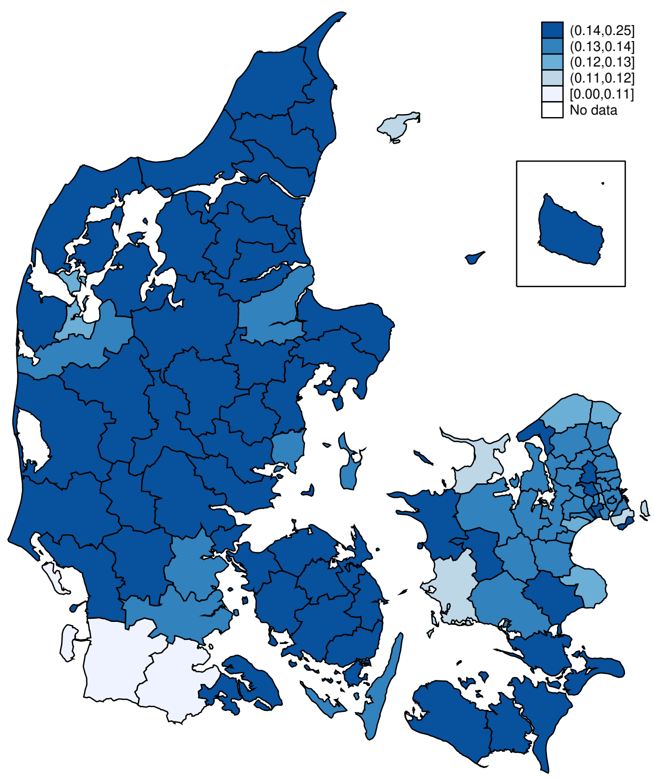


Figure A3: Evolution of the Distribution of the CRP Rate over Time

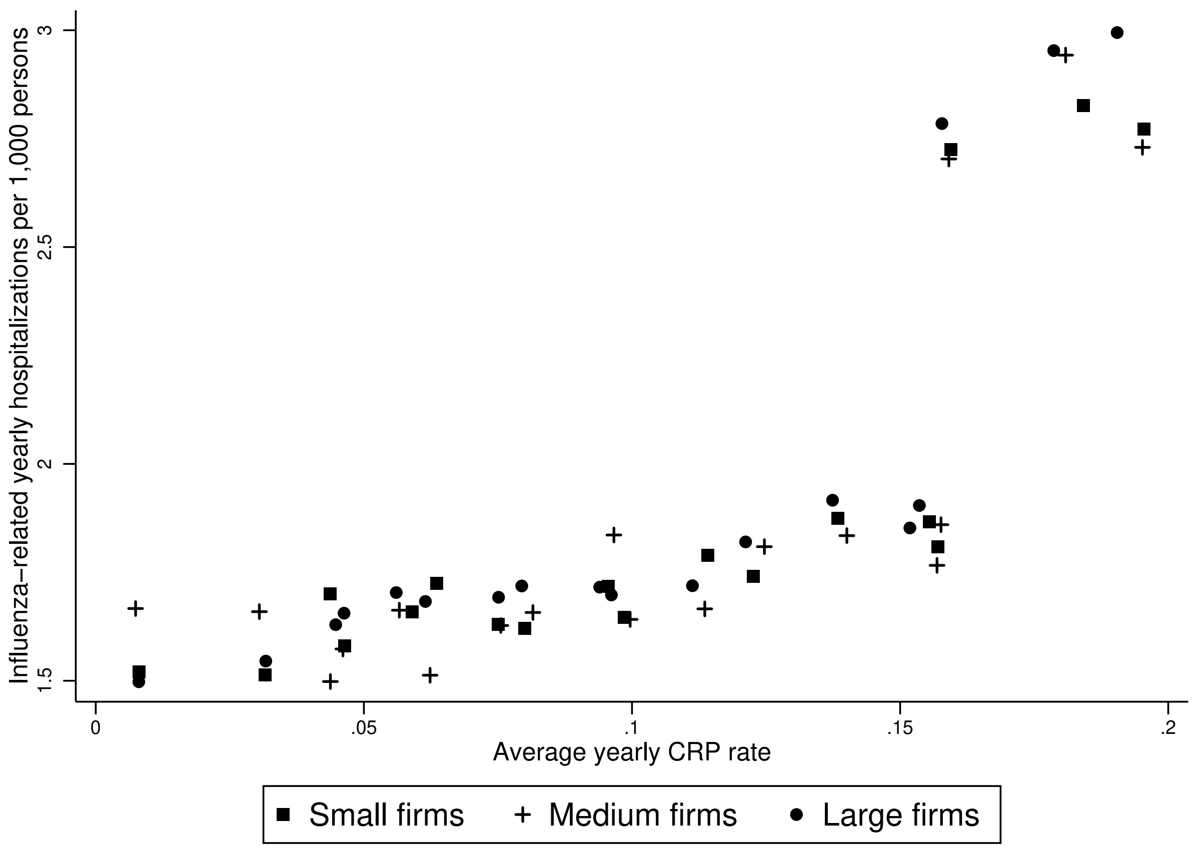


(a) 2004



(b) 2011

Figure A4: Distribution of the CRP Rate across Danish Municipalities and Time



Notes: Each dot represents the average CRP rate and the average hospitalization rate for influenza and pneumonia per 1,000 persons among the employees and family members in firms in the corresponding size bin in a given year. Small firms have fewer than 16 FTE but more than 10 FTE. Medium-sized firms have between 16 and 32 FTE. Large firms have more than 32 FTE.

Figure A5: The Relationship Between the CRP Rate and Hospitalizations for Influenza and Pneumonia, by Firm Size

Table A1: The Effect of Employee Health on Industry-Adjusted Firm Performance

This table examines the effect of employee health on firm operating performance. In Panel A, the dependent variable is an industry-adjusted operating return on assets (OROA). OROA is defined as the ratio of operating income to total assets, and the industry-adjusted version is calculated by taking the difference between a firm's OROA and the average OROA in its 4-digit industry according to the NACE 2.0 classification. In Panel B, the dependent variable is industry-adjusted net income to total assets (NI), defined similarly. To measure employee health, we examine the CRP rate among employees and their families during the flu season. Firm controls include Log(Assets), the natural logarithm of the lagged value of total assets; Market concentration (HHI), measured by the Herfindahl-Hirschmann index of the firm's industry; N days at hospital (avg) — Top-5 employee / Rank and file employee, the average number of days a top-5 / non-top-5 employee was hospitalized in a given year; Local controls (municipality) — Population density / Unemployment rate, the population density of / unemployment rate in the firm's municipality. All variables are winsorized at the 1% level and all specifications focus on firms with at least ten employees and include firm fixed effects. Columns (1) and (3) also include year fixed effects, while Columns (2) and (4) use municipality times year fixed effects. Columns (3) and (4) further include firm age dummies for every five-year bin of firm age. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: Industry-adjusted OROA			
	(1)	(2)	(3)	(4)
CRP rate	−0.0184**	−0.0180**	−0.0182**	−0.0179**
	(0.0076)	(0.0078)	(0.0076)	(0.0078)
Log(Assets)			−0.0115***	−0.0115***
			(0.0012)	(0.0012)
Market concentration (HHI)			−0.0295**	−0.0259*
			(0.0137)	(0.0139)
Top-5 employee, N days at hospital (avg)			−0.0014***	−0.0015***
			(0.0005)	(0.0005)
Rank and file employee, N days at hospital (avg)			−0.0010	−0.0010
			(0.0007)	(0.0007)
Municipality density			−0.0032	
			(0.0190)	
Unemployment rate			−0.2600***	
			(0.0867)	
Controls	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year
N	183,917	183,917	183,917	183,917
R^2	0.318	0.318	0.319	0.319

	Panel B: Industry-adjusted Net Income			
	(1)	(2)	(3)	(4)
CRP rate	−0.0171**	−0.0168**	−0.0165**	−0.0167**
	(0.0072)	(0.0073)	(0.0072)	(0.0073)
Log(Assets)			−0.0100***	−0.0101***
			(0.0012)	(0.0012)
Market concentration (HHI)			−0.0226*	−0.0195
			(0.0130)	(0.0131)
Top-5 employee, N days at hospital (avg)			−0.0010**	−0.0011**
			(0.0005)	(0.0005)
Rank and file employee, N days at hospital (avg)			−0.0010	−0.0009
			(0.0007)	(0.0007)
Municipality density			0.0076	
			(0.0176)	
Unemployment rate			−0.1884**	
			(0.0804)	
Controls	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year
N	183,917	183,917	183,917	183,917
R^2	0.300	0.299	0.300	0.300

Table A2: The Magnitude of the Effect of Employee Health on Firm Performance

This table details the magnitude of the effect of employee health on firm operating performance. In Panel A, the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets. In Panel B, the dependent variable is net income to total assets (NI). In Panels C and D, the dependent variables are the industry-adjusted versions of OROA and NI, respectively, calculated as the difference between the measure of profitability and its average at the 4-digit industry according to the NACE 2.0 classification. To measure employee health, we examine the CRP rate among employees and their families during the flu season. Profit refers to operating return in Panel A and net income in Panel B. Firm controls include Log(Assets), the natural logarithm of the lagged value of total assets; Market concentration (HHI), measured by the Herfindahl-Hirschmann index of the firm's industry; N days at hospital (avg) — Top-5 employee / Rank and file employee, the average number of days a top-5 / non-top-5 employee was hospitalized in a given year; Local controls (municipality) — Population density / Unemployment rate, the population density of / unemployment rate in the firm's municipality. All variables are winsorized at the 1% level and all specifications focus on firms with at least ten employees and include firm fixed effects. Columns (1) and (3) also include year fixed effects while Columns (2) and (4) use municipality times year fixed effects. Columns (3) and (4) further include firm age dummies for every five-year bin of firm age. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: OROA			
	(1)	(2)	(3)	(4)
Effect of 1s.d. increase in CRP rate	−0.0016**	−0.0013**	−0.0015**	−0.0013**
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
— relative to median profit	−0.0243**	−0.0206**	−0.0232**	−0.0204**
	(0.0095)	(0.0097)	(0.0095)	(0.0097)
— relative to average profit	−0.0244**	−0.0206**	−0.0233**	−0.0205**
	(0.0096)	(0.0097)	(0.0095)	(0.0097)
— relative to s.d. of profit	−0.0087**	−0.0073**	−0.0083**	−0.0073**
	(0.0034)	(0.0035)	(0.0034)	(0.0035)
— on average profit ('000 DKK)	−72.1219**	−60.8882**	−68.8352**	−60.3633**
	(28.2307)	(28.7019)	(28.1638)	(28.6942)
— on average profit ('000 USD)	−11.4721**	−9.6852**	−10.9493**	−9.6017**
	(4.4906)	(4.5655)	(4.4799)	(4.5643)
Controls	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year
N	183,917	183,917	183,917	183,917
R^2	0.346	0.346	0.347	0.347

	Panel B: Net Income			
	(1)	(2)	(3)	(4)
Effect of 1s.d. increase in CRP rate	−0.0016***	−0.0014**	−0.0014**	−0.0013**
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
— relative to median profit	−0.0577***	−0.0505**	−0.0538**	−0.0498**
	(0.0219)	(0.0223)	(0.0219)	(0.0222)
— relative to average profit	−0.0799***	−0.0699**	−0.0745**	−0.0690**
	(0.0303)	(0.0308)	(0.0303)	(0.0308)
— relative to s.d. of profit	−0.0091***	−0.0080**	−0.0085**	−0.0079**
	(0.0035)	(0.0035)	(0.0034)	(0.0035)
— on average profit ('000 DKK)	−70.5205***	−61.6660**	−65.7308**	−60.8410**
	(26.7640)	(27.1883)	(26.7061)	(27.1818)
— on average profit ('000 USD)	−11.2174***	−9.8090**	−10.4555**	−9.6777**
	(4.2572)	(4.3247)	(4.2480)	(4.3237)
Controls	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year
N	183,917	183,917	183,917	183,917
R^2	0.326	0.326	0.327	0.327

Table A2 (cont.): The Magnitude of the Effect of Employee Health on Firm Performance

	Panel C: Industry-adjusted OROA			
	(1)	(2)	(3)	(4)
Effect of 1s.d. increase in CRP rate	-0.0015^{**}	-0.0014^{**}	-0.0014^{**}	-0.0014^{**}
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
— relative to median profit	-0.4544^{**}	-0.4457^{**}	-0.4509^{**}	-0.4438^{**}
	(0.1883)	(0.1921)	(0.1878)	(0.1919)
— relative to average profit	-0.7344^{**}	-0.7206^{**}	-0.7287^{**}	-0.7177^{**}
	(0.3044)	(0.3106)	(0.3036)	(0.3104)
— relative to s.d. of profit	-0.0083^{**}	-0.0082^{**}	-0.0083^{**}	-0.0081^{**}
	(0.0035)	(0.0035)	(0.0034)	(0.0035)
— on average profit ('000 DKK)	-66.2009^{**}	-64.9033^{**}	-65.6875^{**}	-64.6374^{**}
	(27.4343)	(27.9699)	(27.3636)	(27.9523)
— on average profit ('000 USD)	-10.5303^{**}	-10.3239^{**}	-10.4486^{**}	-10.2816^{**}
	(4.3639)	(4.4491)	(4.3526)	(4.4463)
Controls	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year
N	183,917	183,917	183,917	183,917
R^2	0.318	0.318	0.319	0.319
	Panel D: Industry-adjusted Net Income			
	(1)	(2)	(3)	(4)
Effect of 1s.d. increase in CRP rate	-0.0014^{**}	-0.0013^{**}	-0.0013^{**}	-0.0013^{**}
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
— relative to median profit	-0.1820^{**}	-0.1791^{**}	-0.1760^{**}	-0.1777^{**}
	(0.0765)	(0.0780)	(0.0764)	(0.0780)
— relative to average profit	-0.7105^{**}	-0.6996^{**}	-0.6869^{**}	-0.6942^{**}
	(0.2988)	(0.3048)	(0.2981)	(0.3047)
— relative to s.d. of profit	-0.0083^{**}	-0.0082^{**}	-0.0081^{**}	-0.0081^{**}
	(0.0035)	(0.0036)	(0.0035)	(0.0036)
— on average profit ('000 DKK)	-61.6793^{**}	-60.6625^{**}	-59.6317^{**}	-60.1902^{**}
	(25.9347)	(26.4333)	(25.8809)	(26.4182)
— on average profit ('000 USD)	-9.8111^{**}	-9.6493^{**}	-9.4854^{**}	-9.5742^{**}
	(4.1253)	(4.2046)	(4.1168)	(4.2022)
Controls	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year
N	183,917	183,917	183,917	183,917

Table A3: The Relationship between Employee Health and Employee Productivity
This table examines the relationship between employee health and measures of employee productivity. The specification is our baseline specification in Equation (2) estimated in our sample of firms, with the log of sales per full-time equivalent as the dependent variable and our full set of controls (see the notes to Table 2 for details). All regressions include year and firm fixed effects. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Log(sales) / FTE (1)
CRP rate	−0.0018
	(0.0158)
Effect of 1 s.d. increase in CRP rate	−0.0001
	(0.0013)
Mean of dependent variable	7.1849
Controls	Yes
Fixed effects	Firm and year
N	183,807
R^2	0.847

Table A4: Summary Statistics: 2010–2016

This table presents the summary statistics for nonfinancial, nonutility, nongovernment-owned firms in Denmark between 2010 and 2016. Panel A focuses on the analysis sample and Panel B on the absence sample. Operating return on assets (OROA) is the ratio of operating income to total assets, net income is the ratio of income to total assets. CRP tests is the number of CRP tests performed on the employees and their families during the flu season. Investment Rate, the ratio of capital expenditures to total assets; Tangibility, the ratio of property, plant, and equipment to total assets; Dividend Payer, an indicator that takes the value of one for dividend paying firms; Market concentration (HHI), measured by the Herfindahl-Hirschmann index of the firm's industry; N days at hospital -Top-5 employee / Rank and file employee, is the average number of days a top-5/ non-top-5 employee was hospitalized in a given year; Population density / Unemployment rate, the population density of / unemployment rate in the firm's municipality. All variables are winsorized at the 1% level.

	Mean	Std. dev.	1%	25%	50%	75%	99%
Panel A. Analysis sample							
— Operating return on assets (OROA)	0.066	0.184	−0.676	0.008	0.066	0.140	0.550
— Net income (NI)	0.024	0.171	−0.732	−0.020	0.032	0.095	0.409
— CRP rate	0.160	0.075	0.023	0.110	0.151	0.200	0.390
— Log(Assets)	9.954	1.256	7.477	9.059	9.803	10.713	12.664
— Full-time employees	37.087	37.717	10.220	14.450	21.820	40.270	159.110
— Firm age (years)	19.422	14.323	2.000	9.000	16.000	27.000	71.000
— Market concentration (HHI)	0.017	0.029	0.002	0.003	0.007	0.028	0.087
— Local population density (municipality)	5.571	1.574	3.659	4.278	4.981	6.511	8.901
— Local unemployment rate (municipality)	0.043	0.012	0.020	0.035	0.043	0.051	0.073
— Top-5 employee, N days at hospital	0.252	0.706	0.000	0.000	0.000	0.200	4.400
— Rank and file employee, N days at hospital	0.357	0.489	0.000	0.083	0.222	0.432	2.727
Panel B. Absence sample							
— Operating return on assets (OROA)	0.069	0.158	−0.479	0.011	0.067	0.136	0.518
— Net income (NI)	0.035	0.143	−0.456	−0.010	0.038	0.096	0.391
— Absence rate	5.063	2.876	0.283	2.977	4.777	6.682	14.245
— CRP rate	0.164	0.056	0.054	0.126	0.158	0.194	0.331
— Log(Assets)	11.421	1.202	8.538	10.522	11.667	12.664	12.664
— Full-time employees	95.646	55.572	12.910	40.510	90.520	159.110	159.110
— Firm age (years)	27.168	18.802	2.000	13.000	24.000	35.000	93.000
— Market concentration (HHI)	0.022	0.036	0.002	0.004	0.012	0.029	0.169
— Local population density (municipality)	5.634	1.571	3.659	4.385	5.014	6.540	8.901
— Local unemployment rate (municipality)	0.043	0.012	0.020	0.035	0.042	0.051	0.073
— Top-5 employee, N days at hospital	0.241	0.700	0.000	0.000	0.000	0.000	4.600
— Rank and file employee, N days at hospital	0.365	0.325	0.000	0.187	0.302	0.444	1.620

Table A5: Employee Absences and CRP Tests

This table shows the effect of CRP tests on employee absences using an annual survey that covers all publicly owned entities and approximately 2,600 private companies, where the latter includes all firms with more than 250 employees and a random sample of firms with 10-249 employees, resampled yearly. We calculate the number of days of absence due to own or child sickness during the influenza season and then construct the absence rate at the firm-year level as the average number of days of absence due to own and child sickness per full-time equivalent employee during the influenza season. Given that our preferred specification includes firm fixed effects, we further restrict the sample to firms with at least two yearly observations. This yields a final sample of 1,712 firms, each observed between 2 and 7 times for a total of 6,610 firm-year observations over the period 2010–2016. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Absence rate			
	(1)	(2)	(3)	(4)
CRP tests	2.9880***	3.1376***	2.5585**	2.7433**
	(1.0400)	(1.0918)	(1.0243)	(1.0810)
Log(Assets)			0.0851	0.1077
			(0.1400)	(0.1432)
Market concentration (HHI)			0.0731	0.0618
			(0.6891)	(0.6891)
Top-5 employee, N days at hospital (avg)			0.1149***	0.1310***
			(0.0437)	(0.0476)
Rank and file employee, N days at hospital (avg)			0.7530***	0.8108***
			(0.1155)	(0.1203)
Municipality density			−1.0283	
			(1.0688)	
Unemployment rate			−6.1476	
			(9.1697)	
Effect of 1s.d. in CRP tests	0.2371***	0.2489***	0.2030**	0.2176**
	(0.0825)	(0.0866)	(0.0813)	(0.0858)
Mean of outcome var	5.0626	5.0692	5.0626	5.0692
Controls	No	No	Yes	Yes
Fixed effects	Firm and year	Firm and muni x year	Firm and year	Firm and muni x year
N	6,610	6,610	6,610	6,610
R^2	0.496	0.494	0.502	0.501

Table A6: Effect of CRP Rate When Controlling for Absenteeism

This table shows the effect of CRP tests on firm performance, taking into account worker absenteeism. In Columns (1)–(3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets, and in Columns (4)–(6) it is net income to total assets (NI). CRP tests are measured among employees and their families during the flu season. The sample consists of the firms in our analysis sample that are also included in an annual survey that covers all publicly-owned entities and approximately 2,600 private companies, where the latter includes all firms with more than 250 employees and a random sample of firms with 10–249 employees, resampled yearly. In Columns (1) and (4), we include all firm-year observations for these firms. In the remaining columns, we consider only the firm-years that are also included in the survey for the firms that are surveyed in at least two years. The absence rate is calculated as the number of days of absence (due to own or child sickness) during the influenza season per employee. All specifications include firm and year fixed effects, age dummies for every five-year bin of firm age, and our full set of firm-level and municipality-level controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA			Net Income		
	(1)	(2)	(3)	(4)	(5)	(6)
CRP tests	−0.0183	−0.0091	−0.0085	−0.0132	−0.0250	−0.0242
	(0.0213)	(0.0449)	(0.0447)	(0.0196)	(0.0426)	(0.0424)
Absence rate			−0.0003			−0.0003
			(0.0008)			(0.0007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	33,529	6,610	6,610	33,529	6,610	6,610
R^2	0.340	0.532	0.532	0.309	0.497	0.496

Table A7: Robustness Analysis

This table examines the effect of employee health on firm operating performance. The dependent variable in Panel A is operating return on assets (OROA). In Panel B, it is net income to assets. In column (1), we also include the one-year lagged CRP rate. In column (2), we exclude years of economic slowdown (2001-03 and 2008/09) from the sample. In column (3), we exclude firms located in the largest municipality and capital of Denmark, i.e. Copenhagen. In column (4), we exclude firms in operation for less than 14 years (the average tenure) during our sample period. In column (5), we measure employee health as the CRP rate among the employees of the firm (i.e., excluding family members). In column (6), we measure employee health by constructing a Health Shock indicator that takes a value of one for all firm years in which a firm's CRP rate exceeds 80% of the sample mean. In column (7), we measure employee health by constructing a Health Shock indicator that takes the value one for all firm years in which a firm's municipality reports flu-related hospitalization events in excess of 80% of the sample mean. In column (6), we use an alternative measure of employee health by examining the employee-weighted average of flu-related hospitalization events from employees' municipalities of residence. We then create a Health Shock indicator that takes a value of one for all firm years in which a firm's measure of flu exposure is in excess of 80% of the sample mean. Finally, in column (9) we rescale our measures of firm productivity by FTE instead of firm assets. In columns (1)–(7) and (9), we include firm and year fixed effects, and in column (8), we replace these fixed effects with municipality times year fixed effects. All variables are winsorized at the 1% level and all specifications include our full set of firm-level and municipality-level controls and firm age dummies for every five-year bin of firm age. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A: OROA								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CRP rate	−0.0185**	−0.0183**	−0.0167**	−0.0195**	−0.0197***				−24.77**
	(0.0077)	(0.0086)	(0.0079)	(0.0090)	(0.0054)				(12.1666)
CRP rate (t-1)	−0.0091								
	(0.0082)								
Treatment						−0.0024*	−0.0022*	−0.0046*	
						(0.0012)	(0.0012)	(0.0027)	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Municipality × year	Firm and year
N	183,105	129,613	166,950	121,852	187,163	183,917	183,920	186,988	187,163
R^2	0.348	0.358	0.345	0.328	0.347	0.347	0.347	0.027	0.347
	Panel B: Net income								
	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(4)
CRP rate	−0.0176**	−0.0178**	−0.0168**	−0.0213**	−0.0175***				−29.62***
	(0.0074)	(0.0081)	(0.0074)	(0.0085)	(0.0052)				(10.1349)
CRP rate (t-1)	−0.0090								
	(0.0077)								
Treatment						−0.0023*	−0.0022*	−0.0039	
						(0.0012)	(0.0011)	(0.0025)	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Municipality × year	Firm and year
N	183,105	129,613	166,950	121,852	187,163	183,917	183,920	186,988	187,164
R^2	0.328	0.337	0.323	0.298	0.327	0.327	0.327	0.026	0.333

Table A8: First-stage Estimates of The Effect of Leave-one-out Measures of Flu Intensity on Firm CRP Rate

This table shows the relationship between our two instruments and the CRP rate at the firm level. In Columns (1)–(3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets. In Columns (4)–(6), the dependent variable is net income to total assets (NI). Columns (1) and (4) repeat our main estimates, while the other columns show the results from 2SLS estimations. The instruments are constructed as leave-one-out measures, where the employees of the firm are excluded from the calculation of the average rate in their municipality of residence, and these rates are averaged at the firm level using weights equal to the firm workforce residing in each municipality. The instruments used in Columns (2) and (5) based on municpality-level CRP rates, while those used in Columns (3) and (6) are based on municipality-level hospitalizations rates for influenza and pneumonia. Panel A presents our baseline specification. In Panel B, we add an indicator for firm size below the median of the FTE distribution and its interaction with the CRP rate. In addition to instrumenting for the CRP rate, we also instrument for this interaction term with the interaction between the instrument indicated in the column and the indicator for firm size below the median. In Panel C, we use terciles of the distribution of full-time equivalent (FTE) to define firm size categories. The resulting categories are as follows: *Small firms* with more than 10 but less than 16 FTE and *Medium-sized firms* with between 16 and 32 FTE. We include indicators that identify firms in these categories, and their interactions with the CRP rate. Similar to Panel B, we instrument for the main effect of the CRP rate and for the interaction terms with the firm size indicators using the instrument indicated in the column and its interactions with the firm size indicators. All variables are winsorized at the 1% level. All specifications focus on firms with at least ten employees, use firm and year fixed effects, and include our full set of firm-level, municipality-level, and age-bucket controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Specification:	Baseline	Firm size relative to median		Firm size in terciles of the size distribution		
Dependent variable:	CRP rate	CRP rate	CRP rate × Below median	CRP rate	CRP rate × Medium-sized	CRP rate × Small
	(1)	(2)	(3)	(4)	(5)	(6)
A. Leave-one-out measure based on municipality-level CRP rate						
Leave-one-out CRP rate	0.8125***	0.8129***	−0.0317***	0.8125***	−0.0130*	−0.0246***
	(0.0141)	(0.0139)	(0.0114)	(0.0138)	(0.0077)	(0.0094)
Below median × Leave-one-out CRP rate		−0.0008	0.8495***			
		(0.0063)	(0.0057)			
Median-sized × Leave-one-out CRP rate				0.0031	0.8466***	0.0064***
				(0.0061)	(0.0050)	(0.0022)
Small × Leave-one-out CRP rate				−0.0028	−0.0070***	0.8542***
				(0.0079)	(0.0026)	(0.0071)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917

Table A8 (cont.): First-stage Estimates of The Effect of Leave-one-out Measures of Flu Intensity on Firm CRP Rate

Specification:	Baseline	Firm size relative to median		Firm size in terciles of the size distribution		
Dependent variable:	CRP rate	CRP rate	CRP rate × Below median	CRP rate	CRP rate × Medium-sized	CRP rate × Small
	(1)	(2)	(3)	(4)	(5)	(6)
B. Leave-one-out measure based on municipality-level hospitalization rates for influenza and pneumonia						
Leave-one-out hospitalization rate	0.3088**	0.3031**	−5.0419***	0.2694**	−3.3862***	−3.7332***
	(0.1243)	(0.1264)	(0.1216)	(0.1301)	(0.0983)	(0.1084)
Below median × Leave-one-out hospitalization rate		0.0127	10.4167***			
		(0.1046)	(0.1074)			
Median-sized × Leave-one-out hospitalization rate				0.0636	10.0058***	0.8934***
				(0.1024)	(0.1038)	(0.0537)
Small × Leave-one-out hospitalization rate				0.0481	0.7786***	10.4201***
				(0.1311)	(0.0702)	(0.1307)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917

Table A9: 2SLS Estimates of The Effect of Employee Health on Firm Performance and Firm Size

This table shows that the effect of employee health on firm operating performance is robust to implementing an instrumental variables strategy. In Columns (1)–(3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets. In Columns (4)–(6), the dependent variable is net income to total assets (NI). Columns (1) and (4) repeat our main estimates, while the other columns show the results from 2SLS estimations. The instruments are constructed as leave-one-out measures, where the employees of the firm are excluded from the calculation of the average rate in their municipality of residence, and these rates are averaged at the firm level using weights equal to the firm workforce residing in each municipality. The instruments used in Columns (2) and (5) based on municpality-level CRP rates, while those used in Columns (3) and (6) are based on municipality-level hospitalizations rates for influenza and pneumonia. Panel A presents our baseline specification. In Panel B, we add an indicator for firm size below the median of the FTE distribution and its interaction with the CRP rate. In addition to instrumenting for the CRP rate, we also instrument for this interaction term with the interaction between the instrument indicated in the column and the indicator for firm size below the median. In Panel C, we use terciles of the distribution of full-time equivalent (FTE) to define firm size categories. The resulting categories are as follows: *Small firms* with more than 10 but less than 16 FTE and *Medium-sized firms* with between 16 and 32 FTE. We include indicators that identify firms in these categories, and their interactions with the CRP rate. Similar to Panel B, we instrument for the main effect of the CRP rate and for the interaction terms with the firm size indicators using the instrument indicated in the column and its interactions with the firm size indicators. All variables are winsorized at the 1% level. All specifications focus on firms with at least ten employees, use firm and year fixed effects, and include our full set of firm-level, municipality-level, and age-bucket controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA			Net Income		
	OLS	IV using CRP rate	IV using hospitalization rate	OLS	IV using CRP rate	IV using hospitalization rate
	(1)	(2)	(3)	(4)	(5)	(6)
A. Baseline specification						
CRP rate	−0.0191**	−0.0642	−0.5011	−0.0182**	−0.0546	−0.5360
	(0.0078)	(0.0441)	(1.0352)	(0.0074)	(0.0421)	(0.9686)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	187,163	187,163	187,163	187,163	187,163	187,163
R^2	0.347	0.001	−0.026	0.327	0.001	−0.034
First-stage F		3,307.1	6.2		3,307.1	6.2

Table A9 (cont.): 2SLS Estimates of The Effect of Employee Health on Firm Performance and Firm Size

	OROA			Net Income		
	OLS	IV using CRP rate	IV using hospitalization rate	OLS	IV using CRP rate	IV using hospitalization rate
	(1)	(2)	(3)	(4)	(5)	(6)
B. Firm size relative to the median						
CRP rate	0.0075	−0.0279	−0.3313	0.0120	−0.0132	−0.3441
	(0.0123)	(0.0452)	(1.0256)	(0.0114)	(0.0433)	(0.9554)
Below median × CRP rate	−0.0382***	−0.0779***	−0.0655**	−0.0435***	−0.0888***	−0.0772***
	(0.0135)	(0.0206)	(0.0288)	(0.0125)	(0.0189)	(0.0267)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.347	0.001	−0.013	0.327	0.001	−0.017
First-stage F		1,562.7	3.1		1,562.7	3.1
C. Firm size in terciles of the size distribution						
CRP rate	0.0207	−0.0201	−0.2816	0.0248*	−0.0050	−0.2777
	(0.0157)	(0.0465)	(1.0394)	(0.0145)	(0.0448)	(0.9672)
Medium-sized × CRP rate	−0.0408**	−0.0460**	−0.0804**	−0.0460***	−0.0566***	−0.0895***
	(0.0171)	(0.0233)	(0.0339)	(0.0157)	(0.0212)	(0.0311)
Small × CRP rate	−0.0512***	−0.0883***	−0.0575	−0.0541***	−0.0943***	−0.0680**
	(0.0175)	(0.0259)	(0.0354)	(0.0162)	(0.0239)	(0.0327)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.347	0.001	−0.010	0.327	0.001	−0.012
First-stage F		1,035.3	2.0		1,035.3	2.0

Table A10: The Effect of Employee Health by Labor/Capital Intensity

This table shows the effect of employee health on firm operating performance by labor/capital intensity. To measure labor intensity and capital intensity, we first compute the ratio of wages to revenues (WtR) and the ratio of total assets to revenues (AtR) for each firm in our sample. We then define an indicator, *Labor Intensive*, which takes a value of one for all firm years with above-average WtR and below-average AtR ratios. Similarly, we define *Capital Intensive*, an indicator that takes a value of one for all firm years with below-average WtR and above-average AtR ratios. In Columns (1)–(3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets, and in Columns (4)–(6), it is net income to total assets (NI). All variables are winsorized at the 1% level. All specifications focus on firms with at least ten employees and include firm and year fixed effects, age dummies for every five-year bin of firm age, and our full set of firm-level and municipality-level controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA			Net Income		
	(1)	(2)	(3)	(4)	(5)	(6)
CRP rate	0.0005	−0.0205**	−0.0004	−0.0035	−0.0198***	−0.0052
	(0.0086)	(0.0080)	(0.0089)	(0.0081)	(0.0076)	(0.0085)
Labor Intensive	0.0072***		0.0074***	0.0016		0.0017
	(0.0021)		(0.0021)	(0.0020)		(0.0020)
Labor Intensive × CRP rate	−0.0435***		−0.0423***	−0.0328***		−0.0307**
	(0.0128)		(0.0131)	(0.0119)		(0.0121)
Capital Intensive		0.0036	0.0057**		0.0062**	0.0073***
		(0.0027)	(0.0027)		(0.0025)	(0.0025)
Capital Intensive × CRP rate		0.0245	0.0075		0.0272*	0.0146
		(0.0171)	(0.0173)		(0.0164)	(0.0166)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.347	0.347	0.347	0.327	0.327	0.327

Table A11: The Effect of Employee Health by Financial Flexibility

This table shows the effect of employee health on firm operating performance by level of financial flexibility. In Panel A, the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets, and in Panel B, it is net income to total assets (NI). We construct the measure of financial constraint proposed by Schauer et al. (2019) and define a firm as financially constrained or unconstrained if its measure lies above or below a certain percentile in the yearly distribution of the financial constraint measure, respectively. We include an indicator for financially unconstrained firms and its interactions with the CRP rate (so that the baseline estimate for the CRP rate represents the effect for financially constrained firms), and we vary the threshold for financially-constrained firms between the 50^{th} and the 90^{th} percentile in increments of 5 percentage points. All variables are winsorized at the 1% level. All specifications focus on firms with at least ten employees and include firm and year fixed effects, age dummies for every five-year bin of firm age, and our full set of firm-level and municipality-level controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Percentile of the distribution of financial constraint measure								
	less constrained								more constrained
	50	55	60	65	70	75	80	85	90
	Panel A: OROA								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CRP rate	−0.0197**	−0.0251***	−0.0264***	−0.0293***	−0.0377***	−0.0463***	−0.0470***	−0.0533***	−0.0650***
	(0.0090)	(0.0093)	(0.0097)	(0.0102)	(0.0109)	(0.0119)	(0.0131)	(0.0150)	(0.0181)
CRP rate × Unconstrained firm	0.0036	0.0139	0.0144	0.0187*	0.0294***	0.0399***	0.0379***	0.0431***	0.0542***
	(0.0103)	(0.0102)	(0.0102)	(0.0105)	(0.0109)	(0.0117)	(0.0128)	(0.0145)	(0.0176)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.353	0.353	0.352	0.352	0.351	0.351	0.350	0.349	0.348
	Panel B: Net Income								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CRP rate	−0.0235***	−0.0286***	−0.0298***	−0.0339***	−0.0428***	−0.0503***	−0.0534***	−0.0602***	−0.0731***
	(0.0085)	(0.0089)	(0.0093)	(0.0098)	(0.0105)	(0.0113)	(0.0126)	(0.0144)	(0.0174)
CRP rate × Unconstrained firm	0.0142	0.0229**	0.0224**	0.0280***	0.0388***	0.0469***	0.0477***	0.0529***	0.0648***
	(0.0097)	(0.0097)	(0.0097)	(0.0099)	(0.0104)	(0.0111)	(0.0123)	(0.0140)	(0.0169)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.333	0.333	0.333	0.332	0.332	0.331	0.331	0.330	0.329

Table A12: The Effect of Employee Health on Firm Performance and Firm Size

This table shows that the effect of employee health on firm operating performance depends on firm size. In Columns (1) and (2), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets. In Columns (3) and (4), the dependent variable is net income to total assets (NI). We use terciles of the distribution of full-time equivalent (FTE) to define firm size categories. The resulting categories are as follows: *Small firms* with more than 10 but less than 16 FTE and *Medium-sized firms* with between 16 and 32 FTE. We include indicators that identify firms in these categories, and their interactions with the CRP rate, as shown in the table. All variables are winsorized at the 1% level. All specifications focus on firms with at least ten employees, use firm and year fixed effects, and include our full set of firm-level, municipality-level, and age-bucket controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA		Net Income	
	(1)	(2)	(3)	(4)
CRP rate	0.0071	0.0207	0.0117	0.0248*
	(0.0123)	(0.0157)	(0.0114)	(0.0145)
Below median	−0.0098***		−0.0105***	
	(0.0024)		(0.0023)	
Below median × CRP rate	−0.0377***		−0.0431***	
	(0.0135)		(0.0125)	
Medium-sized		−0.0015		−0.0030
		(0.0028)		(0.0026)
Medium-sized × CRP rate		−0.0408**		−0.0460***
		(0.0171)		(0.0157)
Small		−0.0100***		−0.0135***
		(0.0034)		(0.0031)
Small × CRP rate		−0.0512***		−0.0541***
		(0.0175)		(0.0162)
Controls	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917
R^2	0.347	0.347	0.327	0.327

Table A13: The Effect of Employee Health on Firm Profits: Employees at Bigger vs. Smaller Establishments Locations
This table shows the effect of employee health on firm profits. We focus on firms with two or more establishments and differentiate between employees working at bigger (above median number of employees) vs. smaller establishments, measured at the firm-year level. In Columns (1) - (3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets, and in Columns (4) - (6), it is net income to total assets (NI). To measure employee health, we examine the number of CRP tests performed on the employees and their families during the flu season, at the establishment level (CRP rate). All specifications use firm and year fixed effects, and include our full set of firm-level, municipality-level, and age bucket controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA			Net Income		
	(1)	(2)	(3)	(4)	(5)	(6)
CRP rate bigger establishments	−0.1092**		−0.1094**	−0.1144***		−0.1147***
	(0.0458)		(0.0457)	(0.0439)		(0.0439)
CRP rate smaller establishments		−0.0519**	−0.0520**		−0.0588**	−0.0590**
		(0.0243)	(0.0243)		(0.0248)	(0.0247)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	6,593	6,593	6,593	6,593	6,593	6,593
R^2	0.459	0.459	0.459	0.426	0.426	0.426

Table A14: Measuring the Effect on Small Establishments of Large Firms

This table compares the effect of employee health on establishment operating performance between similarly sized *small* establishments owned by firms of *different sizes*. The dependent variable is *Profit per employee*, the ratio of establishment gross profit to the full-time employee equivalent of the establishment. To measure employee health, we examine the CRP rate among employees and their families during the flu season. We define large firms as indicated by the row *Firm cutoff: above*, where full-time employment exceeds the 75^{th} percentile of its distribution or an absolute value of 100, respectively. Establishments of these firms are identified with the *in-large* indicator, which we interact with the CRP rate. We restrict the sample to include small establishments as indicated by the row *Establishment cutoff: below*, where establishment employment lies below the 50^{th} percentile, the 25^{th} percentile, or an absolute value of 15, respectively. The interaction term between the CRP rate and the in-large indicator isolates the effect of a health shock on small establishments that are part of a larger firm. Control variables are described in Table 3. All variables are winsorized at the 1% level. Clustered (establishment) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Profit per employee		
Firm cutoff: above	75^{th} FTE pctl.	75^{th} FTE pctl.	100 FTE
Establishment cutoff: below	50^{th} FTE pctl.	25^{th} FTE pctl.	15 FTE
	(1)	(2)	(3)
CRP rate	-0.1048^{*}	-0.2167^{**}	-0.1317
	(0.0557)	(0.1023)	(0.0882)
CRP rate × in-large	0.0324	0.1807	0.0805
	(0.0744)	(0.1184)	(0.1027)
Controls	Yes	Yes	Yes
Fixed effects	Firm x year	Firm x year	Firm x year
N	16,352	6,922	9,446
R^2	0.818	0.813	0.828

Table A15: The Effect of Employee Health on Establishment-Level Performance: Employees at Non-Headquarters
This table shows the effect of employee health on establishment operating performance. We focus on employees not located at headquarters. The dependent variable is *Profit per employee*, the ratio of establishment gross profit (in DKK) to the full-time employee equivalent of the establishment. To measure employee health, we examine the number of CRP tests performed on the employees and their families during the flu season, at the establishment level. Establishment and local controls on the municipality level include *Size*, the natural logarithm of the lagged value of the full-time employee equivalent of the establishment; *Population density* and *Unemployment rate*, the population density of, and unemployment rate in the establishment's municipality, respectively. All variables are winsorized at the 1% level. In Column (1), we include firm and year fixed effects. In Columns (2)–(5), we use firm-year fixed effects instead of firm and year fixed effects. In Columns (4) and (5), we add establishment-level age fixed effects for every five-year bin of establishment age. Clustered (establishment) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Profit per employee				
	(1)	(2)	(3)	(4)	(5)
CRP tests	−0.0738*	−0.0682*	−0.0908**	−0.0744*	−0.0889**
	(0.0427)	(0.0404)	(0.0384)	(0.0394)	(0.0381)
Size				0.0044	0.0058
				(0.0064)	(0.0063)
Municipality density				−0.0031	
				(0.0029)	
Unemployment rate				0.1518	
				(0.3470)	
Controls	No	No	No	Yes	Yes
Fixed effects	Firm and year	Firm x year	Firm x year and muni x year	Firm x year	Firm x year and muni x year
N	32,245	32,245	32,245	32,245	32,245
R^2	0.715	0.833	0.833	0.833	0.834

Table A16: The Effect of Employee Health on Firm Profits: Employees at Headquarters vs. Non-Headquarter Establishments
This table shows the effect of employee health on firm profits. In Columns (1)–(3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets, and in Columns (4)–(6), it is net income to total assets (NI). To measure employee health, we separate CRP rates for employees working at the headquarters and for employees working at all other establishments of the firm. All specifications focus on firms with at least two establishments, use firm and year fixed effects, and include our full set of firm-level, municipality-level, and age bucket controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA			Net Income		
	(1)	(2)	(3)	(4)	(5)	(6)
CRP tests at HQ location	−0.0521		−0.0431	−0.0614		−0.0525
	(0.0404)		(0.0404)	(0.0402)		(0.0401)
CRP tests at non-HQ locations		−0.1023***	−0.0994***		−0.1025***	−0.0990***
		(0.0370)	(0.0371)		(0.0353)	(0.0353)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	6,615	6,615	6,615	6,615	6,615	6,615
R^2	0.458	0.459	0.459	0.426	0.427	0.427

Table A17: The Effect of Employee Health on Firm Profits: Rank-and-File Workers vs. Top Earners

This table shows the effect of employee health on firm performance. In Columns (1)–(3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets, and in Columns (4)–(6), it is net income to total assets (NI). To measure employee health, we use the CRP test rate during the flu season and construct separate measures for rank-and-file employees and the firm's highest-paid employees. This distinction allows us to separate health shocks affecting the broader workforce from those affecting higher-paid, potentially managerial employees. All specifications focus on firms with at least ten employees and include firm and year fixed effects, age dummies for every five-year bin of firm age, and our full set of firm-level and municipality-level controls. Standard errors are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA			Net Income		
	(1)	(2)	(3)	(4)	(5)	(6)
CRP tests of rank-and-file employees	-0.0151**		-0.0142**	-0.0146**		-0.0137**
	(0.0066)		(0.0066)	(0.0063)		(0.0063)
CRP tests of top-5 employees		-0.0088**	-0.0083**		-0.0087**	-0.0082**
		(0.0040)	(0.0040)		(0.0038)	(0.0038)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.347	0.347	0.347	0.327	0.327	0.327

Table A18: The Effect of Employee Health on Establishment-Level Performance: Rank-and-File Employees vs. Top-5 Employees

This table shows the effect of employee health on establishment operating performance. We focus on employees not located at headquarters. The dependent variable is *Profit per employee*, the ratio of establishment gross profit (in DKK) to the full-time employee equivalent of the establishment. To measure employee health, we examine the number of CRP tests performed on employees and their families during the flu season (CRP rate), where we differentiate between the CRP tests performed on rank-and-file-employees and their families, as well as those of the top-5 employees of firms. Establishment and local and controls on the municipality level include *Size*, the natural logarithm of the lagged value of the full-time employee equivalent of the establishment; *Population density* and *Unemployment rate*, the population density of, and unemployment rate in the establishment's municipality, respectively. All variables are winsorized at the 1% level. Firm-year fixed effects, and establishment-level age fixed effects for every five-year bin of establishment age, are included. Clustered (establishment) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Profit per employee		
	(1)	(2)	(3)
CRP rate of rank-and-file employees		−0.0769**	−0.0776**
		(0.0343)	(0.0347)
CRP rate of top-5 employees	0.0060		0.0076
	(0.0177)		(0.0179)
Controls	Yes	Yes	Yes
Fixed effects	Firm x year	Firm x year	Firm x year
N	49,842	49,842	49,842
R^2	0.826	0.826	0.826

Table A19: Distribution of Estimated Vaccine Efficacy Ratio

This table shows the distribution of the estimated vaccine efficacy ratio based on Equation (4). Panel A presents the measure at the firm-year level and Panel B at the firm level. In both cases, we describe the distribution in the full sample and by size, for small and medium-sized firms. Column (1) lists the mean, and Columns (2)–(5) selected percentiles. Finally, Column (6) shows the percentage of firm-years (Panel A) or of firms (Panel B) with an estimated vaccine efficacy ratio below 40%.

	Distribution of vaccine efficacy ratio					Percent lower than 40%
	Mean	Percentile				
		50^{th}	75^{th}	90^{th}	95^{th}	
	(1)	(2)	(3)	(4)	(5)	(6)
A. Vaccine efficacy ratio, firm-year level						
Full sample	39.04	17.58	45.00	100.00	108.89	72.57
Firm size:						
Small	30.65	12.79	37.04	100.00	100.00	76.34
Medium-sized	37.96	17.29	43.92	100.00	106.91	76.34
B. Vaccine efficacy ratio, firm level						
Full sample	44.53	30.85	56.96	89.06	109.74	60.92
Firm size:						
Small	32.43	21.12	47.67	76.63	100.00	69.60
Medium-sized	43.57	25.98	54.70	97.97	109.41	64.94

Table A20: The Effect of Employee Health by Industry

This table shows the effect of employee health on firm operating performance by industry. We focus on wholesale/retail and manufacturing/construction industries. To identify these industries, we define an indicator, *Wholesale/Retail*, which takes a value of one for all firms with a NACE 2.0 industry classification between 45 and 47. Similarly, *Manufact/Construct* is an indicator that takes a value of one for all firms with a NACE 2.0 industry classification between 10 and 33, and between 41 and 43. In Columns (1)–(3), the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets, and in Columns (4)–(6), it is net income to total assets (NI). All variables are winsorized at the 1% level. All specifications focus on firms with at least ten employees and include firm and year fixed effects, age dummies for every five-year bin of firm age, and our full set of firm-level and municipality-level controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	OROA			Net Income		
	(1)	(2)	(3)	(4)	(5)	(6)
CRP rate	−0.0294***	0.0114	0.0171	−0.0271***	0.0079	0.0128
	(0.0092)	(0.0099)	(0.0165)	(0.0087)	(0.0094)	(0.0158)
Wholesale/Retail	−0.0084		−0.0120	−0.0056		−0.0096
	(0.0063)		(0.0100)	(0.0060)		(0.0095)
Wholesale/Retail × CRP rate	0.0375***		−0.0109	0.0323***		−0.0092
	(0.0132)		(0.0195)	(0.0122)		(0.0183)
Manufacturing/Construction		0.0033	−0.0044		0.0012	−0.0050
		(0.0055)	(0.0087)		(0.0051)	(0.0082)
Manufacturing/Construction × CRP rate		−0.0638***	−0.0696***		−0.0547***	−0.0598***
		(0.0135)	(0.0193)		(0.0125)	(0.0182)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,917	183,917	183,917	183,917	183,917	183,917
R^2	0.347	0.347	0.347	0.327	0.327	0.327

Table A21: Workforce Characteristics and the Effect of Employee Health on Firm Performance
This table shows how the effect of employee health on firm operating performance varies with workforce characteristics. In Panel A, the dependent variable is operating return on assets (OROA), the ratio of operating income to total assets. In Panel B, it is net income to total assets (NI). To measure the differential effect of workforce characteristics on employee health, we examine subgroups of employees with similar characteristics and separately calculate the CRP rate among these employees and their families during the flu season. All variables are winsorized at the 1% level and all specifications focus on firms with at least ten employees, use firm, year, and industry fixed effects, and include our full set of firm-level, municipality-level, and age-bucket controls. We further include the fraction of employees of the respective subgroups as additional controls. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

CRP rate among:	Panel A: OROA					
	(1)	(2)	(3)	(4)	(5)	(6)
Low salary employees	−0.0118***					
	(0.0043)					
Medium salary employees	−0.0028					
	(0.0060)					
High salary employees	−0.0063					
	(0.0044)					
Employees in low skill occ.		−0.0096**				
		(0.0048)				
Employees in high skill occ.		−0.0012				
		(0.0047)				
Employees w/o college			−0.0133			
			(0.0084)			
Employees w/ college			−0.0002			
			(0.0034)			
≤34 yrs old employees				−0.0021		
				(0.0047)		
35–54 yrs old employees				−0.0119**		
				(0.0060)		
55+ yrs old employees				0.0015		
				(0.0025)		
Employees w/ kids					−0.0040	
					(0.0050)	
Employees w/o kids					−0.0166***	
					(0.0064)	
Rank-and-file employees						−0.0138*
						(0.0071)
Top-5 employees						−0.0080*
						(0.0043)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm, year, and industry	Firm, year, and industry	Firm, year, and industry	Firm, year, and industry	Firm, year, and industry	Firm, year, and industry
N	173,385	173,385	173,385	173,385	173,385	173,385
R^2	0.350	0.350	0.350	0.350	0.350	0.350

Table A21 (cont.): Workforce Characteristics and the Effect of Employee Health on Firm Performance

CRP rate among:	Panel B: Net Income					
	(1)	(2)	(3)	(4)	(5)	(6)
Low salary employees	−0.0112***					
	(0.0041)					
Medium salary employees	−0.0022					
	(0.0057)					
High salary employees	−0.0072*					
	(0.0042)					
Employees in low skill occ.		−0.0084*				
		(0.0045)				
Employees in high skill occ.		−0.0006				
		(0.0044)				
Employees w/o college			−0.0132*			
			(0.0079)			
Employees w/ college			−0.0001			
			(0.0032)			
≤34 yrs old employees				−0.0008		
				(0.0045)		
35–54 yrs old employees				−0.0137**		
				(0.0056)		
55+ yrs old employees				0.0013		
				(0.0024)		
Employees w/ kids					−0.0021	
					(0.0048)	
Employees w/o kids					−0.0164***	
					(0.0061)	
Rank-and-file employees						−0.0129*
						(0.0068)
Top-5 employees						−0.0085**
						(0.0041)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm, year, and industry	Firm, year, and industry	Firm, year, and industry	Firm, year, and industry	Firm, year, and industry	Firm, year, and industry
N	173,385	173,385	173,385	173,385	173,385	173,385
R^2	0.330	0.330	0.330	0.330	0.330	0.330

Table A22: The Effect of Employee Health on Workforce and Firm Owners

This table shows how employee health affects the firm's workforce and owners. Columns (1) to (3) present results for workers. We measure worker outcomes in several ways. The ratio of log sales over the number of employees is our measure of productivity. We capture total workforce size and salaries with the natural logarithm of full-time equivalent employment and the natural logarithm of average yearly wages. In Column (4), the dependent variable is a dummy variable that is equal to one if a firm has expenses for temporary employment, and zero otherwise. In Column (5), the dependent variable, Cash, is the ratio of cash holdings to total assets, and in Column (6), Dividends is the ratio of dividends to total assets. We use terciles of the distribution of full-time equivalent (FTE) to define firm size categories. The resulting categories are as follows: *Small firms* with more than 10 but less than 16 FTE; *Medium-sized firms* with between 16 and 32 FTE; *Large firms*, with more than 32 FTE. All variables are winsorized at the 1% level. Clustered (firm) standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Worker			Firm		Owner
	Productivity (1)	Employment (2)	Wages (3)	Temp. Labor Dummy (4)	Cash (5)	Dividends (6)
CRP rate × Large	0.2349***	0.1576***	0.0844***	−0.1557***	−0.0252***	0.0100
	(0.0326)	(0.0313)	(0.0180)	(0.0453)	(0.0090)	(0.0065)
CRP rate × Medium-sized	0.0158	−0.0037	−0.0022	0.0333	0.0076	−0.0035
	(0.0232)	(0.0148)	(0.0125)	(0.0341)	(0.0060)	(0.0044)
CRP rate × Small	−0.0879***	−0.0249**	−0.0196*	0.0724**	−0.0012	−0.0107***
	(0.0206)	(0.0106)	(0.0111)	(0.0290)	(0.0051)	(0.0037)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year	Firm and year
N	183,802	183,918	183,043	183,918	183,917	183,917
R^2	0.848	0.951	0.875	0.151	0.442	0.324