Online Appendix to:
Hours Constraints and Wage Differentials across Firms

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Abstract

Although constraints on hours worked at the firm-level are viewed as an important determinant of firm wages, little direct evidence exists to support this view. In this paper, we use linked employer-employee data on hours worked in Denmark to measure hours constraints and to investigate how these constraints relate to firm wages. We show that firms with stricter constraints pay higher firm-specific wages and that these premiums are concentrated in more productive firms. Starting from these findings we discuss a framework in which hours constraints are motivated by the productivity gains derived from having a more cooperative production process, leading more productive firms to constrain hours and to pay compensating wage differentials.

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A Data construction and further empirical results

In this section we provide further details of the data construction and empirical results. Since some of the details that are behind our data work and institutional setting are already described in Labanca and Pozzoli (2022), in what follows we focus only on those aspects that are new. We refer to the Online Appendix of Labanca and Pozzoli (2022) for all the other details.

A.1 Measures of firm productivity

We base our analysis on two measures firm productivity: valued added per worker and total factor productivity (TFP). In what follows we describe each measure in details.

A.1.1 Value added per worker

We obtain value added based on the information contained in accounting data and the definition provided by Statistics Denmark. This definition varies over the years of interest to account for changes in the accounting standards that occurred in that period. Specifically, from 2002 to 2003, the value added is calculated as

$$(OMS + AUER + ADR + DLG) -$$
$$(KRH + KENE + KLOE + UDHL + UASI + UDVB + ULOL + EKUD + SEUD)$$

where OMS stands for total sales, AUER is the value of work performed for one's own purposes and capitalized as a part of fixed assets, ADR represents other non-operating income (such as interest payments), DLG measures inventories, KRH consists of purchases of raw materials, finished goods and packaging (excluding electricity), KENE denotes energy purchases, KLOE represents labor costs, UDHL measures rents, UASI represents losses on small inventories, UDVB denotes the costs of hiring workers from other companies (such as temporary agency employment), ULOL measures leasing costs, EKUD represents other external costs (a part from secondary costs), and SEUD measures secondary costs.

From 2004 to 2011, the valued added is calculated as

$$(OMS + AUER + ADR + DLG)-$$
$$(KVV + KRHE + KENE + KLOE + UASI + UDHL + UDVB + ULOL + EKUD + SEUD)$$

where KVV is the purchase of goods for resale, while KRHE consists of purchases of raw materials, finished goods and packaging (excluding electricity).

A.1.2 Total factor productivity

Total factor productivity (TFP) is obtained from a Cobb-Douglas production function:

$$y_{it} = \beta_0 + \beta_l \, \ell_{it} + \beta_k \, k_{it} + v_{it} + \varepsilon_{it} \tag{A.1}$$

where y is log value added, ℓ is the log number of full-time employees and k is the log of physical capital in firm i at time t. We assume that the error component ε_{it} cannot be observed or predicted by firms, while the productivity shock v_{it} is assumed to follow a Markov process so that $p\left(v_{it+1} \mid I_{it}\right) = p\left(v_{it+1} \mid v_{it}\right)$, where I_{it} - the information held by a firm at time t- includes the realization of v_i up to t (Olley and Pakes, 1996). This assumption implies that

$$v_{it} = g(v_{it-1}) + \xi_{it} \tag{A.2}$$

where $E\left[\xi_{it} \mid I_{it}\right] = 0$ by construction. We assume that capital at t is a function of capital and investments at $t-1$: $k_{it} = \kappa\left(k_{it-1}, i_{it-1}\right)$, while labor is chosen after $t-1$. Furthermore, following Ackerberg et al. (2015) (henceforth ACF), we assume that labor is part of the demand of intermediate inputs (m_{it}):[1]

$$m_{it} = f(k_{it}, v_{it}, \ell_{it}) \tag{A.3}$$

As in other studies, we assume that $f()$ is strictly increasing in v_{it} so that

$$v_{it} = f^{-1}(k_{it}, m_{it}, \ell_{it}) \tag{A.4}$$

and replacing this equation in (A.1), we have

$$y_{ijt} = \beta_0 + \beta_l \, \ell_{it} + \beta_k \, k_{it} + f^{-1}(k_{it}, m_{it}, \ell_{it}) + \varepsilon_{it} = \Phi_{it}(k_{it}, \, \ell_{it}, m_{it}) + \varepsilon_{it} \tag{A.5}$$

As in ACF we use the following moment condition to obtain an estimate of Φ_{it} ($\hat{\Phi}_{it}$) through GMM:

$$E\left[\varepsilon_{it} \mid I_{it}\right] = E\left[y_{it} - \Phi_{it}(k_{it}, \, \ell_{it}, m_{it}) \mid I_{it}\right] = 0 \tag{A.6}$$

[1] The value of intermediate inputs is given by the sum of the value of raw materials, consumables, finished goods and packaging excluding purchase of energy and energy purchases.

Then, we estimate β_0, β_l and β_k through GMM from the following moment condition:

$$E\left[\varepsilon_{it} + \xi_{it} \mid I_{it-1}\right] =$$
$$E\left[y_{it} - \beta_0 - \beta_l\,\ell_{it} - \beta_k\,k_{it} - g\left(\Phi_{it}(k_{it-1},\,\ell_{it-1}, m_{it-1}) - \beta_0 - \beta_l\,\ell_{it-1} - \beta_k\,k_{it-1}\right) \mid I_{it-1}\right] = 0 \tag{A.7}$$

Finally, TFP is derived as

$$TFP_{it} = \hat{\Phi}_{it} - \hat{\beta}_l\,\ell_{it} - \hat{\beta}_k k_{it} \tag{A.8}$$

In practice, we proxy for $f^{-1}()$ using a 4th order polynomial function of k, ℓ, m and a full set of interactions among these terms, while $g()$ is assumed to be a quadratic function of v_{it-1}.

A.2 Within and between variation in desired hours

In order to assess whether tastes on working hours are more homogenous between than within skill groups, we compare the variability of desired hours between and within skill groups.

We do so based on different measures. First, we use the standard deviation of mean desired hours across skill groups within an industry to measure the variability of these preferences between skill groups. We compare this to the average standard deviation of the desired hours within skill groups in an industry, which is used as a measure of variability of preferences within skill groups. Second, we use the 90th to 10th percentile ratio of average desired hours across skill groups in an industry. We compare this to the average 90th to 10th percentile ratio of desired hours within skill groups in an industry. Finally, following the same procedure we compare the 50th to 10th percentile ratio between and within skill groups. In Labanca and Pozzoli (2022) we perform a similar analysis based only on full-time workers. We refer to the Online Appendix B.2 of that paper for the details of the data construction.

Table 1 reports the results of this analysis and shows that, independently of the measures of variability or skills used for this analysis, desired hours are more homogenous (i.e. less volatile) within the skill groups than across them.

A.3 AKM-based measure of heterogeneity in hours' preferences

In order to control for the sorting of individuals across firms based on hours preferences in equation (1), we first estimate an AKM model using hours as the dependent variable. The estimating equation takes the following form:

$$ln\,\mathrm{h_{ijt}} = \alpha_i^h + \psi_{j(i,t)}^h + \beta_1\, X_{ijt} + r_{ijt} \tag{A.9}$$

where $\mathrm{h_{ijt}}$ is the number of annual hours worked by individual i at firm j in year t. X_{ijt} is a vector of time-varying controls, while $\psi_{j(i,t)}^h$ controls for firm fixed effects.[2] The variable of primary interest for us is the individual fixed effect, α_i^h, that measures the fixed component of hours worked specific to individual i once we control for firm fixed effects and time varying characteristics. We estimate equation (A.9) using the methodology developed by Abowd et al. (2002) (see Table D.11 for a summary of this estimation). We interpret α_i^h as a proxy of individual preferences on hours worked, once we control for the employer-specific effects on hours.

Then, we measure differences in hours' preferences across coworkers using the standard deviation of the individual component of hours across skill groups in a firm:

$$\sigma_{jt}^h = \left[\frac{1}{S_{jt}}\sum_{s=1}^{S_{jt}}\left(\tilde{\alpha}_{ijt}^h - \mu_{jt}\right)^2\right]^{1/2}, \tilde{\alpha}_{sjt}^h = \frac{1}{N_{sjt}}\sum_{i=1}^{N_{sjt}}\hat{\alpha}_{i(sjt)}^h \tag{A.10}$$

where $\hat{\alpha}_{i(sjt)}^h$ is the individual fixed effect obtained from equation (A.9) for employee i who is employed at firm j and belongs to skill group s in year t; $\tilde{\alpha}_{sjt}^h$ is the average of $\hat{\alpha}_{i(sjt)}^h$ across workers in sjt, and μ_{jt} is the average of $\tilde{\alpha}_{sjt}^h$ across skill groups in firm-year jt. Finally, N_{sjt} and S_{jt} are the number of workers in sjt and the number of skill groups in jt, respectively. We use the same definition of skill groups as in the measure of hours constraints (see Section 4.3 of the main paper).

We interpret a low value of this standard deviation as indicating that coworkers in different

[2]We include in X_{ijt} the same set of controls that we use for the estimation of equation (2). See footnote 6 in the main paper for details.

skill groups have similar preferences on hours, which in turn implies that the degree of sorting based on preferred hours is high. In contrast, a high value of this standard deviation indicates that preferred hours are heterogenous among coworkers, which implies that the degree of sorting based on preferences is low. For consistency with the other variables, in equation (1) we use the average of σ^h_{jt} over the years 2003-2011.

B Conceptual framework

In this section, we propose a model in which firms endogenously choose whether to restrict the range of hours available to their employees in exchange for productivity gains. Then, we examine how this choice affects wages.

B.1 Workers

We assume that there are two types i of workers, namely, N_H workers with high skill ($i = H$) and N_L workers with low skill ($i = L$). Workers have preferences over a continuum of consumption goods $\omega \in \Omega$ and leisure ℓ_i of the following type (Dixit and Stiglitz, 1977; Prescott, 2004):

$$U\left(Q_i, \ell_i\right) = \log\left[\int_{\omega\in\Omega} q_i(\omega)^{\frac{\sigma-1}{\sigma}}\, d\omega\right]^{\frac{\sigma}{\sigma-1}} + \eta\, v\left(\ell_i\right), \tag{A.11}$$

where $(Q_i)^{(\sigma-1)/\sigma} \equiv \int_{\omega\in\mathbf{\Omega}} q_i(\omega)^{(\sigma-1)/\sigma} \mathrm{d}\omega$ is the (exponentiated) consumption index for a worker of skill i, and $\sigma > 1$ is the elasticity of substitution between any two goods. We assume that the taste parameter η is positive and that the utility of leisure $v(\ell_i)$ is increasing and concave with $v'(\ell_i) > 0$ and $v''(\ell_i) < 0$.

Workers can take employment in either the non-constrained or constrained labor market. In the non-constrained labor market, workers face equilibrium wages w^*_i and pick their optimal hours $h^*_i = 1-\ell^*_i$, allowing for an optimal consumption level Q^*_i with individual product demand $q^*_i(\omega)$, and resulting in a utility level $U^*_i \equiv U(Q^*_i, h^*_i)$ (see details in the Online Appendix B.7.1).

By contrast, workers employed in the constrained labor market must work for a prescribed number of hours $\hat{h}$ regardless of their skill level. In the constrained market, firms offer skill-specific hourly wages $\hat{\mathrm{w}}_H$ and $\hat{\mathrm{w}}_L$ that are discussed in the next subsection. Workers in this segment consume $\hat{Q}_i$ and $\hat{q}_i(\omega)$, resulting in utility $\hat{U}_i \equiv U(\hat{Q}_i, \hat{h}_i)$. The overall labor market for each skill group clears such that $N_i^* + \hat{N}_i = N_i$ for equilibrium wages w_i^* and $\hat{\mathrm{w}}_i$.

B.2 The wage-hour function

We assume perfect worker mobility between firms in the non-constrained and constrained segments of the labor market. One implication of this assumption is that, in equilibrium, a constrained labor market can co-exist with a non-constrained labor market only if workers are indifferent between employment in the two market segments. The indifference condition for each type-i worker between the constrained and non-constrained labor market segments is

$$U\left(\frac{\hat{\mathrm{w}}_\mathrm{i}}{P}\,\hat{h} + \frac{\bar{\pi}}{P}, \hat{h}\right) = U\left(\frac{\mathrm{w}_\mathrm{i}^*}{P}\,h_i^* + \frac{\bar{\pi}}{P}, h_i^*\right), \tag{A.12}$$

where $P^{\sigma-1} \equiv \int_{\omega\in\mathbf{\Omega}} p(\omega)^{-(\sigma-1)}\,\mathrm{d}\omega$ is the (exponentiated) price index, and $\bar{\pi} \equiv \int_{\omega\in\mathbf{\Omega}} \pi(\omega)\mathrm{d}\omega/(N_H + N_L)$ represents the equal distribution of firm profits as dividends. This condition implicitly defines the wage rates $\hat{\mathrm{w}}_i$ for each type-i worker as a function of the hours worked $\hat{h}$. We refer to this function $\hat{\mathrm{w}}_i(\hat{h})$, which has $\mathrm{w_i}^*$ as a parameter, as the *wage-hour function.*[3]

Regarding the properties of this function, under standard regularity conditions on the shape of the utility function, it can be shown that $\hat{\mathrm{w}}_i'(\hat{h}) < 0$ if $\hat{h} < h_i^*$. In this case, a marginal increase in $\hat{h}$ shortens the distance between $\hat{h}$ and h_i^*, thus requiring less extra compensation to make the worker indifferent between working $\hat{h}$ and working h_i^*. Similarly, $\hat{\mathrm{w}}_i'(\hat{h}) > 0$ if $\hat{h} > h_i^*$, whereas if $\hat{h} = h_i^*$, no extra compensation is needed, and thus, $\hat{\mathrm{w}}_i'(\hat{h}) = 0$. Additionally, it can be shown that $\hat{\mathrm{w}}''(\hat{h}) > 0$ (Online Appendix B.7.2). Therefore, the resulting wage-hour function is U-shaped, with its minimum at the equilibrium wage w_i^*, where hours $\hat{h} = h_i^*$.[4]

The economic insight behind this function is that firms in the constrained market need to offer higher wages to both skill groups when the constrained hours differ from the optimal hours.

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[3] The concept of a wage-hour function of the type described here is not new in the literature; see, for instance, Abowd and Ashenfelter (1981); Altonji and Paxson (1988).

[4] As we show in Online Appendix B.7.2, there are conditions on the curvature of the leisure preferences or economy-wide productivity that ensure that $\hat{\mathrm{w}}''(\hat{h})$ is positive.

B.3 Firms

There is a continuum of firms in which each firm produces a different variety ω of consumption goods under monopolistic competition. Every firm produces with a constant-returns-to-scale technology $q(\omega) = \gamma\,\phi\,G(n_H h_H, n_L h_L)$, where ϕ is a productivity parameter that differs from firm to firm under some probability distribution (similar to Melitz, 2003), γ is a Hicks neutral productivity shifter that varies with hours constraints, and $G(\cdot,\cdot)$ is the production function. The firm employs n_H high-skilled and n_L low-skilled workers.

In what follows, we denote by $G_H(\cdot,\cdot)$ the first derivative of $G(\cdot,\cdot)$ with respect to its argument $(n_H h_H)$ and by $G_L(\cdot,\cdot)$ the first derivative with respect to $(n_L h_L)$. For simplicity, we do not allow for market entry (Chaney, 2008). However, firms can choose whether to operate in the non-constrained or in the constrained labor market. In the non-constrained labor market, $\gamma = 1$, such that firms produce with productivity ϕ. In the constrained labor market, $\gamma = \hat{\gamma} > 1$, meaning that firms can raise their productivity to $\hat{\gamma}\phi$ but must pay a fixed cost $\hat{F}$ to impose hours constraints. The fixed costs of hours constraints can be thought of as the costs of infrastructure, such as office space, conference rooms, and scheduling software, that is needed to sustain a production in which coworkers work a similar number of hours. Consistent with this assumption, in Section 5.2 of the main paper we discuss evidence suggesting that hours constraints are associated with greater interaction among coworkers at the workplace.[5]

The assumption of higher productivity at constrained firms is consistent with the positive association between firm productivity, the degree of hours constraints and the importance of cooperation among coworkers that we observe across Danish firms (see Sections 5 of the main paper). The assumption is also in line with existing evidence from other settings of a positive association between firm productivity and the degree of cooperation among coworkers in production (see Kuhn et al., 2023), and of complementarities in working hours among coworkers obtained from structural estimations (Shao et al., 2022; Battisti et al., 2022). Modelling the increased productivity from hours constraints as an Hicks neutral productivity shifter offers a

[5] In this framework, we assume that the costs of constraining hours vary with firm size only through the wage bill and that the remaining costs are fixed. While this assumption makes the model more tractable, it comes with the limitation of ignoring the costs of constraining hours that vary with firm size and that are not captured in the wage bill.

tractable way to endogenize a firm's choice to constrain hours in a framework with heterogenous firms and workers (see Section B.6 for details).

B.4 Non-constrained labor market

In the non-constrained labor market, firms take equilibrium wages $\mathrm{w}_{\mathrm{i}}^*$ and workers' preferred hours h_i^* as given. Thus, they choose the number of high- and low-skilled workers that minimize costs, which leads to the following first-order conditions:

$$\frac{G_H(n_H^* h_H^*, n_L^* h_L^*)}{G_L(n_H^* h_H^*, n_L^* h_L^*)} = \frac{\mathrm{w}_{\mathrm{H}}^*}{\mathrm{w}_{\mathrm{L}}^*}. \tag{A.13}$$

We assume that $G_H(\cdot,\cdot) > G_L(\cdot,\cdot)$, such that $\mathrm{w}_{\mathrm{H}}^* > \mathrm{w}_{\mathrm{L}}^*$ and $h_L^* \neq h_H^*$, with $h_L^* < h_H^*$ if the substitution effect prevails and the opposite if the income effect prevails.

B.5 Constrained labor market

Firms in the constrained labor market offer contracts for a single number of hours $\hat{h}$ that workers of all skill levels must accept but offer skill-specific wages along the wage-hours function $\hat{\mathrm{w}}_i(\hat{h})$ such that each type-i worker is indifferent between employment in the constrained or non-constrained labor market. This scenario results in the following cost minimization problem:

$$\hat{C}(\omega) \equiv \min_{n_H, n_L, h} \hat{\mathrm{w}}_{\mathrm{H}}\, n_H\, h + \hat{\mathrm{w}}_{\mathrm{L}}\, n_L\, h \qquad \text{s.t.} \quad h\, G(n_H, n_L) \geq q^*(\omega)/(\hat{\gamma}\phi)$$
$$\text{and} \quad U\left(h\frac{\hat{\mathrm{w}}_i}{P} + \frac{\bar{\pi}}{P}, h\right) = U(Q_i^*, h_i^*)$$
$$\text{for } i = H, L.$$

From this, the first-order condition that implicitly defines $\hat{h}$ is (see Online Appendix B.7.3)

$$\hat{n}_H\, \hat{\mathrm{w}}_{\mathrm{H}}'(\hat{h}) \;=\; -\hat{n}_L\, \hat{\mathrm{w}}_{\mathrm{L}}'(\hat{h}). \tag{A.14}$$

Condition (A.14) has several implications. First, it implies that optimal hours $\hat{h}$ are between h_L^* and h_H^*. In fact, since $h_H^* \neq h_L^*$, $\hat{h}$ cannot be equal to either h_L^* or h_H^*. Furthermore, if $\hat{h}$ is greater than h_L^* and h_H^*, then $\hat{\mathrm{w}}'_H > 0$ and $\hat{\mathrm{w}}'_L > 0$, and thus, (A.14) cannot be satisfied. For a similar reason, $\hat{h}$ cannot be smaller than h_L^* or h_H^* to satisfy (A.14). Second, (A.14) establishes that optimal hours are such that the marginal costs of increasing hours in constrained firms equal the marginal benefits. To understand this point, let us consider the case in which high-skilled workers desire to work more than low-skilled workers ($h_H^* > h_L^*$). For any choice of constrained hours $h_L^* < \hat{h} < h_H^*$, a marginal increase in $\hat{h}$ moves them closer to h_H^*. Therefore, this situation results in lower wage premiums paid to high-skilled workers and, in turn, wage bill savings in the amount of $\hat{n}_H\, \hat{\mathrm{w}}_{\mathrm{H}}'$. However, the same increase in hours moves $\hat{h}$ further away from h_L^*, resulting in higher wages paid to low-skilled workers and therefore a higher wage bill in the amount of $\hat{n}_L\, \hat{\mathrm{w}}_{\mathrm{L}}'$. At the optimum, the savings from marginally higher hours equal the costs. Finally, (A.14) implies that $\hat{h}$ is set closer to the desired hours of the larger group of workers in the firm.[6]

Based on (A.14), both high- and low-skilled workers in constrained firms work hours that differ from their desired hours and are therefore compensated with wage premiums. We therefore have the following:

Proposition 1 *Firms that constrain work time at a common number of hours for both skill groups pay higher hourly wages than non-constrained firms, which take the supply of work hours as given.*

B.6 Endogenous market segmentation

We now establish the conditions for the existence of the constrained labor market segment in equilibrium. A firm will optimally choose to enter the constrained labor market if and only if the profits from imposing constraints on hours exceed the profits from being non-constrained. It can be shown that under the assumption of $\hat{\gamma} > \hat{\mu}/\mu^*$ where μ^* and $\hat{\mu}$ are minimized marginal production costs in the non-constrained and constrained segments, respectively, a firm with productivity ϕ will optimally choose to constrain hours if:

$$\phi > \frac{\sigma}{\sigma - 1} \frac{\hat{F}^{1/(\sigma-1)}}{E^{1/(\sigma-1)} P} \frac{\hat{\mu}}{\hat{\gamma} - \hat{\mu}/\mu^*} \equiv \hat{\phi}, \tag{A.15}$$

Intuitively, as the fixed cost $\hat{F}$ of constraining hours or the marginal cost $\hat{\mu}$ of producing in the constrained market increases, the entry threshold increases. Conversely, a less competitive

[6] A greater $\hat{n}_i$ in (A.14) raises the marginal costs of increasing $\hat{h}$ if $\hat{h} > h_i^*$ or decreases the marginal benefits of increasing $\hat{h}$ if $\hat{h} < h_i^*$, which implies that $\hat{h}$ moves closer to h_i^* as $\hat{n}_i$ increases.

market with a high overall price level P and a larger aggregate economy with higher expenditures $E(= PQ)$ facilitate entry and therefore reduce the entry threshold. The inequality would be reversed if $\hat{\gamma} < \hat{\mu}/\mu^*$, and a constrained labor market would not exist (see Online Appendix B.7.4 for more details on the derivation). Therefore, we can state the following:

Proposition 2 *If a firm's productivity premium resulting from constraining work hours is sufficiently large, $\hat{\gamma} > \hat{\mu}/\mu^*$, a constrained labor market co-exists with a non-constrained labor market. Firms with productivity above a unique threshold $\hat{\phi}$ constrain work time, whereas firms with productivity weakly below that threshold remain non-constrained.*

In the model presented in this section we abstract from the discussion of the composition of the labor force in firms that constrain versus firms that do not constrain hours. However, in Section B.7.5 we make more specific assumptions on the shape of the production functions that allow us to derive and discuss the conditions that define the optimal demand of high- and low-skill workers in the two types of firms.

Finally, it is important to mention that in the framework of this section, we do not specifically model the sorting of workers across firms based on hours preferences. In reality, workers with preferences for longer hours may sort into hours-intensive firms, and vice versa. However, to the extent that perfect sorting can be ruled out – as is the case if there exists a continuum of workers' preferences and only a limited number of firms – the predictions of the model would still be valid.

B.7 Supplementary derivations of the theoretical model

B.7.1 The optimal demand of consumption and leisure

Workers with skill i maximize utility (see equation (A.11) in the main paper) given an hourly wage rate w_i and facing the budget constraint

$$E_i \equiv \int_{\omega \in \boldsymbol{\Omega}} p(\omega) q_i(\omega)\, \mathrm{d}\omega \;\leq\; h_i \mathrm{w}_i + \bar{\pi} \;\equiv Y_i, \tag{A.16}$$

where E_i denotes expenditures, Y_i is income, and $\bar{\pi} \equiv \int_{\omega \in \mathbf{\Omega}} \pi(\omega) \mathrm{d}\omega / (n_H + n_L)$ represents the equal distribution of firm profits as dividends. A worker i's optimal product demand then is

$$q_i^*(\omega) = \left[\frac{p(\omega)}{P}\right]^{-\sigma} Q_i, \tag{A.17}$$

and labor supply is implicitly given by

$$\eta \, v'\left(\ell^*\right) = \frac{\mathrm{w}_\mathrm{i}^*}{P\, Q}, \tag{A.18}$$

for the (exponentiated) price index $P^{\sigma-1} \equiv \int_{\omega \in \mathbf{\Omega}} p(\omega)^{-(\sigma-1)} \, \mathrm{d}\omega$. Finally, note that in optimum, $E_i = PQ_i$.

B.7.2 Wage-hours function and optimal hours: the case of an additive separable utility function

Since the indifference condition implicitly defines the wage rate as a function of the hours worked (see equation (A.12) of the main paper), it can be used to express $\hat{\mathrm{w}}'(\hat{h})$ in terms of marginal utilities. Thus, starting from

$$\Phi(\hat{\mathrm{w}}_\mathrm{i}, \hat{h}) = U\left(\mathrm{P}^{-1}\hat{\mathrm{w}}_\mathrm{i}\; \hat{h} + P^{-1}(\bar{\pi}), 1 - \hat{h}\right) - U\left(\mathrm{w}_\mathrm{i}^*\, h_i^* + P^{-1}(\bar{\pi}), 1 - h_i^*\right) = 0, \tag{A.19}$$

we have

$$\hat{\mathrm{w}}_i'(\hat{h}) = -\left(\frac{\partial \Phi(\hat{\mathrm{w}}_\mathrm{i},\, \hat{h})}{\partial \hat{h}}\right)\left(\frac{\partial \Phi(\hat{\mathrm{w}}_\mathrm{i},\, \hat{h})}{\partial \hat{\mathrm{w}}_\mathrm{i}}\right)^{-1} = -\frac{[P^{-1}U_C\hat{\mathrm{w}}_\mathrm{i} - U_\ell]}{P^{-1}U_C\hat{h}}. \tag{A.20}$$

Under decreasing marginal rates of substitution

$$\hat{\mathrm{w}}_i'(\hat{h}) = -\frac{[P^{-1}U_C\hat{\mathrm{w}}_\mathrm{i} - U_\ell]}{P^{-1}U_C\hat{h}} \begin{cases} < 0 & \text{if } \hat{h} < h_i^* \\ = 0 & \text{if } \hat{h} = h_i^* \\ > 0 & \text{if } \hat{h} > h_i^* \end{cases}. \tag{A.21}$$

Assuming that the utility function is additive separable as in (A.11), the second derivative of the wage rate with respect to hours is

$$\hat{\mathrm{w}}_i''(\hat{h}) = -\left[\frac{\hat{\mathrm{w}}_i'\,\hat{h} - \hat{\mathrm{w}}_i}{\hat{h}^2}\right] - \left[\frac{P}{\hat{h}^2}\right]\frac{U_\ell}{U_C} - \frac{U_C U_{ll} + U_{CC}U_\ell\left[P^{-1}\hat{\mathrm{w}}_i'\,\hat{h} + P^{-1}\hat{\mathrm{w}}_\mathrm{i}\right]}{P^{-1}U_C^2\,\hat{h}}. \tag{A.22}$$

Thus, rearranging the terms in (A.22), we have[7]:

$$\hat{\mathrm{w}}_i''(\hat{h}) = -\frac{2}{\hat{h}}\,\hat{\mathrm{w}}_i' - \frac{U_C U_{ll} + U_{CC} U_\ell \left[P^{-1}\hat{\mathrm{w}}_i'\,\hat{h}\, + P^{-1}\hat{\mathrm{w}}_i\right]}{P^{-1}U_C^2\,\hat{h}}. \tag{A.23}$$

In (A.23), we notice that

$$\left[P^{-1}\hat{\mathrm{w}}_i'\,\hat{h}\, + P^{-1}\hat{\mathrm{w}}_i\right] \;=\; \frac{-P^{-1}U_C\hat{\mathrm{w}}_{\mathrm{i}} + U_\ell + P^{-1}U_C\hat{\mathrm{w}}_{\mathrm{i}}}{U_C} = \frac{U_\ell}{U_C} > 0. \tag{A.24}$$

Assuming $U_C > 0$, $U_\ell > 0$, $U_{CC} < 0$ and $U_{ll} < 0$, it follows that the second term in (A.23):

$$-\frac{U_C U_{ll} + \frac{U_{CC}U_\ell^2}{U_C}}{P^{-1}U_C^2\,\hat{h}} > 0. \tag{A.25}$$

(A.25) captures the loss in terms of marginal utilities from working one extra hour. This loss requires wage rates to increase at an increasing rate when hours increase. Combining (A.25) and (A.23), we have

$$\hat{\mathrm{w}}_i''(\hat{h}) = -\frac{2}{\hat{h}}\,\hat{\mathrm{w}}_i' - \frac{U_C U_{ll} + \frac{U_{CC}U_\ell^2}{U_C}}{P^{-1}U_C^2\,\hat{h}}. \tag{A.26}$$

If $\hat{h} = h^*$ since $\hat{\mathrm{w}}_i'(\hat{h}) = 0$, then $\hat{\mathrm{w}}_i''(\hat{h}) > 0$. If $\hat{h} < h_i^*$ then $\hat{\mathrm{w}}_i'(\hat{h}) < 0$ and $\hat{\mathrm{w}}_i''(\hat{h}) > 0$. Finally, if $\hat{h} > h_i^*$, then $\hat{\mathrm{w}}_i'(\hat{h}) > 0$ and the sign of $\hat{\mathrm{w}}_i''(\hat{h})$ is ambiguous. Using (A.20) to rearrange (A.26) $\hat{\mathrm{w}}_i'' > 0$ implies

$$2\frac{\hat{\mathrm{w}}_i}{P} > \frac{U_\ell}{U_C} + \frac{U_{\ell\ell}}{U_C} - \frac{U_{CC}U^2}{U_C^2}. \tag{A.27}$$

This is the case when P is particularly small and/or $U_{\ell\ell}$ is particularly high.

B.7.3 Optimal hours worked in firms with constraints: derivations

The first-order conditions relative to the minimization problem of Section B.2 are

$$\hat{\mathrm{w}}_{\mathrm{L}}'\hat{h}\hat{n}_L + \mathrm{w}_{\mathrm{L}}\hat{n}_L + \hat{\mathrm{w}}_{\mathrm{H}}'\hat{h}\hat{n}_H + \hat{\mathrm{w}}_{\mathrm{H}}\hat{n}_H = G_H\hat{n}_H + G_L\hat{n}_L, \tag{A.28}$$

$$G_H = \hat{\mathrm{w}}_{\mathrm{H}}(\hat{h}), \tag{A.29}$$

$$G_L = \hat{\mathrm{w}}_{\mathrm{L}}(\hat{h}), \tag{A.30}$$

[7] The rearrangement here involves substituting (A.20) into the first term on the right-hand side of (A.22). Then we take the sum of the first two terms. To gain a more transparent intuition of the results, we then express the sum of the first two terms in (A.22) in terms of w'(h).

$$\hat{\gamma}\phi\, G(\hat{n}_L\,\hat{h},\,\hat{n}_H\,\hat{h}) =\, \hat{q}(\omega). \tag{A.31}$$

Replacing G_H from (A.29) and G_L from (A.30) into (A.28) we obtain

$$\hat{\mathrm{w}}'_{\mathrm{H}}(\hat{h})\hat{n}_H\hat{h} + \hat{\mathrm{w}}'_{\mathrm{L}}\hat{n}_L\hat{h} = 0, \tag{A.32}$$

dividing by $\hat{h}$ we obtain condition (A.14) of the main paper.

B.7.4 The product market: prices, revenues and profits

A firm producing variety ω maximizes its profits by setting the variety-specific price $p(\omega)$ given total demand. By summing the demand indexes Q_i^* and $\hat{Q}_i$ over all consumers of different skills and with employment in different labor markets, we arrive at aggregate consumption Q, which firms take as given under monopolistic competition. However, in the product market for their individual variety ω, firms are monopoly price setters, taking demand for their variety into account:

$$q(\omega) = [p(\omega)/P]^{-\sigma}Q,$$

after summing equation (A.17) of the main paper over all consumer groups.[8] The generic profit maximization problem is:

$$\pi(\omega) \equiv \max_{p(\omega)} p(\omega)\, q(\omega) - \frac{\mu}{\gamma\phi}\, q(\omega) - F \qquad \text{s.t.} \quad q(\omega) = \left[\frac{p(\omega)}{P}\right]^{-\sigma} Q, \tag{A.33}$$

where the constant μ is the marginal production cost (given constant returns to scale). Note that $F = 0$, $\gamma = 1$ and $\mu = \mu^*$ in the non-coordinated market, whereas $F = \hat{F}$, $\gamma = \hat{\gamma} > 1$ and $\mu = \hat{\mu}$ for firms that enter the constrained market. Applying Euler's rule to constant-returns-to-scale production (with homogeneity of degree one in production factors), the minimized cost function in firms that do not impose constraints on hours worked takes the form

$$C^*(\omega) = \frac{\mu^*}{\phi}\, q^*(\omega) \qquad \text{with} \quad \mu^* \equiv \mu(\mathrm{w}_H^*, \mathrm{w}_L^*, h_H^*, h_L^*),$$

where μ^* is the Lagrange multiplier of the constrained minimization problem, and $q^*(\omega) = \phi\, G(n_H^* h_H^*, n_L^* h_L^*)$, whereas the function $\mu(\cdot)$ also depends on the parameters of the production

[8] Concretely, aggregate demand is $Q \equiv \sum_{i=H,L} N_i^* Q_i^* + \hat{N}_i\hat{Q}_i$, where $Q_i^* = E_i^*/P$ and $\hat{Q}_i = \hat{E}_i/P$ with $E_i^* = h_i^* w_i^* + T$ and $\hat{E}_i = \hat{h}\hat{w}_i + T$.

function. In constrained firms the minimized costs function takes the form:

$$\hat{C}(\omega) = \frac{\hat{\mu}}{\hat{\gamma}\phi}\,\hat{q}(\omega) \qquad \text{with} \quad \hat{\mu} \equiv \mu(\hat{\mathrm{w}}_H, \hat{\mathrm{w}}_L; \hat{h}(\eta, P; \phi)),$$

where $\hat{\mu}$ is the Lagrange multiplier of the constrained minimization problem in Section B.3 and $\hat{q}(\omega) = \hat{\gamma}\,\phi\,\hat{h}\,G(\hat{n}_H, \hat{n}_L)$. The optimal prices resulting from (A.33) are

$$p^*(\omega) = \frac{\sigma}{\sigma-1}\frac{\mu^*}{\phi} \qquad \text{and} \qquad \hat{p}(\omega) = \frac{\sigma}{\sigma-1}\frac{\hat{\mu}}{\hat{\gamma}\phi}. \tag{A.34}$$

By profit maximization (A.33), firms with the same ϕ choose the same optimal price–over–cost markups, production and revenue, regardless of their specific product variety ω. We therefore adopt the simplifying notation that optimal prices are $p(\phi)$, optimal production is $q(\phi)$, and optimal revenues are $p(\phi)q(\phi)$. Summing equation (A.17) in Section B.3 over all consumer groups, total demand for a firm's output can be written as $q(\phi) = [p(\phi)/P]^{-\sigma}Q$ and the firm's equilibrium revenues are

$$p(\phi)q(\phi) = [p(\phi)/P]^{-(\sigma-1)}PQ = [p(\phi)/P]^{-(\sigma-1)}E,$$

where $E = PQ$ is economy-wide expenditure, aggregated over all consumer groups. By (A.33), the profits of a firm with productivity ϕ are

$$\pi(\phi) = \frac{p(\phi)q(\phi)}{\sigma} - F = \left[\frac{p(\phi)}{P}\right]^{-(\sigma-1)}\frac{E}{\sigma} - F.$$

Using optimal prices (A.34) for non-constrained and constrained firms in this profit relationship, we can state a firm ϕ's prospective profits in the two labor market segments are:

$$\begin{aligned} \pi^*(\phi) &= \left(\frac{\sigma-1}{\sigma}\right)^{\sigma-1}\left(\frac{P}{\mu^*}\right)^{\sigma-1}\frac{E}{\sigma}\,\phi^{\sigma-1}, \\ \hat{\pi}(\phi) &= \left(\frac{\sigma-1}{\sigma}\right)^{\sigma-1}\left(\frac{\hat{\gamma}P}{\hat{\mu}}\right)^{\sigma-1}\frac{E}{\sigma}\,\phi^{\sigma-1} - \hat{F}, \end{aligned}$$

where $E = PQ$ are economy-wide expenditures, and μ^*, $\hat{\mu}$ are minimized marginal production costs in the non-constrained and constrained segments, respectively. Based on these conditions, a firm with productivity ϕ will choose to enter the constrained labor market if and only if

$$\hat{\pi}(\phi) > \pi^*(\phi).$$

If $\hat{\gamma} > \hat{\mu}/\mu^*$, this inequality can be rewritten in terms of a firm's productivity ϕ:

$$\phi > \frac{\sigma}{\sigma-1}\frac{\hat{F}^{1/(\sigma-1)}}{E^{1/(\sigma-1)}P}\frac{\hat{\mu}}{\hat{\gamma}-\hat{\mu}/\mu^*}.$$

Assuming that $\hat{\gamma} > \hat{\mu}/\mu^*$, we indicate with $\hat{M}$ and M^* the total mass of unconstrained and constrained firms in equilibrium, respectively. It follows that the total number of each type-i worker in the two labor market segments is $\hat{N}_i = \hat{M} \cdot \hat{n}_i$ and $N_i^* = M^* \cdot n_i^*$.

B.7.5 Optimal demand of high- relative to low-skill workers in constrained versus non-constrained labor markets

In what follows we first derive the optimal demand of high- to low-skill workers in firms that do not constrain hours worked and in firms that constrain hours worked. Then, we discuss the conditions under which firms that constrain hours worked employ relatively more high-skill workers than firms that do not constrain hours worked.

In order to compare the optimal demand of high- and low-skill workers in firms that constrain hours worked versus firms that do not constrain hours worked, we assume a Cobb-Douglas production function with constant returns to scale of the following type:

$$G = (n_H h_H)^{\alpha}(n_L h_L)^{1-\alpha}. \tag{A.35}$$

Based on the production function (A.35) and the optimality condition (A.13), the optimal demand of high- versus low-skill workers in firms that do not constrain hours worked is as follows:

$$\frac{n_H^*}{n_L^*} = \frac{w_L^*}{w_H^*}\frac{\alpha}{1-\alpha}. \tag{A.36}$$

Combining the optimality condition (A.14) and condition (A.19), the optimal demand of high- versus low-skill workers in firms that constrain hours worked can be expressed as:

$$\frac{\hat{n}_H}{\hat{n}_L} = -\frac{\hat{w}_L'(\hat{h})}{\hat{w}_H'(\hat{h})} = -\frac{\frac{P^{-1}U_{C,L}\hat{w}_L - U_{\ell,L}}{P^{-1}U_{C,L}\hat{h}}}{\frac{P^{-1}U_{C,H}\hat{w}_H - U_{\ell,H}}{P^{-1}U_{C,H}\hat{h}}} = -\frac{\hat{w}_L - \frac{U_{\ell,L}}{P^{-1}U_{C,L}}}{\hat{w}_H - \frac{U_{\ell,H}}{P^{-1}U_{C,H}}}. \tag{A.37}$$

Under the assumption, consistent with the evidence of Table 1, that high-skill workers desire to work more hours than low-skill workers, constrained hours at the optimum are lower than the desired hours of high-skill workers and higher than the desired hours of low-skill workers: $h_L^* < \hat{h} < h_H^*$ (see Section B.5 for details). This implies that, at the optimum, the following inequalities must be satisfied: $\hat{w}_H - \frac{U_\ell}{P^{-1}U_{c,H}} > 0$ and $\hat{w}_L - \frac{U_\ell}{P^{-1}U_{c,L}} < 0$ (see condition (A.21)).

Combining conditions (A.36) and (A.37) and taking into account the inequalities of the previous paragraph, we can conclude that firms that constrain hours worked employ a relatively more skilled workforce than firms that do not constrain hours worked if the following condition is satisfied:

$$\frac{\hat{n}_H}{\hat{n}_L} > \frac{n_H^*}{n_L^*} \Leftrightarrow \frac{\frac{U_{\ell,L}}{P^{-1}U_{C,L}} - \hat{w}_L}{\hat{w}_H - \frac{U_{\ell,H}}{P^{-1}U_{C,H}}} > \frac{w_L^*}{w_H^*}\frac{\alpha}{1-\alpha}. \tag{A.38}$$

Condition (A.38) implies that firms that constrain hours worked are more likely to employ relatively more high-skill workers if the marginal utility of leisure of high-skill workers ($U_{\ell,H}$) is low. In this case, in fact, high-skill workers require lower compensating differentials for deviating from their desired hours. This makes it optimal for firms that constrain hours to demand more high-skill workers. Similarly, if the marginal utility of consumption of high-skill workers ($U_{C,H}$) is high, these workers derive high utility from any extra dollar of compensating wage differentials, thus demanding lower premiums for deviating from their desired hours. This leads firms in the constrained labor market to demand relatively more high-skill workers.

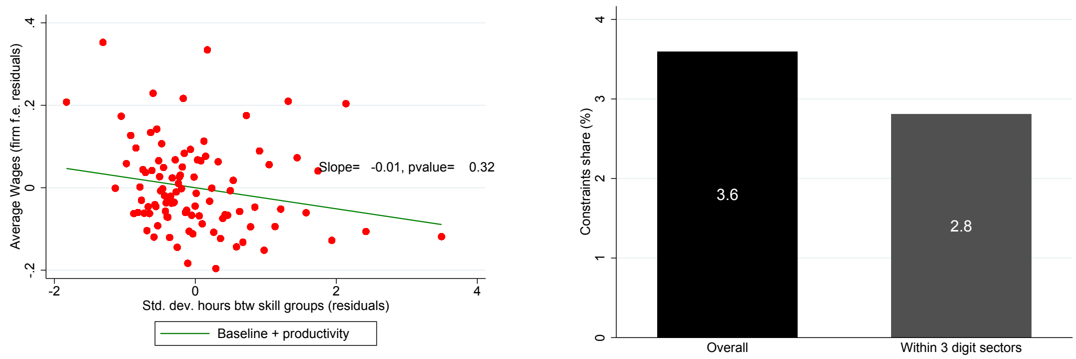
On the contrary, if the marginal utility of leisure of low-skill workers ($U_{\ell,L}$) is low and/or the marginal utility of consumption of low-skill workers ($U_{C,L}$) is high, (A.38) is less likely to be satisfied. In this case, low-skill workers demand lower compensating differentials for deviating from their desired hours making them more attractive for firms that constrain hours. Finally, in case the output elasticity to high-skill labor (α) is high, (A.38) is less likely to be satisfied. In this scenario, firms in the non-constrained labor market demand a greater number of high-skill workers driving up the cost of high- relative to low-skill labor. Firms in the constrained labor market respond optimally by demanding fewer high-skill workers.[9]

[9] We note that the effect of relative market wages (i.e. $\frac{w_L^*}{w_H^*}$) on the optimal demand of skilled to unskilled labor in the constrained and non-constrained labor market is ambiguous. On the one hand, an increase in the price of skilled labor (i.e. a decrease in $\frac{w_L^*}{w_H^*}$) would decrease the demand of high-skill workers in the non-constrained sector thus lowering the right-hand side of (A.38). On the other hand, an increase in the market wage of high-skill workers would also increase the wage paid to high-skill workers in the constrained labor market ($\hat{w}_H$) driving down the left-hand side of (A.38).

C Appendix: Additional figures and tables

C.1 Additional Figures

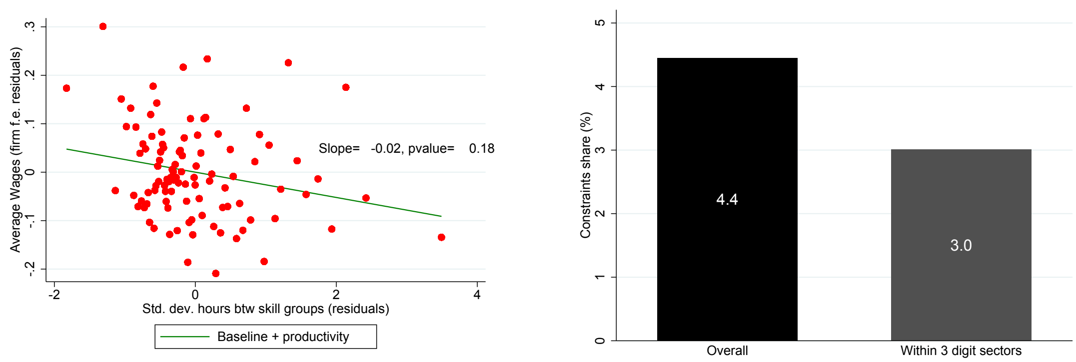
Figure D.1: Hours constraints, productivity and firm wages controlling for polynomial functions of TFP



(a) Hours constraints, wages and productivity (b) Constraints share

Notes: This figure re-estimate the specifications of Figure 3 including square and cubic functions of TFP as extra controls. The specifications are otherwise identical to Figure 3.

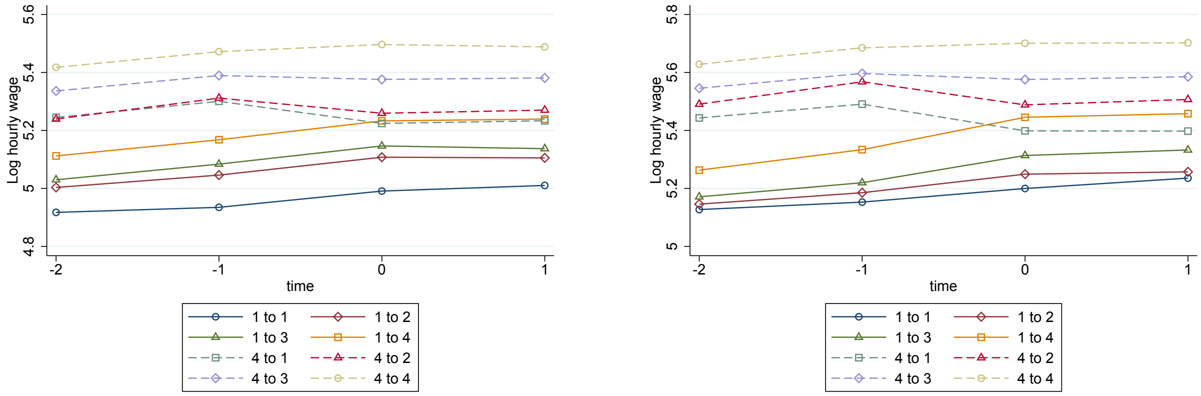
Figure D.2: Hours constraints, productivity and firm wages including the value of fringe benefits



(a) Hours constraints, wages and productivity (b) Constraints share

Notes: This figure re-estimate the specifications of Figure 3 using a measure of the firm-component of wages that includes both taxable fringe per hour worked and hourly wages. The specifications are otherwise identical to Figure 3.

Figure D.3: Wage dynamics of movers

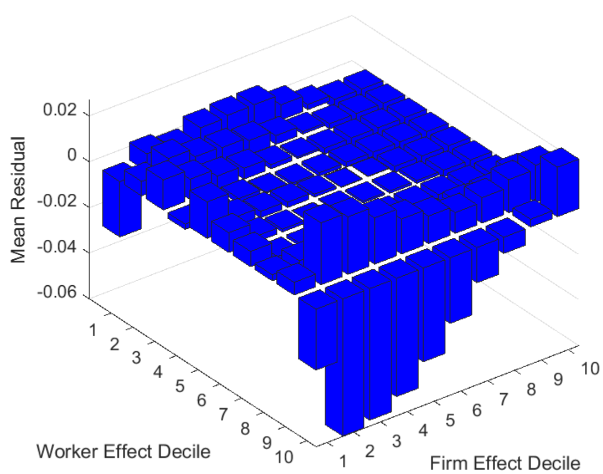


(a) Females

(b) Males

Notes: The figure shows trends in hourly wages of movers around the time of the transition to the new job (time 0 in the figure). We construct the mean of log coworkers' wages for each person in each year to obtain a distribution of coworkers' wages in each year. Thus, we assign each worker to a quartile of the coworkers' wages distribution in a year based on the average log wage of his/her coworkers in that year. We then identify movers as workers who move from one firm to another and who can be observed for two consecutive years in both the sending firm and the receiving firm. Thus, we derive average wage rates of movers in the two years before and after the move in each quartile of the coworkers' wages distribution. The Figure D.3 shows the wage trends of movers from the 1st (i.e., low paying) or 4th (i.e., high paying) quartile of the coworkers' wage distribution. We find rather symmetric wage losses and wage gains for workers moving from high- to low-paying firms, and vice versa. We also do not find any systematic trend in wages prior to a move for workers who move to high- versus low-paying firms (Figure D.3). We also fail to find large changes in the wages of workers moving across firms in the same quartile of the coworkers' wage distribution. This evidence is confirmed in Tables D.13 and D.12, which show the average log wage changes associated with transitions from and to each quartile of the coworker wage distribution. Differently from the analogous figure in Labanca and Pozzoli (2022), we here consider both full-time and part-time workers.

Figure D.4: Mean residuals by person-establishment deciles



Notes: The figure shows the mean residuals from estimated AKM with cells defined by decile of estimated firm effect, interacted with decile of the estimated person effect. Reassuringly, the mean residuals are uniformly low and never exceed 6%. Therefore, while for some workers and firms, we observe small deviations from the additivity assumption, these appear unlikely to play a major role. Differently from the analogous figure in Labanca and Pozzoli (2022), we here consider both full-time and part-time workers.

C.2 Additional Tables

Table D.1: Descriptive statistics

	IDA Sample		**IDA -Firmstat-LON sample**		**Final sample**	
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Workers Characteristics						
Mean Age	39.82	12.87	39.59	12.07	41.30	11.42
Fraction < 30	0.27	0.44	0.25	0.43	0.19	0.35
Fraction > 50	0.27	0.44	0.23	0.42	0.26	0.44
Fraction Males	0.50	0.50	0.64	0.48	0.68	0.46
Fraction Unionized	0.70	0.46	0.69	0.19	0.75	0.16
Fraction Hourly	0.17	0.37	0.32	0.47	0.33	0.47
Fraction Partimers			0.13	0.34	0.10	0.30
Fraction Primary Educ.	0.33	0.47	0.33	0.47	0.31	0.46
Fraction Secondary Educ.	0.40	0.49	0.48	0.50	0.49	0.49
Fraction Tertiary Educ.	0.27	0.43	0.17	0.38	0.17	0.38
Hourly wage (in DKK)			186.15	239.26	183.58	206.68
Annual Labor Income (in 1000 DKK)	267.00	448.30	328.25	287.52	330.47	248.37
Total Annual Hours			1759.36	454.21	1796.93	382.31
Overtime Annual Hours			29.54	108.71	29.11	97.71
Workers by sector (% of total)						
Agriculture, forestry and fishing, mining and quarrying	2.52		0.34		0.15	
Manufacturing	26.60		30.16		34.57	
Construction	10.35		8.4		9.56	
Electricity, gas, steam and air conditioning supply,						
Trade and transport	30.14		45.25		40.42	
Financial and insurance, Real estate, Other business	22.95		15.67		15.15	
Other services	7.44		0.18		0.15	
Firms Characteristics						
Standard deviation of annual hours between skill groups					199.84	184.40
Mean Firm Size			46.01	304.03	42.84	292.27
Mean Capital per employee (1000 DKK)			429.83	6866.57	889.33	41668.53
Mean Value Added per employee (1000 DKK)			430.90	2824.12	504.86	1715.60
Mean Revenues per employee (1000 DKK)			1648.00	6188.12	2112.85	8392.03
Exporters (%)			35.19	42.45	43.60	48.21
Number of observations	22,379,298		5,171,188		875,210	
Number of individuals	3,518,236		1,468,516		452,623	
Number of firms	266,196		29,561		9,069	

Notes: The table shows the mean and standard deviations for a set of variables for 3 groups of employees. In all 3 groups, we consider only workers who are between 15 and 65 years of age in the years 2003-2011. The "IDA Sample" refers to the entire Danish population. The "IDA-Firmstat-LON" sample refers to the sample of workers in IDA that can be matched to the Firmstat and LON samples. The "Final sample" is composed of all workers from IDA-Firmstat-LON who are employed in firms for which information on hours is available for at least 95% of the workforce. The data on employment by industry for the entire population are from Statistikbanken (Statistics Denmark), which does not provide standard errors around the mean values. Annual and hourly earnings, value added, capital and sales are expressed in Danish Kroner (DKK) and deflated by using the CPI index with 2000 as the base year (8 DKK $\simeq$ 1 USD in 2000). Constraints are measured as the standard deviation of mean hours (regular and overtime) worked across skill groups within a firm and year. Skill groups are defined as deciles of the distribution of $\hat{\alpha_i} + \hat{\beta} X_{ijt}$ from the AKM model (4.3). Differently from the analogous table in Labanca and Pozzoli (2022), in column 4 and 5 we consider both full-time and part-time workers.

Table D.2: Hours constraints and margins of flexibility in hours: full-time workers only

	Stand. dev. of hours across skill groups within firms - full-time only (1)	(2)	Obs.
Share of workers with a secondary job	-0.033***	-0.042***	16648
	(0.007)	(0.007)	
Share of workers with inflexible hours	-0.078***	-0.065***	16648
	(0.010)	(0.011)	
Share of part-time workers	0.207***	0.134***	17527
	(0.010)	(0.014)	
Share of hourly workers	0.230***	0.380***	17527
	(0.011)	(0.009)	
Share of workers with overtime hours	0.176***	0.111***	17527
	(0.009)	(0.011)	
St. dev. vacation hours btw skill groups	0.187***	0.131***	12760
	(0.011)	(0.010)	
3 digits Sector f.e.	NO	YES	

Notes: The table shows the standardized coefficients from the regressions of the standard deviation of hours worked by full-time workers across skill groups within firms on firm characteristics and a constant. Each characteristic is considered separately. In column 2, we add industry fixed effects to the baseline regressions using the Danish industry classification DB07. Following the official definition, we define part-timers as those working less than an average of 26 weekly hours over a one-year period. "Std dev. vacation hours btw skill groups" in the table refers to the standard deviation of the vacation hours across skill groups within a firm. Skill groups are defined as deciles of the distribution of $\hat{\alpha}_i + \hat{\beta} X_{ijt}$ from the AKM model (4.3). The regressions are based on the firm-year observations from the firms in our final sample (Online Appendix Table D.1) over the years 2003–2011. Annual hours of vacation are only available in the years 2003–2010 which results in a lower number of observations for the "Std dev. vacation hours btw skill groups". The standard errors in parentheses are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.

Table D.3: Hours constraints and workforce characteristics

	Stand. dev. of hours across skill groups within firms (def.1)		Obs.
	(1)	(2)	
Share of workers $\widehat{s_{ijt}} \leq$ 10th percentile	0.212***	0.115***	17746
	(0.013)	(0.013)	
Share of workers 10th percentile< $\widehat{s_{ijt}}$ < 20th percentile	0.070***	0.028***	17746
	(0.011)	(0.010)	
Share of workers 20th percentile< $\widehat{s_{ijt}}$ < 30th percentile	0.001	-0.009	17746
	(0.009)	(0.009)	
Share of workers 30th percentile< $\widehat{s_{ijt}}$ < 40th percentile	-0.009	-0.008	17746
	(0.009)	(0.010)	
Share of workers 40th percentile< $\widehat{s_{ijt}}$ < 50th percentile	-0.009	-0.005	17746
	(0.009)	(0.009)	
Share of workers 50th percentile< $\widehat{s_{ijt}}$ < 60th percentile	-0.016*	-0.010	17746
	(0.010)	(0.009)	
Share of workers 60th percentile< $\widehat{s_{ijt}}$ < 70th percentile	-0.032***	-0.033***	17746
	(0.010)	(0.010)	
Share of workers 70th percentile< $\widehat{s_{ijt}}$ < 80th percentile	-0.036***	-0.022**	17746
	(0.010)	(0.010)	
Share of workers 80th percentile< $\widehat{s_{ijt}}$ < 90th percentile	-0.075***	-0.029**	17746
	(0.010)	(0.010)	
Share of workers $\widehat{s_{ijt}}$ > 90th percentile	-0.104***	-0.024**	17746
	(0.011)	(0.010)	
Share of female workers	0.061***	0.053***	17746
	(0.008)	(0.008)	
Share of blue collar workers	0.111***	0.186***	17746
	(0.015)	(0.015)	
Share of managers	-0.065***	-0.109***	17746
	(0.009)	(0.009)	
Share of workers older than 30	-0.194***	-0.191***	17746
	(0.013)	(0.013)	
Share of female blue collar workers	0.094***	0.120***	17746
	(0.012)	(0.012)	
Share of female managers	0.008	-0.039***	17746
	(0.014)	(0.013)	
Share of male blue collar workers	0.029*	0.089***	17746
	(0.017)	(0.017)	
Share of male managers	-0.140***	-0.190***	17746
	(0.014)	(0.014)	
3 digits Sector f.e.	NO	YES	

Notes: The table shows the standardized coefficients from the regressions of the standard deviation of hours across skill groups within firms from Section 4.3 on firm characteristics and a constant. Each cell in the table corresponds to a different regression. In column 2, we add industry fixed effects to the baseline regressions using the Danish industry classification DB07. The regressions are based on the firm-year observations from the firms in our final sample (Table D.1) over the years 2003–2011. The standard errors in parentheses are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.

Table D.4: Hours constraints and wage differentials across firms: excluding unionization rate

	(1) Firm Mean Wage	(2) Firm f.e.	(3) Firm f.e.	(4) Firm f.e.	(5) Firm f.e.
Std. dev. hours btw skill groups	-0.146***	-0.040**	-0.036**	-0.041***	-0.039***
	(0.027)	(0.019)	(0.014)	(0.013)	(0.013)
Firm size			0.021**	0.018*	0.031***
			(0.008)	(0.011)	(0.008)
Exporter status			0.087***	0.073***	0.026*
			(0.024)	(0.024)	(0.014)
Female share			-0.074	-0.133***	-0.117***
			(0.047)	(0.040)	(0.026)
Average hours			-0.116	-0.078	-0.090
			(0.144)	(0.137)	(0.117)
Av. Hours Sq.			0.058	0.048	-0.007
			(0.149)	(0.147)	(0.117)
log(Cap./empl)			0.052***	0.019	0.039***
			(0.018)	(0.019)	(0.012)
Std dev. $\alpha^{\hat{h}}\_i$ btw skill groups				0.021	0.011
				(0.021)	(0.021)
Region f.e.	NO	NO	YES	YES	YES
Controls for sorting	NO	NO	YES	YES	YES
3 digits Sector f.e.	NO	NO	NO	NO	YES
Mean dep. variable	5.171	-0.124	-0.124	-0.124	-0.124
Std. dev. dep. variable	0.295	0.235	0.235	0.235	0.235
Mean SD Hours btw skills	204.553	204.553	204.553	204.553	204.553
Part. R-sq SD Hours	0.021	0.001	0.001	0.001	0.001
Part. R-sq VA and Sales	0.135	0.020	0.013	0.027	0.025
Constraints Share	0.156	0.073	0.049	0.045	0.041
R-sq	0.021	0.001	0.024	0.296	0.350
N	7458.000	7458.000	7458.000	7458.000	7458.000

Notes: In this table, we report the results of estimating equation (1). All regressions report standardized coefficients. In column (1), the dependent variable is the firm's mean wage. In columns (2)-(5), the dependent variable is the firm fixed effect from the AKM model (2). The variable "Std dev. hours btw skill groups" in the table refers to our measure of hours constraints, which is the standard deviation of the average total (regular and overtime) hours worked across skill groups within a firm (Section B). Skill groups are defined as deciles of the distribution of $\hat{\alpha_i} + \hat{\beta} X_{ijt}$ from the AKM model (4.3). The exporter dummy is defined as the modal exporter status (i.e., zero for not exporting, one for exporting) between 2003 and 2011. "Region f.e." refers to the following region dummies: Capital Region of Denmark; Central Denmark Region; North Denmark Region; Region Zealand; and Region of Southern Denmark. "Controls for sorting" refers to a vector of controls for the share of workers in each skill group, a vector that contains the average value of the individual fixed effects $\hat{\alpha_i}$ in each quartile of the distribution of $\hat{\alpha_i}$ within a firm and the average hours squared. "Constraints Share" is derived as the ratio of "Part. R-sq SD Hours" and "Part. R-sq VA and TFP" (see section 5). "Part. R-sq VA and TFP" is from Table D.10. Value added and TFP are obtained as described in Online Appendix A.1. Standard errors are clustered at the 3-digit industry level. *, ** and *** indicate significance at the 10-, 5- and 1-percent levels, respectively.

Table D.5: Hours constraints and wage differentials across firms including fringe benefits

	(1) Mean Benefits	(2) Firm f.e.	(3) Firm f.e.	(4) Firm f.e.	(5) Firm f.e.	(6) Firm f.e.
Std. dev. hours btw skill groups	-0.198***	-0.050**	-0.038***	-0.042***	-0.035***	-0.045***
	(0.036)	(0.021)	(0.014)	(0.014)	(0.012)	(0.012)
Std. dev. hours btw skill groups X bargaining firm						-0.019**
						(0.009)
Firm size			0.017**	0.015	0.023***	0.025***
			(0.007)	(0.009)	(0.008)	(0.007)
Exporter status			0.098***	0.079***	0.024*	0.025*
			(0.023)	(0.021)	(0.013)	(0.014)
Union. rate			0.011	0.006	0.030	0.030*
			(0.021)	(0.019)	(0.018)	(0.018)
Female share			-0.076	-0.140***	-0.122***	-0.122***
			(0.048)	(0.036)	(0.027)	(0.027)
Average hours			-0.127	-0.089	-0.109	-0.104
			(0.174)	(0.156)	(0.143)	(0.142)
Av. Hours Sq.			0.077	0.062	0.010	0.005
			(0.170)	(0.161)	(0.136)	(0.134)
log(Cap./empl)			0.053***	0.021	0.039***	0.039***
			(0.020)	(0.017)	(0.014)	(0.013)
Std dev. $\alpha^{\hat{h}}\_i$ btw skill groups				0.025	0.012	0.013
				(0.026)	(0.026)	(0.026)
Bargaining firm						-0.032***
						(0.011)
Region f.e.	NO	NO	YES	YES	YES	YES
Controls for sorting	NO	NO	YES	YES	YES	YES
3 digits Sector f.e.	NO	NO	NO	NO	YES	YES
Mean dep. variable	5.099	-0.237	-0.237	-0.237	-0.237	-0.237
Std. dev. dep. variable	0.268	0.238	0.238	0.238	0.238	0.238
Mean SD Hours btw skills	204.575	204.575	204.575	204.575	204.575	204.575
Part. R-sq SD Hours	0.039	0.002	0.001	0.001	0.001	0.001
Part. R-sq VA and Sales	0.180	0.025	0.015	0.028	0.027	0.027
Constraints Share	0.217	0.094	0.047	0.044	0.030	0.031
R-sq	0.039	0.002	0.027	0.290	0.344	0.345
N	7458	7458	7458	7458	7458	7458

Notes: In this table, we report the results of estimating equation (1). All regressions report standardized coefficients. In column (1), the dependent variable is the firm's mean hourly benefit value where hourly benefits are determined by the sum of wage payments and the value of taxable fringe benefits per hour worked. In columns (2)-(5), the dependent variable is the firm fixed effect from the AKM model (2), in which hourly benefits (i.e. the dependent variable in equation (2)) includes wage payments and fringe benefits per hour worked. The variable "Std dev. hours btw skill groups" in the table refers to our measure of hours constraints, which is the standard deviation of the average total (regular and overtime) hours worked across skill groups within a firm (Section B). Skill groups are defined as deciles of the distribution of $\hat{\alpha_i} + \hat{\beta} X_{ijt}$ from the AKM model (4.3). The exporter dummy is defined as the modal exporter status (i.e., zero for not exporting, one for exporting) between 2003 and 2011. "Region f.e." refers to the following region dummies: Capital Region of Denmark; Central Denmark Region; North Denmark Region; Region Zealand; and Region of Southern Denmark. "Controls for sorting" refers to a vector of controls for the share of workers in each skill group and the share of: female managers, female middle managers, male managers, male middle managers, workers below the age of 30 and workers above the age of 50. "Constraints Share" is derived as the ratio of "Part. R-sq SD Hours" and "Part. R-sq VA and TFP" (see section 5 of the main paper). ' Standard errors are clustered at the 3-digit industry level. *, ** and *** indicate significance at the 10-, 5- and 1-percent levels, respectively.

Table D.6: Hours constraints and wage differentials across firms controlling for the importance of collective labor agreements

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Firm Mean Wage	Firm f.e.	Firm f.e.	Firm f.e.	Firm f.e.	Firm f.e.
Std. dev. hours btw skill groups	-0.146***	-0.040**	-0.037***	-0.039***	-0.033***	-0.044***
	(0.038)	(0.018)	(0.012)	(0.013)	(0.011)	(0.013)
Std. dev. hours btw skill groups X bargaining firm						-0.021**
						(0.008)
Firm size			0.020**	0.018	0.028***	0.030***
			(0.008)	(0.011)	(0.007)	(0.008)
Exporter status			0.088***	0.074***	0.026*	0.027**
			(0.022)	(0.023)	(0.014)	(0.014)
Union. rate			0.025	0.014	0.040**	0.041**
			(0.020)	(0.019)	(0.016)	(0.016)
Female share			-0.074*	-0.133***	-0.123***	-0.123***
			(0.043)	(0.035)	(0.025)	(0.025)
Average hours			-0.102	-0.086	-0.096	-0.091
			(0.169)	(0.156)	(0.144)	(0.117)
Av. Hours Sq.			0.045	0.055	-0.004	-0.011
			(0.165)	(0.162)	(0.138)	(0.117)
log(Cap./empl)			0.046***	0.019	0.041***	0.041***
			(0.017)	(0.018)	(0.013)	(0.012)
Std dev. $\alpha^{\hat{h}}\_i$ btw skill groups				0.019	0.007	0.008
				(0.028)	(0.027)	(0.020)
Bargaining firm						-0.034***
						(0.009)
Share of workers covered by binding collective labor agreements			0.061*	-0.004	-0.053	-0.054
			(0.032)	(0.032)	(0.060)	(0.059)
Region f.e.	NO	NO	YES	YES	YES	YES
Controls for sorting	NO	NO	YES	YES	YES	YES
3 digits Sector f.e.	NO	NO	NO	NO	YES	YES
Mean dep. variable	5.171	-0.124	-0.124	-0.124	-0.124	-0.124
Std. dev. dep. variable	0.295	0.235	0.235	0.235	0.235	0.235
Mean SD Hours btw skills	204.553	204.553	204.553	204.553	204.553	204.553
Part. R-sq SD Hours	0.021	0.001	0.001	0.001	0.001	0.001
Part. R-sq VA and Sales	0.135	0.020	0.014	0.027	0.025	0.025
Constraints Share	0.156	0.073	0.050	0.039	0.028	0.029
R-sq	0.021	0.001	0.028	0.296	0.352	0.353
N	7458	7458	7458	7458	7458	7458

Notes: In this table, we report the results obtained from re-estimating the specifications of Table 3 while adding as an extra control the share of workers covered by a biding collective labor agreement. We link workers to collective agreements based on the classification of Dahl et al. (2013). In this classification we consider *standard rate* agreements as biding. These agreements are negotiated at the industry level and cannot be modified by individual firms. The specifications of the table are otherwise identical to Table 3. Standard errors are clustered at the 3-digit industry level. *, ** and *** indicate significance at the 10-, 5- and 1-percent levels, respectively.

Table D.7: Wage differentials from hours constraints: Lavetti and Schmutte (2018) approach

	(1)	(2)
	OME	TWFE
Dependent Variable	Log Wage - $\hat{\beta}\, X$	Log Wage
Std Dev. btw skill groups	-0.013***	-0.013***
	(0.007)	(0.007)
R-squared	0.759	0.776
Obs.	629410	629410

Notes: Following Lavetti and Schmutte (2018), column 1 reports the effects from an orthogonal match effect model (OME) obtained from a two-step procedure. In the first step, we estimate the following regression: $ln\, \mathrm{w_{it}} = \beta_1\, X_{it} + \beta_2\, \sigma_{jt} + \Phi_{ij(i,t)} + \epsilon_{it}$, where σ_{jt} is the measure of hours constraints described in section 4.3, and skills are defined as as deciles of the distribution of $\hat{\alpha_i} + X'_{ijt}\, \hat{\beta}$ from equation (2) in the Online appendix (AKM regression). $\Phi_{ij(i,t)}$ is the match effect between individual i and firm j, and X_{it} includes the following set of controls: year dummies interacted with education dummies, quadratic and cubic terms in age interacted with education dummies, VA per employee, capital per employee, sales per employee, exporter status, and the fraction of salaried workers. The second step consists of estimating the following regression: $P_{it} = \alpha_i + \lambda_t + \gamma_{ome}\, \sigma_{jt} + \psi_{j(i,t)} + r_{it}$ where $P_{it} = ln\, \mathrm{w_{ijt}} - \hat{\beta_1}\, X_{it}$, α_i is an individual fixed effect, λ_t is a year fixed effect, and $\Psi_{j(i,t)}$ is a firm fixed effect. Column 1 in the table reports the coefficient $\hat{\gamma}_{ome}$ estimated from the second step regression that captures the wage differentials from hours constraints. In column 2, we estimate a two-way fixed effects model (TWFE) of the following type: $ln\, \mathrm{w_{it}} = \alpha_i + \gamma_{twfe}\, \sigma_{jt} + \psi_{j(i,t)} + \beta_1\, X_{it} + \xi_{it}$ where the notation is the same as in the OME model above. Column 2 in the table reports $\hat{\gamma}_{twfe}$. The table shows standardized coefficients that are therefore comparable to those of Table 3. Standard errors are clustered at the 3-digit industry level.

Table D.8: Hours constraints and other firm characteristics

	Stand. dev. of hours across skill groups within firms		Obs.
	(1)	(2)	
Std dev. btw skill groups excluding part-timers	0.998***	0.998***	18184
	(0.000)	(0.000)	
Std. dev. Hours (overall)	0.877***	0.882***	18188
	(0.007)	(0.008)	
Stand. Dev. w/i skill groups	0.553***	0.500***	15546
	(0.010)	(0.010)	
Tenure	-0.211***	-0.033	
	(0.039)	(0.039)	17872
Tenure squared	0.169***	0.012	
	(0.041)	(0.085)	
3 digits Sector f.e.	NO	YES	

Notes: The table shows the standardized coefficients from the regressions of the standard deviation of hours across skill groups within firms from Section 4.3 on firm characteristics and a constant. Each characteristic is considered separately with the exception of tenure and tenure squared that are part of the same regression. In column 2, we add industry fixed effects to the baseline regressions using the Danish industry classification DB07. The regressions are based on the firm-year observations from the firms in our final sample (Table D.1) over the years 2003–2011. The standard errors in parentheses are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.

Table D.9: Firm productivity, hours constraints and wage premiums

	(1) Firm F.E.
Std dev. btw skill groups	-0.017
	(0.013)
Firm size	0.020***
	(0.007)
Exporter status	0.011
	(0.012)
Union. Rate	0.053***
	(0.015)
Female Share	-0.127***
	(0.025)
Average Hours	-0.264*
	(0.156)
Av. Hours squared	0.102
	(0.145)
log(Cap/empl)	-0.037*
	(0.020)
Std dev. $\hat{\alpha_i^h}$ btw skill groups	0.007
	(0.028)
log(VA/empl)	0.176***
	(0.035)
log(VA/empl) squared	0.379*
	(0.212)
log(VA/empl) cubed	-0.398*
	(0.211)
TFP	0.140***
	(0.023)
Region f.e.	YES
Additional Controls	YES
3 digits Sector f.e.	YES
R-sq	0.365
N	7202

Notes: Table shows standardized coefficients. Exporter and industry dummies are based on the median value between 2003 and 2011. "(Cap/empl)" stands for physical capital over the number of full-time-equivalent employees. "(VA/empl)" stands for value added per employee. "Additional Controls" refers to a vector of controls for sorting and region fixed effects that are included in column (5) of Table 3. We refer to the footnote of Table 3 for a detailed description of these controls. Standard errors are clustered at the 3-digit industry level. *, ** and *** are 10, 5 and 1 percent significance levels, respectively.

Table D.10: Value added, TFP and wage premiums relative to Table 3

	(1)	(2)	(3)	(4)	(5)	(6)
	Firm Mean Wage	Firm f.e.	Firm f.e.	Firm f.e.	Firm f.e.	Firm f.e.
log(VA/empl)	0.250***	0.132***	0.141***	0.173***	0.141***	0.141***
	(0.022)	(0.018)	(0.018)	(0.020)	(0.017)	(0.017)
TFP	0.206***	0.037	0.048**	0.075***	0.068***	0.068***
	(0.038)	(0.031)	(0.022)	(0.025)	(0.022)	(0.022)
Firm size			0.022***	0.019**	0.026***	0.026***
			(0.007)	(0.008)	(0.007)	(0.007)
Exporter status			0.074***	0.057***	0.012	0.013
			(0.023)	(0.022)	(0.013)	(0.013)
Union. rate			0.035	0.030	0.045***	0.046***
			(0.025)	(0.021)	(0.016)	(0.015)
Female share			-0.079*	-0.134***	-0.123***	-0.124***
			(0.045)	(0.035)	(0.026)	(0.026)
Average hours			-0.238*	-0.218*	-0.205*	-0.200*
			(0.135)	(0.130)	(0.121)	(0.121)
Av. Hours Sq.			0.126	0.127	0.067	0.061
			(0.141)	(0.140)	(0.119)	(0.119)
log(Cap./empl)			0.030*	-0.008	0.013	0.013
			(0.018)	(0.017)	(0.013)	(0.012)
Std dev. $\alpha^{\hat{h}}$_i btw skill groups				0.011	0.002	0.003
				(0.022)	(0.022)	(0.021)
Region f.e.	NO	NO	YES	YES	YES	YES
Controls for sorting	NO	NO	YES	YES	YES	YES
3 digits Sector f.e.	NO	NO	NO	NO	YES	YES
R-sq	0.135	0.020	0.043	0.333	0.374	0.376
N	7202	7202	7202	7202	7202	7202

Notes: All regressions show standardized coefficients. Exporter and industry dummies are based on the median value between 2003 and 2011. (Cap/empl) stands for physical capital over the number of full-time-equivalent employees. All specifications control for quadratic and cubic functions of value added per employee and TFP. "Controls for sorting" refers to a vector of controls for the share of workers in each skill group and a vector containing the average value of the individual fixed effects $\hat{\alpha_i}$ in each quartile of the distribution of $\hat{\alpha_i}$ within a firm. Standard errors are clustered at the 3-digit industry level. *, ** and *** are 10, 5 and 1 percent significance levels, respectively.

Table D.11: Summary statistics of the AKM regressions: wages and hours

	Log wages		Log hours	
	All Sample	Largest group	All Sample	Largest group
Person and establishment parameters				
Number of person effects	1468515	1461467	1468515	1461467
Number of firm effects	29561	27218	29561	27218
Summary of parameters estimates				
Std. dev. of person effects	0.343	0.342	0.296	0.296
Std. dev. of firm effects	0.148	0.148	0.178	0.178
Std. dev. Of Xb	0.194	0.194	0.140	0.140
Correlation of person/firm effects	-0.085	-0.085	-0.124	-0.124
RMSE of Model	0.314	0.314	0.211	0.211
R-squared	0.686	0.686	0.580	0.580
Std. dev.	0.478	0.478	0.431	0.431
Number of person-year observations	5186956	5171188	5186956	5171188

Notes: Controls in the AKM regressions include the following: year dummies interacted with education dummies, quadratic and cubic terms in age interacted with education dummies. As in Card et al. (2018) we restrict the age profile to be flat at age 40. In addition, we also control for firm characteristics that change over time such as value added, sales, capital per employee, exporter status and the share of hourly workers. These additional firm controls isolate the average wage premium paid by a firm from temporary fluctuations due to firm-level shocks. We estimate the AKM model on all workers and firms for which data on hourly wages, individual and firm characteristics are available (column 2 in Table D.1).

Table D.12: Mobility and wage changes: females

Women					
		Mean of log wages of movers		Log wage change	
Origin/destination quartile	Number of moves	2 years before	2 years after	Raw	Adjusted
1 to 1	3489	4.92	5.02	0.10	0.05
1 to 2	921	4.99	5.28	0.29	0.06
1 to 3	535	5.21	5.10	0.11	0.07
1 to 4	294	5.02	5.14	0.12	0.06
2 to 1	648	5.06	5.10	0.04	-0.02
2 to 2	1167	5.09	5.16	0.07	0.02
2 to 3	962	5.12	5.22	0.10	0.04
2 to 4	517	5.18	5.28	0.10	0.04
3 to 1	354	5.12	5.14	0.12	-0.03
3 to 2	940	5.18	5.22	0.04	0.00
3 to 3	3219	5.23	5.29	0.06	0.00
3 to 4	1145	5.28	5.38	0.10	0.05
4 to 1	219	5.25	5.25	0.00	-0.06
4 to 2	458	5.24	5.27	0.03	-0.02
4 to 3	1472	5.34	5.38	0.04	0.00
4 to 4	3511	5.40	5.47	0.07	0.01

Notes: Entries are observed mean log real hourly wages in the 2003-2011 period for job changers with at least 2 years of wages at the old job and the new job. Job refers to the firm of main occupation in the year. Origin/destination quartiles are based on mean wages of coworkers in the year before (origin) or year after (destination) a job move. Four-year wage changes in adjusted regressions include controls for age, age squared and cubed, education dummies, and quadratics of age fully interacted with education. Differently from the analogous table in Labanca and Pozzoli (2022), we here consider both full-time and part-time workers.

Table D.13: Mobility and wage changes: males

Men					
		Log wages of movers (mean)		Log wage change	
Origin/destination quartile	Number of moves	2 years before	2 years after	Raw	Adjusted
1 to 1	3009	5.13	5.24	0.11	0.06
1 to 2	1603	5.14	5.26	0.12	0.06
1 to 3	1054	5.16	5.33	0.17	0.11
1 to 4	554	5.25	5.45	0.20	0.14
2 to 1	1070	5.21	5.24	0.03	-0.03
2 to 2	2839	5.27	5.33	0.06	0.01
2 to 3	2068	5.32	5.42	0.10	0.04
2 to 4	1007	5.38	5.51	0.13	0.08
3 to 1	663	5.34	5.33	-0.01	-0.07
3 to 2	2213	5.36	5.40	0.04	-0.02
3 to 3	6766	5.40	5.46	0.06	0.01
3 to 4	2283	5.47	5.57	0.10	0.04
4 to 1	318	5.44	5.39	-0.05	-0.11
4 to 2	833	5.49	5.52	0.03	-0.03
4 to 3	2490	5.55	5.59	0.04	-0.02
4 to 4	6914	5.62	5.70	0.08	0.01

Notes: See notes from Table D.12

C.3 Standard deviation of hours across occupation-education groups

In this section, we present the results of a parallel analysis performed using the standard deviation of hours across skill groups, where skill groups are defined at the intersection of 3 educational groups (i.e., primary, secondary and tertiary education) and 3 broad occupational categories (i.e., manager, middle manager and blue collar) (Section 4.3).

Table D.14: Desired hours by skill group

	Mean desired weekly hours		Obs.
Panel B: Skills Definition 2 (education-occupation)			
	(1)	(2)	
Primary education, blue collar	31.56	34.73	1445
Secondary education, blue collar	37.79	38.08	216
Tertiary education, blue collar	40.62	42.29	56
Primary education, middle manager	37.20	38.38	1566
Secondary education, middle manager	37.84	37.93	852
Tertiary education, middle manager	41.34	43.78	133
Primary education, manager	34.07	35.06	153
Secondary education, manager	38.70	38.73	709
Tertiary education, manager	42.54	42.65	113
Industry	NO	YES	
Mean standard deviation of desired hours between skill groups			6.05
Mean standard deviation of desired hours within skill groups			5.14
Mean 90/10 percentile ratio of desired hours between skill groups			1.71
Mean 90/10 percentile ratio of desired hours within skill groups			1.35
Mean 50/10 percentile ratio of desired hours between skill groups			1.41
Mean 50/10 percentile ratio of desired hours between skill groups			1.20

Note: This table shows average desired hours of work by skill group. Information on desired hours is obtained for the sample of workers in the 2008-2010 Danish labor force survey that can be matched to the sample of administrative data used for the main analysis. For consistency with the sample of administrative data used in the main analysis, we focus on workers in the labor force survey whose reference week for the interview is in November. Skills definition 2 refers to skill groups defined at the intersection of occupational (manager, middle-manager and blue-collar) and educational (primary, secondary and tertiary) category. In Column 2 we show average desired hours worked conditional on 3-digit industry fixed effects. Observations are weighted by survey weights. The measures variability of desired hours within and between skills groups that are reported at the bottom of the table are based on averages values across 200 industries. We use industries, rather than firms, because the labour force survey does not contain enough observations to compute these statistics at the firm level. For more details on the measures of variability that are reported in the table see also Online Appendix A.2.

Table D.15: Hours constraints and wage differentials, definition 2

	(1) Firm Mean Wage	(2) Firm f.e.	(3) Firm f.e.	(4) Firm f.e.	(5) Firm f.e.	(6) Firm f.e.
Std dev. hours btw skill groups	-0.134***	-0.036**	-0.028**	-0.031**	-0.022*	-0.031**
	(0.027)	(0.018)	(0.013)	(0.013)	(0.013)	(0.013)
Std. dev. hours btw skill groups X bargaining firm						-0.018**
						(0.009)
Firm size			0.020**	0.016*	0.029***	0.032***
			(0.008)	(0.008)	(0.008)	(0.008)
Exporter status			0.089***	0.056***	0.016	0.017
			(0.023)	(0.020)	(0.013)	(0.013)
Union. rate			0.026	0.057**	0.051**	0.052**
			(0.024)	(0.022)	(0.021)	(0.021)
Female share			-0.071	-0.227***	-0.142***	-0.142***
			(0.049)	(0.039)	(0.024)	(0.024)
Average hours			-0.133	-0.098	-0.120	-0.116
			(0.148)	(0.113)	(0.107)	(0.108)
Av. Hours Sq.			0.076	0.019	-0.000	-0.006
			(0.152)	(0.122)	(0.110)	(0.110)
log(Cap./empl)			0.049***	0.057***	0.045***	0.045***
			(0.018)	(0.013)	(0.012)	(0.012)
Std dev. $\alpha^{\hat{h}}\_i$ btw skill groups				-0.025	-0.028	-0.027
				(0.021)	(0.021)	(0.020)
Bargaining firm						-0.035***
						(0.010)
Region f.e.	NO	NO	YES	YES	YES	YES
Controls for sorting	NO	NO	YES	YES	YES	YES
3 digits Sector f.e.	NO	NO	NO	NO	YES	YES
Mean dep. variable	5.171	-0.124	-0.124	-0.124	-0.124	-0.124
Std. dev. dep. variable	0.295	0.235	0.235	0.235	0.235	0.235
Mean SD Hours btw skills	184.637	184.637	184.637	184.637	184.637	184.637
Part. R-sq SD Hours	0.018	0.001	0.000	0.001	0.000	0.000
Part. R-sq VA and Sales	0.135	0.020	0.013	0.018	0.010	0.010
Constraints Share	0.133	0.058	0.025	0.037	0.026	0.027
R-sq	0.018	0.001	0.024	0.331	0.365	0.366
N	7420	7420	7420	7420	7420	7420

Note: In this table, we report the results of estimating equation (1). In column (1), the dependent variable is the firm mean wage. In columns (2)-(6), the dependent variable is the firm fixed effect from the AKM model (2). The "Stand. Dev." is the standard deviation of the average total hours worked across skill groups within a firm. Skill groups are defined at the intersection of 3 educational groups (i.e., primary, secondary and tertiary education) and 3 broad occupational categories (i.e., manager, middle manager and blue collar). All regressions show standardized coefficients. The exporter dummy is derived as the modal exporter status between 2003 and 2011. (Cap/empl) stands for physical capital over the number of full-time equivalent employees. "Controls for sorting" refers to a vector of controls for the share of workers in each skill group, and a vector containing the average value of the individual fixed effects $\hat{\alpha_i}$ in each quartile of the distribution of $\hat{\alpha_i}$ within a firm. Constraints share is derived as the ratio of "Part. R-sq SD Hours" and "Part. R-sq VA and TFP". Standard errors are clustered at the 3-digit industry level. *, ** and *** are 10, 5 and 1 percent significance levels, respectively.

Table D.16: Hours constraints and wage differentials, definition 2: robustness checks

	(1) Firm f.e.	(2) Firm F.E.	(3) Firm F.E.	(4) Firm F.E.	(5) Firm F.E.	(6) Firm F.E.	(7) Hourly Wages
Std dev. btw skill groups		-0.025*			-0.034**		-0.028***
		(0.015)			(0.015)		(0.001)
Stand. Dev. Normal Hours	-0.034*						
	(0.020)						
Stand. dev. w/i skill groups			-0.071***				
			(0.014)				
Std. dev. hours (overall)				-0.080***			
				(0.018)			
Median abs. dev. btw skill groups						-0.026**	
						(0.012)	
Firm size	0.027***	0.024***	0.030***	0.031***	0.025***	0.028	0.031***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.009)	(0.017)	(0.002)
Exporter status	0.014	0.020	0.017	0.017	0.017	0.014	0.014***
	(0.011)	(0.016)	(0.014)	(0.013)	(0.014)	(0.012)	(0.001)
Union. Rate	0.018	0.059**	0.054***	0.044**	0.033**	0.052***	0.001
	(0.018)	(0.024)	(0.019)	(0.020)	(0.015)	(0.012)	(0.001)
Female Share	-0.085***	-0.148***	-0.137***	-0.141***	-0.116***	-0.144***	0.055***
	(0.021)	(0.026)	(0.023)	(0.023)	(0.028)	(0.015)	(0.002)
Average Hours	0.163	-0.136	-0.195*	-0.171	-0.048	-0.130**	0.049***
	(0.110)	(0.109)	(0.111)	(0.104)	(0.110)	(0.064)	(0.002)
log(Cap/empl)	0.030***	0.044***	0.042***	0.044***	0.042***	0.047***	0.046***
	(0.011)	(0.014)	(0.011)	(0.012)	(0.011)	(0.011)	(0.001)
Std dev. $\alpha^{\hat{h}}\_i$ btw skill groups	-0.030*	-0.027	-0.026	-0.029	0.065	-0.025*	0.009
	(0.018)	(0.025)	(0.021)	(0.021)	(0.190)	(0.014)	(0.021)
3 digits Sector f.e.	YES	YES	YES	YES	YES	YES	YES
Av. Hours b/w 36.5 and 37.5	YES	NO	YES	YES	YES	YES	YES
Part-time Workers	YES	YES	YES	YES	NO	YES	YES
KSS leave-out estimation	NO	NO	NO	NO	NO	NO	YES
R-sq	0.250	0.372	0.375	0.368	0.328	0.365	0.631
N	7357	5689	7320	7458	7464	7458	453117

Note: In this table, we report a set of robustness checks of the results presented in column (6) of Table 3. All regressions report standardized coefficients. The dependent variable in column (1) is based on wage rates from regular hours only. "Std Dev. Hours btw Skill Groups" in the table refers to the standard deviation of the average total (regular and overtime) hours worked across skill groups within a firm (Section 4.3). "Std. Dev. Normal hours" is the standard deviation of the regular hours worked across skill groups within a firm. "Stand. Dev. w/i skill groups" refers to the standard deviation of the average total (regular and overtime) hours worked within skill groups within a firm. The "Median Abs. Dev." is the median absolute deviation of median hours (regular and overtime) across skill groups within a firm. Skill groups are defined at the intersection of 3 educational groups (i.e., primary, secondary and tertiary education) and 3 broad occupational categories (i.e., manager, middle manager and blue collar). All specifications include additional controls for the share of workers in each skill group, a vector containing the average value of the individual fixed effects $\hat{\alpha_i}$ in each quartile of the distribution of $\hat{\alpha_i}$ within a firm and average hours squared. In columns (1) to (7) we also control for region fixed effects. We refer to the footnote of Table 3 for more details on the construction of the other variables that are part of the table. In column (7) we also control for the dummy "bargaining firm". We define an employer as a "bargaining firm" if it is in the fourth quartile of the standard deviation of within-firm changes in log wages among stayers (Lachowska et al., 2022). Standard errors in column (1) to (7) are clustered at the 3-digit industry level. Standard errors in column (8) are based on the Kline et al. (2020) (KSS) leave-one-out estimator. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table D.17: Hours constraints and firm characteristics, definition 2

	Stand. dev. of hours across skill groups within firms (def.2)		Obs.
	(1)	(2)	
TFP	-0.133***	-0.086***	16378
	(0.010)	(0.012)	
Time cooperating with coworkers	-0.117***	-0.038***	10325
	(0.012)	(0.015)	
Sharing work-related information	-0.083***	-0.025**	10325
	(0.012)	(0.012)	
Coordination	-0.019	-0.010	13578
	(0.012)	(0.014)	
Negotiation	-0.187***	-0.115***	13628
	(0.010)	(0.014)	
Persuasion	-0.137***	-0.085***	13628
	(0.012)	(0.016)	
Social perceptiveness	-0.133***	-0.077***	13628
	(0.011)	(0.014)	
Blue collar workers: 90th/10th wage ratio	0.091***	0.082***	16348
	(0.017)	(0.016)	
Top managers: 90th/10th wage ratio	-0.067***	-0.028***	12862
	(0.009)	(0.008)	
3 digits Sector f.e.	NO	YES	

Notes: The table shows standardized coefficients from a regression of the standard deviation of hours across skill groups on firm characteristics. Each cell is a different regression. In column 2, we add 3-digit industry fixed effects to the baseline classification. We use the Danish industry classification DB07 that for the first 4-digit classification corresponds to NACE rev.2. TFP is obtained from the procedure described in Ackerberg et al. (2015). To avoid confusion, we label the O*NET descriptor "Coordination" as "Adjust Actions to Others". Standard errors in parentheses are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.

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