

# WORKING TIME REGULATIONS & REDISTRIBUTION

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# WORKING TIME REGULATIONS: DAYS

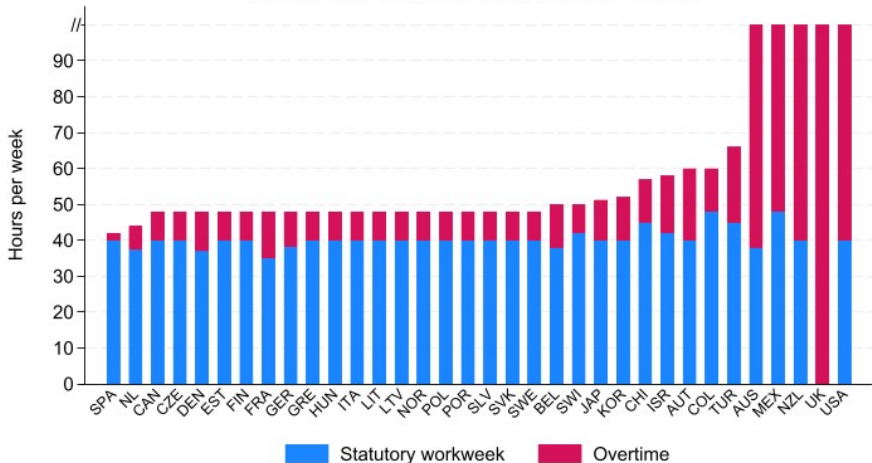
## Holidays across the OECD



Source: OECD Employment Outlook 2020

# WORKING TIME REGULATIONS: HOURS

## Maximum workweek across the OECD



Source: OECD Employment Outlook 2020

# POLITICAL HISTORY

- France

- 1841: max 12h/day for teens
- 1848: max 12h/day for all
- 1904: max 10.5h/day
- 1919: 48h workweek, 8h/day
- 1936: 40h workweek, 2 weeks PTO
- 1956: 3 weeks of PTO
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- United States

- 1872 : "8 hours" strike song
- 1896 : SCOTUS *blue laws*
- 1933 : National Industrial Recovery Act
- 1935 : SCOTUS strikes down NIRA
- 1938 : Fair Labor Standards Act
  - ★ 40 hours-workweek
  - ★ *Time-and-a-half*
  - ★ Minimum wage

# INTRODUCTION

- Vast heterogeneity of working time regulations across countries
    - Days: public holidays, paid time off, weekends Worldwide
    - Hours: maximum workweek, overtime
  - Long history Quotes BE vs USA
  - Hot topic in BEL, DEN, FRA, GER, LUX, KOR, USA, ... Long hours
  - Research questions:
    1. Wage and employment effects
    2. Winners and losers
- ⇒ This paper: a welfare analysis of hours regulations

## THIS PAPER

- Wage-employment-hours in general equilibrium
- Hedonic workers: leisure-consumption tradeoff

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1. Toy model: no unemployment risk
    - Empirical predictions
      - #1 Pure monopsony : wage-hours covariance is positive
      - #2 Perfect competition: wage-hours covariance is negative

# THIS PAPER

- Wage-employment-hours in general equilibrium
  - Hedonic workers: leisure-consumption tradeoff
1. Toy model: no unemployment risk
    - Empirical predictions
      - #1 Pure monopsony : wage-hours covariance is positive
      - #2 Perfect competition: wage-hours covariance is negative
  2. General model: directed search
    - Sorting
      - #3 ↗ Productivity  $\implies$  ↗ wage rates, job quality  
↘ hours worked, job-finding probability
    - Welfare
      - #4 Quantify gains/losses in sufficient statistics
  3. Empirical part: Belgium's first-ever WTR in coal mines (WIP)



# CONTRIBUTIONS

- **Wages, hours and employment + regulations** Marimon and Zilibotti (2000), Rocheteau (2002), Lang and Majumdar (2004), Gandhi and Ruffini (2022), Jardim et al. (2022), Carry (2023), Fagnart et al. (2023), Gravouelle (2023), and Kim et al. (2023)
  - Contribution: a new model + welfare analysis
- **Hedonic theory of wages** (Rosen, 1974, 1986; Hwang et al., 1998) + **competitive search equilibrium** (Moen, 1997; Vergara, 2023)
- **Compensating differentials and amenities:** Mas and Pallais (2017), Clemens et al. (2018), Hall and Mueller (2018), Mas and Pallais (2020), Clemens (2021), Lamadon et al. (2022), Sockin (2022), and Ouimet and Tate (2023)
  - Contribution: normative analysis

# HEDONIC THEORY OF WAGES (ROSEN, 1974) + EMPLOYMENT

- Workers :  $u(wl, l)$  and outside option  $\sim G(c)$ 
  - Hence, labor supply  $N_S(w, l) = G(u(wl, l))$ 
    - ★ Increasing in  $w$
    - ★ Increasing and then decreasing in  $l$

Conditions on  $G$

# HEDONIC THEORY OF WAGES (ROSEN, 1974) + EMPLOYMENT

Conditions on G

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  - Hence, labor supply  $N_S(w, l) = G(u(wl, l))$ 
    - ★ Increasing in  $w$
    - ★ Increasing and then decreasing in  $l$
- Firms profits:

$$N^\alpha l^\beta - Nwl$$

## – Assumptions

- ★  $\alpha < 1$
- ★  $\beta < 1$
- ★  $\alpha < \beta$

*fixed costs of hiring*  
*fatigue*  
*experience*

# MONOPSONY EQUILIBRIUM

- Monopsony chooses wage rates and hours

$$\max_{w,l,N} N^\alpha l^\beta - Nwl \quad \text{s.t.} \quad N = N_S(w, l)$$

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- Equilibrium conditions:

$$w \text{ s.t.} \quad \frac{\partial N_S}{\partial w} (\alpha N^{\alpha-1} l^\beta - wl) = lN$$

$$l \text{ s.t.} \quad \frac{\partial N_S}{\partial l} (\alpha N^{\alpha-1} l^\beta - wl) + \beta N^\alpha l^{\beta-1} - wN = 0$$

- Remarks:

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- Remarks:
  - **Earnings** & **Payroll per hour** are marked down
  - $\frac{\partial N_S}{\partial l} < 0 \implies$  workers would like to work less!

## MONOPSONY: WORKING TIME REDUCTION

- The wage condition is  $\frac{\partial N_s}{\partial w} (\alpha N^{\alpha-1} l^\beta - wl) = Nl$
- Consider a small binding  $d\bar{l} < 0$ . Total derivative reads:

$$dw \underbrace{\left( \frac{\partial^2 \pi}{\partial^2 w} \right)}_{\leq 0} + dl \underbrace{\left( \frac{\partial^2 \pi}{\partial w \partial l} \right)}_{\geq 0} = 0$$

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- **WTR implies that monopsony wage rate decreases**

- Intuition :

- ★ WTR increases participation
- ★ Marginal product of a job ↓
- ★ Wage elasticity of labor supply ↓

⇒ lower wage rates

$$\frac{\partial N_s}{\partial l} < 0$$

$$\alpha < 1$$

# COMPETITIVE EQUILIBRIUM

- Price-taking agents
  - Firms choose employment
  - Workers choose hours

$$N_d = \arg \max N^\alpha l^\beta - wlN$$

$$l = \arg \max u(wl, l)$$

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- Remarks:
  - No **markdown on earnings**
  - Positive profits

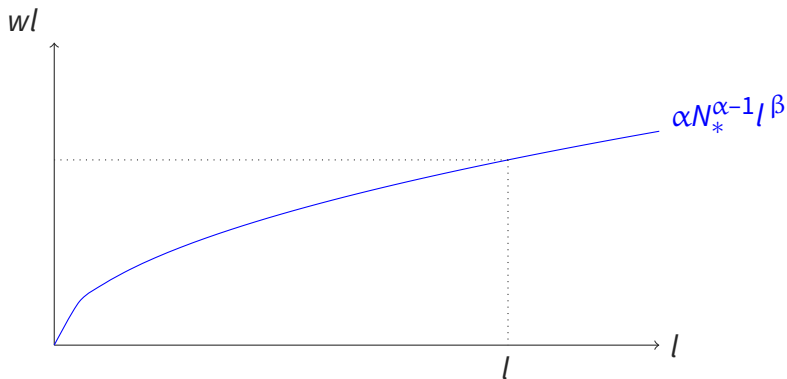
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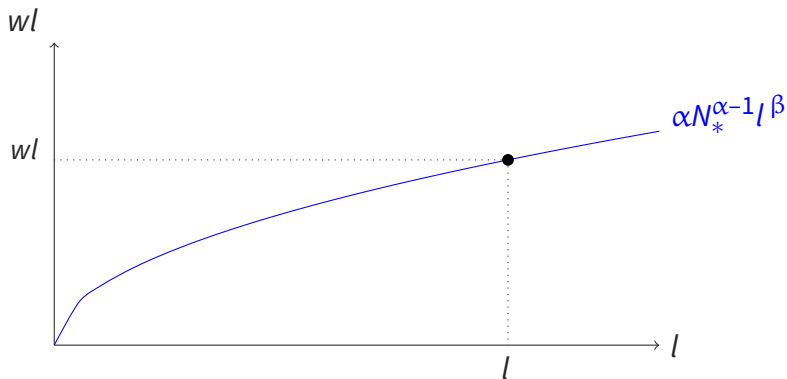
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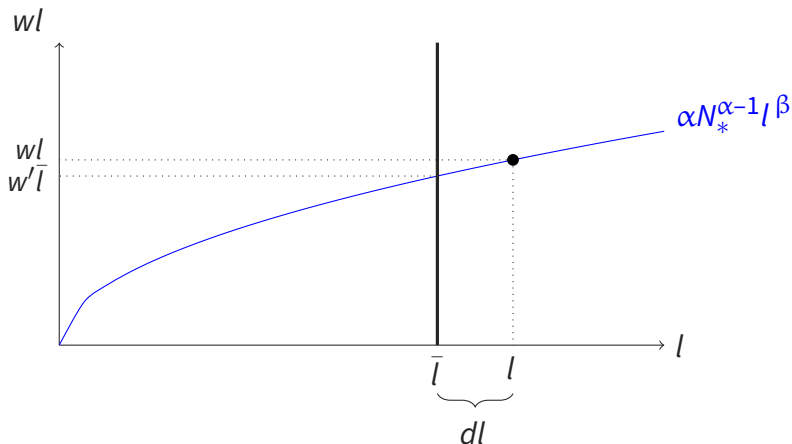
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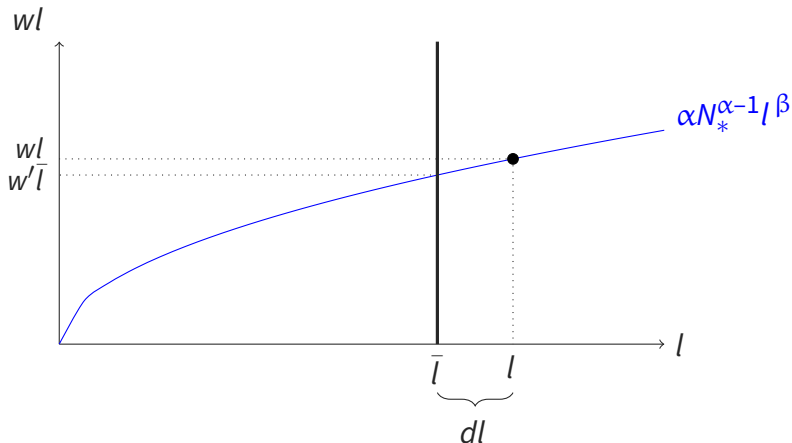
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## COMPETITION: WORKING TIME REDUCTION

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- Competitive wages increases after WTR!

## BUT..

- This toy model is too simple for welfare analysis
  - Only two homogeneous agents
  - No unemployment risk: participation=employment
  - Workers' welfare  $\leftrightarrow$  employment
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- This toy model is too simple for welfare analysis
  - Only two homogeneous agents
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  - Only one contract in equilibrium
- General model embeds the toy model and adds
  - Matching frictions, contract posting and directed search
  - Workers trade-off good contracts with unemployment risks
  - Firms are heterogeneous in productivities  $\psi_j$

## GENERAL MODEL

- Submarket  $m$  for each contract  $(w_m, l_m)$ , Matching  $\mathcal{M}(a_m, v_m)$ :
  - $p_m$  : job-finding probability
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- Firm  $\psi_j$  choose vacancies, wage rates and hours worked

$$\max_{w_m, l_m, v_m} \int_m \psi_j (\tilde{q}_m v_m)^\alpha (l_m)^\beta - \tilde{q}_m v_m w_m l_m - k(v_m) dm$$

- Entry decisions [Details](#)

# EQUILIBRIUM PROPERTIES

- Contract dispersion among observably similar workers
- Earnings markdown
- If  $\alpha < \beta < 1$ , then WTR decreases wage rates
- Sorting: firms with higher  $\psi_j$  have
  - ↗ wage rates
  - ↘ hours worked
  - ↗ job quality
  - ↗ vacancies
  - ↗ applications
  - ↘ job-finding probability

# GOVERNMENT INTERVENTION

- Agents' types
  - Firms : heterogeneous  $\psi_j$
  - Workers : heterogeneous  $u_i(c, l)$



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  - Government observe  $(w, l)$  but not segmentation
- Social welfare : utilitarian weighted sum over types of
  - Expected utility of employed, unemployed, inactive
  - Expected profits

## SUFFICIENT STATISTICS

- A reform  $dl$  is welfare improving if

$$0 \leq \sum_i \frac{dSW^i}{d\bar{l}} = \omega_W^i \frac{1}{\alpha^i} \int_{m^i} \frac{dE_{m^i}}{d\bar{l}} u^i(w_{m^i}, l_{m^i}) \\ + E_{m^i} \frac{du^i(w_{m^i}, l_{m^i})}{d\bar{l}} dm^i + \int_{\psi^*}^{\bar{\psi}} \omega_K(\psi) \frac{d\pi(\psi)}{d\bar{l}} d\mathcal{H}(\psi)$$

where  $\omega_W^i, \omega_K(\psi)$  are marginal social welfare weights and  $\alpha^i$  is a constant

- ⇒ The macro-elasticity of **employment, wage and profits** are sufficient to assess the reform
- ⇒ WTR redistributes from firms' profits to workers' welfare

# CONCLUSION

- This paper:
  - New model of codetermination of  $N, w, l$
  - New welfare analysis of working time regulations
- Ongoing
  - Estimate sufficient statistics with the Belgian 1910 WTR in coal mines

# Thank you!

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 @ant1germain

# EXTRA ASSUMPTIONS

- $G(\cdot)$  is
  - Strictly increasing
  - Concave
- $\frac{\partial N^S}{\partial w \partial l}$  is positive

Back

# ENTRY

- Workers
  - Heterogeneous disutility of participation  $c$ , with c.d.f  $\mathcal{G}(c)$
  - Workers enter the labor market if and only if  $\bar{U} \geq c$
  - Labor force is given by  $N \times \mathcal{G}(\bar{U})$

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- Firms are owned by capitalists  $\psi_j \in [\underline{\psi}, \bar{\psi}]$ , c.d.f.  $\mathcal{H}(\psi)$ 
  - Fixed cost of entry denoted by  $x$
  - Capitalist  $\psi_j$  enters the labor market iff  $\pi(\psi_j) \geq x$
  - As  $\pi(\cdot)$  is monotonic,  $\exists$  **decisive**  $\psi^*$ :  $\forall \psi_j \geq \psi^*$  participate



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  - As  $\pi(\cdot)$  is monotonic,  $\exists$  **decisive**  $\psi^*$ :  $\forall \psi_j \geq \psi^*$  participate
- Inactive population size is  $I(\bar{U}, \psi^*) = N \times (1 - \mathcal{G}(\bar{U})) + K \times \mathcal{H}(\psi^*)$

# COMPETITIVE SEARCH EQUILIBRIUM (MOEN, 1997; VERGARA, 2023)

$$\left\{ \bar{U}, \psi^*, \{a_m, v_m, w_m, l_m\}_{\forall m} \right\} \text{ CSE for } e = \left\{ \mathcal{M}, N, K, \mathcal{G}, \mathcal{H}, x, k, F, u() \right\}$$

1. Firms are exp. profit maximizers :  $v_m, w_m, l_m$  solves FOC's  $\forall m$
2. Capitalists entry constraint :

$$\psi^* \text{ solves } \pi(\psi^*) = x$$

taking  $\bar{U}$  given

3. Across-submarket equilibrium condition:

$$a_m \text{ solves } \bar{U} = p_m \left( \frac{v_m}{a_m} \right) u(w_m l_m, l_m) \text{ taking } \psi^*, v_m, l_m, w_m \text{ given}$$

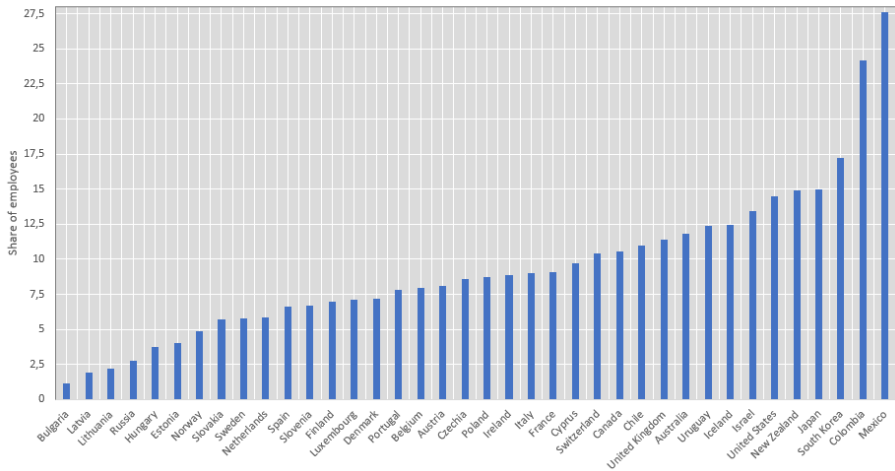
4. Workers' participation constraint :

$$\bar{U} \text{ solves } \int_m a_m dm = \mathcal{G}(\bar{U}) \times N \quad \text{taking } \psi^*, u, a_m \text{ given}$$



# LONG HOURS IN THE DATA

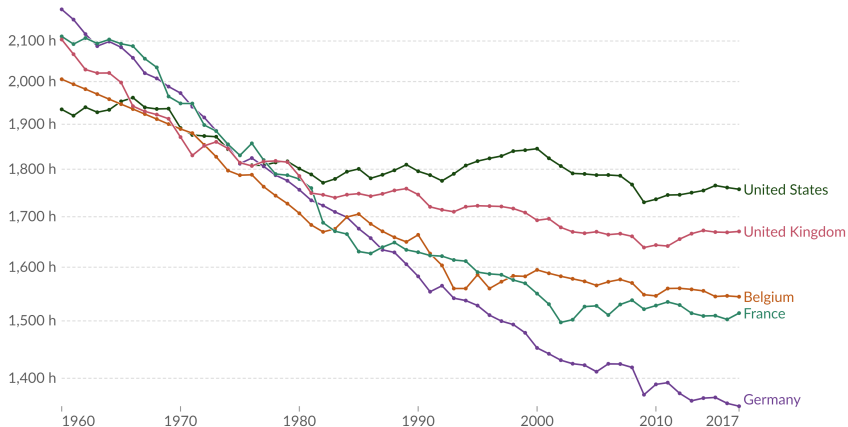
Share of employees working more than 49h per week



Source: ILOSTAT Wage and Working Time Statistics Database 2023

# Annual working hours per worker

Average working hours per worker over an entire year. Before 1950 the data corresponds only to full-time production workers (non-agricultural activities). Starting in 1950 estimates cover total hours worked in the economy as measured primarily from National Accounts data.



Data source: Huberman & Minns (2007) and PWT 9.1 (2019)

[OurWorldInData.org/working-hours](https://OurWorldInData.org/working-hours) | CC BY

Note: We plot the data from Huberman & Minns (2007) and extend coverage using an updated vintage of PWT, which uses the same underlying source. Comparisons between countries are limited due to differences in measurement.

# POLITICAL HISTORY

- France

- 1841 : max 12h/day if age  $\in [12, 16]$
- 1848 : max 12h/day for all
- 1904 : max 10.5h/day
- 1919 : 48h workweek, 8h/day
- 1936 : 40h workweek, 2 weeks PTO
- 1956 : 3 weeks of PTO
- 1968 : 4 weeks of PTO
- 1982 : 39h workweek, 5 weeks PTO
- 2000 : 35h workweek

- United States

- 1872 : "8 hours" strike song
- 1896 : SCOTUS *blue laws*
- 1933 : National Industrial Recovery Act
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  - ★ 40 hours-workweek
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  - ★ Minimum wage

Note 1: PTO mandates in 1900s in Germany, 1910s Austria-Hungary and Scandinavia, 1920s in Lux., Poland, Tchechoslovakia, Italy, Greece, Roumania, Spain, Portugal, Chili, Mexico, Brazil

Note 2 : Hunter-gatherers had more leisure than agrarian/industrial societies (Dyble et al., 2019)

Note 3 : first Sunday off by Constantine 321 BC. Religious roots (*Shabbath, dies dominini, Jumu'ah*)

## BLUE LAWS

*Upon no subject is there such a concurrence of opinion, among philosophers, moralists and statesmen of all nations, as on the necessity of periodical cessation from labor. One day in seven is the rule, founded in experience and sustained by science. ... The prohibition of secular business on Sunday is advocated on the ground that by it the general welfare is advanced, labor protected, and the moral and physical well-being of society promoted.*

Justice Stephen Field —*Hennington v. Georgia*, 163 U.S. 299 (1896)

*“Everyone has the right to rest and leisure, including reasonable limitation of working hours and periodic holidays with pay.”*

Art. 24, Universal Declaration of Human Rights. Paris, December 10, 1948

# LEGISLATIVE HISTORY

- Belgium

- 1889 : 12h/day for children
- 1905 : Sunday rest law
- **1910 : max 9h/day in mines**
- 1921 : 48h workweek, 8h/day
- 1936 : 1 week of PTO
- 1956 : 2 weeks of PTO
- 1964 : 45h workweek
- 1966 : 3 weeks of PTO
- 1975 : 4 weeks of PTO
- 1978 : 40h workweek
- 1996 : 39h workweek
- 2001 : 38h workweek

- United States

- 1896 : SCOTUS *blue laws*
- 1916 : 8h/day rail workers
- 1933 : National Industrial Recovery Act
- 1935 : SCOTUS strikes down NIRA
- 1938 : Fair Labor Standards Act
  - ★ 40h workweek
  - ★ *Time-and-a-half*
  - ★ Minimum wage