Working Time Regulation, Unequal Lifetime and Fairness

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Fall 2016

Introduction (1)

- Since the 19th century, workers movements have called for working time reductions.

Year	Reform fixing the maximum working time to
1848	84 hours per week (12 hours per day)
1900	70 hours per week in the industry (10 hours per day)
1919	48 hours per week (8 hours per day for 6 days)
1936	40 hours per week
1982	39 hours per week
2000	35 hours per week (for firms $>$ 20 workers, in 2002 for all)

Table 1: A brief history of working time regulation in France.

Introduction (2)

- Working time reductions certainly have some impact on *unemployment* (Crépon and Kramartz, 2002; Chemin and Wasmer, 2009), *firm productivity* (Crépon et al. 2004) , *actual # of hours worked* (Hunt, 1999), *female labour supply* (Goux et al. 2011) etc.
- Also, redistributive impact of WT regulations:
  If WT reduction is *compensated*, this implies a rise in hourly wage, and affects the distribution of income between capital and labor.
- But... NO research has paid attention to the redistributive impact of WT regulations from a *lifecycle perspective.*

Introduction (3)

- Without longevity inequalities, the lifetime redistributive impact of WT regulations would be neutral because everybody would face the same constraints at each and every period of their life.
  ....but with longevity inequalities, regulations are no longer neutral.

- **Goal of this paper:** examine redistributive consequences of WT regulations in an economy where agents have different longevities.
  $\rightarrow$ study how WT regulations can be used to reduce welfare inequalities between SL and LL, and how to improve the situation of the unlucky short-lived agents.

Introduction (4)

- There remain significant longevity inequalities for which agents cannot be held *responsible*.
  Christensen et al (2006): genetic factors account for $1/4$ of the variance in adult longevity.

- *Principle of Compensation (Fleurbaey, 2008)*: inequalities due to circumstances should be abolished
  $\rightarrow$ strong ethical support for government intervention in reducing welfare inequalities due to premature death.

- Difficulty with the compensation of a short-lived person:
  ex ante, short-lived cannot be identified but *ex post*, it is too late to affect the well-being of these agents.

- We study here how WT regulations can help compensating SL agents.

Introduction (5)

The model in a nutshell:

- Lifecycle model with risky lifetime where agents choose how many hours they would like to work at each period of their life as well as when to retire.
- Derive the LF and see how uniform WT regulations affect lifetime welfare.
- Derive Ex post egalitarian optimum, how to decentralize it and how age-specific WT regulations can help (or not).

Introduction (6)

The results in a nutshell:

- Uncompensated WT reduction can, in some cases, reduce lifetime inequalities but it will worsen the situation of the SL agents.
- Compensated WT reduction makes the SL better-off but at the cost of increasing welfare inequalities between SL and LL.
- Ex post egalitarian optimum involves *a number of worked hours increasing with the age*.
- The decentralization needs taxation of savings and LS taxation. Age-specific WT regulations alone cannot fully decentralize the Ex post Egalitarian optimum but it can reduce inequalities and increase the welfare of the SL.
- Numerical simulations for France (1948-2000) show that WT regulations significantly improved the welfare of the SL.

Introduction (7)

- It complements the literature on WT regulations and its economic consequences.
  It also complements the studies on how the government could / should intervene to reduce inequalities in lifetime welfare between SL and LL.

- This is part of a research agenda started with Fleurbaey and Ponthière some years ago:
  Fleurbaey, Leroux and Ponthière, *JMathE* (2013);
  Fleurbaey and Ponthière, *JPubE* (2013);
  Fleurbaey, Leroux, Pestieau and Ponthière, *IER* (2013);
  Fleurbaey, Leroux, Pestieau, Ponthière and Zuber, *somewhere (one day)*

The model (1)

- *3-period model*:
  - Period 1: Childhood.
  - Period 2 (young adulthood): Agents supply $\ell_y \in [0,1]$, consume and save.
  - Period 3 (old adulthood): Agents supply $\ell_0 \in [0,1]$ in period 3 for a length of time z. They retire during a period $1-z$. They consume.

- Only a fraction $\pi \in [0,1]$ of young adults reach period 3.

- 2 groups of agents *ex post*:
  - A fraction π of LL agents
  - A fraction $1-\pi$ of SL agents.

The model (2)

- **Expected lifetime utility:**

$$u(c) - v(\ell_y) + \pi\left[u(d) - zv(\ell_o)\right] \tag{1}$$

with $u(\bar{c}) = 0$, $v(0) = 0$, $v'(0) = 0$.

- **Lifetime resource constraint:**

$$c + \pi d = \ell_y w + \pi z \ell_o w \tag{2}$$

(perfect annuity market with actuarially fair returns and $R = 1$)

The laissez-faire (1)

Maximisation of expected utility:

$$\max_{c,d,\ell_y,\ell_o,z} u(c) - v(\ell_y) + \pi\left[u(d) - zv(\ell_o)\right]$$
$$\text{s.t. } \ell_y w + \pi z \ell_o w \geq c + \pi d$$

which yields the following FOCs:

$$u'(c) - \lambda = 0$$
$$u'(d) - \lambda = 0$$
$$wu'(c) - v'(\ell_y) = 0$$
$$wu'(d) - v'(\ell_o) \geq 0$$
$$w\ell_o u'(d) - v(\ell_o) \geq 0$$

Since $v'(\ell_o) > \frac{v(\ell_o)}{\ell_o}$, at the equilibrium, the FOC for ℓ_o is binding but not the FOC for z.

The laissez-faire (2)

- **Results (shortened Prop. 1):**

$$\begin{aligned} c^{LF} &= d^{LF} = \ell w \\ \ell_y &= \ell_o = \ell^{LF} \in]0,1[\\ z^{LF} &= 1 \end{aligned}$$

- Allocation is independent of π.
- Same result as the Utilitarian optimum.
- Same expected lifetime well-being.
- LL agents are better-off than SL if

$$U^{LL} - U^{SL} = u(w\ell^{LF}) - v(\ell^{LF}) > 0.$$

$\rightarrow$ A higher w increases welfare inequalities and thus for a high w, this inequality is more likely to hold.

Uniform working time regulations

Government fixes a uniform maximum working time $\bar{\ell}$. We assume that mandatory retirement age is fixed to $\bar{z} = 1$.

Several cases:

- No possibility of *overtime work* or possibility of overtime work with a higher wage for the extra hours.
- *Constant hourly wage* or not: constant so that total earnings decrease (*uncompensated*) or adjusted upwards so that total earnings remain constant (*compensated*).

No possibility of overtime work (1) - Prop. 2:

Uncompensated reduction of working time:

- *If working time regulations are not constraining:* $\ell_y = \ell_o = \ell^{LF} < \bar{\ell}$, exact same results as in the LF.
- *If working time regulations are constraining,* i.e. $\bar{\ell} < \ell^{LF}$, the agent chooses $\ell_y^R = \ell_o^R = \bar{\ell}$ and

$$c^R = w\bar{\ell} < w\ell^{LF}$$

- When the WT regulation is constraining, *inequalities between long-lived and short-lived persons are reduced* in comparison to the LF if:

$$u(w\bar{\ell}) - v\left(\bar{\ell}\right) < u\left(\ell^{LF} w\right) - v\left(\ell^{LF}\right)$$

  ... but this is at the cost of *reducing the welfare of short-lived individuals.*

No possibility of overtime work (2) - Prop. 2:

Compensated reduction of working time:

- The hourly wage w is adjusted upwards, so that the total labour income remains unchanged.
  The adjusted hourly wage rates are:

$$w'_y = w\frac{\ell^{LF}}{\ell_y^{CR}} \text{ and } w'_o = w\frac{\ell^{LF}}{\ell_o^{CR}}$$

- *If working time regulations are not constraining:* exact same results as in LF. No effect on inequalities between the SL and the LL.
- *If working time regulations are constraining ($\bar{\ell} < \ell^{LF}$):*
  $\ell_y^{CR} = \ell_o^{CR} = \bar{\ell} < \ell^{LF}$ and $c^{CR} = d^{CR} = \bar{\ell}w' = \ell^{LF}w = c^{LF}$
  $\Rightarrow$ *SL have higher welfare than at the LF:*

$$u(c^{CR}) - v\left(\bar{\ell}\right) > u(c^{LF}) - v\left(\ell^{LF}\right)$$

...but this is at the cost of *higher welfare inequalities between SL and LL*.

Possibility of overtime work (1):

- Below $\bar{\ell}$, agents obtain a wage w, while after this threshold, they obtain a wage $w(1+p)$ where p is strictly positive.

- The problem of the agent:

$$\max_{c,d,\ell_y,\ell_o} u(c) - v(\ell_y) + \pi [u(d) - v(\ell_o)]$$

s.t. $w\bar{\ell} + (\ell_y - \bar{\ell})w(1+p) + \pi(w\bar{\ell} + (\ell_o - \bar{\ell})w(1+p)) \geq c + \pi d$
if $\ell_o, \ell_y \geq \bar{\ell}$
or $\ell_y w + \pi \ell_o w \geq c + \pi d$ if $\ell_o, \ell_y < \bar{\ell}$

- Whether $\ell_y^{RR} = \ell_o^{RR} \gtrless \bar{\ell}$ depends on the specific forms of $u(\cdot)$ and $v(\cdot)$ as well as on the size of the premium p.

Possibility of overtime work (2):

2 possible solutions

- If $\ell_o^{RR}, \ell_y^{RR} < \bar{\ell}$, $\ell_o^{RR} = \ell_y^{RR} = \ell^{LF} \rightarrow$ identical to LF.
- If $\ell_o^{RR}, \ell_y^{RR} \geq \bar{\ell}$, $c^{RR} = d^{RR}$, $\ell_y^{RR} = \ell_o^{RR} > \ell^{LF}$ defined by

$$\begin{aligned} u'(c^{RR}) &= u'(d^{RR}) = \lambda \\ v'(\ell_y^{RR}) &= v'(\ell_o^{RR}) = w(1+p)\lambda \end{aligned}$$

- In 2^{nd} case, inequalities are smaller than at the LF if

$$u\left(c^{RR}\right) - v\left(\ell_o^{RR}\right) < u\left(c^{LF}\right) - v\left(\ell^{LF}\right)$$

with $\ell_O^{RR} > \ell^{LF}$ and $c^{RR} = (w\bar{\ell} + w(1+p)(\ell_o^{RR} - \bar{\ell}) > c^{LF} = w\ell^{LF}$.

- But, if welfare inequalities are reduced, this will be at the cost of reduced welfare for the SL.

Ex post egalitarian optimum (1)

- Agents are identical *ex ante*, before the duration of life is revealed ... but *ex post*, they turn out to be different because of *circumstances* (death) over which they have no control.
- *Principle of Compensation (Fleurbaey and Maniquet, 2004; Fleurbaey, 2008)*: inequalities in realized lifetime well-being due to differences in longevities should then be abolished by the government.
- Cannot rely on the *Utilitarian* SW criterion as it legitimates the LF and the inequalities between SL and LL.
- The *ex-post Egalitarian* SW criterion maximizes the realized lifetime well-being of the worst-off in the society (see Fleurbaey et al. 2014).
- However, one major difficulty is that it is impossible to identify *ex ante* the individuals who will turn out to be SL.

Ex post egalitarian optimum (2)

- Under an ex post egalitarian social objective, the social planner's problem becomes:

$$\max_{c,d,\ell_y,\ell_o,z} \min \quad \{u(c) - v(\ell_y), u(c) - v(\ell_y) + u(d) - zv(\ell_o)\}$$

$$\text{s.t.} \quad \ell_y w + \pi z \ell_o w \geq c + \pi d$$

or equivalently:

$$\max_{c.d,\ell_y,\ell_o,z} \quad u(c) - v(\ell_y)$$

$$\text{s.t. } \ell_y w + \pi z \ell_o w \geq c + \pi d$$

$$\text{s.t. } u(d) - zv(\ell_o) \geq 0$$

Ex post egalitarian optimum (3)

Shortened Proposition 4

- At the ex post egalitarian optimum, we have:

$$\begin{aligned} u'(c^*) &= \frac{\mu}{\pi} u'(d^*) \\ v'(\ell_y^*) &= u'(c^*)w \\ v'(\ell_o^*) &= u'(d^*)w \\ \ell_y^* w + \pi z^* \ell_o^* w &= c^* + \pi d^* \\ u(d^*) &= z^* v(\ell_o^*) \\ z^* &= 1 \end{aligned}$$

- This implies that if $\frac{\mu}{\pi} \leq 1$,

$$c^* \geq d^* > \bar{c} \text{ and } \ell_o^* \geq \ell_y^*.$$

- While if $\frac{\mu}{\pi} > 1$,

$$\begin{aligned} d^* &\geq c^* \text{and } d^*, c^* < \bar{c} \\ \ell_y^* &> \ell_o^*. \end{aligned}$$

Ex post egalitarian optimum (4)

- When $\frac{\mu}{\pi} \leq 1$, we have a decreasing consumption profile and an increasing labour profile with the age.

- The compensation of the prematurely dead requires to make the young work less, consume more and, to make the surviving old work more and consume less.
  It increases the utility of the young and thus, the lifetime well-being of SL agents.

- By definition, no inequality in lifetime welfare remains: $u(d^*) = v(\ell_o^*)$.

- The *ex post* Egalitarian criterion enables to maximize the lifetime welfare of the short-lived and to minimize inequalities in realized lifetime well-being.

Uncompensated age-specific WT regulations (1)

The government imposes ℓ_y^*, ℓ_o^* with $\ell_y^* < \ell_o^*$ as *maximal* working time and $z^* = 1$.

- If $\ell^{LF} \leq \ell_y^* < \ell_o^*$, the regulation is not constraining and $c^R = d^R = \ell^{LF} w$.
- If $\ell_y^* < \ell_o^* \leq \ell^{LF}$, the regulation is constraining in both periods $\ell_y^R = \ell_y^*$ and $\ell_o^R = \ell_o^*$, but consumption is still smoothed:

$$c^R = d^R = \frac{\ell_y^* w + \pi \ell_o^* w}{1+\pi} < w\ell^{LF}.$$

- If the working time regulations are constraining only at the young age ($\ell_y^* < \ell^{LF} < \ell_o^*$), $\ell_y^R = \ell_y^*$ and $\ell^{LF} < \ell_o^R \leq \ell_o^*$ and

$$c^R = d^R = \frac{\ell_y^* w + \pi \ell_o^R w}{1+\pi} \lesseqgtr w\ell^{LF}.$$

Uncompensated age-specific WT regulations (2)

- **Age-specific working time regulations cannot alone decentralize the ex-post Egalitarian optimum:**
  - Consumption is still smoothed along the life cycle.
  - WT regulations enable to obtain the ex-post Egalitarian labour supply levels *only* when the LF levels of labour supply at *both* the young and the old ages are greater than at the egalitarian optimum.

- It is not clear that uncompensated age-specific WT regulations are going to reduce welfare inequalities between SL and LL.

Uncompensated age-specific WT regulations (3)

What about welfare inequalities?

- **If WT regulations are constraining at both periods:**

$$U^{LL} - U^{SL} = u\left(\frac{\ell_y^* w + \pi \ell_o^* w}{1+\pi}\right) - v\left(\ell_o^*\right) \gtreqless u(w\ell^{LF}) - v(\ell^{LF})$$

with $c^R < w\ell^{LF}$ and $\ell_o^* < \ell^{LF}$.
$\rightarrow$ It depends on the specific forms of preferences.

- But, it is not necessarily the case that a reduction in inequalities is achieved at the cost of making the short-lived worse off. We may have:

$$\begin{aligned} u\left(\frac{\ell_y^* w + \pi \ell_o^* w}{1+\pi}\right) - v\left(\ell_o^*\right) &< u(w\ell^{LF}) - v(\ell^{LF}) \\ &< u\left(\frac{\ell_y^* w + \pi \ell_o^* w}{1+\pi}\right) - v\left(\ell_y^*\right) \end{aligned}$$

Uncompensated age-specific WT regulations (4)

- **If WT regulations are constraining only in the first period:** We can have both a decrease in welfare inequalities and an increase in the welfare of the SL with respect to the laissez-faire, when:

$$
\begin{aligned}
u\left(\frac{\ell_y^* w + \pi \ell_o^R w}{1+\pi}\right) - v\left(\ell_o^R\right) &< u(w\ell^{LF}) - v(\ell^{LF}) \\
&< u\left(\frac{\ell_y^* w + \pi \ell_o^R w}{1+\pi}\right) - v\left(\ell_y^*\right)
\end{aligned}
$$

where $\ell_y^* < \ell^{LF} < \ell_o^R$ and $c^R \gtrless c^{LF}$.

$\Rightarrow$ **Contrary to what prevails under uniform uncompensated labor time regulations, age-specific uncompensated labor time regulations can, in some cases, both reduce inequalities and make the short-lived better off.**

Compensated age-specific WT regulations (1)

Government imposes maximum number of hours ℓ_y^* and ℓ_o^* with $\ell_y^* < \ell_o^*$ while maintaining the total labor earnings constant so that $w'_y = w\ell^{LF}/\ell_y^{CR}$ and $w'_o = w\ell^{LF}/\ell_o^{CR}$.

- If $\ell^{LF} \leq \ell_y^* < \ell_o^*$, $\ell_y^{CR} = \ell_o^{CR} = \ell^{LF} \rightarrow$ same results as in LF.
- If $\ell_y^* < \ell_o^* < \ell^{LF}$, $\ell_y^{CR} = \ell_y^*$ and $\ell_o^{CR} = \ell_o^*$ and welfare inequalities increase with respect to the LF:

$$u(w\ell^{LF}) - v(\ell^{LF}) < u(w'_o\ell_o^*) - v(\ell_o^*) = u(w\ell^{LF}) - v(\ell_o^*)$$

but the SL is better-off than at the LF:

$$u(w\ell^{LF}) - v(\ell^{LF}) < u(w'_y\ell_y^*) - v(\ell_y^*) = u(w\ell^{LF}) - v(\ell_y^*)$$

Compensated age-specific WT regulations (2)

- If $\ell_y^* < \ell^{LF} \leq \ell_o^*$, $\ell_y^{CR} = \ell_y^*$ and $\ell^{LF} \leq \ell_o^{CR} \leq \ell_o^*$, welfare inequalities are identical to the LF:

  $$u(w\ell^{LF}) - v(\ell^{LF}) \geq u(w_o'\ell_o^{CR}) - v(\ell_o^{CR}) = u(w\ell^{LF}) - v(\ell_o^{CR})$$

  (no additional benefit for the old agent to supply ℓ_o^{CR} above ℓ^{LF}) and SL agents are better off than at the LF:

  $$u(w\ell^{LF}) - v(\ell^{LF}) < u(w_y'\ell_y^*) - v(\ell_y^*) = u(w\ell^{LF}) - v(\ell_y^*).$$

$\Rightarrow$ **All in all, age-specific WT regulations alone cannot decentralize the ex post egalitarian optimum but it can in some cases, both reduce welfare inequalities between SL and LL and increase lifetime welfare of the unlucky-SL (which was impossible under uniform labour time regulation).**

Decentralization of the Egalitarian optimum (1)

Decentralisation of the ex-post Egalitarian optimum:

- Only need a tax on the return of savings:

$$\tau^* = 1 - \frac{\mu}{\pi} = 1 - \frac{u'(c^*)}{u'(d^*)} > 0.$$

- Lump sum transfers so as to ensure $u(d^*) = z^* v(\ell_o^*)$. (no inequality is left between SL and LL).

- In that case, no need for WT regulations: agents will optimally choose (ℓ_y^*, ℓ_o^*).

Numerical Illustration (1)

- Annual utility of consumption and annual disutility of work:

$$u(c) = T_1 \frac{c^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}} + \alpha \quad ; \quad v(\ell) = T_2 \beta \frac{\ell^2}{2} + \theta$$

  with $T_1 = 52$ and $T_2 = 47$.
- **2 situations:** $\beta = 6$ and $\beta = 12$ so that at the laissez-faire, agents work *more* (resp. *less*) than under the current regulations.
- Becker et al. (2005): $\gamma = 1.250$ and $\alpha = -16.2$. We also set $\theta = 0$.
- Agents devote 8 hours a day to basic daily life activities (like eating, bathing, sleeping), this leaves 16 hours as a maximum to work per day. We set the working time regulation to $\bar{\ell} = 35/80 = 0.4375$.
- 3 periods of 20-30-30 years. Legal retirement age is fixed at 65 years old $\Rightarrow \bar{z} = 0.5$.
  Life expectancy is around 77 years old $\Rightarrow \pi = 0.9$.
- $w = 10\$$ and premium is $\{20\%, 50\%\}$.

Numerical Illustration (2)

	low disutility of labor ($\beta = 6$)					high disutility of labor ($\beta = 12$)				
	LF	UUR	UCR	UROT $p = 0.2$	UROT $p = 0.5$	LF	UUR	UCR	UROT $p = 0.2$	UROT $p = 0.5$
c	404	267	404	397	475	275	210	275	237	303
d	404	267	404	397	475	275	210	275	237	303
ℓ_y (h/week)	40	35	35	49	53	27	27	27	31	38
ℓ_o (h/week)	40	35	35	49	53	27	27	27	31	38
z (years)	80	65	65	65	65	80	65	65	65	65
U^{SL}	307	288	316	289	293	283	282	283	264	286
$U^{LL} - U^{SL}$	307	301	330	315	324	283	245	300	286	291

Table 1: The laissez-faire and various uniform working time regulations.

Numerical Illustration (3)

Some comments:

- Uniform uncompensated working time regulation (UUR) reduces inequalities but at the cost of making the SL worst-off.
- The uniform compensated labor reduction (UCR) makes the short-lived better off under β low, and does not affect his well-being under β high.
  In both cases, inequalities are larger than at the laissez-faire.
- When overtime work (UROT) at an extra wage is possible, inequalities always increase with respect to the laissez-faire.
  Moreover, the short-lived is generally worse off unless the extra wage is large enough.

Numerical Illustration (4)

	low disutility of labor ($\beta = 6$)				high disutility of labor ($\beta = 12$)			
	LF	EO	AUR	ACR	LF	EO	AUR	ACR
c	404	923	333	404	275	724	221	275
d	404	6	333	404	275	79	221	275
ℓ_y (h/week)	40	21	21	21	27	13	13	13
ℓ_o (h/week)	40	80	47	40	27	74	33	27
z (years)	80	80	80	80	80	80	80	80
U^{SL}	307	398	320	333	283	381	295	310
$U^{LL} - U^{SL}$	307	0	281	307	283	0	255	283

Table 2: Laissez-faire and *ex post* egalitarian optimum.

Working time reforms in France (1848-2000) (1)

How did labour regulations reforms affect realized lifetime well-being? Did those reforms reduce inequalities in realized lifetime well-being between the long-lived and the short-lived?

- We use variations in policy parameters T_2 (number of working weeks in a year), $\bar{\ell}$ (working time per week) and $\bar{z}$ (legal retirement age) over the last two centuries in France (1848-2000).
- We also account for the variations in real wage, w.
- We compute variations in realized lifetime well-being for the short-lived and the long-lived.
- Agents can work for a maximum length of time of 126 hours a week: a maximum of 18 hours devoted to work in a day and 6 hours to activities of daily living.

Working time reforms in France (1848-2000) (2)

Year	T_2	# worked h/ week	$\bar{\ell}$	ret. age	$\bar{z}$
1848	52	84	$84/126 = 0.666$	-	1
1900	52	70	$70/126 = 0.555$	-	1
1919	52	48	$48/126 = 0.380$	65	0.500
1936	50	40	$40/126 = 0.317$	65	0.500
1982	47	39	$39/126 = 0.309$	60	0.330
2000	47	35	$35/126 = 0.277$	60	0.330

Table 6 : A brief history of working time regulation in France.

Working time reforms in France (1848-2000) (3)

Year	daily wage	# worked hours a week	Hourly wage w
1848	14	84	$14/(84/7) = 1.67$
1900	29	70	$29/(70/7) = 2.9$
1919	13	48	$13/(48/7) = 1.90$
1936	15	40	$15/(40/7) = 2.625$
1982	37.9*	39	$37.9/(39/7) = 6.80$
2000	93.5*	35	$93.5/(35/7) = 18.7$

Table 7: Daily real wages (source: de Zwart et al. (2014)), and hourly wages, France, 1848-2000.

Note: Second column corresponds to the real wages of building laborers defined as "*the number of subsistence baskets that a daily wage buys*". The last column reports the *full-week-worked-equivalent hourly wage*. It is computed *as if* agents were working the total number of hours over 7 days.

Working time reforms in France (1848-2000) (4)

years	life expectancy at age 10	π
1848	47.13	0.24
1900	50.40	0.35
1919	51.76	0.39
1936	57.71	0.59
1982	69.77	0.992
2000	73.24	0.999*

Table 8: Survival probability at age 50 for France. (source Human Mortality database)

Note: The above values for π are obtained as follows:

$$10 + (\text{life expectancy at } 10) = 50 + 30\pi.$$

Working time reforms in France (1848-2000) (5)

Calibration of preference parameter, α:

- The unit of the real wage is a subsistence basket.
- α is such that an individual with a consumption equal to one subsistence basket (i.e. 7 subsistence baskets per week) would be indifferent between life and death:

$$u(7) - v(\bar{\ell}_{1848}) = 0$$

- Equivalently

$$52\frac{7^{1-\frac{1}{1.25}}}{1-1.25} + \alpha - T_{2,1848}\beta\frac{(\bar{\ell}_{1848})^2}{2} = 0$$

which yields $\alpha = -314.37$.

Working time reforms in France (1848-2000) (6)

years	$u(c)$	$\bar{z}v(\bar{\ell})$	U_{SL}	U_{LL}	$U_{LL} - U_{SL}$	ΔU_{SL} (%)	ΔU_{LL} (%)
1848	384.46	69.33	315.13	630.26	315.13	-	-
1900	438.07	48.15	389.93	779.85	389.93	+ 23.7 %	+ 23.7 %
1919	307.71	11.32	285.07	581.46	296.39	- 26.8 %	- 25.4 %
1936	318.61	7.56	303.49	614.54	311.05	+ 6.4 %	+ 5.6 %
1982	417.86	4.50	404.35	817.70	413.35	+ 33.2 %	+ 33.0 %
2000	562.55	3.63	551.67	1110.59	558.92	+ 36.4 %	+ 35.8 %

Table 9: Realized lifetime well-being for short / long-lived, 1848-2000.

- The introduction of working time regulations and of the (potentially induced) rise in the real wage have resulted in an increase over time of *both* the realized lifetime well-being of the SL and of the LL.
- ... But also increase in inequalities between SL and LL.

Conclusion (1)

- This paper examined, from a lifecycle perspective, the redistributive effects of working time regulations in an economy where individuals have unequal longevity.

- Impact of uniform working time restrictions (compensated / uncompensated, with / without overtime work) on welfare inequalities between SL and LL.
  $\rightarrow$ *Uniform WT regulations create a dilemna between (in) (de)creasing utility of the SL and (in) (de)creasing welfare inequalities.*

- Contrast LF with the ex-post Egalitarian optimum: consumption profile should be *decreasing* with the age, whereas the working hours profile should be *increasing* with the age so as to guarantee some justice between the SL and the LL.
  In simulations: 20 hours a week at young age (until 50) but almost 4 times more at old age.

Conclusion (2)

- *Campanella (1604), The City of the Sun*: 4 hours a day.
- WT regulations (even if there are age-specific) alone cannot decentralize the Egalitarian optimum.
  $\rightarrow$ Only need taxation of savings and LS transfers.
- Numerical exercise to historical WT regulations in France: rise in welfare inequalities between SL and LL ...but still, increase in the welfare of unlucky-SL.
- **The use of age-specific working time regulations as a way to redistribute from lucky long-lived individuals towards unlucky short-lived individuals could only be a second-best redistributive device in a world where the taxation of savings return and lump sum taxation are subject to strong political constraints.**