Veblen effects, political representation, and the reduction in working time over the 20th century

Seung-Yun Oh*, Yongjin Park†, and Samuel Bowles‡

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Abstract We explain the substantial decline in work hours over the 20th century by the joint influence of both what Veblen termed the employees’ “pecuniary emulation” of the “conspicuous consumption” of top income earners and the balance of political power of employers and employees in the presence of their possible conflicts of interest over the issue of working time. We present a new labor discipline model in which hours are determined by employers and subject to complete contracts but employee work effort is not. We show that while Veblen effects increase the hours sought by employees, the hours selected by profit-maximizing employers may exceed that preferred by employees, who may then seek to reduce work hours by means of collective bargaining or governmental intervention. We also identify conditions under which employees will prefer longer hours than offered by employers. Using newly available data on top income shares, and on work hours from ten major industrial economies we test two hypotheses: that increases in the relative incomes of the very rich are associated with increased hours, while increases in the political representation of workers has the opposite effect. The estimated effects are large in economic magnitude, highly significant and robust to alternative econometric specifications, including country and time fixed effects.

JEL Classification: J22, J5, J88, N30

Key words: conflict over working hours, labor supply, labor discipline, Veblen effect, pecuniary emulation, welfare state

*Department of Economics, University of Massachusetts at Amherst, United States
†Department of Economics, Connecticut College, United States
‡Santa Fe Institute, United States and Dipartimento di Economia Politica, University of Siena, Italy
1 Introduction

On the eve of the First World War, workers in the ten major industrial economies that we study averaged a thousand hours more on the job than they did at the end of the 20th century. The decline was dramatic in all countries, averaging almost two-fifths of the working time in 1913 and ranging from over half in the Netherlands to about a third in the U.S. As Figure 1 shows, the decline was particularly steep early in the century, and it was not monotonic, workers in both the U.S. and Sweden clocked increased hours at the end of the century. What accounts for these trends?

![Figure 1. Annual work hours, ten nations 1900-2000.](image)

The average annual work hours of production workers from Huberman (2004)

We provide a model and econometric estimates of the role of conflict between employers and employees in the determination of work hours and how this process is affected by both workers’ political organization and Veblen effects, the latter occurring when the employees’ desire to emulate the consumption standards of the rich influences an individual’s desired allocation of time between labor and leisure. In contrast to most models and empirical studies of work hours (in which employees choose their hours) we develop a labor discipline model in which hours are determined by employers and subject to complete contracts, but employee work effort is not. We identify the conditions under which Veblen effects increase the hours sought by employees, and under
which the hours selected by profit-maximizing employers will nonetheless exceed that preferred by employees.

The Veblen pecuniary emulation effects occur in our model because even though the hours of work is selected by the employer, the employees’ desire to emulate the rich influences their desired level of work hours, and hence also influences the present value of the job at each of the employer’s chosen hours levels. The conflict over work hours occurs because while the employer takes account of the worker’s hours preferences, profit maximization constrained by the employee’s best (effort) response function (as in the case of other costly workplace amenities (Bowles, 2004)) entails under-providing the amenity, in this case the workers’ optimal choice of hours. The firm’s profit maximizing choice of hours and wages is thus Pareto-inefficient, regardless of whether the workers would prefer fewer or more hours than the firm selects. The model allows us to study the political economy of work hours, providing conditions under which policies to limit hours would be adopted by trade unions or political parties with varying degrees of scope (from local to centralized) and foresight (from myopic to cognizant of a zero profit general equilibrium condition). A surprising result, but one consistent with empirical results heretofore found to be anomalous, is that where unions are localized, increasing union density may be associated with longer rather than shorter hours (Bowles and Park, 2005; Faggio and Nickell, 2007).

These results motivate our empirical predictions that increased political representation of employees will explain hours reductions while increase relative incomes of top income earners will have the opposite effect.

Other studies taking account of the fact that hours are chosen by employers, not employees, have demonstrated that inefficiently long work hours may occur when working time serves as a screening device for selecting workers with low disutility of work (Rebitzer and Taylor, 1995; Landers et al., 1996), or with high-productivity (Sousa-Posa and Ziegler, 2003). Others show that employees’ desired and actual work hours may differ due to rising age-earning profiles adopted by employers to reduce incentive to shirk under mandatory retirement (Lazear, 1981; Lang, 1989). We differ from these papers in that neither preference heterogeneity nor screening play a role in our model. Rather work hours may be either shorter or longer than employees prefer, the difference arising from the fact that while work hours are subject to a complete contract, work itself is not and the employer’s profit maximizing labor discipline strategy is constrained by the employees’ effort incentive compatibility constraint, not the employees participation constraint.

Veblen effects are derived from a class of social-comparison-based utility functions on which there is a growing literature and some empirical evidence (Bagwell and Bernheim, 1996; Layard, 1980; Frey and Stutzer, 2002; Van Praag, 1993; Sen, 1983; Hirsch, 1976; Scitovsky, 1976; Easterlin, 1974; Frank, 1997; Cole et al., 1995). Clark and Oswald (1996) for example found that the satisfaction levels reported by British workers (in the British Household Panel Survey) vary inversely with
the wage levels of peers. Applications to labor supply include Neumark and Postlewaite (1998), who using data from the U.S. NLSY, found some evidence that women whose sister’s husband had a higher income than their own husband were more likely to be employed. Park (2010) using CPS data found, after controlling for husbands’ absolute income and other individual characteristics, that married women are more likely to be in labor force when their husband’s relative income is low. Bowles and Park (2005) use a Veblen effects model to study the relationship between income inequality and work hours, finding evidence consistent with the pecuniary emulation hypothesis for a sample of OECD countries in recent decades. We differ from these contributions by exploring the workings of Veblen effects in a setting where the employer not the employee selects the hours of work and by explicitly modeling the possible conflict of interest between the two and our estimates are based on a new century long data set.

In the next section we present the model described above. Section 3 and 4 give conditions under which (respectively) workers will prefer either shorter or longer hours than those selected by a profit maximizing employer and increases in the income share of the rich will increase or decrease equilibrium work hours. In section 5 we study direct limits on working hours by trade unions or leftist parties. Section 6 presents data on hours, top income shares and political representation of workers in 10 countries over the past century, and Section 7 presents estimates of the Veblen effect and the political representation effects identified by the model.

2 Model

2.1 Workers

Workers derive utilities from consumption, leisure, but disutility from exerting effort. When employed, a worker spends $h$ hours working at a wage rate $w$ per hour, exerting per hour effort $e$. Individuals do not save, so the individual’s own consumption is just income, $wh$. To model the effect of the conspicuous consumption of an individual’s top-income reference group, we define effective consumption, $x$, as an individual’s own consumption level minus the invidious consumption effect, namely a constant $v$ (for Veblen) times the consumption level of the reference group($\vec{c}$); $x = wh - v\vec{c}$. This form captures the fact that invidious comparisons with wealthier individuals both reduce one’s own utility and raise the marginal utility of own consumption. We assume that the utility function is separable and additive. The utility of effective consumption in a given time period takes the following form;

$$C(x) = \frac{1}{1-\rho} (x^{1-\rho} - 1),$$
where the parameter $\rho$ measures the rate at which the marginal utility of effective consumption diminishes. Workers’ utility of the leisure $l$ is $L(l)$, where $l = 1 - h$, the time endowments are normalized to 1, and $L$ is increasing and concave in its argument. Workers’ disutility of work effort is increasing and convex in the total effort expended, $g(\varepsilon h)$. We assume for simplicity that workers provide either $\varepsilon = 0$ or $\varepsilon = 1$. When employees shirk($\varepsilon = 0$), they do not experience disutility of work effort, $g(0) = 0$. When unemployed, a worker receives an unemployment benefit, $b$, so the effective consumption of the unemployed is $b - \nu \hat{c}$. The unemployed benefit is less than the income of the employed, $wh > b$, over the relevant ranges of $w$ and $h$. Thus we have following instantaneous utility functions for the non shirking employees($U^N$), the shirking employees($U^S$), and the unemployed($U^U$).

\[
U^N(w;h;\hat{c}) = C(wh - \nu \hat{c}) + L(1 - h) - g(h)
\]
\[
U^S(w;h;\hat{c}) = C(wh - \nu \hat{c}) + L(1 - h)
\]
\[
U^U(\hat{c}) = C(b - \nu \hat{c}) + L(1)
\]

The employee will choose not to shirk if the utility from shirking is no greater than the utility from not shirking. We derive the no-shirking condition(NSC) following Shapiro and Stiglitz(1984):

\[
\frac{U^N - U^U}{r + \lambda + q} \geq \frac{U^S - U^N}{t},
\]

where $q$ is the probability of per period job separation either by exogenous factors or retirement, $\lambda$ is the per period job acquisition rate, and $r$ denotes the per period discount rate. Employers can detect and dismiss shirkers with termination probability $t$, which is linear in work hours($t = \tau h$), where $\tau$ is a positive constant given by the nature of the production process. See the Appendix for the derivation of the NSC. The left-hand side of (1) is the present value of the job rent, that is, the benefit of not shirking; and the right-hand side is the expected benefit of shirking, namely the per period utility gain from shirking on the job multiplied by the expected duration of a shirker’s employment($\frac{1}{t}$). Another expression of (1) in terms of per period job rent is

\[
U^N - U^U \geq (r + \lambda + q) \frac{U^S - U^N}{t}
\]

The right hand side of (2) is the minimum per period job rent sufficient to deter shirking, which is the expected benefit of shirking($\frac{U^S - U^N}{t}$) multiplied by the discount factor. We call the right hand side of (2) simply the expected benefit of shirking and denote it by $\eta(h)$, i.e. $\eta(h) := (r + \lambda + q) \frac{g(h)}{\tau(h)}$, where $g(h) = U^S - U^N$. Solving (2) as an equality for the wage, we get the no-shirking wage as a function of $h$ and $\hat{c}$: $\bar{w} = \bar{w}(h, \hat{c})$. We call $\bar{w}_h$ the employer’s marginal wage cost of increasing
work hours.

2.2 The Firm

We assume that there is a large number of firms in the economy. An employer varies working hours, the number of workers, and the wage rate to maximize profits subject to a no shirking condition (NSC). Hiring shirking workers is not profitable (output is zero when an individual shirks). Thus the firm’s production function is $f(nh)$, where $f’ > 0$, $f'' < 0$. There is a positive employment cost ($k$) to employ a worker, independent of the number of hours, which consists of search, training, and related costs that do not vary with hours. Firm’s profit maximization problem can be written as

$$\max_{w,n,h} f(nh) - n(wh + k)$$

s.t. $w \geq \bar{w}(h)$

Let $(n^*, h^*)$ be the interior equilibrium that satisfies the following first order conditions.

$$\pi_n = h f’ - (\bar{w}h + k) = 0$$
$$\pi_h = n f’ - n(\bar{w}_h h + \bar{w}) = 0$$

where $\pi(n, h) = f(nh) - n(\bar{w}(h)h + k)$ and subscripts denote partial derivatives. From these two first order conditions, we find

$$\bar{w}_h h = \frac{k}{\bar{h}} \quad (3)$$

The employer offers the equilibrium hours $h^*$ such that the marginal effect on the wage bill of increasing hours (the left hand side of (3)) is equal to the average (employment) cost per hour (the right hand side of (3)).

Figure 2 illustrates the profit maximizing choice of work hours by the employer given by the tangency of the iso-profit locus to the no shirking condition. We also see that when $k = 0$, the slope of the NSC and the slope of the iso-profit function are zero, while they are positive when
Figure 2. The employer’s profit maximizing choice of work hours subject to the NSC

We now determine \( \tilde{w}_h \) the marginal wage cost of increasing work hours (namely, the slope of the NSC in Figure 2). By differentiating (2) with respect to \( h \), we get

\[
C'(\tilde{w} + h\tilde{w}_h) - L' - g' = \eta'
\]

where \( \eta'(h) = (\frac{r+\lambda+q}{t})(g' - \frac{\ell'}{\tau}g) \) is the marginal effect of an increase in hours on the expected benefit of shirking (namely the increased marginal disutility of providing effort minus the effect of greater hours on the probability of termination). The terms on the left hand side of (4) give the effects of an increase in work hours on the per period job rent by raising income and so utilities of consumption\( (C'(\tilde{w} + h\tilde{w}_h)) \), reducing worker’s leisure\( (-L') \), and increasing the disutility of effort\( (-g') \) respectively. By rearranging (4), we get the expression of \( \tilde{w}_h \) as follows.

\[
\tilde{w}_h = -\frac{\tilde{w}C' - L' - g'}{hC'} + \frac{\eta'}{hC'}
\]

The first term on the right hand side is the marginal rate of substitution between hours and wages on the employees’ indifference locus\( (-\frac{V_{Nw}}{V_N} = -\frac{\tilde{w}C' - L' - g'}{hC'}) \). Intuitively, the marginal effect on no-shirking wage of an increase in work hours\( (\tilde{w}_h) \) will depend on two required compensations: to make no-shirking workers indifferent \( (-\frac{\tilde{w}C' - L' - g'}{hC'}) \), and to offset the induced incentive to shirk because of the prolonged work hours\( (\frac{\eta'}{hC'}) \). Note that \( \eta'(h) \) in the second term is positive for all \( h \) because we have \( g' > \frac{\ell'}{\tau}g = \frac{g}{h} \) from the assumptions, \( \frac{\ell'}{\tau} = \frac{1}{h} \) and \( g(0) = 0, \ g'' > 0 \). Thus the NSC is always "steeper" than the employee’s indifference locus. This fact will be important when we investigate trade union or other interventions to limit work hours, because it means that if they were restricted to \( \{w, h\} \) pairs along the equilibrium NSC, currently employed workers would
prefer hours greater than \( h^* \) (and the associated higher wages).

We now explore the conditions under which employees would prefer to work longer or shorter hours than \( h^* \).

3 Conflict over working hours

Employers have an interest in providing hours that employees prefer, because by doing so they enhance the present value of the job rent and thereby reduce the no-shirking wage. But here are two sources of possible conflict over work hours. Shorter hours require paying the fixed employment cost \( (k) \) for more employees, so the interests of the employer and employee are not perfectly aligned when \( k > 0 \), and conditional on a given wage \( (w^*) \) employees may prefer shorter hours, \( h^o < h^* \). Employer and employee interests diverge in a second way, one that may offset the first. Increases in hours raise the expected benefits of shirking \( (\eta'(h) \text{ in equation (5)}) \). This is because the effect of greater hours on the marginal disutility of not shirking exceeding the effect on the likelihood that a shirker will be detected. This effect provides a motive for the employer to offer fewer hours than the employee would prefer. When expected-benefits-of-shirking effect exceeds the employment-cost effect, workers will prefer more hours than employers provide conditional on the given wage.

3.1 Employee’s optimal working hours

Since it is profitable for the employer to hire non-shirking employees, he offers no-shirking wage and the employed workers will not shirk, so we derive workers’ optimal hours for non-shirking employees. Suppose that for some arbitrary wage, workers were to choose working hours: they would maximize the present value of the job, \( V^N = \frac{(\lambda+r)U^N+rU^U}{(\lambda+r+q)} \), by choosing the optimal hours. Let \( h^o = h^o(w) \) be the worker’s optimal working hours determined by equating the marginal utility of the increased consumption made possible by greater hours to the distuility of lost leisure and increased on the job effort, or

\[
U^N_h(w, h^o) = wC' - L' - g' = 0, \text{ for the given } w
\]  

(6)

It is easy to check that \( h^o \) is a local maximum, satisfying the second order condition, \( U^N_{hh} = (w^2C'' + L'' - g'') < 0 \), because \( C'' < 0, \ L'' \leq 0, \) and \( g'' > 0 \). When \( U^N_h \) is evaluated at the equilibrium (no shirking) wage and workers’ optimal hours, we have \( U^N_h(w^*, h^o(w^*)) = 0 \). If we evaluate \( U^N_h \) at the equilibrium hours and wages \( (w^*, h^*) \), there are three possibilities: \( U^N_h(w^*, h^*) < 0 \), \( U^N_h(w^*, h^*) > 0 \), or \( U^N_h(w^*, h^*) = 0 \). The sign of \( U^N_h(w^*, h^*) \) determines whether workers prefer longer \( (U^N_h(w^*, h^*) > 0) \) or shorter \( (U^N_h(w^*, h^*) < 0) \) hours than \( h^* \). If \( U^N_h(w^*, h^*) < 0 \), then
\[ U_h^N(w^*, h^*) < U_h^N(w^*, h^0(w^*)) = 0, \text{ thus workers will prefer shorter hours than the equilibrium } h^* > h^0, \text{ because the marginal utility is decreasing in } h (U_{hh}^N < 0) \text{ given the wage.} \]

### 3.2 Conflict between employer and employee

We now show that whether the workers’ optimal working hours are equal to, shorter, or longer than that the employer offers will be determined by the size of the fixed employment cost, \( k \), and the size of the effect of hours on the expected benefits of shirking (\( \eta'(h) \)). By substituting (5) into (3), we get the employer’s equilibrium condition from which \( h^* \) is determined:

\[
k = h^2\tilde{w}_h = -\frac{h}{C'}(\tilde{w}C' - L' - g') + \frac{h}{C'}\eta' \tag{7}
\]

If we evaluate the term \((-\tilde{w}C' - L' - g')\) at the equilibrium hours and wage \((h^*, w^*)\), it is the same as \( U_h^N(w^*, h^*) \). When \( k = 0 \), the term should be positive because \( \eta'(h) > 0 \) for all \( h \). Then the marginal rate of substitution of between hours and wages on the employees’ indifference loci \((-\frac{\tilde{w}C' - L' - g'}{hC'}\) will be negative at \((h^*, w^*)\). Panel A in Figure 3 shows workers’ indifference loci \( V^N \) that go through \((w^*, h^0(w^*))\) and \((w^*, h^*)\) when \( k = 0 \). The slope of \( V^N \) at workers’ optimal hours is zero, while it is negative at the equilibrium. Thus the workers’ optimal hours are longer than \( h^* \). Panel B shows the case of positive \( k \). If \( k = \frac{h}{C'}\eta' \) at the equilibrium, then from (7), \((-\tilde{w}C' - L' - g')\) will be zero, so workers’ optimal hours and the equilibrium hours at the wage \( w^* \) will coincide. We denote \( k^0 \) the corresponding fixed cost. Finally, if \( k > \frac{h}{C'}\eta' \), the term \((-\tilde{w}C' - L' - g')\) will be negative \( (U_h^N(w^*, h^*) < 0) \), so the slope of \( V^N \) at the equilibrium is positive. This implies workers prefer shorter hours than \( h^* \), as shown in Panel C.

Figure 3. Optimal Hours for Employers and Employees for various \( k \)
The economic intuition is the following. The difference between workers’ optimal choice of $h$ and the employer’s comes from the employment cost and the effect of $h$ on the benefit of shirking, $\eta’(h)$. If there is no employment cost, the fact that an increase in $h$ raises the benefit of shirking and therefore requires a higher no shirking wage will induce the employer to offer shorter working hours than workers prefer (Panel A in Figure 3). However, if the employment cost is greater than the effect on the benefit of shirking it will be profitable for the employer to hire fewer workers with longer hours that are preferred by employees at the no shirking wage. We record this observation as Proposition 1.

**Proposition 1 (Conflict over hours)** If we have the condition that $k > \frac{h^*}{C_0} \eta’(k < \frac{h^*}{C_0} \eta’)$ at the equilibrium, the employer selects longer (shorter) working hours than workers prefer.

### 4 The Veblen effect

The conflict over work hours (Proposition 1) occurs because on the margin the firm evaluates the hours-wages trade off differently from workers. By contrast, the Veblen effect on work hours occurs because the firm responds to the change in workers’ preferences that result from an increase in consumption by a richer reference group ($\hat{c}$), which alters the workers’ wages-hours trade off, inducing them to prefer more hours. To see this we begin with the effect of $\hat{c}$ on worker’s optimal working hours from (6):

$$h^*_\hat{c} = \frac{wvC''}{w^2C'' + L'' - g''} > 0$$

Thus the increase in the consumption of the top reference group induces workers to desire longer working hours. Now we perform the comparative statics of the changes in $\hat{c}$ on the equilibrium working hours, which we call Veblen effect. No shirking wage is now a function of $h$ and $\hat{c}$; $\tilde{w} = \tilde{w}(h, \hat{c})$. The effect of an increase in $\hat{c}$ on the equilibrium $h^*$ is

$$\frac{dh^*}{d\hat{c}} = \frac{f''nh^2\tilde{w}_{h\hat{c}}}{|H|}$$

where the denominator, $|H| = -f''nh^2(2\tilde{w}_h + h \tilde{w}_{hh})$, is positive for a maximum profit (See the Appendix for the derivation).

Before we find $\tilde{w}_{h\hat{c}}$, we need to calculate $\tilde{w}_c$. From the NSC, we get

$$\tilde{w}_c = \frac{v}{hC'}(C' - C'_U) < 0$$

where $C'_U$ is the unemployed workers’ marginal utility of consumption evaluated at $b - v\hat{c}$; i.e. $C'_U = C'(b - v\hat{c})$. We have $\tilde{w}_c < 0$, because the marginal utility of effective consumption of the
unemployed is greater than that of the employed \((C' < C'_U)\) because \(wh - v\hat{c} > b - v\hat{c}\) and \(C'' < 0\), so the increase in \(\hat{c}\) raises the value of the employment rent \((U^N - U^U)\), while the increase in \(\hat{c}\) has no effect on the expected benefit of shirking \((\eta(h))\). Thus the employer can induce effort with a lower wage than before.

We then find \(wh\hat{c}\) using (5) and (9):

\[
\tilde{w}_{h\hat{c}} = -\frac{C''(h\tilde{w}_c - v)}{hC''} \left\{ -(\tilde{w}C' - L' - g') + \eta' \right\} - \frac{1}{hC''} \{ \tilde{w}_c C' + \tilde{w}C''(h\tilde{w}_c - v) \} \tag{10}
\]

Proposition 2 provides an intuitive sufficient condition under which the increase in the consumption of the top reference group lowers the marginal wage cost of increasing work hours, so the employer offers longer work hours.

**Proposition 2 (Veblen effect)** If we have \(\rho > \frac{wh^* - v\hat{c}}{wh^*}\), then the increase in \(\hat{c}\) raises the equilibrium working hours.

**Proof.** From the assumption, we have

\[
\frac{d\rho}{dc} > 0 \Rightarrow \frac{d\tilde{w}_{h\hat{c}}}{dh} < 0 \quad \text{from the equation (8)}
\]

Then \(C' + w^*h^*C'' < 0\), and \((C' + w^*h^*C'')(\tilde{w}_c - vw^*C'' > 0\), so the second term in (10) is negative. We know that the term \(- (\tilde{w}C' - L' - g') + \eta'\) is positive from (5) because we have \(\tilde{w}_h > 0\). So, the first term on the right hand side of (10) is negative because \(C'' < 0\) and \(\tilde{w}_c < 0\). Thus we have \(\tilde{w}_{h\hat{c}} < 0\), and we conclude \(d\tilde{w}_{h\hat{c}}/dh > 0\) from the equation (8).

We illustrate the Veblen effect in Figure 4. For any given \(h\), the increase in the income of the top reference group lowers the no-shirking wage \((\tilde{w}_c < 0)\) and lowers the cost of increasing hours \((\tilde{w}_{h\hat{c}} < 0)\), which rotates the \(\tilde{w}(h, \hat{c})_1\) clockwise to \(\tilde{w}(h, \hat{c})_2\). Thus equilibrium working hours are longer.

![Figure 4. The Veblen effect (increase in \(\hat{c}\))](image-url)
Intuitively, if the increase in $c$ lowers $\tilde{w}_h$ (the marginal cost of increasing $h$), then given the concavity of the production function, the firm in response will raise working hours to satisfy the first order condition. This gives us the Veblen effect. The increase in $c$ lowers $\tilde{w}_h$ because i) it lowers effective consumption, and so raises $C'$ since we have $C'' < 0$, ii) raises the job rent, so the firm can lower the wage, which we already showed, namely $\tilde{w}_c < 0$. However, the increase in $c$ also has an offsetting effect on $\tilde{w}_h$ because the lowered wage weakens the income effect of $h$ that enables the employer to reduce the no-shirking wage. The first effect inducing the employer to offer longer working hours will dominate the second effect if workers’ $C''$ is large relative to $C'$ in absolute value. Note that the condition $\rho > \frac{w^*h^* - \mu^c}{w^*h^*}$ does not require an implausible level of concavity of the workers’ utility function; a logarithmic function ($\rho \to 1$) satisfies the condition for example, and for a substantial Veblen effect considerably less concave functions do as well.

5 Policies to limit working hours

The work hours observed in any economy are determined in part by the competitive and non-cooperative interactions of workers and employers, as we have modeled them above. But work hours are typically also influenced by collective action by workers and their employers and by governments. If employers offer longer hours than the work hours desired by employees, trade unions may bargain directly with employers to limit the length of the working day, and political parties representing workers may advocate government interventions to reduce work hours.

We treat the trade union or political party as a single actor, attributing to it an objective function that might be the outcome a plausible political processes within the relevant organization (Deriving the objective function formally would add no additional insights). We are interested in interventions that might be proposed by a trade union or political party with varying degrees of inclusiveness and foresight.

We have already seen (Proposition 1) that conditional on a given wage, workers may prefer to work fewer hours than $h^*$, and indeed most of the demands for work hours limitations historically took the form of fewer hours at the going wage, or even more commonly, fewer hours for the same daily pay (i.e. an hourly wage increase accompanied by an hours reduction). Of course such an intervention, if successful, would reduce the firms profits possibly also the firm’s equilibrium number of employees hired; if adopted on an economy-wide basis, such an intervention would also lead to the exit of some firms and a reduction in the fallback position of employed workers due to the lower job acquisition rate (to restore the zero profit condition).

To account for varying degrees of foresight with respect to these firm reactions and general equilibrium effects, and for the fact that the relevant entity may be a local firm-level union, an political party, or national union we consider four cases. The difference between the local and the
national organization is that the former takes account of the individual firm’s responses with to the union’s demands but not the general equilibrium effects operating at the economy wide level. The national organization is aware of these economy wide effects and takes account of them in evaluating an intervention.

We first study a local union interacting with a single firm (one of many in the economy) and consider two cases in which the union has the power to impose a wage increase or an hours reduction but not both, so that the firm’s response will be to restore the NSC as a binding constraint. The first case is the exclusive rent seeking union whose decision making is dominated by employees with sufficient seniority or other protection that they will not be among those laid off, should the firm’s response to the union’s demands be to reduce the number of employees. The exclusive rent seeking union simply bargains for higher wages; to satisfy the NSC the firm responds with longer hours.

The second case is an inclusive job-spreading union that maximizes a function of the utility of both employed and unemployed workers, and bargains for fewer work hours, to which the firm (moving along the NSC) responds with lower wages. The final case of a local union is one with sufficient bargaining power to impose on the firm an hours reduction with no loss in hourly pay. As in the other cases we evaluate the conditions under which this intervention would be favored by the inclusive job spreading and exclusive rent seeking union.

Finally we consider a national union or party that is cognizant of the general equilibrium effects of limiting hours of work. We do not consider trade union or governmental interventions to require firms to offer longer hours in the case that \( h^o > h^* \), but the results for this case are readily anticipated on the basis of what follows.

In all four cases we assume that the objective function of the workers’ organization takes account of the subjective well being of workers. We define union’s objective function \((V_T)\) as follows.

\[
V_T = \alpha V^N + (1 - \alpha) V^U, \quad 0 \leq \alpha \leq 1
\]

where \( \alpha \) denotes the weight on the subjective well being of the currently employed workers in the union’s objective function. We assume that an exclusive union takes \( \alpha = 1 \), while, an inclusive union cares equally about employed and unemployed workers, so \( \alpha \) is the ratio of the employed to the total workers. We also assume that at an equilibrium wage, \( w^* \), the employees prefer shorter hours than \( h^* \), denoting \( \frac{dV^N(w^*,h)}{dh}\bigg|_{h=h^*} < 0 \), but among the packages \{\( w, h \)\} on the NSC curve, employees’ well-being increases with a higher wage and longer hours, denoting \( \frac{dV^N(\hat{w}(h),h)}{dh} > 0 \)
5.1 A local union

A local union is only a small part of the labor market. Thus we assume that the union does not take account of the effect of the hours in their firm on the fallback position of workers or the welfare of the unemployed workers\( (V^U \text{ is exogenously given}) \), but the union is aware that should it impose shorter working hours than the firm’s profit maximizing choice, this will affect the wage and the number of employees hired by the firm. And conversely should the union impose higher wages this will affect the firms hiring and hours of work decisions.

An exclusive rent seeking union

The objective function of an exclusive union is simply the same as employed worker’s utility function. Suppose rent seeking exclusive union bargains for higher wages\( (w > w^*) \), and if the union demands are implemented, the firm will offer longer hours, satisfying the NSC given the higher wage. Let \( h = \tilde{w}^{-1}(w) \) be the inverse relation of \( w = \tilde{w}(h) \) for only the packages \( \{w, h\} \) along the positive sloped NSC. Since the union is bargaining for higher wages, we can write the objective function as follows.

\[
V^T = V^N = \left(1 + \frac{r}{q}\right)U^N(w, \tilde{w}^{-1}(w)) + qV^U
\]

where the NSC is binding. From the previous section we know that the slope of the NSC curve in \( w - h \) plane is steeper than the slope of the worker’s indifference loci given by the marginal rate of substitution between hours and wages on the employee’s indifference locus: \( \frac{d\tilde{w}}{dh} > -\frac{V^N}{V^N_h} \). Thus the effect of a wage increase and the accompanying hours increase to remain on the NSC on the union’s utility is

\[
\frac{dV^T}{dw} = \frac{dV^N}{dw} = V^N_w + V^N_h \frac{dh}{dw} > 0
\]

The employed workers gain as a result (abstracting from general equilibrium effects), and firm level profits are lower.

An inclusive job-spreading union

This union cares equally about the subjective well being of the \( n \) workers currently employed and the \( N - n \) workers who are out of work in the relevant local labor market. Thus the objective function of a job-spreading inclusive union is

\[
V^T(h, n) = \frac{n}{N}V^N(h) + \left(1 - \frac{n}{N}\right)V^U
\]

where \( \alpha = \frac{n}{N} \), and \( N \) is the total number of workers included in the local union. Suppose the union can successfully bargain for shorter hours, \( h < h^* \). The wage will be determined by the NSC and firm’s optimal hiring will be \( n = n(h) \), satisfying \( \pi_n = 0 \). We find \( \frac{dn}{dh} \) as follows;

\[
\frac{dn}{dh} = -\frac{n}{h} - \frac{f' - \tilde{w} - hw_h}{h^2f''}
\]
The first term on the right hand side of (13) is the the substitution effect: to produce the same amount as before with fewer hours the firm needs more workers (this is substitution along a given isoquant). The second term is offsetting the substitution effect because the firm may produce less output (so demand less workers) due to the reduced profit associated with the reduction in $h$. If we evaluate $\frac{dn}{dh}$ at the equilibrium $h^*$, we have $f' - \tilde{w} - h\tilde{w}_h = 0$, thus

$$\frac{dn}{dh}\bigg|_{h=h^*} = -\frac{n^*}{h^*} < 0 \quad (14)$$

For some arbitrarily small reduction in work hours, the firm will raise the number of workers hired, as the job spreading union intended.

Now with the reduction in hours and the corresponding larger employment, we have

$$\frac{dV}{dh} = \frac{1}{N} \left\{ \frac{dn}{dh} (V^N - V^U) + n \frac{dV^N}{dh} \right\} \quad (15)$$

where $\frac{dV^N(\tilde{w}(h), h)}{dh} > 0$, and $\frac{dn}{dh}|_{h=h^*} < 0$. Let the hours elasticity of the job rent and the hour elasticity of employment take the following forms respectively.

$$E_{V^N-V^U,h} = \frac{h}{(V^N - V^U)} \frac{d(V^N - V^U)}{dh}, \quad E_{n,h} = -\frac{h}{n} \frac{dn}{dh}$$

The equation (15) can be rewritten as

$$\frac{dV^T}{dh} = \frac{1}{N} \frac{n}{h} (V^N - V^U) \left\{ \frac{h}{n} \frac{dn}{dh} + \frac{h}{(V^N - V^U)} \frac{d(V^N - V^U)}{dh} \right\} = \frac{1}{N} \frac{n}{h} (V^N - V^U) \left\{ -E_{n,h} + E_{V^N-V^U,h} \right\}$$

From the result (14), we have $-\frac{h}{n} \frac{dn}{dh} = 1$, thus if the hours elasticity of the job rent is less than one, $E_{V^N-V^U,h} < E_{n,h} = 1$, we have $\frac{dV^T}{dh}|_{h=h^*} < 0$. The inclusive union can be better off by the reduction in work hours because it has conferred job rents $(V^N - V^U)$ on some of the previously unemployed (the first term in the brackets on the right hand side of (15)), even though the members had been employed at the previous equilibrium are worse off (the second term in the brackets on the right hand side of (15)).

**A local union with more bargaining power** Suppose the local union is strong enough to limit hours and sustain wages so that the NSC is satisfied as an inequality. Since the wage is fixed at $w^*$, the the effect of a reduction in hours on $V^N$ is the following.

$$\frac{dV^N(w^*, h)}{dh}\bigg|_{h=h^*} = \frac{1 + r}{r + q} \frac{\partial U^N(w^*, h)}{\partial h}\bigg|_{h=h^*} = \frac{1 + r}{r + q} \{w^*c' - l' - g'\} < 0$$

14
Thus a rent seeking exclusive union is obviously better off.

Now we consider the job-spreading inclusive union. Since the wage is fixed at $w^*$, equation (13) becomes

$$\frac{dn}{dh} = -\frac{n}{h} - \frac{f' - w^*}{h^2 f''}$$

(16)

Since $f' - w^* = \frac{k}{h} > 0$ for any positive $k$, we need the condition, $\pi_{nh}|_{\text{given } w^*} = nh f'' + f' - w^* < 0$ to have $\frac{dn}{dh} < 0$. Thus the employer hires more workers in response to the restriction on work hours, if the production function is sufficiently concave. The intuition behind this condition is that the reduction in hours of work has two opposite effects on the number of workers hired. First, it raises the cost per hour of work (due to the fixed cost now being spread over fewer hours). But second, it also raises the marginal product of labor for a given number of employees hired (because the sum of labor provided to production is reduced). If the production function is sufficiently concave, this reduction in labor input will result in a large enough increase in the marginal product of labor to offset the increased cost. An example illustrates this. Let $f(x) = x^\beta$, $0 < \beta < 1$, be the production(or revenue) function. Then the condition for $\frac{dn}{dh} < 0$ can be expressed as $f' + nh f'' < w^*$, which in the example is $\beta^2 (nh)^{\beta-1} < w^*$. Note that the condition holds for sufficiently low $\beta$ (sufficiently concave) because the term $\beta^2 (nh)^{\beta-1}$ is increasing in $\beta$ and lower values of $\beta$ make the function more concave. Thus from (15) if $E_{V,N-V,U,h} < E_{n,h}$, then the inclusive union is better off by the intervention. We summarize the result in the following proposition.

**Proposition 3 (Local union bargaining)** Given $\lambda$ and $V^U$, and a situation in which currently employed members would prefer a reduction in work hours at the current wage,

i) a rent seeking exclusive union will favor an increase in the wage with longer hours as dictated by the NSC and a reduction in hours with no wage change.

ii) a job spreading inclusive union will favor a reduction in hours with lower wages as dictated by the NSC and correspondingly greater employment, and a reduction in hours with no change in the wage, both conditional on if the hours elasticity of employment being larger than that of the job rent.

### 5.2 A national workers’ organization

We now consider the case of the economy-wide union or party representing employees, like the Swedish Landsorganisationen (LO), that is aware of the effects of its demands on the profitability of firms and hence on their hiring decisions. In our model the organization advocates government interventions to limit working hours, preserving the equilibrium wage and compensating the firms’ profit loss by reducing the fixed cost of employment. Our benchmark is a general equilibrium $(h^*, n^*, w^*, \lambda^*)$ in which the employer chooses $h, n, w$ given a fixed cost of employment $k$, and
workers prefer shorter hours than offered by the employer given the equilibrium wage. The number of firms in the economy is determined by a zero profit condition (ZPC).

In a general equilibrium the job acquisition rate is endogenously determined, so we first endogenize λ. Let N be the total number of workers (both employed and unemployed), and m be aggregate employment, which is \( m = Mn \), where M is the number of firms and n is the number of employment of each identical firm. In steady state the flow into the unemployment pool is equal to the flow out, \( qm = \lambda (N - m) \), so \( \lambda = \frac{qm}{N - m} \). Now the NSC has two endogenous variables, h and λ.

\[
U^N - U^U \geq (r + \lambda + q) \frac{U^S - U^N}{t} \iff w \geq \hat{w}(h, \lambda)
\]

We have \( \hat{w}_\lambda = \frac{1}{\hat{h}} r \frac{q}{t} > 0 \), and \( \frac{d\lambda}{dm} > 0 \), so an increase in aggregate employment raises the no shirking wage, \( \hat{w}_m = \hat{w}_\lambda \frac{d\lambda}{dm} > 0 \).

In contrast to individual workers, who take the wage as given and just think about whether fewer or more hours at that wage would be nice, we assume that the union knows that i) the job acquisition rate λ is influenced by the total number of employees which in turn depends on the number of firms and hence on the profit rate, and ii) the no shirking wage is affected by h and λ. We assume that the national organization is inclusive so we express the union’s objective function, denoted by \( V^T \), as the normalized sum of all workers’ utilities;

\[
V^T = \frac{nM}{N} V^N + \frac{N - nM}{N} V^U
\]

Trade unions may value expanding employment more highly than this "sum of worker utility" approach because they would like to increase membership or have pro-poor distributional values (Alesina et al., 2010). But we adopt this formulation here for simplicity, and because it could arguably be the objective function of a social planner maximizing social welfare. From the equation \( \lambda = \frac{qm}{N - m} \), we get \( \frac{m}{N} = \frac{\lambda}{\lambda + q} \) and \( \frac{N - m}{N} = \frac{q}{\lambda + q} \); we can simplify \( V^T \) further as follows;

\[
V^T = \frac{1}{r} \frac{1 + r \lambda U^N + q U^U}{\lambda + q}
\]

The job acquisition rate positively affects the union’s utility, \( V^T_\lambda = \frac{1 + r q (U^N - t U^U)}{r (\lambda + q)^2} > 0 \), so the union prefers high aggregate employment, \( V^T_m = V^T \frac{d\lambda}{dm} > 0 \). Note that the job acquisition rate negatively affects the employer’s profit, \( \pi_\lambda = -nh \hat{w}_\lambda < 0 \), which implies \( \pi_m < 0 \). Thus we can verify that union and the employer have a conflict over the aggregate employment.

We denote the maximum hours limit by \( \hat{h}(< h^*) \). The employer will choose the maximum hours \( \hat{h} \) because \( \pi_m |_{h < h^*} > 0 \), and the optimal number of workers to hire by solving (17) given the
Given the wage \( w^* \) and the fixed cost \( k \), the effect of the reduction in hours on the number of workers hired by the firm is the same as (16). If the production function is sufficiently concave (\( \beta \) is sufficiently low), then the condition for \( \frac{dn}{dh} < 0 \) is satisfied. The increase in employment per firm does not necessarily imply the total employment is higher because due to the reduction in profits some firms which cannot satisfy the ZPC may exit the market. Let the reduced fixed cost of employment which guarantees restoring the ZPC is denoted by \( \hat{k} \). Note that the number of firms \( M \) does not change because the intervention is designed to include a reduction in \( k \) so that \textit{ex ante} profits are restored. The decrease in the fixed cost of employment may further increase the number of workers, see the Appendix. As a result we have \( \hat{n} > n^* \), and the job acquisition rate corresponding to \( \hat{h} \) is higher than before (\( \hat{\lambda} > \lambda^* \)).

**Proposition 4 (National union bargaining)** In a competitive market equilibrium in which employees prefer shorter work hours than offered by employers, the policy imposing the maximum hours accompanied with preserved wage and compensation on the profit loss by reducing the fixed cost of employment makes union better off while employers being indifferent, if the production function is sufficiently concave (the second derivative \( \pi_{nh} < 0 \)) at the new policy equilibrium.

**Proof.** Since the ZPC holds for both cases and the number of firms is unchanged, employers are indifferent under the policy. We compare union’s utilities under the two equilibria. From the assumption of \( \pi_{nh} < 0 \), we have \( \frac{dn}{dh} < 0 \), so \( \hat{n} > n^* \) and \( \hat{\lambda} > \lambda^* \). Since the equilibrium wage is the same, we rewrite objective function of the union or political party advocating this policy change as follows;

\[
V^T(h, \lambda) = \frac{1 + r}{r} \left\{ \frac{\lambda}{\lambda + q} U^N(w^*, h) + \frac{q}{\lambda + q} U^U \right\}
\]

We know that \( V^T_\lambda > 0 \), and \( V^T_{h}(w^*, h)|_{h=h^*} = \frac{1 + r}{r} \frac{\lambda}{\lambda + q} \frac{dU^N}{dh} < 0 \) because \( \frac{dU^N}{dh}(w^*, h^*) < 0 \). The maximum hours \( \hat{h} \) shorter than \( h^* \) (but not shorter than individual workers’ optimum) will make the union better off in the new equilibrium, \( V^T(\hat{h}, \hat{\lambda}) > V^T(h^*, \lambda^*) \). ■

### 6 Top incomes, political representation, and work hours

The importance of both society-wide interpersonal comparison-based utilities (the Veblen effect) and national-level political representation in the determination of work hours in our model suggests that studying work hours averaged over individuals using a historical data set may be the proper way to test the model. The historical data on work hours for the whole 20th century...
is provided by Huberman (2004) (The alternative measure of work hours by Huberman and Minns (2007) yields identical results (not reported here)). These figures are annual average work hours for full-time production workers. Because significant long run changes in work hours are driven by work week related legislation such as the minimum annual paid leave provisions (Faggio and Nickell, 2007), it is important to use a work hours measure that covers variations in both weeks worked and hours per week.

To implement the idea (demonstrated in earlier work (Bowles and Park, 2005)) that the reference group the comparison based utility function is the rich (Veblen’s leisure class), we chose the incomes of the richest 1% of the population as our measure of income inequality. Beginning with the work by Piketty (2003) on the long-run distribution of top incomes in France, researchers have used taxation-based data to estimate the share of total income received by the richest groups. Since tax was levied only on the richest portion of each country in earlier years of 20th century, only the top 1% share provides a long enough series to cover the entire 20th century for the ten advanced economies in the data set. Leigh (2007) provides measures for these countries that are adjusted to make them more comparable; we use this adjusted measure.

For the political representation through which employees may reduce the gap between their preferred hours and employer determined hours, we measure two political elements. First given that democratically implemented reforms take time, we measured the cumulative effect of democratic governance measured in terms of the number of years from the start of general male suffrage (similar to the “stock of democracy” in Gallagher and Thacker (2008)). The second dimension affecting the political representation of employees is the total vote shares of social democratic and leftist parties in each country. The start years of democracy is that date of universal male suffrage and is constructed from Therborn (1977). The data on vote share of social democratic and leftist parties are from Von Beyme (1985). The data on which our measures are based and further measurement information appears in Table 1. We constructed the political representation variable as a product of the two variables so as to capture the complementarity between the democracy and political representation of employees (the marginal effect of each is assumed to be increasing in the level of the other). Since the marginal contribution of maturity of a regime of universal suffrage to the degree of democracy is expected to decrease as citizens and their political parties move up a learning curve we use the natural logarithm, of the years from the general male suffrage (results are not qualitatively different if we use simply years).
<table>
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<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>7.601</td>
<td>0.179</td>
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<td>Ln(Top Share)</td>
<td>84</td>
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<td>0.427</td>
</tr>
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<td>Political Representation</td>
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<td>0.099</td>
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<tr>
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<td>0.127</td>
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<td>0.101</td>
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<td>Political Representation</td>
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<td>JAPAN Ln(Work Hours)</td>
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<td>Political Representation</td>
<td>5</td>
<td>0.051</td>
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</tr>
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Table 1. Summary Statistics of Key Variables by Country.

7 Estimates

Figure 5 presents the top income share and political representation data along with annual hours. The simple correlations ($r = 0.77$ and $r = -0.67$, respectively) are substantial, but as we will see, this arises both from country differences that may reflect influences on hours that are not part of our model and the statistical association of top income shares and the political
Figure 5. Scatter Plots for work hours, top income shares and political representation.

We therefore estimate the following, more complete model.

$$h_{it} = a + bV_{it} + cR_{it} + dX_{it} + \lambda^i + \delta^t + \mu_{it}$$

where $h_{it}$ is the natural logarithm of work hours in country $i$ in time $t$, $V_{it}$ is the measure of top income share, $R_{it}$ is the measure of political representation, and $X_{it}$ is a vector of other possible exogenous influences on hours (with $c$ its vector of estimated coefficients), $\lambda^i$ is a country fixed effect, $\delta^t$ is a year fixed effect, and $\mu_{it}$ is an error term. The country fixed effects will take account of cultural and institutional differences and other country-specific unobserved influences on hours. For control variables we have included real gross domestic product per capita (to measure possible influences of income levels on consumption and leisure preferences) and the deviation of real per
capita GDP from its 5 year moving average as a measure of variations in the demand for labor over the business cycle. The GDP variables are expressed in common units. A couple of demography variables – the share of those who are over 65, the fraction of the population that is aged 5 to 14, and the population growth rate – are added to control for the changes in demographic structure capturing the negative effect of child care demands and aging on labor supply. We included year fixed effects to capture the possible influences of changes in preferences due to the advent of time-using leisure goods on the value of non working time (Greenwood and Vandenbroucke, 2005). In contrast to other measures of income inequality, the top 1% income share is unlikely to be affected by the work hours of full time production workers, so we assume that variations in top shares are not the result of variations in hours.

Our estimates in Table 2 indicate significant positive effects of top incomes shares on work hours and significant negative effects of political representation on work hours. The estimated coefficients of the two key variables remain stable in magnitude and statistically significant when fixed effects for each country and year are added (column 2 and 3) and additional controls for demographic structure are added (column 4). Moreover, these effects are large. Based on estimates in column 3 (our preferred estimate), a 10 percent change in top share increases work hours by 1.2 percent, while a standard deviation increase in the political representation of employees decreases work hours by 4.5 percent. Taken literally, the changes in average values of political representation and top income shares over the 20th century combined (an increase from 0.01 to 0.19 for political representation and a decrease from 3.0 to 2.23 for top share) predict more than a third of total work hour reduction (a decrease from 2724 to 1652) over the same time span.

Per capita GDP has the predicted sign but in the country and year fixed-effects equations its coefficient is small and insignificant, suggesting that year fixed-effects may be capturing the income effect of a common income growth of the ten advanced economies in the sample.
<table>
<thead>
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<th>CountryFE</th>
<th>BothFE</th>
<th>Demography</th>
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<td>0.109***</td>
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<td>0.139***</td>
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<tr>
<td></td>
<td>(0.0269)</td>
<td>(0.0302)</td>
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<td></td>
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Table 2. Baseline Regressions.

The dependent variable is the natural logarithm of working hours.

Standard errors in parentheses. ***p<0.01, **p<0.05,*p<0.1

Given the small number of control variables in our baseline regression, it would be useful to address the possibility of omitted variable bias in our findings. Two prominent candidates for
omitted variables would be the tax rate and the composition of the labor force such as women’s labor force participation and part-time labor. For the tax variable, we could not include the variable(s) because of the lack of comparable tax rate data that covers especially the earlier years. Since tax rates may change based on a tax payer’s income and the potential effect of tax on labor supply critically depends on the progressiveness of income tax rates, it is inherently difficult to find a macroeconomic tax variable that can properly capture its effect on labor supply. Moreover, it is important to note that only a small and very high-income fraction of the general public paid income tax before the Second World War and the tax rate itself was relatively low to have a significant impact on work hours. For example, according to estimates of Barro and Shahasakul (1983) the average marginal tax rate of the US before the Second World War is around 5 percent and then it went through a significant increase for funding the war and remained high around 30 percent afterwards. Given that the most rapid decrease in work hours happened mostly before the Second World War in Figure 1, it is unlikely that the tax was the key factor for the decrease.

Changes in the composition of the labor force are also unlikely to have an impact on work hour reduction. According to Huberman and Minns (2007), part-time work in the period before the interwar years was minimal and only in the 1970s did a sizeable proportion of the labor force in certain countries begin to work less than full-time. As for women’s hours, these tended to be close to those of men in the early years. While the gap between men’s and women’s hours in many countries widened with the rise in female labor force participation in the 1960s, the ratio of men’s to women’s hours has been stable for most countries since 1980. The fact that our estimates are insensitive to the inclusion of age structure variables suggests that the biases in the coefficients of interest associated with the absence of gender specific data may be modest.

So far we have implicitly assumed that our two key variables are independent. Of course, however, it is likely that the political strength of leftist parties can indirectly affect the work hours by limiting the share of top 1%. We examine this possibility using a set of recursive regressions in Table 3. The first equation measures the effect of political representation without the top share variable capturing the total effect of political representation on work ours. The second regression shows the effect of political representation on the income share of top 1%. The third equation, which is identical to the one in the third column in Table 2, shows how the total effect of political representation in the first column is divided into direct effect – the coefficient of political representation variable - and the indirect effect.

Based on the estimates in Table 3, a standard deviation change in political representation decreases work hours by 6.2 percent, while the same change decreases the top percentile income share by 13.7 percent. In turn, a 13.7 percent decrease in top share would decrease the work hours by about 1.6 percent. When we add that to the 4.5 percent reduction that a standard deviation change in political representation may directly cause, we can see that the political representation
has both direct and indirect effect on work hours and its sum is almost 6.2 percent.

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<th>DEPENDENT VARIABLES</th>
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<th>Ln(Top Share)</th>
<th>Ln(Work Hours)</th>
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<td>Constant</td>
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<td>3.264**</td>
<td>7.656***</td>
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Table 3. Recursive Regression Results.

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1

8 Conclusion

We have provided a new model of equilibrium work hours selected by a profit maximizing employer who selects a wage rate as well as hours to satisfy a no-shirking condition. Unlike the
standard model of labor supply in which the employee faces a parametric wage and trades off leisure and goods to maximize utility, here the employee’s leisure-labor trade-offs affect hours indirectly by altering the cost to the employer of satisfying a labor discipline condition necessitated by the incomplete nature of the employment contract.

In addition to institutional realism – the employer not the worker chooses the hours offer – there are four attractive features of the model. First, by embedding it in a principal agent model, we extend the analysis of the comparison-based utility that produces Veblen effects when employees seek to emulate the consumption standards of the well to do “leisure class”. Second we provide a model – the first to our knowledge – of one of the most important social conflicts from the beginning of the industrial revolution until the Great Depression: the opposing interests of workers and their employers concerning the length of the working day. Third, we identify conditions in this setting under which employees would prefer to work longer (as well as less) than the hours selected by the employer. Finally and perhaps surprisingly, we can show that the equilibrium hours that result from the interaction of the profit maximizing employer and the utility maximizing employee are Pareto-inefficient even if the equilibrium hours selected by the employer do not differ from those that maximize the present value of employee utility.

This last result follows directly from the fact that the employer maximizes profits subject to the no shirking condition – an incentive compatibility constraint based on the employee’s best response – rather than the employee’s participation constraint. Implementation of the increase in wages and hours that would implement the Pareto improvements as a Nash equilibrium, however, is impossible, because the small change in \((\Delta h, \Delta w)\) satisfying \(\frac{\Delta w}{\Delta h} < \bar{w}_h(h^*)\) violates the NSC. The resulting hours of work and wage will be Pareto inefficient even in the case (Panel B in Figure 3) where there is no conflict over work hours. The economic intuition is clear from Panel B in Figure 3, where the shaded lens indicates the set of Pareto improvements over \(\{h^*, w^*\}\). (See the Appendix)

This model has motivated analysis of the interaction of Veblen effects and conflict between employers and employees to a new centuries-long data set, yielding results suggesting that the increasing political representation of employees and (partly as a result) the reduced top income shares combined to reduce work hours over the 20th century. Much of the reduction, however, remains unexplained by our model. With the exception of Australia, our model accounts for country differences, suggesting that cultural, political or other influences on hours that are uncorrelated with our measures are of limited importance.

Our results are consistent with the following explanation of the deceleration and even reversal of the fall in work hours during the last quarter of the past century. As equilibrium hours approached those preferred by workers, further reductions in work hours dropped in importance on the agendas of the organizations and parties representing workers; and the increase in top income
shares (in some countries) led employees to place a higher value on longer hours.
References


Appendix A

A.1. Derivation of NSC

The present value of the job for an employed shirker($V^N$), employed non-shirker($V^S$), and the present value of the unemployed($V^U$) are

\[
\begin{align*}
V^N &= U^N + \frac{qV^U + (1-q)V^N}{1+r} \\
V^S &= U^S + \frac{(q+t)V^U + (1-q-t)V^S}{1+r} \\
V^U &= U^U + \frac{\lambda V + (1-\lambda)V^U}{1+r}
\end{align*}
\]

\[\iff \begin{align*}
V^N &= \frac{(1+r)U^N + qV^U}{r+q} \\
V^S &= \frac{(1+r)U^S + (q+t)V^U}{r+q+t} \\
V^U &= \frac{(1+r)U^U + \lambda V}{r+\lambda}
\end{align*}\]

where $V$ is the expected utility of an employed worker, which equals $V^N$ at the equilibrium. By solving (18) and (20), we get

\[\begin{align*}
\frac{r}{1+r}V^U &= \frac{\lambda U^N + (r+q)U^U}{\lambda + r + q} \quad (21) \\
\frac{r}{1+r}V^N &= \frac{(\lambda + r)U^N + qU^U}{\lambda + r + q} \quad (22)
\end{align*}\]

The worker will choose not to shirk if $V^N \geq V^S$. Substituting (20) into (18) and (19), we get the no shirking condition (NSC).

\[\frac{U^N - U^U}{r+\lambda+q} \geq \frac{U^S - U^N}{t}\]

where $U^N - U^U = C(wh - v\bar{c}) + L(1-h) - g(h) - C(b - v\bar{c}) - L(1)$, and $U^S - U^N = g(h)$.

A.2. Pareto inefficiency

We illustrate Pareto inefficiency. Let $(w, h) = (h^* + \Delta h, w^* + \Delta w)$ be a pair of wages and hours near the equilibirum $(h^*, w^*)$ with sufficiently small $(\Delta h, \Delta w)$ such that $-\frac{V^N}{V^w}(h^*, w^*) < \frac{\Delta w}{\Delta h} < \bar{w}(h^*)$, then both workers and the employer are better off.

First, we evaluate $V^N$ at $(h^* + \Delta h, w^* + \Delta w)$, then

\[\begin{align*}
V^N(h^* + \Delta h, w^* + \Delta w) &\simeq V^N(h^*, w^*) + V^N_{w\Delta h} \Delta w + V^N_{h\Delta h} \Delta h \\
&> V^N(h^*, w^*) + V^N_w(-\frac{V^N_h}{V^N_w} \Delta h) + V^N_h \Delta h \\
&= V^N(h^*, w^*)
\end{align*}\]

Second, we evaluate the iso-profit function, $\bar{\pi}(n, h, w) = f(nh) - n(wh+k)$ at $(n^*, h^*+\Delta h, w^*+\Delta w)$,
then we have

\[
\bar{\pi}(n^*, h^* + \Delta h, w^* + \Delta w) \simeq \bar{\pi}(n^*, h^*, w^*) + \bar{\pi}_w \Delta w + \bar{\pi}_h \Delta h
\]

\[
> \bar{\pi}(n^*, h^*, w^*) + \bar{\pi}_w \Delta w + \bar{\pi}_h \frac{\Delta w}{\bar{w}_h}
\]

\[
= \bar{\pi}(n^*, h^*, w^*) + (\bar{\pi}_w \bar{w}_h + \bar{\pi}_h) \frac{\Delta w}{\bar{w}_h}
\]

\[
= \bar{\pi}(n^*, h^*, w^*)
\]

The last equality holds because from the employer’s first order condition we have

\[
\bar{\pi}_h(n^*, h^*) = \bar{\pi}_w \bar{w}_h + \bar{\pi}_h = 0
\]

Thus both workers and the employer are better off.

**A.3. Second order conditions**

The Hessian matrix is given as

\[
H = \begin{pmatrix}
\bar{\pi}_{nn} & \bar{\pi}_{nh} \\
\bar{\pi}_{hn} & \bar{\pi}_{hh}
\end{pmatrix}
\]

where the second derivatives are

\[
\bar{\pi}_{nn} = f'' h^2
\]

\[
\bar{\pi}_{nh} = f'' n h + f' (\bar{w} + h \bar{w}_h) = f'' n h
\]

\[
\bar{\pi}_{hh} = f'' n^2 - n (2 \bar{w}_h + h \bar{w}_{hh})
\]

(23)

The second equation in (23) holds because \( \bar{\pi}_h = f'n - n(\bar{w} + h \bar{w}_h) = 0 \). For \( h^* \) to be the strict maximum of the profit function, the Hessian matrix must be negative definite. We have \( \pi_{nn} < 0 \), and the condition for \(|H| > 0\) is

\[
|H| = \begin{vmatrix}
\bar{\pi}_{nn} & \bar{\pi}_{nh} \\
\bar{\pi}_{hn} & \bar{\pi}_{hh}
\end{vmatrix} = \pi_{nn} \pi_{hh} - \pi_{nh}^2 > 0
\]

\[
= -f'' n h^2 (2 \bar{w}_h + h \bar{w}_{hh}) > 0
\]

Since we have \( f'' < 0 \), the sufficient condition for the maximum is \( 2 \bar{w}_h + h \bar{w}_{hh} > 0 \).

**A.4. Comparative Statics**

Let \( z \) be an exogenous variable. Applying Cramer’s rule and the implicit function theorem,
we get
\[
\frac{dh^*}{dz} = \frac{\pi_{nh} \pi_{nz} - \pi_{nn} \pi_{hz}}{|H|} \quad (24)
\]
\[
\frac{dn^*}{dz} = \frac{\pi_{nh} \pi_{hz} - \pi_{hh} \pi_{nz}}{|H|} \quad (25)
\]

**A.4.1. Comparative statics of \( \hat{c}, b, \) and \( \lambda \)**

Let \( z \) be an exogenous variable of the no shirking wage, \( \bar{w} = \bar{w}(h, z) \). We have
\[
\pi_{nz} = -h\bar{w}_z \\
\pi_{hz} = -n(\bar{w}_z + h\bar{w}_h)
\]
Thus we get the following result from (23) and (24)
\[
\frac{dh^*}{dz} = \frac{-f''nh^2\bar{w}_z + f''nh^2(\bar{w}_z + h\bar{w}_h)}{|H|} = \frac{f''nh^3\bar{w}_h}{|H|} \quad (26)
\]
\[
\frac{dn^*}{dz} = \frac{-f''n^2h^2\bar{w}_h - nh\bar{w}_z(2\bar{w}_h + h\bar{w}_h)}{|H|} \quad (27)
\]

**A.4.2. Comparative statics of \( \lambda \)**

Let \( z = \lambda \). We have following derivatives
\[
\pi_{h\lambda} = -n(h\bar{w}_{h\lambda} + \bar{w}_\lambda) < 0, \quad \pi_{n\lambda} = -h\bar{w}_\lambda < 0 \\
\bar{w}_\lambda = \frac{1}{hC'} g' \frac{t}{t^2} > 0, \quad \bar{w}_{h\lambda} = -\frac{\bar{w}_\lambda[C' + \bar{w}hC'' + h^2C''\bar{w}_h]}{hC'} + \frac{1}{hC'} \frac{g' t -gt'}{t^2}
\]
If \( C' + h\bar{w}C'' < 0 \), then \( \bar{w}_{h\lambda} > 0 \). From (23), (26), and (27) we get
\[
\frac{dh^*}{d\lambda} = \frac{f''nh^3\bar{w}_{h\lambda}}{|H|} < 0 \\
\frac{dn^*}{d\lambda} = \frac{-f''n^2h^2\bar{w}_{h\lambda} - nh\bar{w}_\lambda(2\bar{w}_h + h\bar{w}_h)}{|H|}
\]

**A.4.3. Fixed cost of employment**

Let \((n^*, h^*)\) be the interior equilibrium and it satisfies the following first order conditions
\[
\pi_n = f'h - (\bar{w}h + k) = 0 \\
\pi_h = f'n - n(\bar{w} + h\bar{w}_h) = 0
\]
The second derivatives are

\[ \pi_{hh} = 0, \quad \pi_{nk} = -1 \]

Again from (23) and (24) we have

\[
\frac{dn^*}{dk} = \frac{\pi_{hh}}{|H|} < 0
\]  \hspace{1cm} (28)

since \( \pi_{hh} < 0 \).