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MONOPSONY POWER AND WORKER UTILITY IN THE 6X1 LABOR SCHEDULE

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ABSTRACT
This study analyzes the 6x1 work schedule, characterized by six consecutive workdays followed by one rest day, highlighting its economic and social impacts. It explores the interaction between firm-level profit maximization and worker utility, incorporating monopsony power in wage-setting and diminishing returns to labor productivity. Using a theoretical model, the study examines how long working hours affect worker health, morale, and productivity while influencing organizational outcomes. Findings reveal significant distortions in equilibrium wages and hours due to monopsony power, emphasizing the trade-offs between economic efficiency and worker well-being. The study calls for policies addressing these inefficiencies to ensure sustainable labor practices.

Keywords: Labor Schedule. Worker Utility. 6x1 Work System. Productivity. Labor Economics.

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INTRODUCTION

The structure of modern work schedules has been a focal point in labor economics, particularly as organizations strive to balance productivity with worker well-being. Among these schedules, the 6x1 model—six consecutive workdays followed by one rest day—has drawn significant attention due to its implications for economic efficiency and worker health. This rigid structure, characterized by prolonged workweeks, poses intricate challenges for both employers and employees. On one hand, it promises potential productivity gains through continuous labor. On the other, it risks exacerbating worker fatigue, decreasing morale, and undermining long-term organizational efficiency.

The complexity of this problem lies in the dual pressures faced by firms and workers. Firms aim to maximize output and profits while minimizing labor costs. This objective is often pursued through extended work schedules, yet such strategies may lead to diminishing returns in productivity as worker fatigue accumulates. For workers, the trade-off between income and well-being becomes central. Extended hours provide higher earnings but often at the expense of physical and mental health, work-life balance, and overall job satisfaction.

Existing research highlights both the potential advantages and the risks of extended schedules like the 6x1 model. While longer hours may initially increase productivity due to learning and skill acquisition, the effects of burnout and psychological stress frequently counteract these gains. Additionally, the economic burden of health issues associated with long hours—such as stress-related illnesses and reduced life satisfaction—can further complicate the evaluation of such schedules.

This paper approaches the problem by analyzing the 6x1 schedule through a theoretical framework that integrates firm-level profit maximization and worker utility optimization. By considering the monopsony power of firms in the labor market and the diminishing returns to labor productivity, this study offers a formalized perspective on the interaction between wages, hours worked, and worker well-being. This approach aims to illuminate the underlying trade-offs inherent to rigid work schedules and contribute to the broader discussion on sustainable labor practices.

EXTENDED WORK HOURS AND ECONOMIC EFFICIENCY

The impact of different work schedules, particularly the 6x1 schedule (six days of work followed by one day off), on worker productivity has garnered significant attention in

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recent economic and labor studies. This schedule, characterized by extended working hours and limited rest, raises critical questions about its implications for productivity, worker well-being, and overall economic efficiency. The relationship between working hours and productivity is complex, influenced by various factors including worker health, psychological well-being, and organizational outcomes.

Research indicates that long working hours, such as those associated with the 6x1 schedule, can lead to diminished productivity due to fatigue and decreased worker morale. For instance, studies have shown that continuously working long weeks, particularly those exceeding 50 hours, is linked to increased health problems, including fatigue and stress, which can adversely affect productivity levels (Park et al., 2012; Kim, 2023). The "fatigue effect," where prolonged work hours lead to diminishing returns in output, is a well-documented phenomenon in labor economics. Conversely, some studies suggest that longer hours may initially enhance productivity through increased skill acquisition and job familiarity, a concept referred to as the "learning effect" (Lee & Lim, 2014; Lee & Lim, 2017). However, this effect is often overshadowed by the negative consequences of fatigue and burnout, particularly in demanding work environments.

The psychological implications of the 6x1 work schedule cannot be overlooked. Research has established a correlation between long working hours and increased rates of anxiety and depression among workers (Kim, 2023; Park et al., 2022). The mental strain associated with such schedules can lead to higher absenteeism and presenteeism, ultimately reducing overall productivity. Furthermore, the economic costs associated with mental health issues, including lost productivity and increased healthcare expenditures, highlight the broader implications of work schedules on organizational efficiency (Wong et al., 2021). In this context, the 6x1 schedule may not only affect individual workers but also have significant repercussions for organizational performance and economic productivity at large.

Moreover, the impact of work schedules on worker well-being extends beyond immediate productivity concerns. Long working hours can disrupt work-life balance, leading to negative outcomes in personal relationships and overall life satisfaction (Holly & Mohnen, 2012; Barck-Holst et al., 2020). The tension between work demands and personal life can create a cycle of stress that further exacerbates health issues, compounding the negative effects on productivity. Studies have shown that flexible working arrangements, which allow for better work-life balance, can enhance job satisfaction and overall productivity (Haines et

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al., 2012; Collewet & Sauermann, 2017). In contrast, rigid schedules like the 6x1 can lead to worker dissatisfaction and increased turnover rates, which are costly for organizations (Kim et al., 2016).

The economic efficiency of labor is also influenced by regulatory frameworks surrounding working hours. In countries where labor regulations impose limits on working hours, there is often a corresponding increase in productivity per hour worked. For example, research has demonstrated that reducing working hours can lead to improved productivity outcomes, as workers are more focused and less fatigued (Lee, 2022; Domínguez et al., 2011). This relationship underscores the importance of considering not only the quantity of hours worked but also the quality of those hours in terms of worker engagement and output.

Furthermore, the implications of the 6x1 schedule extend to broader economic considerations. The potential for increased productivity through longer hours must be weighed against the risks of worker burnout and health deterioration. Long working hours have been associated with various health issues, including cardiovascular diseases and mental health disorders, which can lead to increased healthcare costs and reduced labor force participation ("Correlation of Working Hours with Morbidity in Working Professionals", 2020). The economic burden of these health issues can offset any short-term gains in productivity, suggesting that a more balanced approach to work schedules may yield better long-term outcomes for both workers and employers.

In addition, the impact of working hours on productivity is not uniform across different demographic groups. Research indicates that the effects of long working hours can vary significantly based on factors such as gender, age, and socioeconomic status (Park et al., 2022; Moortel et al., 2017). For instance, women and lower-income workers may experience more pronounced negative effects from extended work hours, as they often juggle multiple responsibilities both at work and at home. This disparity highlights the need for policies that consider the diverse experiences of workers and promote equitable working conditions.

The relationship between working hours and productivity is further complicated by the evolving nature of work in the digital age. The rise of remote work and flexible schedules has transformed traditional notions of working hours, leading to new challenges and opportunities for productivity (Howard, 2022; Gatsi et al., 2021). While some workers may thrive in flexible environments, others may struggle with the blurred boundaries between work and personal life, leading to increased stress and decreased productivity.

This dynamic necessitates a nuanced understanding of how different work arrangements impact worker well-being and organizational outcomes.

THEORETICAL MODEL

This theoretical model examines the relationship between productivity and worker well-being under the 6x1 work schedule, characterized by six consecutive workdays followed by one rest day. It incorporates the interaction between working hours (H) and additional hours spent (S) on activities such as commuting and preparation, which influence both utility and productivity.

The firm's objective is to maximize profit:

$$\Pi = P \cdot f(K,H) - r \cdot K - w \cdot H$$

where the production function is:

$$f(K,H) = A \cdot K^{\alpha} \cdot H^{\beta}, \quad \beta < 1$$

with $\beta < 1$ capturing diminishing marginal returns to labor.

The worker maximizes utility:

$$U = \frac{(w \cdot H)^{1-\gamma}}{1-\gamma} - \frac{\phi(H+S)^{1+\eta}}{1+\eta}$$

where:

- $w \cdot H$ represents income;
- $\phi > 0$ is the weight of disutility;
- $\eta > 0$ reflects increasing marginal disutility from total time spent.

The first-order condition for the worker's optimization is:

$$w^{1-\gamma} \cdot H^{-\gamma} = \phi(H+S)^{\eta}$$

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FIRM'S OPTIMIZATION PROBLEM WITH MONOPSONY POWER

If the firm has monopsony power in the labor market, it determines the wage $w(H)$ as a function of hours worked H. The profit function becomes:

$$\Pi = P \cdot f(K, H) - r \cdot K - w(H) \cdot H$$

where:

- P: Price of output (exogenous).
- $f(K, H) = A \cdot K^{\alpha} \cdot H^{\beta}$: Production function, with $0 < \alpha, \beta < 1$.
- $w(H) = \lambda \cdot H^{\theta}$: Wage function, determined by labor supply.
- $\lambda, \theta > 0$: Parameters of labor supply elasticity.

MARGINAL COST OF LABOR (MCL)

The marginal cost of labor (MCL) reflects the additional cost of hiring one more unit of labor:

$$MCL = w(H) + H \cdot \frac{\partial w(H)}{\partial H}$$

Substituting $w(H) = \lambda \cdot H^{\theta}$:

$$MCL = \lambda \cdot H^{\theta} + H \cdot \left(\lambda \cdot \theta \cdot H^{\theta - 1}\right) = \lambda \cdot H^{\theta} \cdot (1 + \theta)$$

FIRST-ORDER CONDITIONS (FOCS)

The firm chooses K and H to maximize profit.

1. Capital Decision (K)

The FOC for K is:

$$\frac{\partial \Pi}{\partial K} = P \cdot \frac{\partial f(K, H)}{\partial K} - r = 0$$

The marginal product of capital is:

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$$\frac{\partial f(K,H)}{\partial K} = A \cdot \alpha \cdot K^{\alpha-1} \cdot H^{\beta}$$

Substituting:

$$P \cdot A \cdot \alpha \cdot K^{\alpha-1} \cdot H^{\beta} = r$$

Solving for K:

$$K = \left(\frac{P \cdot A \cdot \alpha \cdot H^{\beta}}{r}\right)^{\frac{1}{1-\alpha}}$$

2. Labor Decision (H)

The FOC for H is:

$$\frac{\partial \Pi}{\partial H} = P \cdot \frac{\partial f(K,H)}{\partial H} - MCL = 0$$

The marginal product of labor is:

$$\frac{\partial f(K,H)}{\partial H} = A \cdot \beta \cdot K^{\alpha} \cdot H^{\beta-1}$$

Substituting MCL:

$$P \cdot A \cdot \beta \cdot K^{\alpha} \cdot H^{\beta-1} = \lambda \cdot H^{\theta} \cdot (1+\theta)$$

Substitute K into the Labor Equation

Substitute K from the capital decision into the production function:

$$K^{\alpha} = \left(\frac{P \cdot A \cdot \alpha \cdot H^{\beta}}{r}\right)^{\frac{\alpha}{1-\alpha}}$$

Replace K in the FOC for H:

$$P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}} \cdot H^{\beta-1+\frac{\alpha \cdot \beta}{1-\alpha}} = \lambda \cdot H^{\theta} \cdot (1+\theta)$$

Solve for H:

Rearrange the terms:

$$H^{\beta-1+\frac{\alpha \cdot \beta}{1-\alpha}} = \frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}}$$

Define the exponent:

$$\zeta = \beta - 1 + \frac{\alpha \cdot \beta}{1-\alpha} - \theta$$

Thus, the firm's demand for H is:

$$H = \left(\frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}}\right)^{\frac{1}{\zeta}}$$

LABOR SUPPLY FUNCTION (H)

The labor supply function represents the worker's decision to supply hours of work (H) based on the wage w, while maximizing utility.

Worker's Utility Function

The worker's utility is given by:

$$U = \frac{(w \cdot H)^{1-\gamma}}{1-\gamma} - \frac{\phi(H+S)^{1+\eta}}{1+\eta}$$

where:

- $w \cdot H$: Total income (w is the wage rate and H is hours worked),
- $\phi > 0$: Weight of disutility associated with working hours,
- $\eta > 0$: Elasticity of disutility with respect to total hours,
- $\gamma > 0$: Risk aversion parameter,
- S: Additional hours spent related to work (e.g., commuting, preparation).

Optimization Problem

The worker maximizes U by choosing H:

$$\max_{H} \quad U = \frac{(w \cdot H)^{1-\gamma}}{1-\gamma} - \frac{\phi(H+S)^{1+\eta}}{1+\eta}$$

First-Order Condition (FOC)

Taking the derivative of U with respect to H:

$$\frac{\partial U}{\partial H} = \frac{\partial}{\partial H}\left[\frac{(w \cdot H)^{1-\gamma}}{1-\gamma}\right] - \frac{\partial}{\partial H}\left[\frac{\phi(H+S)^{1+\eta}}{1+\eta}\right]$$

1. Derivative of the income utility term:

$$\frac{\partial}{\partial H}\left[\frac{(w \cdot H)^{1-\gamma}}{1-\gamma}\right] = (1-\gamma) \cdot w^{1-\gamma} \cdot H^{-\gamma}$$

2. Derivative of the disutility term:

$$\frac{\partial}{\partial H}\left[\frac{\phi(H+S)^{1+\eta}}{1+\eta}\right] = \phi \cdot (H+S)^{\eta}$$

Setting the FOC to zero:

$$w^{1-\gamma} \cdot H^{-\gamma} = \phi \cdot (H+S)^{\eta}$$

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Solving for H

Rearranging terms:

$$H^{-\gamma} = \frac{\phi \cdot (H+S)^{\eta}}{w^{1-\gamma}}$$

Taking both sides to the power of $-1/\gamma$:

$$H = \left(\frac{w^{1-\gamma}}{\phi \cdot (H+S)^{\eta}}\right)^{\frac{1}{\gamma}}$$

Approximating $H + S$

Assuming $H \gg S$, we approximate $H + S \approx H$. Substituting:

$$H^{-\gamma} \approx \frac{\phi \cdot H^{\eta}}{w^{1-\gamma}}$$

Combine terms:

$$H^{-\gamma-\eta} = \frac{\phi}{w^{1-\gamma}}$$

Simplify:

$$H = \left(\frac{w^{1-\gamma}}{\phi}\right)^{\frac{1}{\gamma+\eta}}$$

Labor Supply Function

The worker's labor supply H as a function of the wage w is:

$$H(w) = \left(\frac{w^{1-\gamma}}{\phi}\right)^{\frac{1}{\gamma+\eta}}$$

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Equilibrium Conditions and Analysis

To establish equilibrium, the firm's *labor demand* (H_D) and the worker's *labor supply* (H_S) must be equal. This equilibrium condition ensures that the hours of labor demanded by the firm at a given wage match the hours supplied by workers at the same wage. The equilibrium condition is given by:

$$H_D = H_S$$

where both H_D and H_S are functions of the wage rate w and depend on the firm's monopsony power and the worker's utility preferences.

Labor Demand

The firm's demand for labor is derived from its optimization problem and is expressed as:

$$H_D = \left(\frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}} \right)^{\frac{1}{\zeta}}$$

where:

$$\zeta = \beta - 1 + \frac{\alpha \cdot \beta}{1-\alpha} - \theta$$

Labor Supply

The worker's labor supply function, derived from the utility maximization problem, is:

$$H_S = \left(\frac{w^{1-\gamma}}{\phi} \right)^{\frac{1}{\gamma+\eta}}$$

Here, $\gamma + \eta$ represents the combined effects of risk aversion (γ) and disutility from working hours (η).

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Equilibrium Condition

At equilibrium, $H_D = H_S$. Substituting the expressions for H_D and H_S:

$$\left(\frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}}\right)^{\frac{1}{\zeta}} = \left(\frac{w^{1-\gamma}}{\phi}\right)^{\frac{1}{\gamma+\eta}}$$

Equilibrium Wage (w)

To solve for the equilibrium wage w, raise both sides to the power of $\zeta \cdot (\gamma + \eta)$:

$$\left(\frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}}\right)^{(\gamma+\eta)} = \frac{w^{1-\gamma}}{\phi}$$

Rearranging:

$$w^{1-\gamma} = \phi \cdot \left(\frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}}\right)^{(\gamma+\eta)}$$

Taking both sides to the power of $\frac{1}{1-\gamma}$, we find the equilibrium wage:

$$w = \left[\phi \cdot \left(\frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}}\right)^{(\gamma+\eta)}\right]^{\frac{1}{1-\gamma}}$$

Equilibrium Hours (H)

Once the equilibrium wage is determined, we substitute it back into the worker's labor supply function to find the equilibrium hours worked:

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$$H = \left(\frac{w^{1-\gamma}}{\phi}\right)^{\frac{1}{\gamma+\eta}}$$

Substituting the expression for w into this equation:

$$H = \left(\frac{\left[\phi \cdot \left(\frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}}\right)^{(\gamma+\eta)}\right]^{\frac{1}{1-\gamma}}}{\phi}\right)^{\frac{1}{\gamma+\eta}}$$

Simplifying:

$$H = \left(\phi^{\frac{1}{1-\gamma}-1} \cdot \left(\frac{\lambda \cdot (1+\theta)}{P \cdot A \cdot \beta \cdot \left(\frac{P \cdot A \cdot \alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}}\right)^{\frac{\gamma+\eta}{1-\gamma}}\right)^{\frac{1}{\gamma+\eta}}$$

ANALYSIS

The derived equilibrium highlights the distortions introduced by monopsony power in the labor market. The equilibrium wage is lower, and the equilibrium hours worked are reduced compared to a competitive market. Several factors influence these results:

First, monopsony power, captured by the parameters λ and θ, gives the firm the ability to suppress wages below the marginal product of labor. This reduces labor supply and hours worked (H). Second, worker preferences, such as risk aversion (γ) and the disutility of hours worked (η), further shape the equilibrium by limiting how much labor workers are willing to supply even at higher wages. Third, productivity and market **conditions**, represented by $A, \alpha, \beta, P,$ and r, define the firm's demand for labor and its ability to pay higher wages.

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These results provide insights into the tension between the firm's profit maximization under monopsony and the worker's utility-maximizing decisions. Interventions, such as minimum wage policies, could mitigate these distortions and lead to higher equilibrium wages and hours worked.

CONCLUSION

This study has examined the 6x1 work schedule through the lens of labor economics, focusing on the intricate balance between firm-level profit maximization and worker utility optimization. The 6x1 schedule, characterized by six consecutive workdays followed by one rest day, presents a significant challenge due to its rigid structure, prolonged working hours, and the inherent trade-offs between economic efficiency and worker well-being. Firms aim to maximize output while strategically managing labor costs, often at the expense of workers' income and satisfaction, particularly in contexts where monopsony power distorts labor market dynamics.

The analysis underscores the role of monopsony power, where firms exploit their market position to set wages below competitive levels. The wage function $w(H) = \lambda \cdot H^{\theta}$, with $\lambda > 0$ representing the baseline sensitivity of wages to hours worked and $\theta > 0$ reflecting the elasticity of labor supply, illustrates how firms strategically manipulate wages to minimize costs. This suppression results in an equilibrium wage w that is heavily influenced by the firm's monopsony parameters, worker preferences, and production factors.

On the worker's side, the utility function $U = \frac{(w \cdot H)^{1-\gamma}}{1-\gamma} - \frac{\phi(H+S)^{1+\eta}}{1+\eta}$ captures the critical trade-off between income and disutility from work. Here, $\gamma > 0$ reflects the worker's aversion to risk or diminishing marginal utility of income, while $\phi > 0$ and $\eta > 0$ quantify the weight and elasticity of disutility, respectively. The term $H + S$, which includes hours worked H and additional time costs S, such as commuting or preparation, highlights the compounded burden of labor. The equilibrium hours H, derived from both labor demand and labor supply, demonstrate how these constraints influence worker behavior and limit their capacity to respond to wage changes.

The findings show that monopsony power introduces significant distortions in the labor market, leading to lower equilibrium wages and fewer hours worked compared to a competitive scenario. The firm's labor demand, driven by diminishing returns to productivity

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($\beta < 1$) and the cost of capital (r), interacts with the worker's labor supply, constrained by disutility from prolonged working hours ($H + S$). These dynamics lead to suboptimal outcomes, where workers are compensated less than their marginal productivity and are employed for fewer hours than would occur in a competitive equilibrium.

This framework highlights the inefficiencies inherent in rigid schedules such as the 6x1 model. While such schedules may offer short-term productivity gains through extended workflows, the long-term consequences include worker fatigue, diminished morale, and increased health-related costs, which undermine sustainable labor practices. By integrating the theoretical dynamics of monopsony power with worker utility considerations, this study emphasizes the need for balanced labor policies that address these inefficiencies. Interventions such as minimum wage regulations or flexible scheduling could reduce the negative impacts of monopsony, creating more equitable and sustainable labor outcomes while preserving economic efficiency.

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