

# *The Effect of Supervision on Working Efficiency: How is Working Overtime Driven?*

Dianyu Li<sup>1\*†</sup>, Yelin Deng<sup>2†</sup>, Chengjia Wang<sup>3†</sup>

<sup>1</sup>*School of Economics and Management, Shihezi University, Shihezi, China*

<sup>2</sup>*International Department, The Affiliated High School of South China Normal University, Guangzhou, China*

<sup>3</sup>*Shanghai High School International Division, Shanghai, China*

*\*Corresponding Author. Email: michaeli20050308@163.com*

*†These authors contributed equally to this work and should be considered as co-first author.*

**Abstract.** As the phenomenon of overtime working causes significant social harm, especially in China, to effectively make policies against this issue, it became vital to decode the factors that drives people to work overtime. Aside from the “involution” conformity pressure and intrinsic motivation, we believe that supervision from an authoritative figure plays a key role under different conditions. Within our study, by analyzing our data from a questionnaire we distributed on our own with linear regression and entropy weighting, we derived at the conclusion that: (1) supervision can significantly improve the overtime working efficiency and tendency of the employees. (2) Autocratic supervision exerts the strongest influence (+18.45% willingness, +19.59% acceptance) on the employee’s tendency to work overtime. (3) Normative social influence acts as the primary motivator for overtime working among employees generally (64.02 entropy weight), outweighing reciprocity (50.04), signaling (44.31), and intrinsic motivation (21.73). (4) Supervised settings increase predicted overtime efficiency by 5.45%.

**Keywords:** Overtime Working, Regression, Entropy Weighting

## 1. Introduction

The pervasive culture of overtime work emerged as a phenomenon, harnessing significant devastation upon employee well-being, productivity, and organizational sustainability. Overtime work, defined as hours worked beyond regular schedules. In our research, we analyze the situation that overtime work is voluntary and unpaid.

Excessive overtime can lead to burnout, diminished mental health, and reduced job satisfaction. However, in China, the practice of voluntary working overtime has become prevalent. We believe that the supervisor's role in shaping these phenomena is particularly significant, as managerial practices directly influence workplace norms, employee motivation, and compliance behaviors. Understanding how supervision and leadership styles influence employees' willingness to work beyond standard hours is therefore essential for developing evidence-based policies that promote both operational efficiency and benign working environments.

Despite broad recognition of the workplace culture glorifying overtime as essential for the development of the enterprise, the main catalyst pushing employees to overtime--the supervision from

superior figures--remains unexplored. Prior research often treats "supervision" monolithically, neglecting how distinct leadership approaches impact employee psychology and behavior differently. This gap is especially amplified in contexts where overtime is driven by implicit social pressures rather than explicit demands, serving the exigence for our research where we dive into the motivational theories under different supervisory modes.

In this paper, we investigate how four supervision modes—autocratic, democratic, laissez-faire, and no supervision (control)—affect workers' willingness to work overtime, their acceptance of working overtime norms, and their self-predicted efficiency during extended hours. Using a purpose-built scenario-based survey distributed via WeChat, we employ a quasi-experimental design where participants imagine overtime scenarios under randomized supervision types. We control for age, gender, career tenure, occupation, and city tier to isolate supervisory effects. Next, we combine regression analysis, t-tests, and entropy-weighted factor evaluation to test three hypotheses: (1) whether supervision increases overtime-working propensity; (2) how supervision increases overtime-working propensity; and (3) how four motivational theories (signaling, intrinsic drive, social norms, reciprocity) explain observed behaviors.

We find robust evidence that supervisory presence significantly increases both the likelihood and acceptance of overtime work relative to unsupervised settings. Autocratic supervision exerts the strongest effect (18.45% willingness, 19.59% acceptance), while laissez-faire supervision shows weaker impacts. Efficiency gains, though smaller, remain statistically significant (5.45%). Crucially, social norms emerge as the dominant motivator: employees under autocratic and laissez-faire supervision report 1.65 SD and 1.23 SD higher social-norm-driven compliance, respectively. Entropy-weighting analysis confirms social norms' primacy (64.02 weight score) over reciprocity (50.04), signalling (44.31), and intrinsic motivation (21.73).

Current literature in this field suggests that 38.4% of employees reported overtime, with higher rates in first-tier cities [1], and that overtime working is significantly correlated with the deterioration of public health. This provides the exigence for investigating the factors causing significant overtime working conditions. Current studies explored factors such as "involution" culture [2], intrinsic motivation [3], yet the effect of the supervision from a superior figure remains unexplored. Hence, we investigate this factor and contributes to a more comprehensive explanation of the factors driving employees to work overtime.

In the paper, section 2 reviews previous literature and supplements the research on overtime behaviour and leaders' overtime. In the section 3, we outline the data sources, key variables, research models and methods. In the section 4, we present the data results and give conclusion. In the section 5, we summarize and put forward suggestions.

## 2. Literature review

### 2.1. The context of working overtime

The Labor Law of the People's Republic of China stipulates that the standard work hour is 40 hours per week. However, due to the weak enforcement and ingrained overtime culture, especially in eastern coastal regions like Guangdong and Zhejiang, where economic development is advanced [4]. As a result, the current average work hours are about 49.1 hours per week. Therefore, employees in China are experiencing overtime that exceeds regulated limits. According to the China Labor-force Dynamics Survey (CLDS), 38.4% of employees reported overtime, with higher rates in first-tier cities [1]. In competitive sectors like IT, real estate, and business, where rapid development and market demands require extended hours, overtime work is widespread and intense.

The overtime work culture in China has long been a controversial issue in China. This culture has generated a series of phenomena, such as the “996” work system and the “glorify narration” of overtime work.

## **2.2. The impact of overtime on mental and physical health**

Current studies illustrate a negative and significant correlation between overtime work and employees’ mental and physical health. As evidence, a meta-analysis find that long working hour is associated with an increased risk of occupational health problems by 24.3%. In addition, mental health issues are more pronounced than physical ones [5]. Specifically, overtime is associated with depression, anxiety, and lower life satisfaction, mediated by social isolation and loneliness [6]. A study using the 2018 Chinese Family Panel Studies (CFPS) found that employees working 44.1–61.9 hours per week had an 11% higher probability of depressive symptoms, with those working  $\geq 62$  hours per week showing even stronger effects [7].

## **2.3. The impact of overtime on employee productivity**

Studies also demonstrate an adverse effect of overtime work on employees’ productivity. In previous research, they utilize AI facial recognition technology to capture participants’ emotions after long work hours and collect psychological detachment and motivation to work the next day in a 12-day experiment. Their analysis revealed that mandatory unpaid overtime results in negative emotions, which subsequently undermine employees' motivation to work the next day [8]. According to a study in China, overtime work without rewards negatively correlates with productivity, as employees experience decreased work engagement and higher turnover intention [9].

It is noteworthy that if employees are voluntarily working overtime and driven by intrinsic motivation, such as pushing the work progress in a situation that is not compulsory, skill development, or career advancement, the productivity will increase.

Research finds that employees motivated by career growth or work challenges are more likely to engage in productive overtime, particularly in supportive environments [10]. Conversely, mandatory overtime, often imposed in de-skilled roles, reduces autonomy and productivity, as employees feel less control over their work [11]. Emimerich and Rigotti found that the Work-related authenticity is positively linked to intrinsic motivation [3].

Overtime working in China is consistently associated with the “involution” culture, which means an internal competition within a company or industries, further exacerbates productivity losses by fostering job insecurity and stress, leading to inefficient overtime behaviors [2].

## **2.4. The effect of supervision**

Supervision refers to the act of overseeing or managing the work or activities of a person or group to ensure tasks are performed correctly and efficiently [12]. In our research, we confine the concept of supervision to the employers’ supervision to the employees. The relationship between supervision and employee behaviour has been a focal point in psychology and economics. Current studies primarily categorize workplace supervision into positive and negative supervisory behaviours.

Positive supervisory behaviours, such as integrity, emotional support, and responsible leadership, enhance employee motivation and commitment, potentially increasing their willingness to work overtime [13], in a study of 330 Italian employees, find that supervisor integrity and responsible behaviours directly improved performance and indirectly boosted engagement through workplace spirituality and work engagement, fostering positive feelings that encourage extra work hours as employees feel valued and motivated to contribute to organizational goals. Similarly, research note

that supervisors demonstrating responsibility and honesty enhance job satisfaction and performance, which may promote voluntary overtime [14].

Negative supervisory behaviours, such as abusive supervision or lack of support, reduce employees' willingness to work overtime by lowering motivation and increasing stress. A meta-analysis of 27 studies with 10,867 social service workers finds that supervisory task assistance and emotional support improved worker outcomes, while their absence led to burnout and turnover intention, deterring overtime [15]. Researches also note that passive or active negative supervisory behaviours harm employee well-being, fostering resistance to extra work hours [16].

Abusive supervision particularly diminishes overtime willingness. A study of 402 Bangladeshi employees, suggest that abusive supervision increased cyberloafing and turnover intention through reduced psychological well-being and emotional exhaustion, discouraging discretionary effort like overtime [17]. This aligns with conservation of resources theory, which posits that employees avoid resource-depleting tasks like overtime when supervisory behaviors drain emotional reserves [18].

However, we notice that the current literature puts less attention on the divergence of employees' reactions when treated by different types of supervision. Therefore, we further classify the supervision type into autocratic, democratic, and laissez-faire.

Democratic supervision flourishes when leaders invite and genuinely respect team insights, guiding collective decisions within a friendly atmosphere that allows individuals to contribute a little beyond the regular schedule without discomfort. Studies confirmed that when supervisors visibly embody integrity and fully accept accountability, they kindle a deep, voluntary engagement within the workforce, which simultaneously enhances output and encourages readiness to accept additional duty [13]. This dynamic within Chinese firms is similar: permitting employees to enjoy slightly broader discretion during the workday reduces weariness and purposefully directs evening effort toward personal advancement [10]. Employees ordinarily reciprocate perceived equity, as social exchange theory predicts [19], through discretionary diligence. Supporting this interpretation, previous studies also locate the prevalence of voluntary overtime in workers reporting that the autonomy to construct personal overtime schedules—an often-evoked advantage of democratic supervision—creates equilibrium without jeopardising health [20].

Autocratic supervision, marked by top-down control and limited employee input, often leads to mandatory overtime and reduced willingness. Bureaucratic control—a defining feature of autocratic supervision—extends overtime hours by de-skilling workers, especially in low-end service and manufacturing sectors where workers have little autonomy [11]. This approach raises the intensity of overtime but decreases voluntary engagement by fostering resentment and low morale [21]. Abusive supervision, a type of autocratic conduct, raises emotional exhaustion and the intention to leave, which further reduces employees' willingness to work extra hours voluntarily [17]. Autocratic supervision is typical in China's hierarchical culture, but it frequently results in compliance-driven rather than motivated overtime [22].

Laissez-faire supervision, characterized by minimal guidance and oversight, has mixed effects on overtime willingness. Although it gives people more freedom, it can also result in ambiguous expectations, which lowers motivation. Previous studies indicate that passive supervisory behaviors have a detrimental effect on workers' well-being and may reduce voluntary overtime because they provide no guidance [16]. Laissez-faire supervision in China can lead to "unconscious overtime," where workers put in more hours because of hazy boundaries, but it can also enable employees with high self-determination to work overtime for personal development [11]. Laissez-faire supervision does not promote the relatedness required for long-term overtime motivation in the absence of active support, especially in high-pressure settings [23].

### 3. Methodology

#### 3.1. Problem restatement

Our research can be divided into the investigation of 4 layers of categories as shown below:

1. To investigate the relationship between the presence of the boss and the willingness/acceptance of his subordinates to work overtime
2. To investigate the relationship between supervision of the boss and the efficiency of employee working overtime
3. To explain the relationship of how the theories of motivation we proposed could account for the reason of why employees work overtime voluntarily
4. To evaluate the generalizability of our conclusion across the variation (for the parameters of our controlled variables) of our sample.

Given the above research targets, since we cannot design an experiment where we observe participants in an isolated controlled environment, we distributed a questionnaire where participants will imagine a hypothetical scenario where they work overtime with/without the supervision of a certain type of boss.

#### 3.2. Data collection

Our research utilized data from a questionnaire we developed by ourselves. We distributed a questionnaire from the wenjuanxing platform in Wechat, collecting 190 sets of data, in which 179 of them provided valid data. Summary statistics is provided as Table 2 in the reference:

From the data, we can observe that the samples from are categories are fully represented. The gender ratio is relatively balanced, with 96 male (53.63%) and 83 female within our sample. The average age of the sample population is 38.21 years, with an average of 16.08 years of working experience. This testifies the validity of our sample that on average the population has enough working experience to express valid opinion on working overtime, and the majority of the population lies within the category of “Central Administrators”, “Technical Specialists”, “Social Service”, and “Other” (25 (13.97%), 43(24.02%), 30 (16.76%), and 59 (32.96%) participants respectively). According to the China’s official classification of occupation (*The Occupational Classification of the People's Republic of China, 2022 Edition*<sup>1</sup>), a majority of the industries within the above categories are reported to engage in overtime working. Moreover, the majority of our sample, 123 participants (68.72%), lives within tier 1 cities (Shanghai, Beijing, Guangzhou, and Shenzhen), which corresponds to cities indicating severe overtime working phenomenon. The detailed summary statistics for each treatment group is displayed below:

#### 3.3. Variable definition

Within our questionnaire, we defined our key parameters that we inquired in our questionnaire as following:

The key dependent variable within the study is the willingness and acceptance of overtime. The independent variables are the presence of each type of boss’ supervision and the motivators. In this study we investigate whether the presence of a certain type of boss would significantly increase the likelihood of an employee to work overtime.

---

<sup>1</sup> The occupational structure in China is formally defined by the Ministry of Human Resources and Social Security.

Factors such as age, gender and tier of city the participants live in are controlled throughout the regression analysis. The details regarding each variable can reference Table 1 in the appendix. The elaboration for specific variables is as follows:

1. Career: Career index is classified according to the China's official classification of occupation<sup>2</sup>. We used the 8 first layer categories within the classification
2. Gender: 0 and 1 represents female and male, respectively. Numbers are directly used in regression and heterogeneity analyses.
3. City: number in city column indicates tier of city, detailed criteria references data<sup>3</sup>.
4. Supervision: we believe the supervision (defining the relationship between the boss and his subordinates) plays a key role in influencing the outcome variables we explore; hence we classify the conclude 4 types of supervision:
  - 1) Autocratic (defined as Treatment 1/T1): one-way management relationship, the boss unilaterally gives his subordinates orders and expects them to be all carried out. Employee has little to no say when making collective decisions.
  - 2) Democratic (defined as Treatment 2/T2): active interaction exist between boss and his subordinates. Employees can influence decisions when making collective decisions.
  - 3) Laissez-Faire: (defined as Treatment 3/T3): there is little to no supervision from the boss to the subordinates. Boss does not interfere with the details of work of his subordinates or boss is not involved such duties.
  - 4) Control: There are no boss or authoritative figures present to supervise working, the employee (hypothetical) works completely on his own.

Within the study, we distributed 4 questionnaires where in each questionnaire we asked the participant to imagine a scenario 1 of the 4 treatments above.

1. Motivation factors: In this research, we proposed 4 potential theories that could explain the behavioral patterns in employee's overtime working when the boss is present or not. The 4 theories are as correspond to Table 1.
2. Signaling Theory: when the boss is present, employee working time is equivalent to sending a signal to the boss signifying that the employee works harder than others.
3. Intrinsic Motivation Theory: The employee works solely for himself: for progress or for a sense of achievement.
4. Social Norm Theory: the employee's behavior is guided by normative social influence from his working environment: the employee dares do not get off work on his own when he is exposed to an environment or an authoritative figure that works overtime.
5. Reciprocity Theory: the employee expresses a tendency to return the boss a favor when the boss does the employee a favor for working overtime for the team.

### 3.4. General methodology

Our study overall uses regression to analyze the relationship between dependent and independent variable as follows: for hypothesis one, we want to test whether there is a significant relationship between whether the supervision from the boss is present or what type of supervision is present and the subjective self-rating of the employee's willingness and likelihood to work overtime. Therefore, we perform regression analysis with treatment as the independent variable and the willingness and

<sup>2</sup> Ministry of Human Resources and Social Security, People's Republic of China. *The Occupational Classification of the People's Republic of China (中华人民共和国职业分类大典)*. 2022 Edition. Beijing: China Personnel Press, 2022.

<sup>3</sup> Sheng Guoqing, "Interpretation of the Statistical Data on Changes in Commodity Residential Sales Prices in May 2022," National Bureau of Statistics of China, June 16, 2022, [http://www.news.cn/fortune/2022-06/16/c\\_1128746477.htm](http://www.news.cn/fortune/2022-06/16/c_1128746477.htm).

likelihood as the dependent variable. To test our second hypothesis, which investigates the relationship between the supervision treatment type and the predicted efficiency of overtime working. Therefore, we perform a regression, in this case, with the independent variable to be the treatment type and the dependent variable as the predicted efficiency of overtime working. For hypothesis 3, as we try to attribute the relationship between the presence of supervision and the employee's willingness and efficiency for overtime working, we perform regression with the dependent variable as the level to which the 4 theories we proposed fits the situation for the participant and the dependent variable as the willingness and efficiency of the employee in overtime working.

Implications for each hypothesis will be further discussed later.

## 4. Results

### 4.1. Hypothesis 1 testification and discussion

The overarching premise of the entire study is that the presence of the boss will influence the overtime working behavior of the employee. We additionally performed a t-test for the "Over\_or\_not" and "Acceptance" variables to see whether there is a statistically significant difference between the acceptance and possibility for an employee to work overtime for the presence or absence of different type of boss. The results are displayed within the Table 4 and Table 5, respectively.

From the results, we can conclude that there is a significant difference between the possibility and acceptance of an employee to work overtime for whether the boss is present or absent. Therefore, we can testify that the presence of the boss does significantly increase the likelihood and acceptance of an employee to work overtime regardless of which supervision treatment group it is compared to.

### 4.2. Hypothesis 2 testification and discussion

Having testified the relationship between the presence of the boss and the willingness/acceptance of his subordinates to work overtime, we move on to testify the effect of different types of supervision with the presence of the boss on likelihood, acceptance and efficiency of the employees in overtime working.

Before the regression, we discovered that for the data for efficiency in overtime working, where people are asked to predict their efficiency in overtime working compared with normal working efficiency, people are likely to take benchmark percentages to facilitate their estimation. This leaves us with a strongly skewed and incontinuous data as displayed in Figure 1.

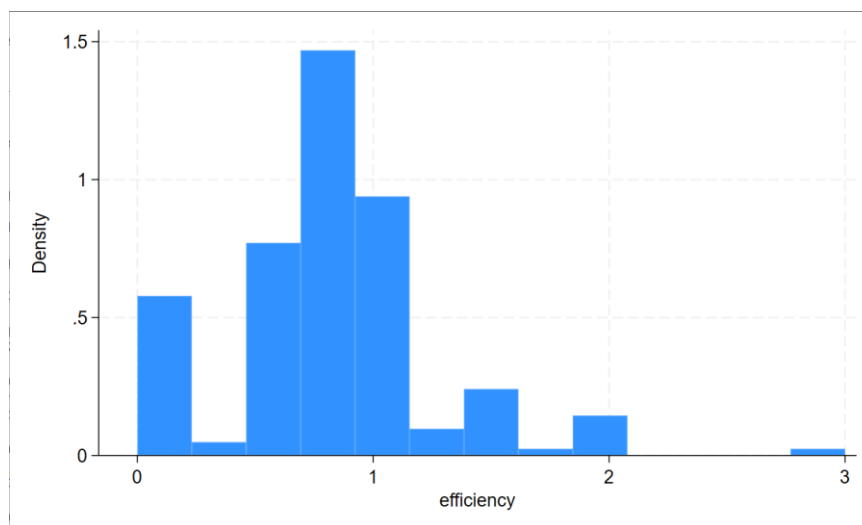


Figure 1. Distribution of predicted overtime efficiency for our whole sample

Therefore, we decided normalize all efficiency to the interval [1,3] with interval scaling and take  $\ln(\text{eff})$  for all data, such that the skewness of the data can be alleviated as displayed within Figure 2 in the appendix. No data normalization is performed on Overtime\_or\_Not and Acceptance.

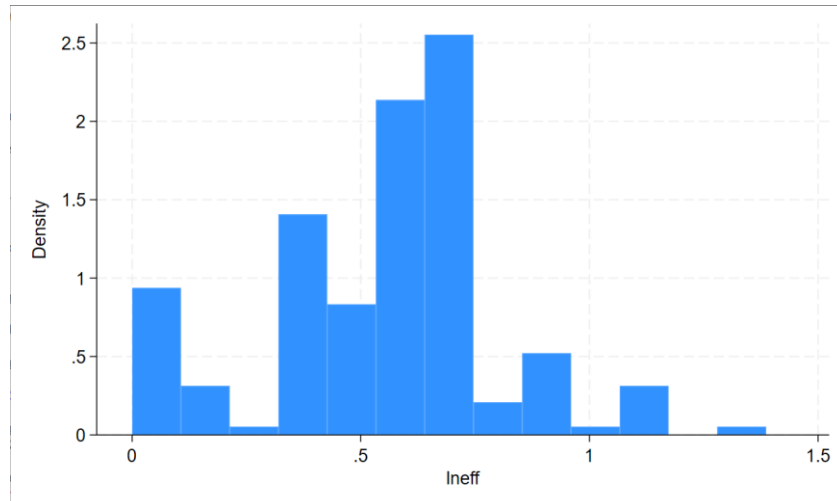


Figure 2. Distribution of predicted overtime efficiency after interval scaling

We perform regression analysis on these 3 parameters separately, and the results are as Table 6 demonstrates. The variable T, T1, T2, and T3 are Boolean values that either take 0 or 1, falling into the indicated treatment (treatment 1, 2, and 3 are defined previously) would give 1 to the value of the treatment variable (for the case of T, if an observation falls into any treatment, T would be 1, otherwise 0). Therefore, we compare people who falls into the indicated treatment groups above and who does not.

We found that people with supervision of a boss displays 14.24 more percentage points in possibility to work overtime, 17.01 more percentage points in acceptance to overtime working, and 5.45 more percentage points in efficiency (accounted for data normalization modifications). Employees under the supervision of authoritarian bosses displays 18.45 and 19.59 more percentage points in likelihood and acceptance to overtime working, respectively, than people who are not under authoritarian supervision.

### 4.3. Hypothesis 3 testification and discussion

As we investigated how the supervision of different bosses would impact the overtime working performance of the employees, we try to explain these relationship and attribute them to the 4 theories we proposed. Same as our previous method, we also attempted to use regression to indicate the relationship between different supervision type an employee is under and motivations behind his overtime working. The results are as Table 7 in the appendix.

From the regression model, we can conclude that only data from the social norm theory displays a significant enough difference between different treatments to explain the overtime work behaviors of employees. However, it would be unreasonable to ignore other theories in explaining the overtime work behaviors. Therefore, we changed the structure of our model: we constructed a comprehensive evaluation model where the 4 motivations can be treated as different factors that contributes to explain the indicators for overtime working behavior. Therefore, since our initial target would be to calculate the relative importance between the 4 factors, we simply have to give weight to the 4 parameters. Detailed plan, which is entropy weighting, is established under a key hypothesis:

The smaller the entropy, the larger the variation of responses exist within the data set we obtain, indicating a larger importance of the parameter.

This hypothesis fits our situation since the larger the variation across responses for a certain motivation factor, the more it can signify differences among individual responses, which statistically tells more information, and therefore is given a greater weight.

The results of entropy weighting is displayed as in Table 8

As we sum up the weight of each motivation within each treatment group multiplied by the number of observations within the treatment, we derive at a final weight score for each motivation factor as follows: the weight of signaling factor is 44.312; the intrinsic factor weight is 21.728, the social norm factor weight is 64.020, the reciprocity factor weight is 50.037.

From the weighting method, we can observe that social norms still has the greatest significance in explaining overtime working behavior, yet the intrinsic motivation theory is testified to have the least significance in explaining overtime working behavior. A possible explanation for this is that the wording of the questionnaire leads the participants to respond in a way that surmises social influence plays the most important role in working overtime.

## 5. Conclusion

Concluding our research, our results can be organized for each hypothesis as follows: (1) The supervision of boss to his employees can significantly increase ( $p < 0.05$ ) the tendency of an employee to work overtime. (2) Autocratic supervision exerts the strongest influence (+18.45% willingness, +19.59% acceptance) on the employee's tendency to work overtime. (3) Normative social influence acts as the primary motivator for overtime working among employees generally (64.02 entropy weight), outweighing reciprocity (50.04), signaling (44.31), and intrinsic motivation (21.73). (4) Supervised settings increase predicted overtime efficiency by 5.45% ( $*p* < 0.05$ ), though gains are modest compared to behavioral compliance. (5) Employees in higher-tier cities exhibit significantly *lower* overtime acceptance and social norm susceptibility.

Our results rely on hypothetical overtime scenarios ("imagine a situation...") rather than observing real-world behavior heavily, which could lead to biases in responses. Moreover, by including a small sample size of  $N=179$ , with an 68% of participants in T1 cities, our sample would fail to represent the population well. In the future, we could aim to expand the sample size and conduct a better-designed controlled environment, such as an experiment to improve the validity of our results.

Table 1. Reference table for parameter definition

Variable	Type	Definition
Age	Control	Age of participant
Career*	Control	index of occupation category
Career_time	Control	Years since participant is employed
Gender*	Control	Gender of participant
City*	Control	Tier of city the participant live in
Over_or_not	Dependent	participant's possibility to work overtime
Acceptance	Dependent	participant's acceptance to working overtime
Eff	Dependent	Predicted efficiency of overtime working
ln(X)	Dependent	ln value of parameter X
Supervision*	Independent	Type of supervision from boss employee is under(defined)
Motiv_Sig*	Independent	Score of signaling theory as overtime motivation
Motiv_Intr*	Independent	Score of intrinsic motivation theory as overtime motivation
Motiv_Soc*	Independent	Score of social norm theory as overtime motivation
Motiv_Rec*	Independent	Score of reciprocity theory as overtime motivation

Note: Variable with asterisk (\*) will be explained with elaboration

Table 2. Summary statistics

Variable	Obs	Amount	Proportion	Mean	Std. dev.
Career	179				
Central Administrators		25	13.97%		
Technical Specialists		43	24.02%		
Executive Support		6	3.35%		
Primary Economic Workers		5	2.79%		
Social Service		30	16.76%		
Manufacturing		9	5.03%		
Military Affiliation		2	1.12%		
Other		59	32.96%		
Gender	179				
Male		96	53.63%		
Female		83	46.37%		
Supervision <sup>4</sup>	179				
Autocratic		62	34.64%		
Democratic		23	12.85%		
Laissez-Faire		46	25.70%		
Control		49	27.37%		
City	179				
Tier 1		123	68.72%		
Tier 2		21	11.73%		
Tier 3		35	19.55%		
Age	179			38.21	14.47
Career Time	179			16.09	13.49

Notes: All models are estimated using Entropy Weighting. Source: SPSSAU Data Analysis Software  
 Control: we controlled for the participants' age, gender, city they live in, and career time in regressions.

Table 3. Summary statistics for each treatment group

Variables	T1	T2	T3	Control
Gender				
Male	39	9	22	25
Female	22	14	24	24
Age				
Average	38.98	39.26	45.68	29.33
SD	14.18	11.17	15.44	11.75
Career Time (average)	17.15	15.83	22.51	8.54
City				
Tier 1	41	23	28	32
Tier 2	7	0	10	3
Tier 3	13	0	8	14

Table 4. T-test results for overtime

	T1	T2	T3	Control
T1	0			
T2	0.73*	0		
T3	1.06**	0.33	0	
Control	2.04***	1.31**	0.98*	0

Notes: All models are estimated using one-sided t-test. Source: Author's own calculations. Significance levels: \*\*\*: p < 0.01, \*\*: p < 0.05, and \*: p < 0.1. We controlled for the participants' age, gender, city they live in, and career time in regressions.

<sup>4</sup> Supervision: stands for the number of observation datasets included in each of our treatment group

Table 5. T-test results for acceptance

	T1	T2	T3	Control
T1	0			
T2	0.96*	0		
T3	0.39	0.57	0	
Control	2.22***	1.26**	1.83***	0

Notes: All models are estimated using one-sided t-test. Source: Author's own calculations. Significance levels: \*\*\*:  $p < 0.01$ , \*\*:  $p < 0.05$ , and \*:  $p < 0.1$ . We controlled for the participants' age, gender, city they live in, and career time in regressions.

Table 6. Regression between group and willingness and efficiency to work

Variables	Overtime Willingness (1)	Acceptance (2)	Efficiency (3)
T	1.424*** (0.494)	1.701*** (0.505)	0.087** (0.042)
Controls	Yes	Yes	Yes
N	179	179	179
R-sq	0.107	0.131	0.023
T1	1.845*** (0.537)	1.959*** (0.556)	0.042 (0.040)
T2	1.419* (0.728)	1.397* (0.752)	0.034 (0.575)
T3	0.627 (0.608)	1.391** (0.629)	0.020 (0.044)
Controls	Yes	Yes	Yes
N	179	179	179
R-sq	0.107	0.131	0.002

Notes: All models are estimated using OLS. Significance levels: \*\*\*:  $p < 0.01$ , \*\*:  $p < 0.05$ , and \*:  $p < 0.1$ .

Control: we controlled for the participants' age, gender, city they live in, and career time in regressions.

Source: Author's own calculations.

Table 7. Motivation factors under different supervision types

Dependent Variables:	Signaling (1)	Intrinsic Motivation (2)	Social Norm (3)	Reciprocity (4)
T	0.365 (0.515)	-0.252 (0.458)	1.333** (0.535)	0.364 (0.550)
Controls	Yes	Yes	Yes	Yes
N	179	179	179	179
R-sq	0.080	0.048	0.096	0.057
T1	0.884 (0.557)	-0.038 (0.502)	1.652*** (0.587)	0.656 (0.604)
T2	-0.938 (0.754)	0.046 (0.679)	0.492 (0.795)	-0.412 (0.818)
T3	0.157 (0.631)	-0.837 (0.568)	1.227* (0.664)	0.271 (0.684)
Controls	Yes	Yes	Yes	Yes
N	179	179	179	179
R-sq	0.080	0.048	0.096	0.057

Notes: All models are estimated using OLS. Significance levels: \*\*\*:  $p < 0.01$ , \*\*:  $p < 0.05$ , and \*:  $p < 0.1$ .

Control: we controlled for the participants' age, gender, city they live in, and career time in regressions.

Source: Author's own calculations.

Table 8. Entropy weighting results by treatment

Variable	Treatment (1)	Entropy (2)	Info. Utility (3)	Weight (4)	Observations (5)
Signaling	Control	0.9433	0.0567	27.68%	49
Intrinsic Motivation	Control	0.9773	0.0227	11.08%	49
Social Norms	Control	0.9265	0.0735	35.88%	49
Reciprocity	Control	0.9481	0.0519	25.36%	49
Signaling	Autocratic	0.9793	0.0207	22.11%	62
Intrinsic Motivation	Autocratic	0.9878	0.0122	13.00%	62
Social Norms	Autocratic	0.9694	0.0306	32.76%	62
Reciprocity	Autocratic	0.9700	0.0300	32.12%	62
Signaling	Democratic	0.9571	0.0429	31.97%	23
Intrinsic Motivation	Democratic	0.9916	0.0084	6.24%	23
Social Norms	Democratic	0.9501	0.0499	37.21%	23
Reciprocity	Democratic	0.9670	0.033	24.58%	23
Signaling	Laissez-Faire	0.9697	0.303	21.05%	46
Intrinsic Motivation	Laissez-Faire	0.979	0.021	14.57%	46
Social Norms	Laissez-Faire	0.9451	0.0549	38.20%	46
Reciprocity	Laissez-Faire	0.9623	0.0377	26.18%	46

## References

- [1] Liang, Z. (2016). China's great migration and the prospects of a more integrated society. *Annual Review of Sociology*, 42, 451–471. <https://doi.org/10.1146/annurev-soc-081715-074435>
- [2] Niu, L., & Yang, Z. (2022). Impact of performance climate on overtime behaviors of new generation employees: The moderating effect of perceived employability and mediating role of job insecurity. *Psychology Research and Behavior Management*, 15, 3733–3749. <https://doi.org/10.2147/PRBM.S390051>
- [3] Emmerich, A. I., & Rigotti, T. (2017). How personal resources influence work engagement and leadership behavior: The effects of job and personal resources on work engagement and the consequences for leadership behavior. *Zeitschrift für Arbeits- und Organisationspsychologie A&O*, 61(3), 133–148. <https://doi.org/10.1026/0932-4089/a000248>
- [4] Liu, B., Chen, H., Yang, X., & Hou, C. (2019). Why work overtime? A systematic review on the evolutionary trend and influencing factors of work hours in China. *Frontiers in Public Health*, 7, 343. <https://doi.org/10.3389/fpubh.2019.00343>
- [5] Sparks, K., Cooper, C. L., Fried, Y., & Shirom, A. (1997). The effects of hours of work on health: A meta-analytic review. *Journal of Occupational and Organizational Psychology*, 70(4), 391–408. <https://doi.org/10.1111/j.2044-8325.1997.tb00656.x>
- [6] Cui, Y., Zhang, Y., & Liu, Y. (2023). Overwork-induced exploitation of Chinese adults: Social isolation, loneliness as mediating effects on mental health. *Heliyon*, 9(11), e22345. <https://doi.org/10.1016/j.heliyon.2023.e22345>
- [7] Li, R., Liu, S., & Huang, C. (2023). Association between overtime and depressive symptoms among Chinese employees. *Heliyon*, 9(6), e17344. <https://doi.org/10.1016/j.heliyon.2023.e17344>
- [8] Shen, J., Benson, J., Zhang, Y., & Zhu, L. (2025). The hidden cost of mandatory unpaid overtime: How and when mandatory unpaid overtime undermines subsequent motivation to work. *Human Resource Management Journal*, 35(2), 397–413. <https://doi.org/10.1111/1748-8583.12598>
- [9] Bell, D. N. F., Hart, R. A., Hübler, O., & Schwerdt, W. (2000). Paid and unpaid overtime working in Germany and the UK (IZA Discussion Paper No. 133). Institute for the Study of Labor (IZA). <https://www.iza.org/publications/dp/133/paid-and-unpaid-overtime-working-in-germany-and-the-uk>
- [10] Tan, J., Zhang, C., & Li, Z. (2023). Why do employees actively work overtime? The motivation of employees' active overtime in China. *Frontiers in Psychology*, 14, 1120758. <https://doi.org/10.3389/fpsyg.2023.1120758>
- [11] Wang, Y., Zhao, T., & Zhang, Y. (2025). The perception of labor control and employee overtime behavior in China: The mediating role of job autonomy and the moderating role of occupational value orientation. *Sustainability*, 17(5), 1956. <https://doi.org/10.3390/su17051956>
- [12] Merriam-Webster. (n.d.). Supervision. In Merriam-Webster.com dictionary. Retrieved August 21, 2025, from <https://www.merriam-webster.com/dictionary/supervision>

- [13] Benevene, P., Dal Corso, L., De Carlo, A., Falco, A., Carluccio, F., & Vecina, M. L. (2020). Positive supervisor behaviors and employee performance: The serial mediation of workplace spirituality and work engagement. *Frontiers in Psychology*, 11, 1834. <https://doi.org/10.3389/fpsyg.2020.01834>
- [14] De Carlo, N. A., Dal Corso, L., Falco, A., Girardi, D., & Piccirelli, A. (2016). “To be, rather than to seem”: The impact of supervisor’s and personal responsibility on work engagement, job performance, and job satisfaction in a positive healthcare organization. *TPM Testing, Psychometrics, Methodology in Applied Psychology*, 23(4), 561–580. <https://doi.org/10.4473/TPM23.4.9>
- [15] Mor Barak, M. E., Travis, D. J., Pyun, H., & Xie, B. (2009). The impact of supervision on worker outcomes: A meta-analysis. *Social Service Review*, 83(1), 3–32. <https://doi.org/10.1086/599028>
- [16] Fosse, T. K., Skogstad, A., Einarsen, S., & Martinussen, M. (2019). Active and passive forms of destructive leadership in a military context: A systematic review and meta-analysis. *European Journal of Work and Organizational Psychology*, 28(5), 708–722. <https://doi.org/10.1080/1359432X.2019.1634550>
- [17] Haque, A., Islam, M. S., & Chowdhury, S. P. (2023). The effects of abusive supervision on the behaviors of employees in an organization. *Heliyon*, 9(10), e20596. <https://doi.org/10.1016/j.heliyon.2023.e20596>
- [18] Hobfoll, S. E., Halbesleben, J., Neveu, J.-P., & Westman, M. (2018). Conservation of resources in the organizational context: The reality of resources and their consequences. *Annual Review of Organizational Psychology and Organizational Behavior*, 5, 103–128. <https://doi.org/10.1146/annurev-orgpsych-032117-104640>
- [19] Blau, P. M. (1965). *Exchange and power in social life*. Wiley.
- [20] Yu, J., & Leka, S. (2022). Where is the limit for overtime? Impacts of overtime on employees’ mental health and potential solutions: A qualitative study in China. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.976723>
- [21] Chanty team. (2024). Working overtime: Pros, cons, and 20 statistics. Chanty Blog. <https://www.chanty.com/blog/working-overtime/>
- [22] Kang, J. H., Matusik, J. G., & Barclay, L. A. (2017). Affective and normative motives to work overtime in Asian organizations: Four cultural orientations from Confucian ethics. *Journal of Business Ethics*, 140(1), 115–130. <https://doi.org/10.1007/s10551-015-2683-4>
- [23] Yang, S., Chen, L., & Bi, X. (2023). Overtime work, job autonomy, and employees’ subjective well-being: Evidence from China. *Frontiers in Public Health*, 11. <https://doi.org/10.3389/fpubh.2023.1077177>