Long working hours and self-rated health

Long Working Hours and Self-Rated Health: Evidence from Beijing, China

Abstract: Western research has shown that working long hours have detrimental effect on health. This paper examines the relationship between long working hours and self-rated health in Chinese cities, using data from a large-scale questionnaire survey in Beijing. The results show that individuals who report long working hours are more likely to report poor health. Migrant workers who report long working hours are more likely to report poor health than urban workers. We also find that the relationship between long working hours and self-rated health varies by occupation. Additional results provide an insight into the contextualized dependent nature of the interaction effect of commuting time and long working hours on self-rated health.

Keywords: self-rated health, neighbourhood, long working hours, China

1 Introduction

Long working hours that impose challenges on individuals' health are of particular relevance to urban quality of life in East Asian countries (Mishra and Smyth, 2013). China offers a typical case for this line of research. Before the 1980s, the *Danwei*[1] was the collective unit of urban workplace organizations in which standard working hours and social life patterns were regulated and controlled by the state (Bray, 2005). The market-oriented economic reform launched since the 1980s has changed the dominance of the *danwei* system in employment relations (Cooney, 2007; Li, 2008). In post-reform urban China, employees working overtime are ubiquitous in cities today, and there have been considerable social media discussions about the number of people who die each year from excessive work demands (*guo lao si*)[2]. However, the existing evidence on the association between long working hours and health in China is particularly sparse, despite the fact that overwork is widely believed to cause physical and self-reported health concerns (Zhao, 2008; Nie et al., 2015). On the other side of the ledger, Chinese urban residents often face the reality that subjective lived experiences are not improving as quickly as economic performance (Kahn and Zheng, 2016).

This study explores the relationship between working long hours and self-rated health among residents of Beijing. It contributes to the existing literature in several

[1] *Danwei* refers to the Chinese socialist workplace and is used to provide employees with a comprehensive package of social welfare and working regulations (Bray, 2005).

[2] https://thediplomat.com/2014/03/working-to-death-in-china/

dimensions. First, it adds to the traditional line of research in evaluating the population-level effects of working long hours on self-rated health. Using a large-scale individual survey of Beijing metropolitan areas, conducted in 2013, we measure people's ratings of their health conditions. This assessment is critical because it allows us to understand the degree to which extended working hours generate adverse health implications, which is a highly sensitive issue in post-reform urban China. The evidence is of interest in its own right, and it is also necessary for the development of optimal labour governance and employment contract policy. Our study provides insights not just on the side-effects of long working hours, but also on the ways in which these side-effects vary with individuals' demographic and commuting characteristics.

Second, we examine the differentiated associations between long working hours and self-rated health between urban workers and migrant workers. Taking the advice from Park et al. (2001), it may be the indirect stress due to the cumulative fatigue induced by long working hours that generates potential implications on health. While previous studies have looked at the impacts of neighbourhood environment and housing stress on subjective wellbeing and mental health among migrants living in cities (Wu, 2015; Liu et al., 2017a; Liu et al., 2017b; Liu et al., 2019; Li and Liu, 2018), little attention has been paid to how long working hours will affect migrant workers and urban workers differently in China.

We also consider the moderating effect of occupational types and commuting behaviour on the relationship between working long hours and self-rated health. The

rationale behind this is that expectations of working hours may vary depending on professional types and workers with different commuting modes and time durations. Such heterogeneity may lead to differentiated impacts of long working hours on self-rated health. Our intention is to clarify the importance of considering the contextualized dependent nature of psychological reflections that may be related to local contextual amenities and household socioeconomic characteristics (Wu et al., 2019a). We anticipate that our findings will shed new light on the social and commuting-dependent nature of 'long working hours' as they are subjectively experienced by workers from different socioeconomic backgrounds.

2 Literature review and hypothesis development

Existing research on work hours and health provides clear evidence that long work hours have an adverse effect on self-reported health (Sparks et al., 1997). In this section, we highlight the institutional backgrounds of working long hours in post-reform urban China and develop hypotheses to explain the relationship between working long hours and health in the present study.

There is an extensive literature dealing with extended working hours and ways of affecting employees' health status in developed countries (Atack and Bateman, 1991). One fundamental mechanism underlying the adverse health effect of long working hours is stress, especially regarding ill health or fatigue. The results vary across

occupational types (Wantabe et al., 1993), sex (Park et al., 2001), and other social dimensions. Although working hours play an important role in the processes of labour contract formation in China, in the pre-reform period there was little evidence that working long hours was linked to poor health and wellbeing. Employees lived in residences provided by their employers and there were few concerns about job demands, job insecurity, and job-housing spatial mismatch. As compared to Western market economies, this discrepancy was likely to be attributed to several underlying psychological channels at work. In part, the lack of clear evidence on the relationship between working long hours and subjective health and wellbeing outcomes was attributed to the collective nature of the work unit (*danwei*) system where employees' working hours were highly regulated by their work units.

Moreover, it was widely believed that working long hours was normalized in socialist countries and East Asian societies,[3] although longer working hours do not necessarily mean improved productivity (Shepard and Clifton, 2000). These factors were thought to act as psychological channels for lowering people's awareness of the adverse health and wellbeing implications of working long hours. Only a limited number of papers look at the relationship between working hours and health in China. In what is probably the most closely related paper to our own, Nie et al. (2015) found that working long hours did significantly increase the probabilities of poorer reported

[3] http://news.bbc.co.uk/1/hi/439595.stm

health at the national level. However, such national-level analysis may not be representative of the relationship between self-rated health and working long hours in megacities, and the survey used by Nie et al. (2015) did not report people's commuting characteristics. As a complementary inquiry, we look at the association between self-reported health and working long hours within a megacity. This suggests our first hypothesis:

H1: Working for more than eight hours a day will have a negative effect on self-rated health.

We add to the previous work by explicitly considering the social heterogeneity of the effects of long working hours among Chinese workers in a context where the urban society has been experiencing transformation. It would be particularly interesting to investigate the social heterogeneity in the effects of long working hours on health between workers with different occupational status after controlling for other household demographic characteristics such as age, income and sex. The common perception is that technical professionals and manual workers are more likely to endure heavy working pressures and longer working hours than clerks, although they may gain higher salaries as compensation. Further, there has been a gradual relaxation of effective restrictions on rural-to-urban migrations that apply under the *hukou* registration system. This is an important predictor of migration status that can offer solid prospects for generating a feeling of residential stability for Chinese workers (Wu and Logan, 2016). This leads to our second hypothesis:

H2: The effects on self-rated health from having a regular working time pattern identified in Hypothesis 1 vary across occupational types and migration status.

The spatial consideration of working long hours in post-reform Chinese cities is a highly sensitive issue for urban policymakers and planners, particularly in megacities, where workers suffer from heavy commuting costs due to congestion. Existing studies have mostly focused on weekly working days or daily working hours, while little attention has been paid to incorporating the commuting time when calculating the time worked in spatial contexts (Dex et al., 1995). Previous studies have found that long commuting time can induce stress (Novaco and Collier, 1994). Stressful experiences during commuting could further be complicated by different commuting modes (Novaco et al., 1990). That said, interaction effects between long commuting times and working hours on health may be associated with travel time exposure to the outdoor environment. For example, workers are very likely to be exposed to high particulate matters (PM) when walking or waiting along commuting routes and when using motorcycles on the road (Tsai et al, 2008). A key to successful assessment lies with the incorporation of commuting time and commuting modes into the analysis, and an evaluation of the effects with explicit control for neighbourhood characteristics. The richness of our survey data would enable us to explore the ways in which the interaction effects of long commuting times and long working hours on health may vary by commuting modes. As far as we know, this is the first type of this application in the

literature. This leads to our final hypothesis:

H3: commuting time to work and commuting modes will play a role in moderating the relationship between long working hours and self-rated health.

3 Methodology

3.1 Data

The data for this study is cross-sectional data drawn from a survey of evaluations of Beijing residential environments carried out by the Chinese Academy of Sciences in 2013. The survey was conducted under the oversight of the research committee of the Institute of Geographic Sciences and Natural Resource Research, the Chinese Academy of Sciences. All respondents were invited to give their written consent. The survey targeted residents who had lived in Beijing for more than six months. It included urban residents with local *hukou* registration status (Beijing *hukou*) and migrants without local *hukou* registration status. Questionnaires were circulated to metropolitan Beijing districts employing a stratified proportional-to-population-size sampling design. Recent studies have shown that the survey participants are representative of the city's population in terms of demographics derived from 2010 population census data. After data cleaning, the total valid sample comprised 5689 respondents.

3.2 Key measures

Self-rated health has witnessed a growing interest within cross-disciplinary research in recent years (Hawe and Shiell, 2000). The term 'self-rated health' in the present study is defined based on the survey question: "what do you think of your health condition?" Response to this question is measured by using a five-point Likert scale ranging from "very bad" (1) to "very good" (5). This measurement is useful in the sense that it summarizes aspects of subjective evaluations of health conditions on a scaled level, making empirical interpretation more straightforward.

3.3 Covariates

Regressions are adjusted for a set of individual covariates, including home ownership, *hukou* status, sector of employer, income, education, occupational status, sex, the presence of residential relocation and neighbourly relationships. First, our model specifications control for factors that may be related to social class such as income, education and occupational status. The rationale behind this is that social class has been found to be related to self-rated health (Chen et al., 2017; Feng et al., 2012). We group the occupational types into three broad categories (Kaikkonen et al., 2009; Cho et al., 2015). The first occupational category comprises those who work as technical professionals in skill-intensive industry sectors. The second occupational category includes those who work as clerks. Manual workers such as agricultural and

fishery workers, craftsmen and related workers, plant and machine operators and elementary workers in labour and resource-intensive industries are grouped into the last occupational category. It is expected that clerks might not have heavy working pressures and workloads compared to professionals and manual workers. Our analysis focuses on full-time workers, since recent studies (Benavides et al., 2000) have suggested that the adverse health effects of overwork are more pronounced for full-time workers. Second, we adjust for a covariate regarding neighbourly relations, as a vast body of literature has identified a protective effect of neighbourhood social ties on health (Kawachi et al., 1999). The survey invited respondents to rate their satisfaction with their neighbourly relationships on a five-point Likert scale. For additional robustness, we control for the presence of residential relocation over the past five years. Specifically, respondents who have not experienced residential relocations over the past five years are regarded as long-term "stayers", whereas respondents who have recently moved into their current residential locations are regarded as "movers". We also control for homeownership and local *hukou* registration status in the model specification. These allow us to control for potential effects of residential experience and housing conditions (Hu, 2013). Finally, we control for neighbourhood characteristics such as access to parks, central business districts, hospitals, expressways and the subway (Wu et al., 2019b)

Table 1 summarizes the key variables in our research. Urban workers have a higher proportion of good health than migrants (72.4 percent vs. 72.3 percent). Approximately

27.8 percent of urban workers and 42.7 percent of migrant workers work more than 8 hours a day, while 30.3 percent of urban workers and 55.1 percent of migrant workers work more than 5 days a week. 70.4 percent of urban workers own at least a house (vs. 15.4 percent of migrant workers). 34.4 percent of urban workers are clerks (vs. 55.5 percent of migrant workers). Migrant workers are on average less educated than urban workers (50.5 percent vs. 69.7 percent for high school education and above) and 49.5 percent of migrant workers have not finished high school. Finally, 41.4 percent of urban workers earn over 10000 *yuan* per month (vs. 27.9 percent of migrant workers).

Before looking at the relationship between long working hours and self-rated health, we examine the correlates of a worker's working time pattern. Table 2 presents the results. We find that urban workers are more likely to have a regular pattern of working hours than migrant workers within the labour law framework (Yao, 2001; Li, 2008). However, the results suggest that workers of different occupational status are likely to have different working time patterns. Workers who are homeowners are less likely to have regular working day patterns compared to non-homeowners. The results also suggest that full-time workers are more likely to have regular patterns of working days than part-time workers. Female workers work more regularly as compared with male workers. Workers who have higher education attainment levels are less likely to work at weekends. Respondents who have not experienced residential relocations are more likely to have a regular working time pattern compared to those who have relocated in the last five years.

3.4 Statistical analysis

Ordered logistic regression is used to test the association between regular working day/week pattern and people's self-rated health outcomes. We apply the ordered logistic regression model in our study since our dependent variable – "self-rated health" – is measured on an ordinal level (i.e. a five-point scale). The first category (1) is considered as the lowest self-rated health outcome and the last category (5) is considered as the highest self-rated health benefit that people may receive. We first examined the relationship between workers who have a regular working pattern and self-rated health through the ordered logit models, controlling for household demographics and neighbourhood characteristics. Following the convention of the Labor Contract Law, we define a regular working day pattern as eight working hours a day and we treat a regular working week pattern as five working days a week. We consider several scenarios as robustness checks of the results in terms of changes in the definition of long working hours. In each scenario, working hours per day is set as a binary variable indicator. Specifically, workers' working hours is categorized into three categories: workers reporting >8 hours of work per day (≤8 hours is set as the reference category and coded as 0); workers reporting 8<hours≤10 of work per day (≤8 hours is set as the reference category and coded as 0); and workers reporting >10 hours of work per day (≤8 hours is set as the reference category and coded as 0). Working days were categorized into two categories: workers reporting ≤5 days of work per week is set as

the reference category and coded as 0. The indicator of working time pattern can be divided into three levels: workers who report >8 hours of work per day and >5 days of work per week; workers who report 8<hours≤10 of work per day and >5 days of work per week; and workers who report >10 hours of work per day and >5 days of work per week.

We further adjust for individuals' socio-economic characteristic in the regression models. Specifically, we consider the influences of occupational types and migration status on moderating the relationship between regular working hours and self-rated health. Accompanied with public transport infrastructure improvements (Wu and Hong, 2017), we further consider the importance of commuting behaviour in the empirical analysis (Wu et al., 2019c). In the survey, respondents were asked to report their daily commuting time to work and their commuting modes. Specifically, commuting modes are reported in two categories based on commuters' exposure time to the outdoor environment during their daily commute. The first category refers to workers who commute to work by motorcycle, bus, or on foot, as these workers will be exposed to the outdoor environment for a relatively long time. For example, motorcycle commuters have been found to experience high PM exposure during their daily commute (Tsai et al., 2008). Bus commuters are also exposed to traffic emissions from passing vehicles while they are waiting at bus stops. In contrast, workers who take the subway or drive to work are grouped into the second category, as they spend a majority of their time inside the cars or cabins and therefore have potentially less outdoor time and exposure

to traffic emissions. We set the conventional lengths of commuting time to work as one hour per day. This setting was based on the 2017 annual city traffic travel report, which indicates that the average commuting time in Beijing is 52.9 minutes per day.[4] Our prior expectation is that long commuting time and commuting modes with higher outdoor travel time and exposure could induce residual stress, leading to poor self-rated health.

4 Results

4.1 Baseline results

Table 3 presents the baseline results of the relationship between long working hours and self-rated health based on the sample of respondents who are aged above 20 and are full-time employees. We find that working for more than 8 hours per day has a negative association with self-rated health. Such effects remain relatively stable when controlling for household demographics and neighbourhood characteristics. Specifically, the probability of workers reporting poor health increases by 3.4 percent points if they work for more than 8 hours a day (Column 3). This suggests that overtime working (in excess of eight hours per day) may have substantial effects on workers' self-rated health. Similarly, we find that the probability of workers reporting poor health increases by 4.1 percent points if they report working $8<\text{hours}\leq 10$ per day (Column 4).

[4] The report can be seen on the website: http://b2b.toocle.com/detail--6435107.html

These results provide confidence regarding the negative effects of long working hours on self-rated health.

By revisiting Table 3, our results show that holding local *hukou* and income are significantly associated with self-rated health. Migrants are more likely to report poorer health as compared to residents with Beijing *hukou* status. Higher income residents tend to report better health, after controlling for household demographics and neighbourhood characteristics. Residents with higher education attainment levels are more likely to report better health outcomes. Residents who are married tend to have lower self-rated health. The results also suggest that neighbourhood characteristics such as access to expressways play a critical role in influencing self-rated health levels.

4.2 Robustness and heterogeneity of effects

The first set of our analyses focus on whether our key results are sensitive to different occupational types. Table 4 reports the results. The survey provides detailed information about workers' occupational status.

Panel A of Table 4 reports the results by using workers reporting >8 hours of work per day as the indicator of long working hours, whereas Panel B shows the results by using workers reporting 8<hours≤10 of work per day as an alternative indicator of long working hours. The results largely support our expectation that access to different occupational types is likely to generate heterogeneous effects on individuals' self-rated

health. We find that the probability of professionals reporting poor health increases by 13 percent if they report working >8 hours per day. Similarly, the probability of manual workers reporting poor health increases by 9 percent if they report working >5 days of work per week compared to clerks and professionals. However, we find no significant association between regular working time patterns and the chance of reporting good health among any occupational group. Additionally, the marginal effects remain significant and robust with regard to professionals reporting 8<hours≤10 of work per day. This is followed by manual workers, in whom reporting poor health increases by 9 percent when they report 8<hours≤10 of work per day. However, we find no significant association between reporting 8<hours≤10 of work per day and the chance of good health for clerks.

Second, we examine the moderating effect of migration status on the relationship between long working hours and self-rated health. We make use of residents' *hukou* status to categorize the whole sample into two subsamples: urban workers and migrant workers. Table 5 presents the results. While the first panel uses workers reporting >8 hours of work per day as the indicator of long working hours, the second panel considers workers reporting 8<hours≤10 of work per day as an alternative indicator of long working hours. The headline finding here is that the relationship between long working hours and self-rated health is significant for both urban workers and migrant workers reporting >8 hours of work per day.

Table 6 presents results that focus on the interaction effects of long working hours

and long commuting on self-rated health. Such effects are presented using the interaction terms of two indicators. As shown in Table 6, Indicator 1 equals to 2 for workers whose commuting time is greater than 60 minutes, whose working time is more than 8 hours a day, and whose working day is more than 5 days a week. As additional robustness checks, Indicator 2 is equal to 2 for workers whose commuting time is greater than 60 minutes, whose working time is more than 8 hours but less than 10 hours a day and who work more than 5 days a week. With regard to commuting mode, we follow Tsai et al. (2008) and divide the whole sample into two sub-samples: Column 1 reports the results by using the subsample of commuters with potentially long exposure to the outdoor environment, while Column 2 reports the results by using the subsample of commuters with potentially less out-door exposure to traffic emissions. The results indicate that overwork in commuters with long commuting times and long outdoor travel exposure could generate more pronounced adverse relationships between long working hours and self-rated health. This finding supports our third hypothesis. Specifically, we find that the probability of overworking commuters with long commuting times and long out-door travel exposure reporting poor health increased by 5 percent compared to their counterparts. Notably, in results that are not tabulated here, we find similar effects by reclassifying the commuting sub-samples in different ways. Finally, we use the propensity score-matching approach as an alternative model specification to assess the robustness of the results (Rosenbaum, 2004). The matching approach is widely conducted to overcome the non-random nature of samples used in

cross-sectional population studies (Oakes and Johnson, 2006). Following the literature (Białowolski and Węziak-Białowolska, 2017), matching estimates represent the influence of working long hours on residents' health perceptions by comparing workers reporting long working hours with those who have not reported long working hours. The main results from Table 7 show that workers who work long hours are more likely to report lower self-rated health outcomes. Such effects remain robust to the application of different score-matching methods.

5 Conclusions

Long weekly working hours in the developing world have given rise to international concerns about negative effects on health (Mishra & Smyth, 2013). This study used a large-scale individual survey administrated in Beijing to document the heterogeneity in the association between long working hours and self-rated health across social and commuting dimensions. We reached three important findings. First, our results suggest that long working hours has a negative influence on self-rated health. Second, we find that the association between self-rated health and working long hours varies significantly across occupational and migration status. For example, professionals who work more than 8 hours a day report lower self-rated health outcome than those who work less than 8 hours a day. Migrant workers who are exposed to long working hours are more likely to report lower self-rated health than urban workers.

Third, we find strong interaction effects of long commuting and long working hours on self-rated health. Our results therefore provide insights on the role of commuting behaviour in moderating the relationship between long working hours and self-rated health.

Our results have some implications for policymakers who aim to promote healthy lifestyles among residents of Chinese cities. First, there has been considerable debate about the emerging patterns of working long hours in Chinese megacities, although the new Labour Contract Law has regulated the standard working time and other employment-related requirements for employers (Li, 2008). For example, it is common for high-status workers in the finance industry or in the so-called new economy sectors to work more than 8 hours per day and more than 5 days per week. Our results suggest that people's responses regarding the adverse health implications of long working hours are pronounced but tend to vary by occupational types.

Furthermore, we find that migrant workers' self-reported health levels are sensitive to exposure to long working hours. On the one hand, migrant workers may not enjoy fully covered health insurance in their host cities, and the potential cost of medical service for health care might contribute to their adverse health perceptions (Qiu et al., 2011). On the other hand, migrant workers are found to be more likely than local urban workers to report good health, probably because of the selectivity of migration. As indicated by the healthy migration hypothesis, potential migrants who are healthy are more inclined than their unhealthy counterparts to leave their hometown and move

away for migrant work (Abraído-Lanza et al., 1999; La Parra-Casado et al., 2017). The temporal nature of residence and endurance of poor working conditions might be interacting to configure the legacy of social assimilation (*shi min hua*) of migrants (Wu and Logan, 2016). Adopting a copying strategy could embed migrants into the host city and make working long hours less important contributors to their perceived adverse health evaluations.

Finally, our results go beyond the conventional wisdom of the negative association between working long hours and self-rated health and justify the importance of considering commuting dimensions in the evaluation. It is reasonable to expect that stress induced by public transit commuting modes could increase with the complexity and crowding experiences in subway cabins (Singer et al., 1977), and stress due to private automobile commuting modes could be associated with congested traffic on roads (Novaco et al., 1990).

There are several limitations associated with our study primarily due to the lack of data. First, a natural next step for this research is to take into consideration the heterogeneity in workers' health costs. To be specific, detailed information about shift working schedules and weekly task composition would be needed to account for the effects of these factors on health (Kivimäki et al., 2015). Our survey is cross-sectional, rather than traceable individual panel data. Future work could make use of natural experiments to select comparable treatment and control groups and examine the effects in a causal sense. Second, sleep quality at night is a further important unobservable

factor that may induce stress after long working hours. A recent literature survey by Bannai and Tamakoshi (2014) has suggested that working long hours has a negative association with sleep conditions. Third, it would be interesting to compare the effects of long working hours on part-time and full-time workers. Some people work part-time because it fits with other commitments such as caring. In such cases, involuntary extension of hours could be as stressful as it is for those working full-time. Eriksson et al. (2001) suggest that it is important to explore individuals' health status by different age groups. Further studies are encouraged to carry out surveys that ask individuals to recall how many involuntary hours they have worked in a period of time and include age-comparative questions if appropriate. This warrants further studies. More research is needed to understand the precise underlying mechanisms and urban policies that could facilitate healthy lifestyles in Chinese megacities.

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Table 1 Descriptive statistics

	Urban		Migrant	
Variable name	N	%	N	%
Total	3639		2050	
Full-time employee aged over 20	2992		1793	
Self-rated health				
Extremely poor health	13	0.4	9	0.4
Poor health	111	3.1	45	2.2
Neutral	875	24.1	511	24.9
Good health	2008	55.2	1061	51.8
Extremely good health	625	17.2	421	20.5
Average working hour per day				
Hours>8	1012	27.8	876	42.7
8<hours≤10	378	10.4	451	22.0
>10 hours	634	17.4	425	20.7
Average working days per week				
>5 working days	1,102	30.3	1130	55.1
≤5 working days	2537	69.7	920	54.9
Working hours * Working days				
Hour>8 * Working Day	734	20.2	735	35.9
8<hours≤10 * Working Day	161	4.4	346	16.9
Hours>10 * Working Day	573	15.7	389	19.0
Commuting time				
Commuting time >60 hours per day	142	3.9	48	2.3

Commuting time ≤60 hours per day	3497	96.1	2002	97.7
Commuting modes				
Long traveling time in outdoor environment	1511	50.4	989	52.9
Short traveling time in outdoor environment	1487	49.6	880	47.1
Indicators				
{Hour (hour>8) +commuting time (hour>1)} * Working Day	601	16.5	702	34.2
{Hour (8<hours≤10) +commuting time (hour>1)} * Working Day	158	4.3	347	16.9
{Hour (hours>10) +commuting time (hour>1)} * Working Day	444	12.2	360	9.9
Homeownership				
Homeowner	2561	70.4	316	15.4
Non-homeowner	1078	29.6	1734	84.6
Sector of employer				
State sector	1140	31.3	224	10.9
Private sector	1173	32.2	1182	57.7
Foreign sector	278	7.6	127	6.2
Occupational status				
Professionals	473	13.0	242	11.8
Clerks	1253	34.4	1137	55.5
Manual workers	123	3.4	49	2.4
Income level				

>10000 RMB per month	1495	41.1	571	27.9
≤10000 RMB per month	2144	58.9	1479	72.1
Sex				
Male	1176	32.3	1110	54.1
Female	1863	51.2	940	45.9
Educational attainment level				
High school level and above	2535	69.7	1036	50.5
Below high school level	1104	30.3	1014	49.5
Mobility				
Stayers	2989	82.1	1195	58.3
Movers	650	17.9	855	41.7
Marital status				
Married	2382	65.5	1027	50.1
Others	1257	34.5	1023	49.9
Neighbourly relationships				
Extremely poor	60	1.6	25	1.2
Poor	374	10.3	246	12.0
Neutral	1696	46.6	974	47.5
Good	1203	33.1	601	29.3
Extremely Good	171	4.7	92	4.5
Distance to amenities				
Distance to park	3221	3.10	1789	3.96
Distance to hospital	3221	0.44	1789	0.54
Distance to expressway	3221	3.40	1789	4.07

Distance to central business district	3221	10.27	1789	11.67
Distance to subway	3221	1.80	1789	2.25

Notes: The reference category is used for benchmark comparison and omitted from the Table. We calculate means to present distance variables including distance to parks, hospitals, expressways, central business districts and subways instead of using percentages.

Table 2 Access to regular working hour patterns and working day patterns

	(1)	(2)
Age	0.099	0.051
	(0.064)	(0.055)
Home ownership	-0.266**	-0.313**
	(0.106)	(0.130)
Hukou status	-0.661***	-0.911***
	(0.129)	(0.149)
State status	-0.004	0.261***
	(0.081)	(0.069)
Occupational status	0.092***	0.083**
	(0.029)	(0.033)
Income level	-0.050	-0.003
	(0.109)	(0.124)
Sex	0.319**	0.417***
	(0.127)	(0.081)
Educational attainment level	-0.661***	-1.028***
	(0.065)	(0.116)
Mobility	0.284***	0.230***
	(0.094)	(0.076)
Marital status	-0.123	-0.225
	(0.120)	(0.150)
Neighbourly relationships	-0.072	-0.045

	(0.070)	(0.065)
Distance to park	0.001	0.006
	(0.114)	(0.116)
Distance to hospital	-0.018	-0.007
	(0.027)	(0.038)
Distance to expressway	0.004	0.007
	(0.015)	(0.010)
Distance to central business district	0.064	0.036
	(0.042)	(0.047)
Distance to subway	0.099	0.051
	(0.064)	(0.055)
/		
cut1	0.510	0.340
	(0.433)	(0.268)
N	3605	3605
aic	3884	3954
bic	3989	4059
pseudo R^2	0.077	0.138
chi2	9050	5142
p	0.000	0.000

Notes: Column 1 represents the correlates of whether a worker has a regular working day pattern (defined as 8 working hours a day) and column 2 reports the correlates of whether a worker has a regular working week pattern (defined as five working days a week). *** significant at the 1 per cent level; ** significant at the 5 per cent level; * significant at the 10 per cent level.

Table 3 Baseline model predicting self-rated health

	(1)	(2)	(3)	(4)	(5)
	Marginal β/SE	Marginal β/SE	Marginal β/SE	Marginal β/SE	Marginal β/SE
Long working hours (>8 hours)	-0.037***	-0.033***	-0.034***		
	(0.013)	(0.012)	(0.012)		
Long working hours (8<hours≤10)				-0.041***	
				(0.014)	
Long working hours (>10 hours)					-0.004
					(0.031)
Long working days (>5 days)	-0.004	-0.004	-0.006	-0.004	-0.005
	(0.012)	(0.018)	(0.017)	(0.019)	(0.017)
Working time pattern	-0.018	-0.018	-0.017	0.008	-0.067
	(0.019)	(0.027)	(0.031)	(0.026)	(0.064)
Age		-0.025***	-0.025***	-0.028***	-0.034***

	(0.006)	(0.006)	(0.006)	(0.007)
Hukou status	-0.037**	-0.043**	-0.038**	-0.044**
	(0.015)	(0.017)	(0.016)	(0.018)
Home ownership	0.010	0.016	0.014	0.012
	(0.017)	(0.016)	(0.016)	(0.018)
State status	0.004	0.002	0.004	-0.004
	(0.015)	(0.016)	(0.017)	(0.017)
Occupational status	-0.002	-0.002	-0.004	-0.002
	(0.003)	(0.003)	(0.004)	(0.002)
Income level	0.038***	0.041***	0.045***	0.048***
	(0.009)	(0.009)	(0.010)	(0.011)
Sex	0.017**	0.019**	0.017	0.017
	(0.009)	(0.009)	(0.011)	(0.011)
Educational attainment level	0.009	0.008	0.009	0.010

	(0.008)	(0.009)	(0.014)	(0.011)
Residential relocation	0.005	0.008	0.011	0.005
	(0.018)	(0.018)	(0.019)	(0.019)
Marital status	0.006	0.010	0.009	0.020
	(0.014)	(0.015)	(0.014)	(0.015)
Neighbourly relationships	0.027***	0.032***	0.032***	0.033***
	(0.006)	(0.006)	(0.006)	(0.007)
Distance to park		-0.003	-0.004	-0.004
		(0.004)	(0.004)	(0.004)
Distance to hospital		0.026**	0.021	0.039***
		(0.012)	(0.013)	(0.013)
Distance to expressway		-0.008**	-0.010***	-0.010**
		(0.003)	(0.004)	(0.004)
Distance to central business district		0.004	0.006*	0.005

			(0.003)	(0.003)	(0.003)
Distance to subway			0.000	-0.001	0.000
			(0.003)	(0.004)	(0.003)
N	4776	3741	3291	2968	2768
aic	10000	7935	6902	6101	5745
bic	10000	8022	7018	6215	5858
pseudo R^2	0.003	0.013	0.018	0.020	0.022
chi2	14	837	8288	12000	8549
p	0.003	0.000	0.000	0.000	0.000

Notes: This table reports the results of individuals' self-rated health based on the sample of residents aged above 20 who are full-time employees (N=4785). Column 1 reports the results by only controlling for the daily working time pattern variable. Column 2 reports the results through controlling for household demographics. Column 3-5 reports the results by controlling for the full sample. Notably, Columns 4 and 5 respectively report the results from workers reporting 8<hours≤10 of work per day and workers reporting >10 hours of work per day, which aims to examine results' robustness. Long working hours is a binary variable. It equals 1 when sampled workers report >8 hours of work per day. Long working day is also a binary variable. It equals 1 when sampled workers report >5 days of work per week. Working time pattern (workers reporting >8 hours a day and workers reporting >5 days of work per week, or workers reporting 8<hours≤10 of work per day and workers reporting >5 days per week, or workers reporting >10 hours of work a day and workers reporting >5 days of work per week) is a binary variable. It equals 1 when sampled workers report working >8 hours of work per day and >5 days of work per week. *** significant at the 1 per cent level; ** significant at the 5 per cent level; * significant at the 10 per cent level.

Table 4 Heterogeneous effects by occupational types

	(1)	(2)	(3)
	Marginal β/SE	Marginal β/SE	Marginal β/SE
Panel A			
Long working hours (>8 hours)	-0.130***	-0.002	-0.055
	(0.043)	(0.026)	(0.049)
Long working days (>5 days)	-0.007	-0.003	-0.091*
	(0.028)	(0.022)	(0.050)
Working time pattern	0.045	-0.032	0.231
	(0.043)	(0.039)	(0.171)
N	492	1526	97
aic	1051	3176	193
bic	1122	3266	229
pseudo R^2	0.054	0.010	0.115
chi2	.	3041	.
p	.	0.000	.
Panel B			
Long working hours (8<hours≤10)	-0.129**	-0.013	-0.085*
	(0.057)	(0.033)	(0.051)
Long working days (>5 days)	-0.005	-0.002	-0.087
	(0.029)	(0.023)	(0.053)
Working time pattern	0.073	-0.003	0.294*
	(0.086)	(0.044)	(0.158)

N	465	1306	90
aic	975	2644	174
bic	1046	2737	206
pseudo R^2	0.050	0.013	0.140
chi2	.	.	.
p	.	.	.

Notes: This table reports the results, with a focus on the role of occupational types in moderating the relationship between long working hours and self-rated health. Column 1 reports the results by using the subsample of professionals (column 1), clerks (column 2), manual workers (column 3), subsample (Age>20, full-time employee). All models included household socioeconomic characteristics and neighbourhood characteristics. *** significant at the 1 per cent level; ** significant at the 5 per cent level; * significant at the 10 per cent level.

Table 5 Self-rated health: urban workers versus migrant workers

	(1)	(2)
	Marginal β/SE	Marginal β/SE
Panel A		
Long working hours (>8 hours)	-0.029*	-0.051*
	(0.016)	(0.029)
Long working days (>5 days)	0.011	-0.026
	(0.030)	(0.018)
Working time pattern	-0.051	0.021
	(0.043)	(0.046)
N	2072	1219
aic	4273	2622
bic	4375	2708
pseudo R^2	0.023	0.019
chi2	3398	.
p	0.000	.
Panel B		
Long working hours (8<hours≤10)	-0.025	-0.095***
	(0.020)	(0.036)
Long working days (>5 days)	0.012	-0.025
	(0.032)	(0.019)
Working time pattern	-0.040	0.083
	(0.037)	(0.052)

N	1955	1013
aic	3984	2107
bic	4084	2191
pseudo R^2	0.022	0.027
chi2	5302	.
p	0.000	.

Notes: This table reports the results, with a focus on self-rated health inequalities of urban workers (column 1) and migrant workers (column 2) sub-samples. All models include household socioeconomic characteristics and neighbourhood characteristics. *** significant at the 1 per cent level; ** significant at the 5 per cent level; * significant at the 10 per cent level.

Table 6 Heterogeneity effects by commuting time and commuting modes

	(1)	(2)
	Marginal β/SE	Marginal β/SE
Indicator1	-0.056	-0.043*
	(0.035)	(0.024)
N	1368	1496
aic	2887	3126
bic	2971	3211
pseudo R^2	0.021	0.017
chi2	7243	458
p	0.000	0.000
Indicator2	-0.050*	-0.012
	(0.029)	(0.030)
N	1226	1337
aic	2546	2740
bic	2633	2829
pseudo R^2	0.025	0.020
chi2	.	.
p	1226	1337

Notes: This table reports the results, with a focus on self-rated health inequalities of workers who have long travelling time in the outdoor environment during their daily commute (column 1) and who have short travelling time in the outdoor environment during their daily commute (column 2). Table 6 reports the results using self-rated health as the outcome of interest. Indicator 1 equals to 2 when sampled workers report >8 hours of work per day, >5 days of work per week and whose commuting time is greater than 60 minutes. Indicator 2 is coded 2 when sampled workers report 8<hours≤10 of work per day, >5 days of work per week, and whose commuting time is greater than 60 minutes. All models include

household socioeconomic characteristics and neighbourhood characteristics. *** significant at the 1 per cent level; ** significant at the 5 per cent level; * significant at the 10 per cent level.

Table 7 Propensity score matching estimates of the association between long working hours and people's self-rated health outcomes.

	(1) K-nearest neighbour matching	(2) Radius matching	(3) Kernel matching
Treatment			
Long working hours (>8 hours)	-0.121***	-0.133***	-0.134***
	(0.042)	(0.033)	(0.032)
Long working hours (8<hours≤10)	-0.084*	-0.104***	-0.102***
	(0.051)	(0.037)	(0.036)
Long working days (>5 days)	-0.091**	-0.088***	-0.084**
	(0.043)	(0.034)	(0.033)
Working time pattern 1	-0.171**	-0.130***	-0.139***
	(0.049)	(0.040)	(0.039)
Working time pattern 2	-0.082	-0.099*	-0.088*
	(0.067)	(0.050)	(0.049)
Indicator 1	-0.130**	-0.129***	-0.137***
	(0.051)	(0.040)	(0.039)
Indicator 2	-0.122*	-0.093*	-0.086*
	(0.065)	(0.050)	(0.049)

Notes: *** significant at the 1 per cent level; ** significant at the 5 per cent level; * significant at the 10 per cent level.