



# Can working hour reduction save workers?



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## HIGHLIGHTS

- We estimate the causal impact of working hours on industrial injury rates.
- We exploit a natural experiment of standard hour reduction in South Korea.
- A one-hour decrease in actual working hours decreases the injury rate by 8%.

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## ABSTRACT

Long working hours are considered as one of the major risk factors for workplace accidents and workers' health. In this paper, we estimate the causal effect of working hours on industrial injury rates. We exploit a quasi-natural experiment in South Korea, where standard hours were reduced at different times by industry and establishment size from 2004 to 2011. We find that a one-hour reduction in weekly working hours significantly decreases the injury rate by about 8%.

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## 1. Introduction

Long working hours are considered as one of the risk factors for accidents at the workplace and workers' health. Increased incidences of accidents with long working hours are not surprising. Long working hours mean that workers are more exposed to accident hazards. At the intensive margin, more accidents are likely to occur per hour if workers are not attentive enough while performing their tasks. The longer they work, the less attentive they become. This is rational, as the marginal cost of attention increases under these circumstances.

Many studies have associated working hours with injury rates at the workplace and, more generally, workers' health and well-being. Dembe et al. (2005) used data from the National Longitudinal Survey of Youth and found that working longer is correlated with higher injury rates. For example, they found that working overtime or on an extended hours schedule increases the injury rate substantially, by 38%. Wagstaff and Lie (2011) conducted a meta-analysis of more than 400 articles about occupational safety and concluded that working longer

than 8 h per day significantly increases the risk of accidents to as much as twice the normal rate at around 12 h. Also, studies have found that long working hours have indirect cumulative adverse impacts on various aspects of workers' health: higher stress levels (Sparks et al., 1997), hypertension (Artazcoz et al., 2009), cardiovascular diseases (Virtanen et al., 2010), and poor mental health (Virtanen et al., 2011, 2012). Further, long working hours reduce sleep time, recovery from work, and family time (Caruso et al., 2006), which should have a negative impact on worker productivity and well-being.<sup>1</sup>

The aforementioned studies have paid little attention to endogeneity bias. However, this is of concern as working hours and occupations are

<sup>1</sup> Many studies have focused on specific occupations. Hospital workers such as doctors and nurses usually have extended work schedules, overtime, and night shifts. Rogers et al. (2004) reported that the risk of their making errors with patients significantly increases with longer working hours, since they become careless and pay less attention to their tasks.

simultaneously chosen by workers.<sup>2</sup> According to the compensating differential theory (Rosen, 1974, 1986), workers sort themselves across jobs with differential working conditions. Consequently, workers across different industries and occupations are likely to be different in terms of unobservable characteristics. Regarding workplace safety, those who choose to work in a hazardous condition are likely to be less risk-averse. Or those who are able to avoid the risk of injuries may choose unsafe workplaces if they are compensated by higher salaries. Working hours, for which there is not much discretion for both workers and firms, should be an important working condition. Workplaces that technologically require longer working hours per worker and per shift would invest more to reduce the risk of accidents at the workplace. Due to such selection on unobservables by both workers and firms, simple comparisons of injury rates between different working hours or even regression-adjusted comparisons may provide misleading estimates of causal effects.

In this study, we attempt to estimate the causal effect of working hours on the risk of injury and death at the workplace. Addressing the concern of endogeneity bias, we exploit a quasi-natural experiment in South Korea, where standard weekly hours were cut from 44 to 40 h.<sup>3</sup> The new overtime law had been gradually adopted at different times by industry and establishment size from 2004 to 2011, initially covering workplaces of 1,000 or more employees and public and financial sectors, and by mid-2008, applying to all but the smallest establishments. Such gradual application of the new overtime law provides us exogenous variation in working hours across groups defined by year, industry, and establishment size (Hunt, 1999; Kawaguchi et al., 2008). This allows us to employ the difference-in-differences and instrumental variable (DD-IV) estimation method—the differences being by year and establishment size, and the exogenous variation in working hours arising from the change in the law—and estimate the causal effects of working hours on the injury and death rates.<sup>4</sup>

Summing up our main findings, we find that a reduction in the standard workweek decreases working hours and that the decrease in working hours, in turn, reduces worker injury rates. Specifically, a one-hour decrease in standard weekly working hours decreases actual working hours by about 14 min. A one-hour decrease in actual working hours per week decreases the injury rate significantly, by about 8%. The effect is larger among smaller establishments or in hazardous industries. Similarly, the death rate is reduced by the decrease in working hours, although the effect is marginally significant.

The remainder of this paper is organized as follows. In Section 2, we present the institutional and historical background of the standard workweek reduction in Korea. Also, we briefly discuss the problem of long working hours in Korea and its relevance to workplace safety and workers' health. In Section 3, we explain our empirical strategy, which exploits the exogenous variation in working hours arising from the adoption of the new overtime law. In Section 4, we introduce the data on industrial injury statistics and working hours. Section 5 presents

the estimation results. In Section 6, we conduct robustness checks and supplementary analysis. Section 7 concludes.

## 2. Institutional background

In 1953, the Labor Standards Act (LSA) was enacted for the purpose of securing and improving the living standard of workers. When it was mandated for the first time, the statutory working hours were an 8-hour workday and a 48-hour workweek. The weekly working hour standard was reduced to 46 h in 1989 and further to 44 h in 1991.<sup>5</sup> Amidst the massive unemployment resulting from the 1997 Asian financial crisis, the public demanded that the government create more jobs by lowering the statutory working hour standard in 1998.

In May 2000, the Korea Tripartite Commission, consisting of the representatives of employees, employers, and the government, established the Special Committee on Reduction of Working Hours to investigate the possible introduction of a shorter workweek. In October, the Committee arrived at a consensus on the general principles of gradual reduction of working hours for the purpose of creating new jobs and improving the living standard of workers. The Committee proposed 40 working hours per week as the new standard, which was in line with the international standards. In late 2002, a bill to revise the LSA was submitted by the government, and it finally passed the Congress in August 2003, one year before its first application to large-sized establishments and the financial and public sectors.

The new LSA mandated adopting the 40-hour workweek system in phases from July 2004 to July 2011 according to establishment size and industry type in order to allow employers the time needed to make adjustments toward reducing their working hours. The 40-hour workweek was first applied in July 2004, initially covering workplaces of 1,000+ employees and workers in the financial and public sectors. Table 1 shows the time schedule of the law's implementation by industry and establishment size. Since then, the new law's coverage has been extended gradually to other industries and smaller establishments: workplaces in all industries with 300–999 employees in July 2005, those with 100–299 employees in July 2006, those with 50–99 employees in July 2007, those with 20–49 employees in July 2008, and all workplaces with 5 or more employees in July 2011 (for details of the overtime legislation, refer to Lee et al. (2012) and Kawaguchi et al. (2013)).<sup>6</sup>

For the purpose of our study, it is important to note a few things regarding the adoption process of the new law. First, although the new law's purpose was to improve the quality of life among workers, there was no specific supplementary policy directly related to that general purpose, besides working hour reduction. It was simply expected that the quality of life would improve as a result of the decrease in working hours. This is important for our empirical analysis, which requires that the variation in working hours arising from the adoption of the new law be exogenous to the frequency of workplace accidents. Second, to the best of our knowledge, no other labor market policy was concurrently implemented as the new overtime law. In particular, no specific

<sup>2</sup> Most economics studies on industrial injury, such as Smith (1979), Viscusi (1979), and McCaffrey (1983), have focused on the effectiveness of the Occupational Safety and Health Administration's (OSHA's) regulations. Recently, using the data drawn from the research of the British Health of Munition Workers Committee during the First World War, Pencavel (forthcoming) found that working hour reduction does not necessarily decrease output since employees working over long hours are less productive; they experience fatigue and stress, which increase the probability of accidents and sickness.

<sup>3</sup> The previous regulation on working hours intended to protect young workers and their welfare, thus reflecting concerns about health, at least partly. The 1833 Factory Act in the U.K. required a maximum working week of 48 h for those aged 9 to 13, with daily working hours limited to 8 h. For children aged between 13 and 18, daily working hours were limited to 12 h.

<sup>4</sup> Since our dataset does not cover the public sector, the variation at the industry level comes from the financial sector in the first year. Due to this limitation and since industrial accidents are rare in the financial sector, we exclude the financial sector from our regression sample. The triple-difference IV results using all the variations from year, industry, and establishment size are presented in Table 8.

<sup>5</sup> The standard working hours were reduced in three stages; in stage 1, the new law of the 46-h workweek was introduced on March 29, 1989, and it was applied to all establishments by September 30, 1989. In stage 2, the 44-h workweek was applied to establishments with 300+ employees and those in the finance/insurance sector by October 1, 1990. Lastly, the 44-hour workweek was applied to all establishments by October 1, 1991. Appendix Fig. 1 presents average annual working hours and injury rates. It is notable that the injury rate decreased significantly, while working hours decreased between 1988 and 1992.

<sup>6</sup> The 40-hour workweek is flexible over a period of up to three months after the law is applied. An employee may work longer than 40 h in a particular week without getting overtime pay so long as the average hours of work for any given 3 months does not exceed 40 h. Any work done beyond the statutory working hours should be compensated as overtime work with extra pay. The maximum hours of overtime work are 12 h per week, which can be extended to 16 h for the first 3 years when the 40-hour workweek is implemented. The overtime premium is 50% of the normal pay rate, but during the transition period, it is 25% for the first 4 h of overtime.

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