The Effects of “Overwork” on the Timing of First Marriage

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Abstract

Rising expectations of “overwork” appear to be detrimental to various dimensions of well-being. In populations with small family sizes, excessive work demands are perceived as a primary factor contributing to fertility rates that have fallen below 1.0 birth per woman — not only via a reduction in marital fertility (quantum effects) but also through delays in the timing of first marriages (tempo effects). Assessing this relationship is challenging, as work, mate selection, and marriage decisions all share many common causes. To contribute evidence to this discussion, we examine changes in the timing of first marriages in the wake of two large-scale legislative changes in South Korea designed to regulate weekly working hours. We employ a fixed effect instrumental variable strategy to assess the impact of overwork on the timing of first marriage. Our preliminary findings suggest that working more than 40 hours per week decreases the probability of entering into a first marriage by approximately 40 percentage points. Furthermore, we observed gender differences in these effects; the impact of overwork was found to be more pronounced among women than men.

Introduction

Excessive working hours have long been a societal concern (Schor 1993), prompting a global trend towards implementing policy measures to restrict working hours. Despite a gradual reduction in the average hours worked over recent decades, South Korea maintains one of the longest working weeks in the OECD (OECD, 2023). Because South Korea currently faces pressing societal challenges — the ultra-low fertility rate foremost among them — investigating the implications of working hours is paramount, not only for expanding our understanding of family dynamics but also for formulating policy interventions to improve population welfare.

The effects of overwork on health are well-established, with research linking excessive working hours to a range of negative outcomes, including smoking and alcohol consumption (Angrave et al., 2014; Virtanen et al., 2015), reduced physical activity (Angrave et al., 2015), diminished objective and subjective health (Park et al., 2001), impaired mental health (Fujino, 2006), as well as decreased life satisfaction and well-being (Valente and Berry, 2016). However, there is a surprising lack of empirical evidence regarding the connection between working hours and the timing of marriage. While existing literature has established a strong association between female labor force participation and age at marriage (Assaad and Zouari, 2003), these studies have not directly examined the impact of long working hours on marriage timing.

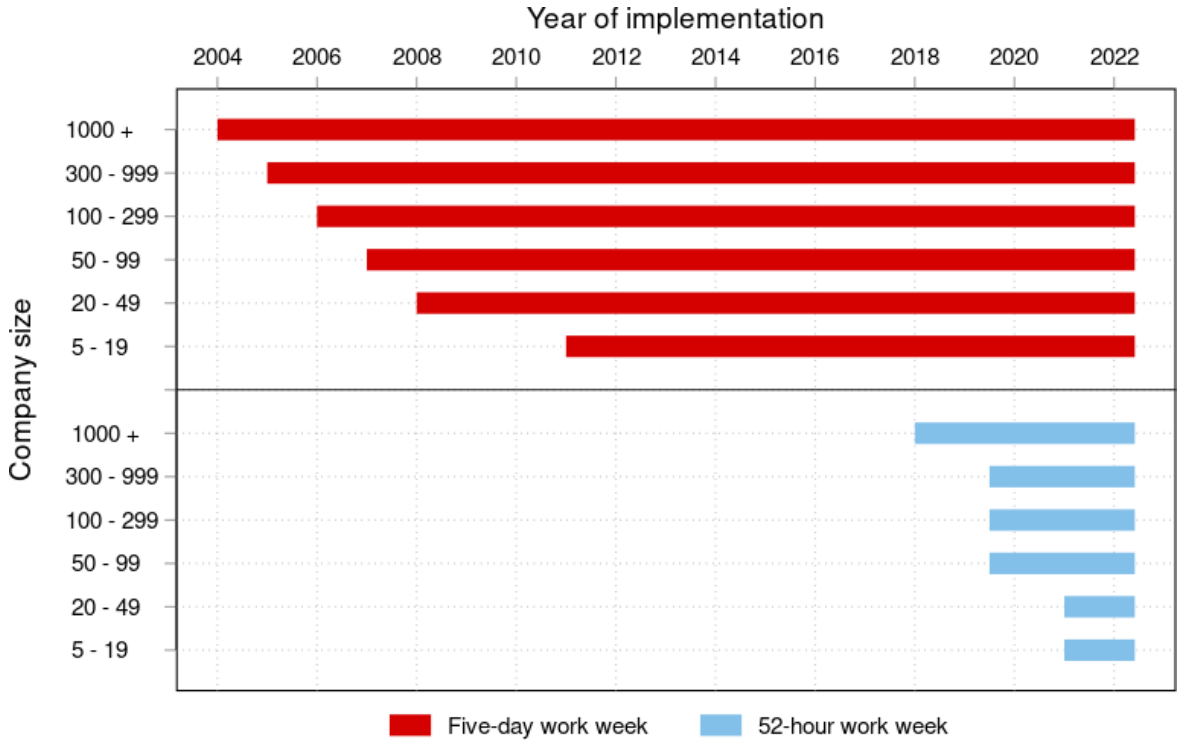
The scarcity of investigations into this relationship may stem from methodological constraints encountered in previous literature. Individuals who work longer hours differ in numerous ways, likely correlating with mate selection and marriage decision (Choi et al., 2005; Cai et al., 2014). Additionally, working hours can be influenced by changing personal circumstances, such as unemployment, job transitions, or health status (Poortman, 2005;

Floderus et al., 2009). These time-variant and -invariant forms of selection pose empirical challenges in distinguishing causation from selection in observational data. A handful of scholars have adopted quasi-experimental designs to estimate the causal effect of working hours (Ahn 2015; Cygan-Rehm and Wunder, 2018; Berniell and Bietenbeck, 2020). To date, this scholarship is limited to health outcomes.

We argue that the effects of overwork on marriage timing are equally important to understand, particularly in societies in which overwork is common. To advance evidence on causes of delayed marriage timing in South Korea, we use a quasi-experimental approach to estimate the effects of overwork. We leverage two major legislative changes in South Korea that restrict working hours. We use the timing of these changes as instrumental variables for hours worked among single men and women. Using a doubly-robust design, we estimate fixed-effect instrumental variable specifications.

In 2005, South Korea introduced a five-day workweek policy, legally limiting regular working hours to 40 per week and capping overtime at 28 hours. In 2018, the 52-hour work regulation was implemented. This legislation, an amendment to the earlier five-day workweek, strictly prohibited employers from paying workers for more than 52 hours of work in a week under any conditions. These policies were implemented and enforced in a stepwise fashion based on firm size. The timeline delineating eligibility for these policy applications is depicted in Figure 1. Conditional on the absence of endogeneity in the instrument assignment, these changes in the working environment are plausibly conceived as external shocks that reduce working hours. The policy-driven changes in work hours, in turn, facilitates identification of the *impacts* of working hours.

Figure 1. Implementation of the five-day work week and the 52-hour work week in South Korea



Data

We use data from the Korean Welfare Panel Study (KOWEPS), administered by the Korea Institute for Health and Social Affairs (KIHASA) in partnership with the Social Welfare Research Institute of Seoul National University. The KOWEPS, initiated in 2006 and conducted annually since, presents a comprehensive overview of a nationally representative samples of South Korean households. Our analysis pools data from the first wave (2006) through to the seventeenth wave (2022). This allows us to capture variation in working hours as a result of the stepwise changes in regulatory policies in South Korea. As this study focuses on the timing of first marriage, our analytic sample is accordingly restricted to individuals who were unmarried at their first survey participation. The KOWEPS uniquely tracks individuals who exit the household due to marriage, minimizing the risk of differential censoring probability. Our final sample comprises 4,050 individuals, yielding 27,270 observations across the survey period.

The KOWEPS data contain information essential for this study. As mentioned, both the 2005 workweek and the 2018 52-hour regulation were progressively implemented based on company size. The KOWEPS data provides specifics about the number of employees in each respondent's company, allowing clear distinctions based on eligibility for the work hour regulatory policies. Moreover, the dataset includes records of regular weekly working hours while also containing information for those engaged in non-standard work schedules. It is important to note that the working hour data are self-reported—akin to the CPS in the U.S.—and are similarly subject to potential measurement error. Instrumental Variable (IV) estimators are recognized to be robust against random measurement error in exposure (Goetghebeur and Vansteelandt, 2005). In the case of non-classical measurement errors, we can still obtain consistent estimates as long as the instruments correlate only with the true treatment values and not with any of the measurement errors (Pischke, 2007).

In this study, the instrumental variables are the introduction of the five-day work week in 2005 and the 52-hour workweek regulation in 2018. These variables are dichotomous, based on the eligibility for each regulation across different waves. Our treatment variables are the working hours of both spouses, attained from responses to questions about average weekly hours worked in the last year. For those without a standard or non-standard working schedule, working hours are imputed as zero[1]. We further establish dichotomous measures for working hours using a 40-hour threshold[2]. We make this choice for two reasons: 1) an effect of continuous treatment is inherently non-linear, and 2) The IV approach estimates average treatment effects among those who adjusted their working hours in line with the altered work restriction policies. Our primary outcome of interest is the probability of the first marriage, as captured in the KOWEPS data, where an individual's marital status is updated in each survey wave. In our analysis, individuals who have experienced divorce, separation, or widowhood are all categorized as married, in order to maintain a focus on the transition into first marriage.

[1] Excluding non-workers may introduce biases since we select the samples who have been consistently worked (i. e. attrition). Our study aims to estimate the local average treatment effects of overwork without being contingent upon one's employment status. Consequently, we assign a value of zero to the working hours of non-workers and incorporate dummy variables for employment status in our model.
[2] Both policies set the legal standard for working hours at 40 hours per week. Under the five-day workweek regulation, the maximum overtime is 28 hours, while the 52-hour workweek regulation allows for a maximum of 12 hours.

Method

We leverage a Fixed Effects Instrumental Variable (FE-IV) approach to identify the causal impact of working hours. The Instrumental variable (IV) hinges on two fundamental assumptions. The instrument must predict the treatment (a strong first stage). Secondly, the instrument cannot be correlated with the error term of the outcome variables, implying that the instrument is associated with the outcomes only via the treatment variables (the exclusion restriction).

Though widely accepted guidelines exist to detect weak instruments, there is no direct assessment of exclusion restriction. The introduction of fixed effects can help relax the exclusion assumption, particularly in cases where potential selection may influence the assignment of the instrument. By accounting for the differential probability of assignment for the instrument, we could reasonably assume the remaining variations in the instrumental variable are occur as if an 'exogenous shock.' For instance, consider a policy change used as the instrument, with its assignment based on specific individual attributes in a particular year. Even though the policy change might not directly affect the outcome except through the treatment, the individual characteristics determining the instrument's assignment could be associated with the outcome, inducing correlations between the instruments and the outcome's error term. By implementing individual fixed effects, we exploit within-individual variations, blocking the backward channel that goes through time-invariant individual characteristics.

Based on this strategy, Ahn (2015) used the five-day work week regulation introduced in Korea in 2005 as an instrument and applied individual fixed effects to account for potential selection related to eligibility for the application. He found that increased working hours raised the incidence of smoking and drinking and decreased regular physical exercise. Cygan-Rehm and Wunder (2018) exploited statutory workweek changes in the German public sector and revealed that increased working hours adversely affected both subjective and objective health measures. Similarly, Berniell and Bietenbeck (2020) leveraged a French reform of the standard workweek from 39 to 35 hours and found working hours increased smoking behavior.

Building upon Ahn (2015), this study uses work hour restriction policies as an instrument for working hours. We additionally leverage the 52-hour workweek regulation introduced in 2018 as an instrument, alongside the five-day workweek standard from 2005. Unlike the five-day work week, the 52-hour workweek regulation strictly limited work hours, it could offer additional explanatory power in the first-stage equation. In addition, Ahn (2015) applied individual fixed effects to account for potential selection in eligibility for work regulation policies. However, given that these work regulation policies were progressively introduced over time, there could be a correlation between policy introduction and the error term if there is a temporal trend in the outcome of interest. For robust estimation, we use two-way fixed effects to account for endogeneity related to both individual characteristics and time trends. Our identification strategy can be articulated as follows.

First stage

$$\widehat{T1}_{it} = \alpha + \beta_1 Z1_{it} + \beta_2 Z2_{it} + \beta_3 X1_{it} + \mu_t + \theta_i$$

Second stage

$$Y_{it} = \kappa + \lambda_1 \widehat{T1}_{it} + \lambda_2 X1_{it} + \omega_i + \sigma_t + \varepsilon_{it}$$

In the equation, $\widehat{T1}_{it}$, denote the predicted working hours estimated via first stage equation. $Z1_{it}$ and $Z2_{it}$ represent the eligibility for the five-day work week regulation introduced in 2005 and the 52 hours work week regulation introduced in 2018. We also employed $X1_{it}$, which is a set of dummy variables representing the employment status. Our dependent variable, Y_{it}, indicate individual's marital status in each wave, and it is regressed on the predicted working hours estimated from the first stage. μ_t and σ_t represent time-fixed effects, while θ_i and ω_i stand for the individual-fixed effects. The parameter of interest is λ_1, which represent the effects of working hours.

In the preliminary results section below, we describe the results of the first stage to assess the relevance of the instrument. Subsequently, we present the results of the second stage regression for the timing of first marriage. It is common practice in research to use the Cox proportional hazard model for analyzing the timing of first marriage. However, when each individual in the dataset experiences no more than one event, as is the case in our study, fixed-effects Cox regression is not feasible (Allison and Christakis, 2000). In preliminary analysis, we estimate the linear probability model as an alternative. It is important to note that the coefficients derived from this model should be interpreted as the probabilities of experiencing a first marriage not the hazard.

Preliminary results

First stage equation

Table 1. The first stage equation estimating working hours

	Working Hours	Overwork (>40)
	(a)	(b)
Instruments		
Five-day work week	-1.306***	-0.098***
	(0.171)	(0.007)
52 hours work week	-0.601	-0.086***
	(0.416)	(0.018)
F statistic	30.99***	102.12***
SW Chi-square	61.98***	204.30***
Observations	27,270	
Individuals	4,050	

Note: Robust standard error in parentheses.
***: p < 0.001; **: p < 0.01; *: p < 0.05.

Table 1 presents the first stage estimates from a fixed effects model. Column (a) illustrates the impact of eligibility for working hours regulation policies on working hours, while Column (b) depicts the effects of these policies on overwork, where working hours are coded into a dichotomous measure. From Column (a), we observe a significant decrease in working hours following the work restriction policies. Specifically, the five-day work week regulation corresponds to a reduction of approximately 2 hours per week. The 52-hour work week regulation reduced weekly working hours by 0.6 hours, but this reduction was not statistically

significant. The estimates on excessive working hours are even clearer; eligibility for both regulations decrease the probability of overwork by 10 and 9 percentage points, respectively.

To serve as valid instruments for working hours, the regulation policies should exhibit strong associations with the treatments of interest. Stock and Yogo (2005) proposed that an F-statistic exceeding 10 precludes weak instruments. Joint hypothesis testing of working hours regulation policies from our analysis confirms this strong first stage across all models presented in the Table 1. Furthermore, we conducted the under-identification tests proposed by Sanderson and Windmeijer (2016). The results reject the null hypothesis that the instruments have insufficient explanatory power to predict the endogenous variable in the model for identification of the parameters.

Second stage equation

Figure 2. The effects of working hours and overwork on marriage probability

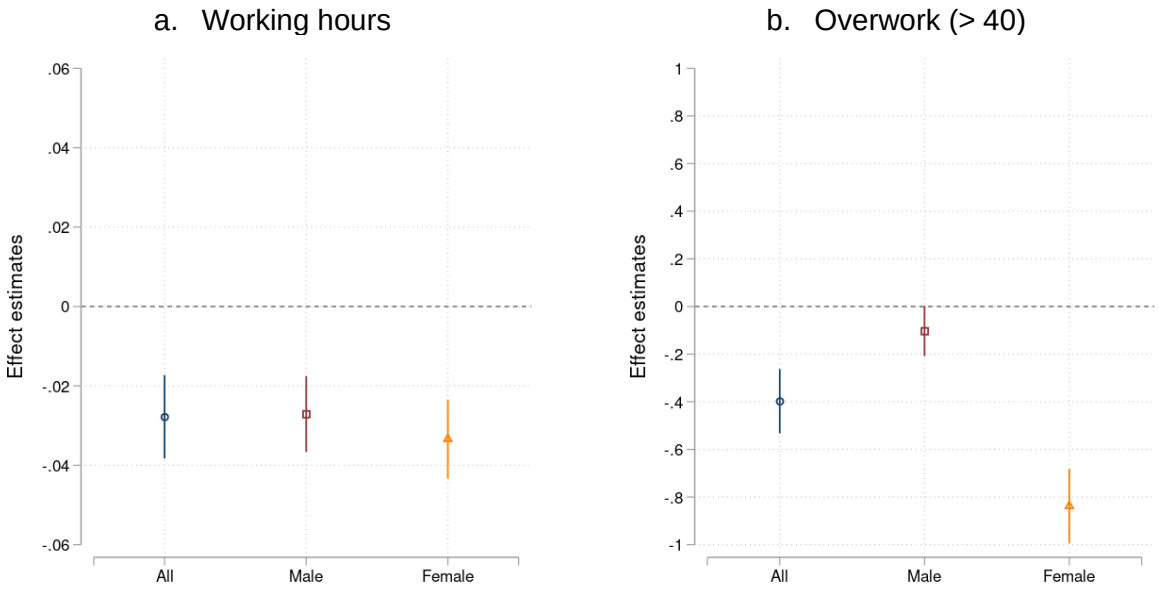


Figure 2 presents the estimated effects of both working hours and overwork on marital status. We regressed marital status on the predicted values of working hours, instrumented by the five-day work week and 52-hour workweek regulations through the first stage equation. Our analysis reveals a considerable effect of working hours on the probability of first marriage. Specifically, an additional working hour per week leads to a 2.7 percentage point reduction in the probability of marriage (95% CI: -0.038 to -0.017). Furthermore, individuals working more than 40 hours per week are less likely to be married, with effect sizes of 40 percentage points (95% CI: -53.2 to -26.3).

Additionally, we examined the effect heterogeneity of working hours on marriage probability according to gender. The results, which include an interaction term in both the first and second stage equations, are also presented in Figure 2. Our findings indicate no significant gender differences in the impact of total working hours. However, when considering working

hours as a binary variable, clear gender differences emerge. Women who work more than 40 hours per week are 84 percentage points less likely to be married (95% CI: -0.99 to -0.68), whereas overwork does not have a significant impact on men's marital status. This disparity may be attributed to the gender-specific division of roles in East Asian societies, particularly the economic responsibilities within marriage (Qian and Sayer, 2016). Consequently, while the negative effects of extended working hours are more pronounced for women, the potential increase in income associated with overwork might mitigate these effects for men.

Next steps

Fixed-effects Cox regression is not feasible when each individual experiences no more than one event. However, Royston and Lambert (2011) have demonstrated that it is possible to obtain identical hazard ratios by fitting a Poisson model in cases without repeated events. As a next step, we are considering a fixed-effects Poisson model to derive hazard and survival functions for marriage timing. Additionally, our ongoing work includes testing the robustness of these specifications. Several findings have stood out in magnitude, and we plan to assess the sensitivity of these outcomes to alternative instrument specifications and conduct falsification tests. While our investigations have primarily focused on effect heterogeneity by gender, we also plan to explore the differential impacts by age, socioeconomic status, and other pre-exposure variables. Finally, although this abstract concentrates on marriage timing, we aim to expand our research to include an examination of marital fertility—a dimension equally relevant to the ultra-low fertility issue in South Korea.

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