The mental health cost of long working hours: the case of rural Chinese migrants

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Abstract

Previous studies looking at the effect of long working hours on mental health have been plagued by the high degree of self-selection of those who work long hours. In this paper we use a new survey of rural-to-urban migration in China which uses the fact that migrants are effectively allowed only temporarily in the cities, meaning that those who must return to poorer villages have greater incentives to work long hours than those returning to richer villages. As a result of the temporary nature of migration, the average rural migrant works almost 60 hours per week for 8 years after which they return to their rural home village. Using home village economic indicators as an instrument, we find that working 60+ hours per week increasers our GHQ mental distress index by one standard deviation.

JEL Classification:

Keywords: Mental Health, GHQ12, working hours, stress, working conditions, migration.

We would like to thank all commentators on this paper.

1. Introduction

In most developed countries more workers are working long hours than ever before. In the U.S., for example, the proportion of male salary workers working more than 48 hours per week rose from 16.6% in 1986 to 24.3% in 2005 (Kuhn and Lozano, 2008). In the OECD, the proportion of workers working more than 10 hours per day increased by 2.2 percentage points between 2000 and 2005 (OECD, 2008). This upward trend in long work hours has raised concerns about worker's health and safety, and also about increased economic costs from lower productivity, additional healthcare expenditure and increased employee turnover. The question we explore in this paper is the effect of working hours on the incidence of mental health problems.

Mental health problems are some of the most prevalent and burdensome diseases, and the costs of treatment and the indirect costs of lost productivity represent a substantial economic liability. For example, it is estimated that the costs associated with mental health problems equal 2% of GDP in the United Kingdom and 1.7% of GDP in Canada (OECD, 2008). If work conditions do lead to mental health problems, then this gives an added reason for governments, who pick up large portions of the cost of mental health, to actively interfere with working conditions.

While there is broad acknowledgement of an increasing trend in work hours, there is far less agreement about the impact that long work hours has on the health of workers. In their review of the literature, Spurgeon et al. (1997) conclude that long work hours negatively affect worker's health through direct and indirect channels. Long work hours are directly harmful for worker's health because of the stress induced by the need to maintain performance levels in the face of increasing fatigue, and are indirectly harmful because they increase the time that a worker is exposed to other sources of workplace stress. A high level of stress has long been regarded as an important factor in the development of a wide-range of illnesses, such as psychiatric problems, cardiovascular disease and gastrointestinal disorders (Cooper and Marshall, 1976). An additional negative outcome is that increased hours at work necessarily reduces the amount of time and often the quality of time spent in leisure activities, which in-turn reduces worker's ability to recuperate both physically and mentally. On the other hand, long work hours may also have some positive effects as they are positively associated with current and future earnings, and with faster rates of career progression (Francesconi, 2001). Improved economic outcomes will raise worker's health to the extent that health is income graded (see Smith, 1999; Deaton, 2003)

The potential for positive and negative impacts from long work hours means it is not possible to determine *a priori* whether long work hours will have negative, positive or no impact upon health, and the health literature appears to reflect this potential for mixed results. Jex (1999), Proctor et al. (1996) and Yang et al. (2006) find a negative effect of long working hours on general health, mental health and cardiovascular disease, whereas Artazcoz et al. (2007), Baldwin et al. (1997) and Park et al. (2001) find no affect of long working hours on each of these same outcomes. Results from the small economics literature are also mixed (see Bardasi and Francesconi, 2000; Ulker, 2006; Dockery, 2006; Llena-Nozal, 2009). For example, Llena-Nozal's fixed-effects panel analysis suggests there exists negative mental health effects of working overtime hours for Australian, Canadian and British men; no effects for Canadian women, Swiss men and women, and British women; and positive effects for Australian women.

The mixed empirical results are not unexpected given the small sample sizes, use of data from specific occupational groups, methodological differences and varying definitions of health and hours worked. Perhaps the most important reason for the mixed results, however, is that both the health and economics literatures inadequately control for endogeneity issues, despite the endogeneity issues being well-recognised. The most severe issue is the "healthy worker effect". Workers with good mental and physical health are generally more likely to work longer hours. This leads to both a cross-sectional and a dynamic bias in that those whose health improves are more likely to take up longer hours, therefore creating an upward bias in both OLS cross-sectional studies and fixed-effect panel studies. Another endogeneity bias comes in if we allow for the possibility that some people are better able to deal with stress, in which case those less affected by stress are more likely to end up working longer hours. Many health economics studies have investigated these types of endogeneity issues in a range of contexts (e.g. Adams et al., 2003); but there exists no study related specifically to long working hours.

Our approach is to use a unique dataset on internal rural-to-urban migrants in China. The reason to look at these migrants is that the urban legal system in China restricts them from staying in the city the rest of their lives, implying that they migrate temporarily to the cities where nearly all work very long hours. These migrants stay in the cities for an average of 8 years where their hourly wages are almost double that in the rural villages, after which they return to raise families and in other ways 'spend' the money they saved during their migration period. Because this behaviour is driven by the legal restriction of not being able to

raise their families in the cities, their generally high working hours can be seen as a natural experiment in working hours.

In our second section we introduce the institutional background to internal migration in China, with particular focus on how the legal environment prevents long-term migration. In our third section we introduce the main data, with the analyses in the fourth section. The final section concludes.

The results from our instrumental variables (IV) analysis suggest that working 60 hours or more per week will decrease mental health by approximately one standard deviation. In addition, it appears that the endogeneity of work hours creates a severe bias, with our IV estimates six times larger than estimates from an OLS model.

2. Institutional Context

At present, there are some 130 million rural-to-urban migrants in China, starting from no more than about 30 million migrants in the mid-1990s and rapidly increasing since the early 2000s. These migrants form roughly 15% of the rural population, but constitute up to 50% of the 20 to 30 year olds from the countryside (Meng and Manning, 2009).

The key institution in the internal migration of China is the Hukou system. Since the 1950s, households are registered as belonging to a particular (rural or urban) community, and they are not supposed to move from that community. Access to government services and government jobs were historically tied to the hukou of a household. A rural person could thus not send their kids to school in a city, nor could the holder of a hukou in one particular city work in another city without going through the almost impossible task of changing their hukou registration. Although the central government has recently outlawed many of the more pernicious aspects of the hukou system, such as the inability of rural migrants to compete for government jobs or to be covered by compulsory employer-provided pensions, implementation of these relaxations has been slow. Early 2008, the hukou system was effectively still operational, making rural migrants guest workers to cities with limited chance of being allowed to stay with their families in the long term.

A direct effect of the constraint that the hukou system has put on the volume of migration is a large income gap between what migrant workers earns in the city and their wage in the rural areas (Du, Park, and Wang, 2005).

In terms of a natural experiment, one main effect of the hukou system is to give young migrants a high incentive to work for very long hours for the duration of their stay in the cities, i.e. to save up for when they return to the rural countryside to raise a family. In this sense the whole group of migrants has been forced by circumstance to work much longer hours than is the norm in any OECD country (see next section), making them ideally suited to see the effect of long working hours.

Another important effect of the hukou system is that the rural wage is not the same across China, because moving across rural regions is also restricted. Hence wages vary depending on the fertility of the land, the distance to the cities, the level of industrial development in the countryside, etc. This makes the wage earned in the countryside an ideal instrument for the number of working hours a migrant chooses to work in the city: the higher the wage level back home in the rural village, the less incentive a migrant has to work extremely long hours in the city. We thus aim to use the self-reported level of wages that 'an unskilled person can earn' in the home village as an exogenous source of variation with respect to working hours. Similarly, we use the proportion of the village that has also migrated as a direct indicator of the economic opportunities in the home village and thus an exogenous reason for working hours to vary independently of mental health. We may mention here already that we control for a wide array of non-mental health indicators, such as self-reported physical health, the health of the parents, and height. This is in order to isolate the effect of working hours on mental health free from any consideration of its effect on physical health, though it turned out there actually was no difference in estimated effects whether physical health was controlled for or not.

3. Data, Definitions and Sample Characteristics

3.1. Urban Migrant Survey

The data we use is drawn from the Urban Migrant Survey, which is from the Rural-Urban Migration in China and Indonesia (RUMiCI) Project.[1] The 2008 Urban Migrant Survey consists of 5007 rural-urban migrants who worked in 15 cities across nine provinces or metropolitan areas: Shanghai, Guangdong, Jiangsu, Zhejiang, Anhui, Hunbei, Si chuan, Chongqing and Henan. The first four locations are the largest migration destinations, the remaining five are among the largest migration sending areas (Gong et al., 2008). The survey uses a sampling frame that is based on information collected in a census of migrant workers at their workplaces. This unusual sampling strategy aims to rectify the sample biases of existing migrant surveys that use administrative records of residential addresses as the basis of sampling. Such residential-based migrant surveys miss the large number of migrant workers who live at their workplaces, such as factory dormitories and construction sites (Gong et al., 2008).

In our sample of migrant workers, the average age is 27 years, 62 percent are male, 42 percent are married, the average number of children is 0.4, and the average years of education is 9.7 years. Gong et al. (2009) report on this data that only 2% of the migrants work in government, with some 26% working in manufacturing, and the rest in services or sales (wholesales and retail).

3.2. Mental health and hours worked

Past research suggests that the relationship between hours worked and mental health is nonlinear, with poor health clustered at the extremes of the hours worked distribution (Sparks et al., 1997). The argument for a nonlinear relationship is that mental health is low for people experiencing under-employment, because of its negative association with status, self-esteem and economic security; high for people experiencing 'regular' work hours; and low for people working long hours as work stresses overcome any positive status and income effects. Given the potential for nonlinearity, we use as our main work hours measure a binary variable indicating that the individual works at least 60 hours per week on average.[2] In other

[1] See http://rumici.anu.edu.au/joomla for background information on this study.

[2] Ideally, we would discretize hours worked and include a number of hours worked dummy variables in our mental health regression models. This approach would allow for a better characterisation of the nonlinear relationship between hours worked and mental health. However, in an instrumental variables analysis, such an approach would require at least one instrument for each hours worked dummy variable.

words, our main measure represents long work hours. For completeness, however, we also present estimation results using a continuous hours worked measure.

Figure 1 illustrates the distribution of average hours worked per week for our sample of migrants. The most striking feature is the high number of hours worked: median hours worked equals 56 and 75% of the sample works more than 48 hours. Another feature of Figure 1 is the absence of migrants working low hours: the minimum value equals 24 hours and 99% are working more than 36 hours. The relatively large number of respondents working long hours is advantageous as it allows for more precise estimates of the long work hours effect. Figure 1 also shows clustering of hours at certain round numbers. This is a common feature of self-reported hours worked variables.

Mental health is measured using the 12-item General Health Questionnaire (GHQ). The GHQ is widely used amongst medical, epidemiological and economics researchers as a scale of psychological distress; recent economics applications include Blanchflower and Oswald (2008), Jones and Wildman (2008), and Madden (2009). The GHQ asks to what extent the respondent has experienced each of the following during the past few weeks: (1) loss of concentration; (2) loss of sleep; (3) playing a useful role; (4) capable of making decisions; (5) constantly under strain; (6) problems overcoming difficulties; (7) enjoy day-to-day activities; (8) ability to face problems; (9) unhappy or depressed; (10) losing confidence; (11) believe in self-worth; (12) general happiness. For each question the respondent chooses one of four options (measured on a scale running between 0 and 3) measuring the frequency or severity of the experience. We follow the standard approach and sum the 12 GHQ responses to form an index running from 0 to 36 (called the Likert scale), with 0 representing the highest level of mental health and 36 representing the lowest level. Figure 2 illustrates the distribution of the GHQ12 mental health index for our sample of migrants. The distribution has a mean of 7.6 and a standard deviation of 4.4, and is typically found is positively skewed with 75% of respondents scoring ≤ 10.

Figure 3 describes the raw relationship between hours worked and mental health. As suggested by previous research the relationship appears nonlinear, with the highest incidence of poor mental health at low and high work hours, and the lowest incidence occurring at around 45 hours per week. As discussed previously, though, it is unlikely that the raw relationship reflects a causal relationship. To make causal statements, we must rely upon our instrumental variables analysis.

4. Estimated Mental Health Effect of Working Long Hours

Estimation is based on a regression model of mental health problems. For worker *i*, we assume that mental health (*MH*) is given by

$$(1) \qquad MH_i = \alpha_1 H_i + \beta_1' X_i + \varepsilon_{1i}$$

where H is a binary variable representing that work hours ≥ 60, X is a vector of worker characteristics, and ε_1 is a random error term. The coefficient α_1 is the parameter of primary interest and represents the impact that long work hours has on mental health. In our main specification the X vector includes the characteristics: gender, age, marital status (married, divorced), number of children, years of education, years since migration, number of friends, height, health, mother and father health, and mother and father education. Appendix Table A1 provides definitions of each of these variables as well as their sample means.

OLS estimates of equation (1) are reported in column 1 of Table 1. The estimates indicate that people who work long hours have significantly more mental health problems. More specifically, working ≥ 60 hours per week increases the mental health index by 0.713 units or around one sixth of a standard deviation; a relatively small effect. This estimate, however, may be downwards biased if healthier people work longer hours.

To allow for endogeneity we introduce an equation explaining long work hours:

$$(2) \qquad H_i = 1\left(\gamma_1^w w_i + \gamma_1^m m_i + \delta_1' X_i + u_{1i} > 0\right)$$

where 1(.) is the indicator function and the random error term u_1 is jointly normally distributed with ε_1. The model represented by equations (1) and (2) is estimated using maximum likelihood and should capture the causal effect of long work hours on mental health. It is formally identified without the need for any exclusion restrictions; however, relying on distributional assumptions for identification is not recommended and so as previously discussed in Section 2, we introduce two instruments: *w* represents expected wage in home village and *m* represents proportion of home village who have migrated. Estimates of equation (2) are reported in column 2 of Table 1. The estimates show that the instruments are significantly related to long work hours, with workers who face lower earnings when returning home working more. Most importantly, the instruments are jointly significant (*p*-value = 0.001), indicating that we do not have a weak instruments problem.

Column 3 of Table 1 presents our main IV estimates. We find that working 60+ hours per week increases mental health problems by 4.2 units or around one standard deviation, and this result is statistically significant at the 0.01 level. Working long hours is clearly detrimental to an individuals mental health.[3] Interestingly, the IV estimated effect is almost six times larger than the OLS estimate, indicating that OLS estimates are downwards biased, as predicted. This downwards bias is reflected in the significantly negative correlation between u_1 and ε_1; estimated correlation equals -0.492.

Columns 4, 5 and 6 repeat the analysis using continuous hours worked instead of a binary indicator of long work hours. Similar results are obtained. The 2SLS estimated effect of hours worked equals 0.228 and is significant at the 5% level. This estimate suggests that working ten extra hour per week increases the mental health index by 2.28, or almost one half a standard deviation. Again, the IV estimated effect is much larger than the OLS effect.

We test the robustness of our main IV results presented in Table 1 by introducing four additional sets of control variables, which have thus far been omitted from the analysis because they are potentially endogenous. Each row in Table 2 presents the IV estimated effect of working 60+ hours per week (column 1) and the effect of working one additional hour per week (column 2) for a different set of additional controls: (1) log weekly wage; (2) occupation categories; (3) industry categories; (4) job contract categories (permanent, long-term contract, short-term contract, casual, temporary). Two main results stand out. First, a comparison across rows demonstrates that the estimated effect of working hours is largely unaffected by the control variables included, with the estimated effects large and statistically significant in all specifications. Second, the estimated effect of work hours appears most affected by the inclusion of controls for the type of job contract. Type of contract is related to long work hours, with permanent, casual and temporary workers working longer hours than workers with short- and long-term contracts. If contract type also influences mental health then a portion of the estimated work hours effects shown in Table 1 may actually reflect contract type. An alternative interpretation, however, is that workers choose their contract type after choosing their optimal hours of work. Under this latter interpretation, the effect of job contract is an indirect effect of long work hours.

How do our estimates compare with those from other studies? A direct comparison is difficult because there exists no other study we are aware of that uses an IV approach, and

[3] The estimation results presented in columns 2 and 3 are from a model that respects the binary nature of our long work hours measure. An alternative IV approach is 2SLS. Using this approach we find an even larger effect: working 60+ hours is predicted to increase our mental health index by 7.5 units.

OLS studies are not an appropriate contrast in the presence of endogeneity bias. Of the fixed-effects panel data studies, which are able to control for time-invariant unobservables, the estimated effects are smaller than our own. For example, Bardasi and Francesconi (2000) find that working long hours in Britain (> 48 hours per week) has no impact on GHQ scores, and Llena-Nozal (2009) finds that working over-time hours in Britain has a small positive effect on GHQ scores (effect size equals 0.131). An explanation for our more negative estimates is that there exists substantial downward bias in OLS and fixed-effects estimates because of a high degree of selectivity. Our sample with an unusually high proportion of individuals working very long hours arguably suffers less from the selectivity problem. Also, our IV approach is designed to control for the remaining selectivity bias.

A note of caution on our results is that the two instruments we use only give reasonable estimates if they are used jointly. In the first stage regression, both have effects of the expected sign: higher unskilled wages in the home village reduces working hours (though insignificantly) whilst a higher proportion of the village having also migrated increases working hours (significantly). In their reduced form effects on mental health, again the signs are as expected in that lower unskilled wages in the home village and higher proportions of migrants increase the number of mental health problems. However, the reduced form effect of unskilled wages is highly significant whilst that of working hours is insignificant, meaning that the IV results depend on the assumption that it is the index of both variables that capture the true economic conditions of the home village.

5. Conclusion

In this paper we looked at the effect of working hours on mental health, using a sample of around 3000 Chinese migrants who on average work over 60 hours. Using the fact that these migrants reasonably expect to be in the city only temporarily because of restrictions on their family staying in the city, we find that the OLS estimate of working 60 hours or more is to score 0.7 higher on a 0 to 36 GHQ12 mental health score, or one-sixth of a standard deviation. Using the variation in the economic conditions of the sending villages as instruments that are assumed to affect the relative pay-off of working longer hours without directly affecting mental health, the estimate of the effect of working 60 hours or more increases to 4.1 units more mental health problem, or one standard deviation. This effect is larger than that found in previous studies based on smaller or more selective samples.

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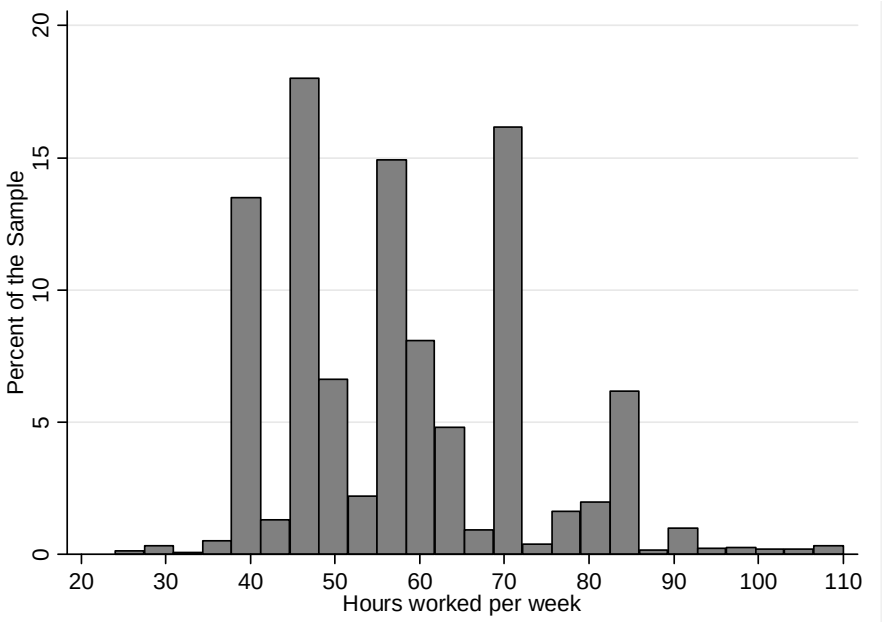

Figure 1: Average Hours Worked per Week by Chinese Rural-Urban Migrants

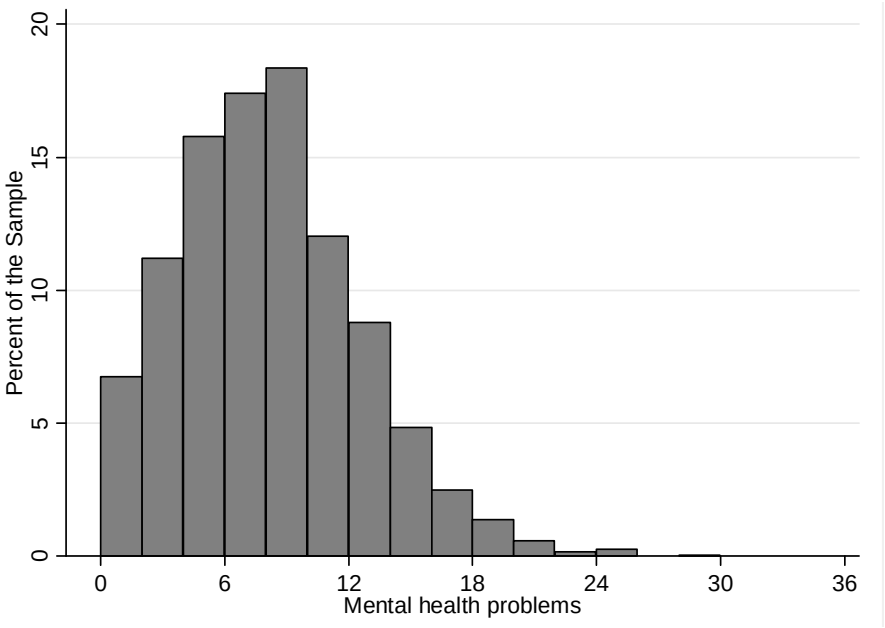

Figure 2: Histogram of GHQ12 Mental Health Index for Chinese Rural-Urban Migrants

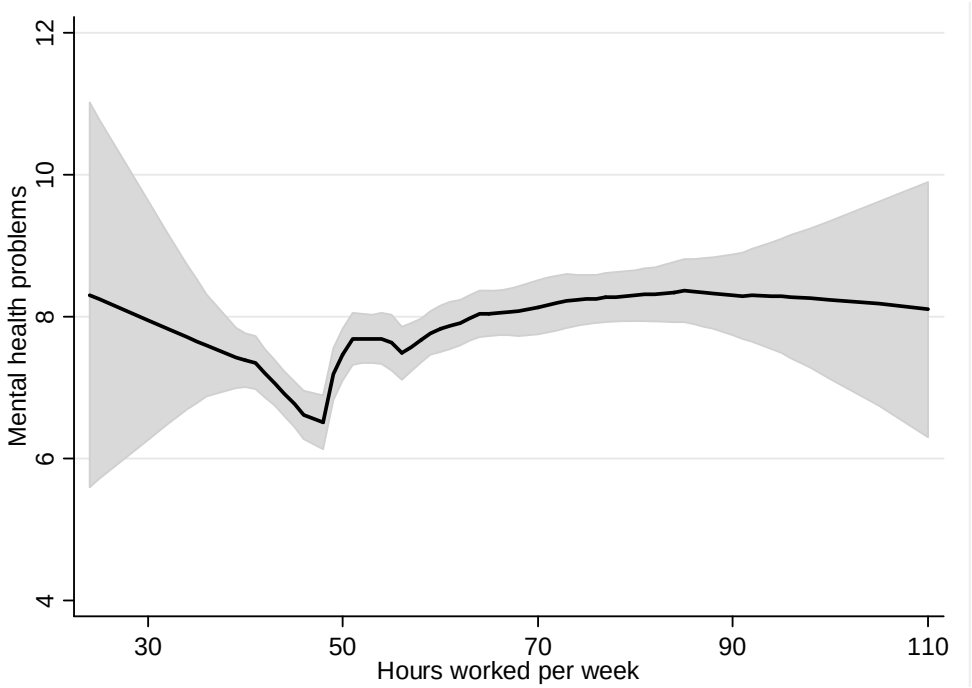

Figure 3: Relationship Between Work Hours and Mental Health with 95% Confidence Interval

Table 1: Estimated Effects of Working Hours on Mental Health Problems

	Work 60+ Hours			Work Hours		
	OLS	IV 1st stage	IV 2nd stage	OLS	IV 1st Stage	IV 2nd stage
	(1)	(2)	(3)	(4)	(5)	(6)
Hours Measure	0.713***		4.192***	0.030***		0.228**
	(0.154)		(0.834)	(0.006)		(0.103)
Home village wage		-0.190***			-4.033**	
		(0.072)			(1.975)	
Proportion left village		0.109**			3.592***	
		(0.044)			(1.223)	
Male	-0.521**	0.054*	-0.722***	-0.574**	3.044***	-1.192***
	(0.224)	(0.028)	(0.245)	(0.224)	(0.717)	(0.418)
Age	-0.000	-0.005**	0.014	0.002	-0.165***	0.035
	(0.016)	(0.002)	(0.017)	(0.016)	(0.050)	(0.025)
Married	-0.721***	-0.029	-0.639**	-0.709***	-0.950	-0.526
	(0.267)	(0.034)	(0.287)	(0.267)	(0.854)	(0.330)
Divorced	1.821**	0.080	1.600**	1.871**	0.083	1.902**
	(0.735)	(0.094)	(0.791)	(0.734)	(2.352)	(0.869)
Number of children	-0.043	0.032	-0.124	-0.055	0.923	-0.240
	(0.176)	(0.023)	(0.190)	(0.176)	(0.563)	(0.230)
Education	-0.233***	-0.039***	-0.102**	-0.227***	-1.061***	-0.010
	(0.036)	(0.005)	(0.049)	(0.036)	(0.114)	(0.121)
Years since migration	0.012	0.002	0.004	0.011	0.065	-0.003
	(0.019)	(0.002)	(0.020)	(0.019)	(0.060)	(0.023)
Number of friends	-0.007***	-0.000	-0.006***	-0.007***	-0.007	-0.005*
	(0.002)	(0.000)	(0.002)	(0.002)	(0.007)	(0.003)
Height	-0.010	-0.004*	0.004	-0.008	-0.158***	0.024
	(0.015)	(0.002)	(0.017)	(0.015)	(0.049)	(0.025)
Healthy	-1.628***	-0.068**	-1.438***	-1.612***	-1.838**	-1.257***
	(0.232)	(0.029)	(0.253)	(0.232)	(0.741)	(0.331)
Mother healthy	-0.567**	0.011	-0.597**	-0.572**	0.259	-0.643**
	(0.257)	(0.032)	(0.276)	(0.256)	(0.821)	(0.306)
Father's healthy	-0.417	-0.103***	-0.083	-0.413	-2.212***	0.065
	(0.263)	(0.033)	(0.293)	(0.263)	(0.843)	(0.399)
Mother's education	0.109	-0.025*	0.194*	0.120	-0.906***	0.306*
	(0.106)	(0.013)	(0.115)	(0.106)	(0.338)	(0.158)
Father's education	-0.088	0.014	-0.145	-0.094	0.537*	-0.209
	(0.099)	(0.012)	(0.108)	(0.099)	(0.318)	(0.132)
Sample size	3143	3143	3143	3143	3143	3143

Note: City fixed effects are included in all regressions but are omitted from the table. IV effect of working 60+ hours is estimated using full information maximum likelihood. The error correlation coefficient for the FIML model is -0.492(0.099). Column 2 results are estimated marginal effects of working 60+ hours per week, calculated at the mean values of the explanatory variables. IV effect of hours per week is estimated using 2SLS. Standard errors in parentheses. *, ** and *** denote significance at .10, .05 and .01 levels.

Table 2: IV Estimated Effects of Working Hours on Mental Health Problems using Additional Controls

	Work 60+ Hours	Hours
Main Controls	4.192***	0.228**
	(0.834)	(0.103)
(1) log weekly wage (1)	4.182***	0.211**
	(0.842)	(0.104)
(2) Occupation category dummies (20)	3.670***	0.256**
	(0.996)	(0.114)
(3) Industry category dummies (15)	3.300***	0.213**
	(1.265)	(0.099)
(4) Job contract type dummies (4)	2.867*	0.242**
	(1.528)	(0.104)

Note: All variables presented in Table 2 plus city fixed effects are included in all regressions. Figures in parentheses indicate number of variables introduced. IV effect of working 60+ hours is estimated using full information maximum likelihood. IV effect of hours is estimated using 2SLS. Sample size equals 3143 in all regressions. Standard errors in parentheses. *, ** and *** denote significance at .10, .05 and .01 levels.

Table A1: Description of Variables Used in Analysis

Variable	Description	Mean
Mental health problems	Aggregate GHQ score	0.376
Work hours	Average weekly hours worked	58.15
Work 60+ hours	Average weekly hours worked ≥ 60 (dv)	0.424
Home village wage	Daily rate of an unskilled laborer in hometown / 100	0.376
Proportion left village	Proportion of hometown labor force that migrated away	0.571
Male	Male (dv)	0.619
Age	Age	26.74
Married	Married (dv)	0.420
Divorced	Divorced (dv)	0.010
Number of children	Number of children	0.433
Education	Years of education	9.684
Years since migration	Years since migration	7.251
Number of friends	Number of people sent New Years good wishes	30.59
Height	Height measured in centimetres	166.7
Healthy	Good or excellent health (dv)	0.872
Mother healthy	Mother has good or excellent health (dv)	0.683
Father's healthy	Father has good or excellent health (dv)	0.714
Mother's education	Mother's years of education	2.115
Father's education	Father's years of education	2.464

Note: The abbreviation dv denotes a dummy variable.