Journal of Development Economics 145 (2020) 102472

Contents lists available at ScienceDirect

Journal of Development Economics

journal homepage: www.elsevier.com/locate/devec

Regular Article

Are spousal labor supplies substitutes? evidence from the workweek reduction policy in China

Yueyuan Ma, Xinzheng Shi *

ARTICLE INFO

JEL classification:
J22
J13
J18

Keywords:
Workweek reduction
Spousal labor supply
Substitutes

ABSTRACT

We estimate the effects of spousal labor supply on individuals' labor supply by using the implementation of China's 1994–1995 workweek reduction policy as a natural experiment. We find that a decrease in the labor supply of wives significantly increased that of husbands, but a decrease in the labor supply of husbands had an insignificantly negative effect on that of their wives. Furthermore, a decrease in the labor supply of one spouse reduced the amount of time spent on housework by the other one. Our findings on the negative relationship between spousal labor supplies differ from those derived from data from developed countries. We find evidence that different income levels may be the underlying reason.

1. Introduction

The study of the interdependency of spousal labor supplies is particularly important for developing countries. In these countries, active labor market policies (ALMPs) are commonly used to intervene in labor markets that are functioning inadequately (see McKenzie (2017) for a review). In such situations, disregarding the interdependency of spousal labor supplies may lead to bias while evaluating the aggregate effects of ALMPs. The reason is that this interdependency determines whether ALMPs targeting a particular population have spillover effects on an extensive set of individuals. Studying this interdependency is also interesting in itself because the majority of the population lives within family units.

However, whether one individual's labor supply will be positively or negatively affected by that of their spouse is difficult to predict. For example, a decrease in one spouse's labor supply increases the time that this spouse can allocate to non-market activities, such as housework and leisure. An increase in one spouse's housework time frees up the other spouse's housework time, but an increase in a spouse's leisure time could increase the other spouse's leisure time if the couple spend their leisure time together. Therefore, whether an individual's labor market time increases depends on whether the substitution effect of their spouse's housework time dominates the complementary effect of their spouse's leisure time. If the substitution effect dominates the complementary effect, then the decrease of one spouse's labor supply will increase the other's labor supply; otherwise, it will reduce the other's labor supply.

Given that no clear theoretical prediction regarding this interaction is currently possible, an empirical study of this issue should be conducted. However, such empirical investigations experience certain challenges. First, it is quite difficult to find independent variations in the labor supplies of individual family members, because both spouses are constantly subject to the same labor market conditions, and their labor supply decisions are jointly determined. Second, a change in an individual's labor supply constantly induces a change in income, which is also correlated with their spouse's labor supply. In the majority of the related cases, the correlations found between the labor supplies of couples cannot be interpreted as causalities.

Our study exploits a policy change that China introduced in 1994–1995, which mandated a reduction in the workweek for employed workers from six days to five, without a change in total wages.[1] This policy applied to individuals working for an employer but did not directly apply to self-employed workers. We use the introduction of this policy as a natural experiment to identify the effects of changes in one spouse's labor supply on the other's labor supply. To investigate whether a substitution effect exists in the housework time spent by each member of a couple, we also estimate the effect of each spouse's labor supply on the other's housework hours.

To facilitate our analysis, we use data from the China Health and Nutrition Survey (CHNS), which has collected detailed information on individual and household characteristics from a panel of individuals, particularly concerning their working hours and housework hours. We use data from 1993 to 1997 to construct an instrumental variable (IV),

* Corresponding author.
E-mail address: shixzh@sem.tsinghua.edu.cn (X. Shi).

[1] Therefore, this policy changed the hours worked across the week, so that the workers spent not only fewer total hours working, but also fewer days.

https://doi.org/10.1016/j.jdeveco.2020.102472
Received 5 August 2019; Received in revised form 25 February 2020; Accepted 14 March 2020
Available online 28 March 2020

which is the interaction between an indicator for being employed in 1993 and a dummy for 1997, for the endogenous spousal labor supply. Essentially, we compare changes in the weekly working hours and housework hours of individuals, whose spouses were employed in 1993 (therefore, affected by the policy change) with those whose spouses were self-employed in 1993 (therefore, unaffected by the policy change).

We find no effect of a spouse's weekly working hours on the probability for the other spouse to have a job. Thereafter, we focus on the sample of spouses with jobs, and we find that with a 1-h decrease in the spouse's weekly working hours, the working hours of husbands increased by 0.402 h, but the working hours did not significantly increase for wives. Unlike the results reported by Goux et al. (2014), our results show a negative interdependency in spousal labor supplies. We also find that a 1-h decrease in a spouse's weekly working hours led to a decrease of 0.413 housework hours for husbands and 0.358 h for wives.

We conduct several robustness checks to ensure the validity of our findings. For example, using data from 1989, 1991, and 1993, we find no difference between pre-existing time trends in the labor supply or the housework hours of individuals whose spouses were employed in 1993, versus those whose spouses were self-employed in 1993. We show that the possibility that the workweek reduction policy induced individuals to change their employment type (from being employed/self-employed to self-employed/employed) did not bias our estimates. Thereafter, we show that our results are not affected by concurrent events, such as the significant decline in township and village enterprises (TVEs) or reform of state-owned enterprises (SOEs).[2] We also show that the crowding out effects do not exist, and our results are robust if the propensity score matched sample is used.

We likewise explore the potential reason for the different findings between our study and that of Goux et al. (2014), which use French data. We find that for rich households, which are defined as those having an income per capita in the top 20 percentile in 1993, spousal labor supplies are complementary and they are substitutable for the remaining households. This result further substantiates the notion that the different economic development levels between China and France may explain these differing findings.

We then investigate whether the significantly negative effect of spousal labor supply on male's labor supply is dominated by an intensive or extensive margin. We find that when a spouse worked less, the probability of doing a second job increased for men, but the working hours in the primary job did not significantly change. Lastly, we also find that when a wife worked shorter hours in the labor market, her husband spent less time cooking and taking care of their children. When a husband worked shorter hours, his wife spent less time doing laundry.

Our study makes several contributions. First, this research is one of the few studies that identify a causal relationship between spousal labor supplies. Goux et al. (2014) exploit a similar policy change in France to identify the effects of spousal labor supply, and they find a positive relation between them. Unlike their findings, we determine a negative relationship between spousal labor supplies. Moreover, we substantiate the notion that the different economic development levels between China and France may be the underlying reason.

Second, previous studies have shown that the complementarity of spousal labor supplies provides an explanation for the difference in elasticity between individual- and macro-level labor supplies (Chetty et al., 2011a, b; Chetty, 2012; Goux et al., 2014). However, our discovery of a negative relationship between spousal labor supplies suggests that in developing countries, such as China, the gap in elasticity between the individual- and macro-level labor supplies may differ from that observed in developed countries.

Third, our study contributes to the literature investigating the interdependency between couples. These studies include those on the interdependency of labor supply (e.g., Ashenfelter and Heckman, 1974; Lundberg, 1988; Blau, 1998; Hamermesh, 2002; Goux et al., 2014) and on individual behaviors in response to spouses' change in work status (e.g., Cullen and Gruber, 2000; Gustman and Steinmeier, 2000; Berger et al., 2003; Gelber, 2014).

Fourth, to the best of our knowledge, our study is the first to examine this issue using data from a developing country.[3] Studying this issue has special importance for developing countries, where government-sponsored programs (including ALMPs) have become increasingly popular. Although McKenzie (2017) concludes that many ALMPs do not have significant effects on either employment or earnings, the literature has found that other programs have a positive effect on individuals' labor supply.[4] The aggregate effects of such programs would be reduced if negative interdependency exists between spousal labor supplies, such as that found by our study. Our findings suggest that governments should consider spousal interactions when formulating policies and evaluating the aggregate effects of their programs.

The remainder of this paper is organized as follows. Section 2 describes the evolution of China's workweek system. Section 3 introduces this study's theoretical framework. Section 4 presents the data used in this study. Section 5 outlines our empirical strategy. Section 6 presents this study's main findings. Section 7 provides the results of the various robustness checks. Section 8 investigates the channels. Lastly, Section 9 details our conclusions.

2. Historical evolution of workweek system in China

The first document regulating working time in China was the *Common Program of China's Political Consultative Conference*, which was issued in 1949 and specified that the daily working hours for all employees should be between 8 and 10 h.[5] Although no official rules specified the total working days per week, the statistics released by the Ministry of Labor show that six working days were commonly implemented.[6] Hu and Xie (2009) also confirm this standard, further noting that this workweek system lasted over 40 years.

In the mid-1990s, the Chinese central government started to investigate the possibility of a shorter workweek. One purpose was to improve worker productivity. The government also endeavored to devise a policy consistent with global standards as a means to signal China's openness to the world (Hu and Xie, 2009). On February 3, 1994, China's State Council released the *Regulations on Employees' Working Time*, which stipulates that employees need to work 8 h per day and 44 h per week (i.e., five and a half days per week).[7] This regulation was revised approximately one year after being implemented. On March 25, 1995, the State Council issued a new policy (i.e., *Decree No. 174 of the State Council*) that reduced the workweek to five days beginning on May 1, 1995.[8]

One feature of the workweek reduction policy was that its regulations

[2] TVEs are market-oriented public enterprises that operate under the purview of local governments based in townships and villages (https://en.wikipedia.org/wiki/Township_and_Village_Enterprises).

[3] Li and Zax (2003) use data from the China Urban Household Survey to estimate the labor supply's response to wages. Goldberg (2016) uses a field experiment approach to estimate the wage elasticity of working in the day labor market in rural Malawi. However, these studies do not consider interactions between couples.

[4] For example, Dinkelman (2011) finds that rural electrification significantly increases the working hours for men and women in South Africa.

[5] Article 32 of the *Common Program of the Chinese People's Political Consultative Conference* (see http://e-chaupak.net/database/chicon/1949/1949bilingual.htm).

[6] See pages 744–745 of the *Selected Documents on the Economy of People's Republic of China (1949–1952)*.

[7] The full text in Chinese can be found at http://law.npc.gov.cn/FLFG/flfgByID.action?txtid=2&flfgID=12007&showDetailType=QW.

[8] The full text in Chinese can be found at http://fgk.chinalaw.gov.cn/article/xzfg/199503/19950300268667.shtml.

Panel A. Males

Panel B. Females

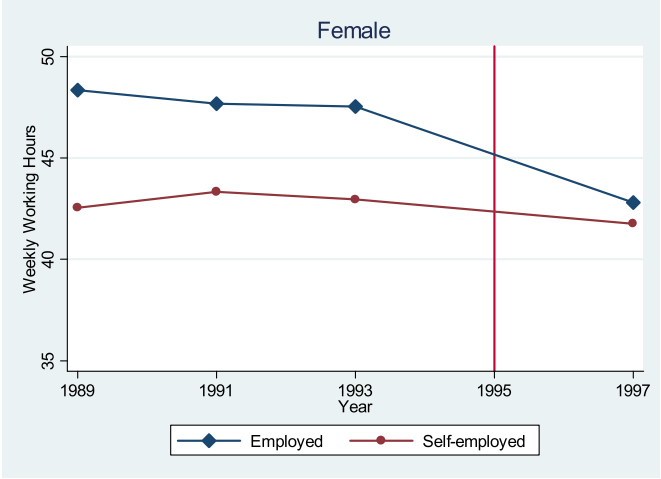

Fig. 1. Impact of workweek reduction policy on weekly working hours. Data source: CHNS.

applied only to formally employed workers (as opposed to self-employed ones). Moreover, note that this policy did not involve a change in total wages, as is illustrated by the details of the policies. To examine these two features, we first use data from CHNS to plot weekly working hours for employed workers against the hours for self-employed workers.[9] Fig. 1 shows this comparison. For men and women, the weekly working hours for employed workers was approximately 48 h in 1989, 1991, and 1993, but the hours decreased to approximately 40 in 1997. However, the weekly working hours for self-employed workers in these years remained unchanged. We also examine the impact of this policy change on individual income, and the findings are provided in the Online Appendix Part A. We find that compared with self-employed workers, this policy change did not have significant effects on the total wages from the primary jobs of employed workers.

3. Theoretical framework

We consider a household composed of a husband and a wife. They have one unit of time and can allocate it between market work and household activities. Market work consists of the primary and secondary jobs (i.e., the latter refers to all jobs other than the primary one). The primary job has a fixed working time and pays a fixed total income. It is consistent with our context, in which the regulation sets the daily working hours (i.e., 8 h per day) and weekly working days (i.e., 6 days before the policy change and 5 days after the policy change). Section 2 mentioned that the policy change did not alter individuals' total income from their primary job.[10] We assume that the secondary job has a flexible working time, and individuals are provided with a fixed wage rate. Household activities involve the husband's and wife's entire non-market time as inputs, and is a general term that includes housework and leisure. Spouses jointly derive utility from the consumption of market goods and household activities. Accordingly, the consumption of market goods is denoted as c and household activities as h. Moreover, h is produced by the couple's non-market time.

The fixed working time of the primary job of the husband and wife is denoted as e_m, e_f; total income from the primary job as Y_m, Y_f; working time of the secondary job as v_m, v_f; and non-market time as h_m, h_f. The husband and wife jointly determine consumption and time allocation to maximize the overall household utility $u(c, h)$.[11] The utility function satisfies $u_c^{'} > 0, u_h^{'} > 0, u_{cc}^{''} < 0, u_{hh}^{''} < 0, u_{hc}^{''} > 0$. The first four assumptions (i.e., $u_c^{'} > 0, u_h^{'} > 0, u_{cc}^{''} < 0, u_{hh}^{''} < 0$) indicate that the marginal utility from the consumption of market goods and household products is positive, but it decreases with the current quantity. These four assumptions are extensively applied. The last assumption (i.e., $u_{hc}^{''} > 0$) implies that the marginal utility derived from household activities increases with consumption (or income) level.[12] Intuitively, richer couples value household activities more. This result is consistent with the literature's empirical findings (Robinson and Godbey, 1999; Jara-Diaz et al., 2008). Husbands and wives input their time to produce household product h using a production function $H(h_m, h_f)$, which is assumed to be increasing in inputs ($H_m, H_f > 0$) and concave. This assumption is also commonly applied.

The household maximization problem is presented as follows:

$$\max_{\{c, v_m, v_f,\ h_m, h_f\}} u(c, h),$$

$$c = Y_m + Y_f + w_m v_m + w_f v_f,$$

$$h = H(h_m, h_f),$$

$$e_m + v_m + h_m = 1,$$

$$e_f + v_f + h_f = 1.$$

The first-order conditions of the problem with respect to h_m and h_f are as follows:

$$u_c^{'}(-w_m) + u_h^{'} H_m^{'} = 0, \# \quad (1)$$

$$u_c^{'}(-w_f) + u_h^{'} H_f^{'} = 0. \# \quad (2)$$

Equations (1) and (2) jointly determine the optimal time allocation (h_m^*, h_f^*).

We take the derivative regarding e_f for Equation (1) and regarding e_m for Equation (2). Accordingly, we obtain the following results (the details of these results are presented in the Online Appendix Part B):

$$\frac{\partial h_m}{\partial e_f} = \beta_m \frac{\partial h_f}{\partial e_f} + Constant_m, \# \quad (3)$$

[9] Section 3 provides a detailed description of CHNS.

[10] Note that hourly wage mechanically increased after the policy since working hours were reduced, while total income did not change.

[11] For simplicity, we consider a unitary household model to deliver our main results, as in Greenwood (2018).

[12] Households spend all income on consumption. Hence, consumption level is equivalent to the income level.

$$\frac{\partial h_f}{\partial e_m} = \beta_f \frac{\partial h_m}{\partial e_m} + Constant_f, \# \tag{4}$$

where

$$\beta_m = \frac{-u_{cc}^{''} w_m w_f + w_m u_{hc}^{''} H_f^{'} + w_f u_{hc}^{''} H_m^{'} - u_{hh}^{''} H_f^{'} H_m^{'} - u_h^{'} H_{mf}^{''}}{w_m^2 u_{cc}^{''} - 2 w_m u_{hc}^{''} H_m^{'} + u_{hh}^{''} H_m^{'2} + u_h^{'} H_{mm}^{''}},$$

$$\beta_f = \frac{-u_{cc}^{''} w_m w_f + w_f u_{hc}^{''} H_m^{'} + w_m u_{hc}^{''} H_f^{'} - u_{hh}^{''} H_f^{'} H_m^{'} - u_h^{'} H_{mf}^{''}}{w_f^2 u_{cc}^{''} - 2 w_f u_{hc}^{''} H_f^{'} + u_{hh}^{''} H_f^{'2} + u_h^{'} H_{ff}^{''}},$$

The two first-order conditions (i.e., Equations (1) and (2)) can be regarded as the best response of h_m to h_f (h_f to h_m) and the exogeneous variables (e_m, e_f). Thus, these two equations can be expressed respectively as $h_m = F(h_f, e_m, e_f)$, $h_f = G(h_m, e_m, e_f)$. Thereafter, $\frac{\partial h_m}{\partial e_f} = \frac{\partial h_f}{\partial h_f}\frac{\partial h_f}{\partial e_f} + F_3$, $\frac{\partial h_f}{\partial e_m} = \frac{\partial h_f}{\partial h_m}\frac{\partial h_m}{\partial e_m} + G_3$. Therefore, β_m and β_f are equivalent to $\frac{\partial h_m}{\partial h_f}$ and $\frac{\partial h_f}{\partial h_m}$, respectively. We are aware that $\frac{\partial h_m}{\partial h_f} = \frac{\partial(1-h_m)}{\partial(1-h_f)}$, $\frac{\partial h_f}{\partial h_m} = \frac{\partial(1-h_f)}{\partial(1-h_m)}$, and $(1 - h_m)$ and $(1 - h_f)$ represent the market time of the husband and wife. Thus, β_m and β_f capture the effect of spousal market working time on one's own market working time, which is what we are interested in.

We have the following propositions.

Proposition 1. *When the non-market time of spouses are not complementary, a decrease in a spouse's market working time leads to an increase in one's own market working time.*

Proof. *See Online Appendix Part B.*

Proposition 2. *When the non-market time of spouses are complementary, a decrease in a spouse's market working time possibly leads to a decrease in one's own market working time. This is more likely to happen for high-income households.*

Proof. *See Online Appendix Part B.*

Intuitively, if the spouse's market time decreases, then they can spend more on non-market activities, including housework and leisure. On the one hand, when one's spouse spends more time on housework, one can spend less time on housework. The reason is that the total amount of housework is often fixed, such that the time spent by two spouses is substitutable, which is supported by the results of our empirical analysis.[13] On the other hand, when one's spouse spends more time on leisure, their own resultant change in leisure time depends on whether the time spent on leisure by the couple is substitutable or complementary. If spousal leisure time is substitutable, then the increase of one's spouse's time on leisure leads to the reduction of one's own time spent on leisure. That is, a spouse's non-market time is not complementary with one's own non-market time. Therefore, the decrease of the spouse's market time increases the time spent on non-market activities, thereby leading to a decrease in one's own non-market time and increase of their market time. This situation is predicted by Proposition 1. However, if spousal time spent on leisure is complementary, then we need to compare whether this complementary effect is stronger than the substitution effects of their time spent on housework. If the substitution effect is stronger, then we can derive that the spousal non-market time is not complementary. Therefore, the prediction of Proposition 1 remains.

By contrast, if the complementary effect of spousal leisure time is stronger, then we can infer that the spousal non-market time is complementary. Therefore, we have the outcome predicted in Proposition 2. Given that richer households value household activities more (Robinson and Godbey, 1999; Jara-Diaz et al., 2008), the complementary effect of their spousal leisure time is expected to be stronger, leading to the complementarity in the spousal non-market time. Thus, the decrease of a spouse's market time is more likely to lead to the decrease of the other's market time in richer households, as predicted by Proposition 2 as well.

4. Data

Our main analysis adopts data from CHNS, which was conducted by the Carolina Population Center of the University of North Carolina at Chapel Hill and National Institute for Nutrition and Health of the Chinese Center for Disease Control and Prevention. This survey covers nine provinces that vary substantially in geography and economic development.[14] A multistage random cluster process was used to draw the samples from each province. This survey started in 1989 and has collected economic, health, and time-allocation information on individuals from mostly the same households every two to four years.[15]

We focus on the survey waves of 1993 and 1997 because they are the closest surveys taken before and after the enforcement of the workweek reduction policy. In our robustness check of the validity of our empirical strategy, we also use data from the survey waves of 1989 and 1991. However, we do not use the data after 1997.[16]

We construct balanced panels of males and females, whose spouses were either employed or self-employed in 1993 and 1997 (as in Goux et al. (2014)). Our final sample includes 1288 males and 1286 females. In this sample, 145 males and 143 females did not have a job in either 1993 or 1997. Therefore, the sample includes 1143 males and females who had jobs in 1993 and 1997.

The most important outcome variables in our study are weekly working hours and weekly housework hours. CHNS collected information on the number of hours worked during the week prior to the survey by employed workers and self-employed workers.[17] CHNS also collected information on the number of hours spent in the prior week doing housework activities, separately for each spouse. The housework activities include buying food, cooking food, washing clothes, and taking care of children.[18] The weekly housework hours are the summations of all time spent on these four activities.

Our main identification variable is employment type and is constructed as follows. We define an individual as "employed by others" if their primary occupation in 1993 was working for other persons or enterprises. We define an individual as "self-employed" if their primary occupation in 1993 was as a self-employed owner-manager with

[13] We find a negative relation between one's time on housework and spousal working hours. We also find that the policy reduced one's working hours but increases their housework hours, suggesting a negative relation between one's working hours and housework hours. The combination of these two findings suggests a negative relation between spousal time spent one housework. See Section 6.2.

[14] The nine provinces are Liaoning, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi, Guizhou, and Heilongjiang.

[15] Additional information on CHNS can be found on its website: http://www.cpc.unc.edu/projects/china.

[16] Our main reason for excluding the data after 1997 is the state-owned enterprise (SOE) reform in 1998. Two concerns are noted on this reform. On the one hand, many SOE workers were laid off during this period (see Hsieh and Zheng (2015)), thereby reducing labor supplies. On the other hand, anecdotal evidence has shown that during the SOE reform period, SOE workers did not work for full time even if they remained employed. That is, these workers' labor supplies were also reduced. Both concerns constitute the confounding effects of the policy under study. In addition, CHNS did not conduct survey every year. After 1997, CHNS collected data in 2000, 2004, 2006, 2009, 2011, and 2015. Therefore, data attrition is also a concern. Given that our main research question aims to test whether spousal labor supplies are complementary or substitutable, we are convinced that the benefits from extending data to additional post-policy years cannot cover the costs it may bring. Therefore, we decide not to use the data after 1997.

[17] The following question was asked in CHNS: "In the last week, how many hours did [you] work?"

[18] For example, the questions asked for buying food are as follows: "In the past week, did you buy food for your household?" and "How much time did [you] spend buying food (minutes)?"

Table 1
Summary statistics.

	Male				Female			
	1993		1997		1993		1997	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Having a job	1	0	0.985	0.121	1	0	0.925	0.263
Employed	0.326	0.469	0.311	0.463	0.253	0.435	0.233	0.423
Spouse having a job	1	0	1	0	1	0	1	0
Spouse employed	0.235	0.424	0.238	0.426	0.360	0.480	0.342	0.474
Weekly working hours	42.115	22.339	40.471	21.096	43.263	22.269	41.864	21.448
Spouse weekly working hours	43.232	22.381	41.766	21.387	42.539	21.556	40.707	20.932
Weekly housework hours	3.761	8.599	3.263	7.221	22.113	18.777	18.630	13.362
Spouse weekly housework hours	22.113	18.820	18.193	12.792	3.656	8.573	3.098	6.950
Annual income (yuan)	4929.594	5266.060	6967.770	7026.428	4156.253	4249.391	5321.395	4887.343
Spouse annual income (yuan)	4087.748	4116.408	5396.773	5221.045	4833.259	5073.735	6708.998	5879.546
Age	38.885	8.200	42.885	8.200	37.616	7.870	41.616	7.870
Spouse age	37.227	7.897	41.227	7.897	39.304	8.190	43.304	8.190
Family size	4.852	1.469	4.811	1.485	4.816	1.431	4.771	1.449
Ratio of 0–6 year-old male members	0.063	0.110	0.025	0.071	0.062	0.110	0.024	0.070
Ratio of 7–18 year-old male members	0.135	0.148	0.144	0.152	0.134	0.149	0.140	0.152
Ratio of 19–60 year-old male members	0.289	0.109	0.318	0.134	0.291	0.110	0.324	0.137
Ratio of above 60 year-old male members	0.019	0.055	0.019	0.055	0.019	0.055	0.018	0.055
Ratio of 0–6 year-old female members	0.049	0.103	0.019	0.061	0.048	0.102	0.019	0.062
Ratio of 7–18 year-old female members	0.117	0.144	0.121	0.147	0.116	0.145	0.118	0.148
Ratio of 19–60 year-old female members	0.297	0.110	0.322	0.126	0.297	0.111	0.325	0.128
Ratio of above 60 year-old female members	0.031	0.069	0.032	0.072	0.032	0.070	0.031	0.072
Number of observations	1288		1288		1286		1286	

employees, or as a self-employed independent operator without employees. In our study, 303 wives (24%) of 1288 males and 463 husbands (36%) of 1286 females were employed in 1993. Only a few of them changed their employment types (i.e., 28 wives of the 1288 males and 56 husbands of the 1286 females) from 1993 to 1997.

Table 1 presents the summary statistics for the main variables in the sample for 1993 (i.e., before the reform) and 1997 (i.e., after the reform). Columns 1 to 4 are for the males and columns 5 to 8 are for females. On average, the males were slightly older than the females. The average family size was approximately five. Given the space limitations, we do not describe the demographic structure variables in detail. Table 1 provides this information.

Table 1 shows that on average, the males worked nearly the same time as the females, but the former spent much less time on housework in 1993 and 1997. To provide additional details, Table 2 lists the summary statistics of weekly working hours and housework hours by year (i.e., 1993 versus 1997) and employment type (i.e., employed versus self-employed). Evidently, the weekly working hours of self-employed males remained nearly the same between 1993 and 1997 (i.e., approximately 39 h), but the weekly working hours of employed males decreased from 50 h to 43 h. The weekly working hours of self-employed females were also similar between 1993 and 1997 (i.e., 42 and 41 h in 1993 and 1997, respectively). However, the weekly working hours for employed females decreased from 48 h in 1993 to 43 h in 1997. Table 2 shows that males spent far fewer hours on housework than females. In both survey years, the weekly housework hours were approximately 3 and 4 h for self-employed and employed males, respectively. By contrast, self-employed females spent 24 and 20 h per week on housework in 1993 and 1997, respectively, while employed females spent 17 and 14 h in 1993 and 1997, respectively.

Table 2
Weekly working hours and housework hours by employment type and year.

		Weekly Working Hours		Weekly Housework Hours	
		Mean	S.D.	Mean	S.D.
Male					
1993	Self-employed	38.561	24.944	3.409	8.528
1997	Self-employed	39.027	23.333	2.618	5.980
1993	Employed	49.552	11.867	4.414	8.546
1997	Employed	42.871	15.099	4.452	8.955
Female					
1993	Self-employed	42.007	24.994	23.956	19.820
1997	Self-employed	41.489	23.548	19.629	13.303
1993	Employed	48.150	10.677	16.719	14.150
1997	Employed	42.905	11.876	14.022	10.895

Note: This table uses male and female samples having jobs.

5. Empirical strategy

We start with the following linear regression:

$$Y_{it} = \alpha_i + Year_{97} + \beta_1 * SWH_{it} + \beta_2 * X_{it} + \beta_3 * Employed_{i93}^{own} * Year_{97} + \varepsilon_{it}, \quad (5)$$

where Y_{it} is a vector of the outcome variables for individual i in year t; α_i is the individual fixed effect, which absorbs any individual-level time-invariant factors; $Year_{97}$ is a year dummy for 1997 to control for any time-specific shocks; SWH_{it} is the weekly working hours of the spouse of individual i in year t; β_1, which is the coefficient of SWH_{it}, is of most interest in our study; and X_{it} is a vector of several variables, including family size, household demographic structure, age squared, and spousal age squared.[19] To absorb the effects of the policy change on an individual's working and housework hours, we include the interaction of an indicator for being employed in 1993 and the 1997 dummy, $Employed_{i93}^{own} * Year_{97}$, into the regression. Moreover, ε_{it} is an error term with a mean equal to 0. Standard errors are calculated by clustering over the community level.[20]

The ordinary least squares (OLS) estimates of Equation (5) are biased because some omitted variables (such as common preferences) are correlated with spousal working hours, and such variables also affect the outcome variables. The policy introduced in 1994–1995 reduced the workweek of employees from six days to five but did not affect the working hours of self-employed workers. This policy was implemented

[19] The demographic structure includes the ratios of male family members aged 0–6, 7–18, 19–60, and over 60, and the same ratios for female family members. The ratio of female family members aged over 60 is omitted to avoid collinearity. As age and spousal age are collinear with the individual fixed effect and the year dummy, we control for age squared and spousal age squared in the regressions.

[20] Our sample has 130 communities.

by the government. Thus, it was beyond the control of individuals. Accordingly, this change provides a good natural experiment that facilitates the construction of our IV. The IV used in our study is $Employed_{i93}^{spouse} * Year_{97}$, which is the interaction of the indicator for a spouse being employed in 1993 ($Employed_{i93}^{spouse}$) and the 1997 dummy ($Year_{97}$). Essentially, we compare the changes in the working and housework hours from 1993 to 1997 for individuals whose spouses were employed in 1993 (i.e., working hours were exogenously reduced by the policy) and those whose spouses were self-employed in 1993 (i.e., unaffected by the policy).

Two conditions need to hold for the IV strategy to be valid. First, IV should be highly correlated with the endogenous variable. We check this condition in Section 6.2.3. Second, the exclusion condition should hold. That is, IV cannot correlate with the error term. Several concerns are related to the idea that the exclusion condition could not hold.

One concern with this IV strategy is that the working and housework hours of individuals whose spouses were employed in 1993 may have followed different time trends from those whose spouses were self-employed in 1993 if the policy had not existed. That is, our IV may correlate with pre-existing time trends, thereby leading to biased estimates. To address this concern, we use data from 1989, 1991, and 1993 to test the presence of different pre-existing time trends (see Section 7.1).

The second concern is that the workweek reduction policy could have induced individuals to change their employment type (i.e., from being employed/self-employed to self-employed/employed), and such change could induce bias into our estimates. For example, if a spouse changed from being employed in 1993 to self-employed in 1997, our estimates would be downward biased. However, this possibility should not be a serious issue because only a few individuals in our sample changed their employment type (i.e., 28 wives of the 1288 males and 56 husbands of the 1286 females). To address this concern, we conduct a robustness check using individuals whose spouses did not change their employment type (see Section 7.2).

The third concern is that the effects of this policy may have been contaminated by the effects of other events in the same period, thereby leading to bias in the estimates. One event was the substantial decline in TVEs in 1995–1996 (see Huang, 2008), which may have caused many employees to lose their jobs or become self-employed. Accordingly, such a change could lead to bias in our estimates. Therefore, we use the aforementioned strategy to address this concern as well.

Another event that could potentially affect our results was the SOE reform, which shut down or privatized many small- and medium-sized SOEs and laid off their workers. This reform is not a huge issue for our study because it started in 1998 (Hsieh and Zheng, 2015), which is one year after our post-reform year of 1997. However, a concern remains that SOE workers could have experienced reduced working hours in 1997 in anticipation of the upcoming SOE reform. For example, among individuals whose spouses were employed by SOEs in 1993, the reduction of the spouses' working hours could have been larger than that induced by the workweek reduction policy. Such a change would cause an upward bias in our estimates. To address this concern, we investigate whether a greater reduction in working hours for SOE workers was noted compared with that for other employed workers (see Section 7.3).[21]

Another concern is that if employees spent their extra time after the policy change on self-employed work, this could have resulted in the crowding out of existing self-employed workers, consequently reducing their working hours as well. In this sense, our estimates could be biased. To address this concern, we exclude individuals whose spouses were employed but had weekly working hours of over 40 in 1993. Employed spouses whose weekly working hours were not over 40 in 1993 should not be affected by the policy. However, if the crowding out effect existed, the working hours of self-employed spouses would have decreased. Then, we should observe effects on individuals whose spouses were self-employed, compared with those with employed spouses having weekly working hours not over 40. Section 7.4 shows the results.

Table 3
First stage: Impact of workweek reduction policy on labor supply.

	(1)	(2)	(3)	(4)
Dependent Variable: Spouse Weekly Working Hours				
	Male Sample		Female Sample	
Spouse employed in 1993*Year1997	−7.234***	−6.290***	−9.198***	−8.916***
	(1.496)	(1.406)	(1.457)	(0.980)
Employed in 1993*Year1997	1.274*	0.400	2.226	2.530*
	(0.635)	(0.793)	(1.853)	(1.432)
Year 1997	16.933***	17.806***	8.328***	9.024***
	(1.830)	(2.204)	(2.623)	(1.499)
Age squared	−0.018	0.004	−0.042***	−0.029**
	(0.015)	(0.012)	(0.012)	(0.014)
Spousal age squared	−0.035***	−0.061***	0.017	0.000
	(0.012)	(0.010)	(0.012)	(0.016)
Constant	94.749***	95.721***	61.293***	61.328***
	(6.072)	(7.386)	(14.356)	(5.714)
Observations	2576	2286	2572	2286
R-squared	0.575	0.589	0.588	0.580
F for weak IV	23.37	20.01	39.83	82.74

Robust standard errors in parentheses are calculated by clustering over community. ***p < 0.01, **p < 0.05, *p < 0.1.
Note: In all regressions, individual fixed effects are controlled. Household demographic structure, including family size, ratios of male family members aged 0–6, 7–18, 19–60, 60 plus, and ratios of female family members aged 0–6, 7–18, 19–60 are also included in all regressions. Ratio of female family members aged above 60 is omitted to avoid collinearity. Columns (1) and (3) use samples with and without jobs and therefore are first stage results for Table 4; Columns (2) and (4) use samples with jobs and therefore are first stage results for Table 5.

6. Results

6.1. Impact on the probability of having a job

We first investigate the impact of spousal labor supplies on the probability of having a job by focusing on the IV estimates.[22]

The first-stage results for the male and female samples are shown in columns 1 and 3, respectively, of Table 3. Evidently, the coefficients of the interaction between the dummy for a spouse employed in 1993 and the year 1997 dummy are −7.234 and −9.198, respectively, both of which are significant at the 1% level. The *F*-values of the test for the weak IV are 23.37 and 39.83, both of which exceed the conventional threshold. These results show that the policy significantly reduced the weekly working hours.

Table 4 shows the IV estimates for the impact of spousal labor supply on the probability of having a job. The coefficients of the spousal labor supply are not significant for the male or female sample. The magnitudes are also small, which are equal to 0.002 and −0.000 for the male and female samples, respectively. These results show that the impact of the spousal labor supply on the probability of having a job is negligible. Therefore, the remainder of our analysis will focus on individuals who had jobs.

6.2. Impact on the weekly working and housework hours

6.2.1. Graphical results

We plot the average weekly working hours and housework hours for the male and female samples in Fig. 2. Panels A and B show the working and housework hours, respectively, for the male sample. Panels C and D show the working and housework hours, respectively, for the female

[21] SOE workers include individuals employed by state institutes because CHNS does not differentiate between these two types of workers.

[22] The OLS results are shown in the Online Appendix Part C Table B.

Table 4
Impact of spousal working hours on own work status.

	(1)	(2)
Dependent variable	Having a job	
	Male	Female
Spousal working hours (Spouse employed in 1993*Year1997 as an IV)	0.002	−0.000
	(0.001)	(0.002)
Employed in 1993*Year1997	−0.009	−0.132***
	(0.006)	(0.011)
Year1997	0.006	0.174***
	(0.014)	(0.035)
Age squared	−0.000	−0.001**
	(0.000)	(0.000)
Spousal age squared	0.000	0.000
	(0.000)	(0.000)
Constant	0.952***	2.232***
	(0.154)	(0.215)
Observations	2576	2572

Robust standard errors in parentheses are calculated by clustering over community. ***p < 0.01, **p < 0.05, *p < 0.1.
Note: In all regressions, individual fixed effects are controlled. Household demographic structure, including family size, ratios of male family members aged 0–6, 7–18, 19–60, 60 plus, and ratios of female family members aged 0–6, 7–18, 19–60 are also included in all regressions. Ratio of female family members aged above 60 is omitted to avoid collinearity.

sample. In each graph, we separately plot the working and the housework hours for individuals whose spouses were employed or self-employed in 1993.

First, no difference exists in the pre-existing time trends of working or housework hours between individuals whose spouses were employed or self-employed in 1993 (before the policy change) for the male and female samples. It provides evidence for the validity of our identification.

Second, Panel A shows that the weekly working hours of individuals whose spouses were employed or self-employed decreased after the policy change. This decline may have happened because some individuals in each of these groups were employed in 1993 and were affected by the policy change as well. In our regressions, we control for whether individuals were employed in 1993 (interacted with a year 1997 dummy) to address this concern. However, the working hours of individuals whose spouses were employed in 1993 decreased less than the hours worked by individuals whose spouses were self-employed in 1993. This finding shows that individuals whose spouses were employed in 1993 may have responded to the policy change by working more. In this case, spousal labor supplies can be negatively correlated. Panel B shows that time spent on housework by males with spouses employed in 1993 decreased more. This pattern shows that when their spouses have more time to spend on housework, males tend to reduce the time they spend on housework.

Third, Panel C shows a decrease in the working hours of females whose spouses were employed or self-employed in 1993. However, the

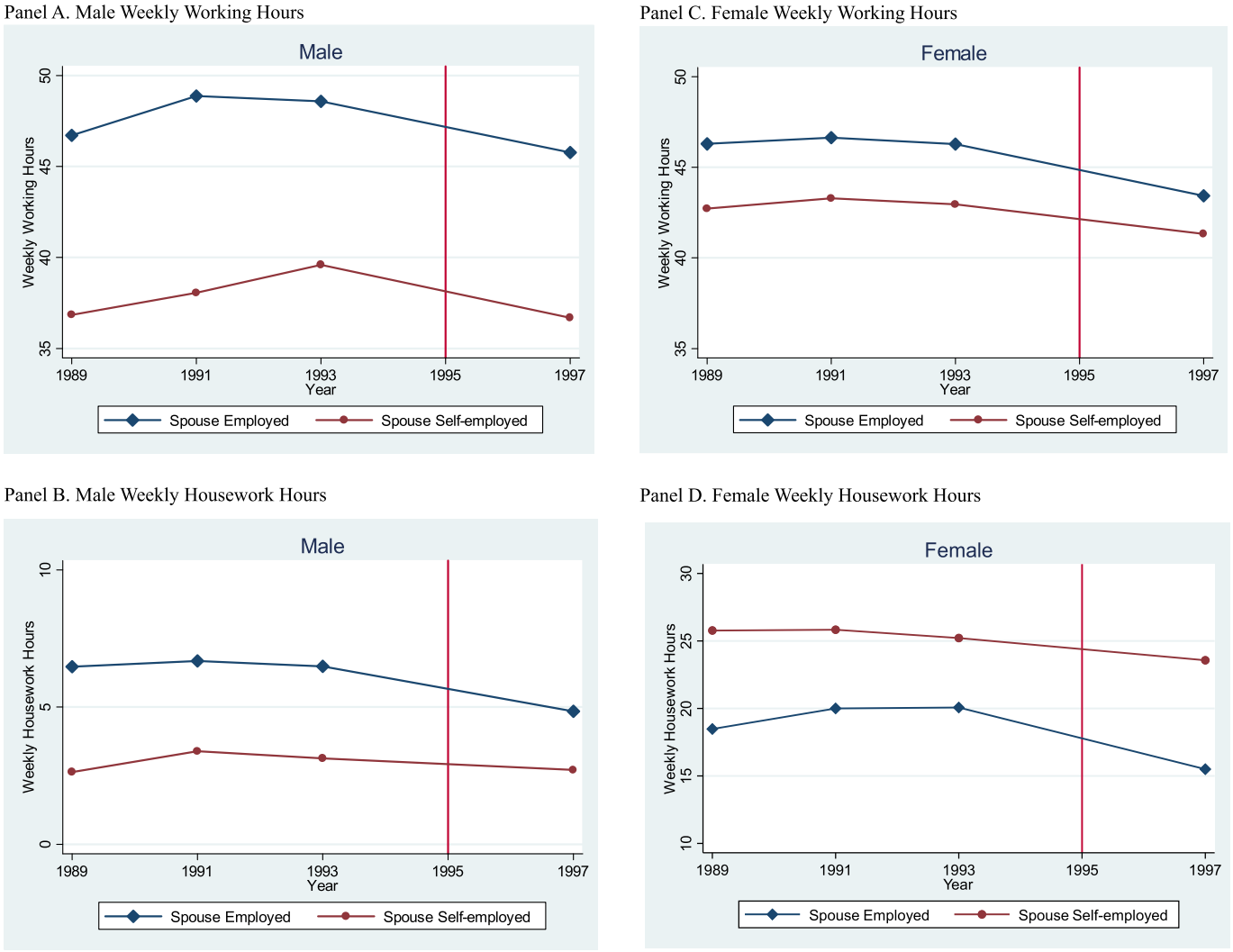

Fig. 2. Impact of Spouse's employment type on weekly working hours and housework hours. Data source: CHNS.

working hours of females whose spouses were employed decreased no more than the hours worked by women whose spouses were self-employed. This set of findings suggest that the negative response of females' working hours to their spouses was not as strong as that of the males' working hours to theirs. Panel D shows an evident decrease in the housework hours of females whose spouses were employed in 1993, compared with those whose spouses were self-employed in 1993. This pattern shows that females tend to spend less time on housework when their husbands have more time to do housework.

Although Fig. 2 provides visual results, we cannot control for other variables in graphs. Therefore, we rely on the following regression results.

6.2.2. OLS results

We use the sample of individuals having a job to first estimate Equation (5) using OLS. The results are shown in the Online Appendix Part C Table C. The coefficient for the weekly spousal working hours is 0.520 for the male sample, which is significant at the 1% level (column 1). However, the effect of the wives' working hours on their husbands' housework hours is an insignificant −0.005 (column 2). Columns 3 and 4 show the coefficients reflecting the effects of husbands' weekly working hours on their wives' weekly working hours and their hours spent doing housework, which are 0.522 and 0.045, respectively, and significant at the 1% level. However, we rely on the results estimated using the IV strategy because the OLS results are biased owing to the endogeneity problem.

6.2.3. IV results

The first stage results for individuals who had jobs are shown in columns 2 and 4 of Table 3. In the male and female samples, the coefficients of the dummy for a spouse employed in 1993 and the 1997 dummy are −6.290 (for the male sample in column 2) and −8.916 (for the female sample in column 4), both of which are significant at the 1% level. The *F*-values for the weak IV are 20.01 and 82.74, respectively. These results also show that the new policy reduced the weekly working hours of employed workers.

Table 5 shows the IV results. Columns 1 and 2 depict the male sample, and columns 3 and 4 depict the female sample. Spousal working hours show a negative effect of −0.402 on the males' working hours, with significance at the 10% level. This finding implies that for each 1-h decrease in their spouses' working hours, the males' working hours increased by 0.402 h. Column 2 shows that the coefficient of spousal working hours is 0.413 for males' housework hours. That is, a 1-h decrease in the working hours of wives decreased the males' time spent on housework by 0.413 h, with significance at the 1% level. This result also suggests that the decrease in their wives' working hours increased the males' leisure time by 0.011 h (0.413 minus 0.402). Columns 3 and 4 show the results for the female sample. Evidently, the husbands' working hours had a negative effect on their wives' working hours, although it is not precisely estimated. However, the husbands' working hours had a significant positive effect on their wives' housework hours, with a coefficient of 0.358.

Apart from the preceding results, Table 5 shows the direct effects of the new policy on the working and housework hours of males and females. For males, the coefficients for the interaction of their employment status in 1993 and the 1997 dummy are −8.755 for working hours (column 1) and 2.483 for housework hours (column 2), with both coefficients being significant at the 1% level. For females, the coefficients are −6.176 for working hours (column 3) and 3.494 for housework hours (column 4), with significance at the 1% and 5% levels, respectively. These results show that for males and females who were employed in 1993, the policy reduced their working hours but increased their housework hours, suggesting a negative relation between one's working hours and time spent on housework. Combined with the finding shown above that the decrease of spousal working hours decreases one's own housework hours, we can derive that time spent on housework by spouses is substitutable.

Table 5
Effect of spousal working hours on own working and housework hours: IV.

Dependent variables (per week)	(1) Male Sample	(2) Male Sample	(3) Female Sample	(4) Female Sample
	Working hours	Housework hours	Working hours	Housework hours
Spousal working hours (Spouse employed in 1993*Year1997 as an IV)	−0.402*	0.413***	−0.045	0.358***
	(0.212)	(0.144)	(0.063)	(0.102)
Employed in 1993*Year1997	−8.755***	2.483***	−6.176***	3.494**
	(0.720)	(0.472)	(0.994)	(1.410)
Year1997	16.186***	−9.927***	18.211***	−13.727***
	(3.399)	(2.063)	(1.860)	(0.988)
Age squared	0.002	0.011**	−0.062***	0.068***
	(0.015)	(0.005)	(0.008)	(0.008)
Spousal age squared	−0.053**	0.020**	0.004	−0.027***
	(0.023)	(0.008)	(0.009)	(0.008)
Constant	119.628***	−87.558***	120.675***	−57.184***
	(19.625)	(23.566)	(11.962)	(19.617)
Observations	2286	2212	2286	2110

Note: In all regressions, individual fixed effects are controlled. The household demographic structure, including family size, the ratios of male family members aged 0–6, 7–18, 19–60, and 60 plus, and the ratios of female family members aged 0–6, 7–18, and 19–60 are also included in all regressions. The ratio of female family members aged above 60 is omitted to avoid collinearity.

6.2.4. Reduced form results

The results from the reduced form regressions (see Table 6) confirm our findings. Columns 1 and 2 show the results for men. The coefficient for the interaction of a spouse's employment status in 1993 and the 1997 dummy is 2.530 for working hours (with significance at the 10% level) and −2.388 for housework hours (with significance at the 1% level). The results for the female sample are presented in columns 3 and 4. For working hours, the coefficient on the interaction of a spouse's employment status in 1993 and the 1997 dummy is 0.400, but this coefficient is not significant. For housework hours, the coefficient is −3.253, with

Table 6
Effect of spousal working hours on own working and housework hours: Reduced form.

Dependent variables (per week)	(1) Male Sample	(2) Male Sample	(3) Female Sample	(4) Female Sample
	Working hours	Housework hours	Working hours	Housework hours
Spouse employed in 1993*Year1997	2.530*	−2.388***	0.400	−3.253***
	(1.432)	(0.842)	(0.793)	(1.061)
Employed in 1993*Year1997	−8.916***	2.545***	−6.290***	4.504**
	(0.980)	(0.686)	(1.406)	(2.022)
Year1997	9.024***	−3.183	17.806***	−11.107***
	(1.499)	(2.101)	(2.204)	(2.274)
Age squared	0.000	0.008	−0.061***	0.058***
	(0.016)	(0.008)	(0.010)	(0.013)
Spousal age squared	−0.029**	0.002	0.004	−0.026*
	(0.014)	(0.011)	(0.012)	(0.015)
Constant	61.328***	−33.384**	95.721***	−36.620
	(5.714)	(15.182)	(7.386)	(25.894)
Observations	2286	2212	2286	2110
R-squared	0.580	0.607	0.589	0.605

Robust standard errors (in parentheses) are calculated by clustering over community. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Note: In all regressions, individual fixed effects are controlled. The household demographic structure, including family size, the ratios of male family members aged 0–6, 7–18, 19–60, and 60 plus, and the ratios of female family members aged 0–6, 7–18, and 19–60 are also included in all regressions. The ratio of female family members aged above 60 is omitted to avoid collinearity.

significance at the 1% level.

These results indicate that males whose wives were employed in 1993 (and affected by the new policy) increased their working hours but reduced their housework hours. By contrast, the females whose husbands were affected by the policy did not reduce their working hours, but they also decreased their housework hours.

6.2.5. Exploring variation from different working hour reductions

In the main analysis, we compare individuals with employed (i.e., affected by the policy change) and self-employed (i.e., unaffected by the policy change) spouses in 1993. However, individuals with employed spouses could be affected differently depending on their spouses' working hours in 1993. For example, the reduction of working hours for a spouse who worked 48 h is different from that who worked 45 h in 1993. To investigate this issue, we calculate reduced weekly working hours as weekly working hours in 1993 minus 40 if weekly working hours exceeded 40, and 0 otherwise. The reduced weekly working hours for self-employed spouses equaled 0 as well. Thereafter, we regress weekly working hours and housework hours on the interaction of spousal reduced working hours and the 1997 dummy, thereby controlling for the same variables used in Equation (5). The results are reported in Table 7. Evidently, the coefficient of this interaction is significantly positive for the male sample (column 1), which means that the more the working hours of their wives were reduced, the more the males worked. This finding is consistent with our previous finding that male working hours are substitutes to their wives' working hours. Columns 2 and 4 also show that the coefficients of the interaction term are significantly negative, which means that the more a spouse's working time was reduced, the less time the other spent on housework. This result is also consistent with our previous finding shown in Table 5. Moreover, this finding substantiates the notion that our main results are not completely driven by the difference (other than whether affected by the policy) between individuals whose spouses were employed and individuals whose spouses were self-employed. Otherwise we would not have observed the effects of the amount of reduced working hours.

Table 7
Impact of spouses' reduced working time.

	(1)	(2)	(3)	(4)
Dependent variables (per week)	Male Sample		Female Sample	
	Working hours	Housework hours	Working hours	Housework hours
Spouse reduced working time*Year 1997	0.141**	−0.192***	0.064	−0.228***
	(0.056)	(0.066)	(0.086)	(0.033)
Employed in 1993*Year1997	−7.972***	1.987***	−6.368***	3.271**
	(0.623)	(0.490)	(1.298)	(1.438)
Year1997	9.370***	−3.414*	17.785***	−11.064***
	(1.277)	(1.838)	(2.215)	(2.148)
Age squared	0.000	0.008	−0.061***	0.059***
	(0.016)	(0.008)	(0.010)	(0.012)
Spousal age squared	−0.030**	0.003	0.004	−0.028*
	(0.015)	(0.010)	(0.013)	(0.014)
Constant	62.220***	−33.760**	95.647***	−35.645
	(5.689)	(15.121)	(7.368)	(25.303)
Observations	2286	2212	2286	2110
R-squared	0.579	0.607	0.589	0.605

Robust standard errors (in parentheses) are calculated by clustering over community. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Note: In all regressions, individual fixed effects are controlled. The household demographic structure, including family size, the ratios of male family members aged 0–6, 7–18, 19–60, and 60 plus, and the ratios of female family members aged 0–6, 7–18, and 19–60 are also included in all regressions. The ratio of female family members aged above 60 is omitted to avoid collinearity.

7. Robustness checks

7.1. Testing for pre-existing time trends

One concern in this study is that the working and housework hours of people whose spouses were employed in 1993 may have followed a different time trend from people whose spouses were self-employed in 1993, if there had not been a policy induced change in the workweek. That is, our IV could be correlated with unobserved time trends, which could lead to biased IV estimates. This section investigates whether these pre-existing time trends were different.

We use data from 1989, 1991, and 1993, and estimate the following equation:

$$Y_{it} = \alpha_i + \sum_{t=89,91} Year_t + \sum_{t=89,91} \gamma_t * Employed_{it}^{spouse} * Year_t + \sum_{t=89,91} \beta_t * Employed_{it}^{own} * Year_t + \delta * X_{it} + \varepsilon_{it} \quad (6)$$

In Equation (6), *Year* is a dummy variable. The other variables are defined similarly as in Equation (5). The results of the estimation are shown in Online Appendix Part C Table D. We can see that for the male and the female samples, no coefficients of the dummy for spousal employment status in 1993 with the year dummies for 1989 and 1991 are statistically significant. These results provide evidence that the time trends in working hours and housework hours were not different for individuals whose spouses were employed or self-employed in 1993.

7.2. Changes of employment type due to the policy

The workweek reduction policy could induce individuals to change their type of employment (from being employed/self-employed to being self-employed/employed). Such changes could lead to bias in our estimates. For example, if a spouse changed from being employed in 1993 to self-employed in 1997, then our estimates would be downward biased. However, this issue should not be serious because only a few individuals in our sample changed their employment type (i.e., 51 males and 25 females among 2286 individuals). Moreover, in this section we conduct a robustness check by using individuals whose spouses did not change their type of employment. We use this sample to estimate the same regressions reported in Table 5. Table E in the Online Appendix Part C shows the results, which are similar to those given in Table 5. These results suggest that a change in a spouse's employment type does not affect the estimates.

7.3. Effects of concurrent events

The effects of the workweek reduction policy may also be contaminated by other events happening in the same period, which could lead to bias in the estimates. Two such events stand out: the substantial decline of TVEs from 1995 to 1996 (Huang, 2008) and the SOE reform of 1998 (Hsieh and Zheng, 2015).

Decline of TVEs. The decline of TVEs may have caused many employed workers to lose their jobs or become self-employed. For example, for individuals whose spouses were employed in 1993, these spouses could have become self-employed by 1997. Our estimates would be upward biased if, on average, people worked more when their spouses were self-employed. The estimates would be downward biased if they worked less when their spouses were self-employed. This concern is probably minor because only a few cases of changes in employment type are noted in our analysis (i.e., accounting for under 5% of our sample). Moreover, the results shown in Section 7.2 (Table E in the Online Appendix Part C) suggest that changes in employment type do not affect our estimates.

SOE reform. The SOE reform should not be a concern for our study because this reform started in 1998 (Hsieh and Zheng, 2015), one year after our post-reform year of 1997. However, SOE employees could have

experienced reduced working hours in 1997 in anticipation of the reform. That is, for individuals whose spouses were employed by SOEs in 1993, the reduction of working hours of their spouses could have been larger than that induced by the workweek reduction policy. In this case, our estimates would be upward biased. To address this concern, we investigate whether SOE employees had a more substantial reduction in working hours than other employees.[23] The results are shown in Table F of the Online Appendix Part C. The *F*-test shows no significant difference between the reductions in working hours for SOE and non-SOE employees.

7.4. Testing the existence of crowding out effects

One may be concerned that if employees spent their extra time after the policy change on self-employed work, this instance could have crowded out existing self-employed workers, consequently reducing their working hours as well. If it were the case, our estimates could be biased. To investigate whether the crowding out effects exist, we use a subsample that includes individuals whose spouses were self-employed in 1993 and individuals whose spouses were employed but had weekly working hours of not more than 40 h in 1993. The latter group of individuals should not be affected by the policy because their weekly working hours were already below 40 before the policy change. We use this sample to estimate the reduced form regression as in Table 6 but replace *Spouse employed in 1993*Year1997* with *Spouse self-employed in 1993*Year1997*. *Spouse self-employed in 1993* is a dummy variable that equals 1 if the spouse was self-employed in 1993, and 0 if they were employed. If the crowding out effect existed (i.e., the weekly working hours of self-employed spouses were reduced), we should expect to see significantly positive (negative) coefficient of *Spouse self-employed in 1993*Year1997* for the outcome variable weekly working hours (housework hours). The results are shown in Table G in the Online Appendix Part C. None of the coefficients of *Spouse self-employed in 1993*Year1997* are significant and the signs are the opposite for three of them (among all four regressions). Therefore, it refutes the existence of the crowding out effect.

7.5. Using matched sample

Our empirical strategy compares individuals whose spouses are employed with those whose spouses are self-employed. Although we have previously established that the pre-existing time trends are not different for these two groups and that our main findings are robust if we exploit variations across individuals with employed spouses, one may continue to be concerned that these two groups of individuals are not comparable. To further address this concern, this section estimates the same effects using a matched sample, following a one-for-one propensity score matching method to find a counterpart in the control group for each in the treatment group (i.e., a man or woman in the control group whose spouse was self-employed in 1993 for each man or woman whose spouse was employed in 1993 in the treatment group).[24] The IV results using this matched sample are shown in Table H of the Online Appendix Part C. Similar results are found using the matched sample, thereby reconfirming the validity of our empirical strategy.

8. Channels

8.1. Source of negative interdependency between spousal labor supplies

Goux et al. (2014) find a positive relationship between spousal labor supplies in France. By contrast, we find that spousal labor supplies in China are negatively related. One possible reason could be the disparity in economic development between France (a developed country) and China (a developing country). The French GDP per capita was 22,380 dollars in 1993 (current price),[25] which is considerably higher than the Chinese GDP per capita (377 dollars in 1993, current price).[26] Higher incomes in France may make spouses value leisure more. Therefore, the complementarity between husbands and wives' leisure time will dominate their time allocation decisions. To investigate whether rich spouses are likely to have positively related labor supplies, we estimate the heterogeneous effects in terms of household income per capita.

We focus on the heterogeneous effects between rich households in our sample (income per capita in the top 20 percentile in 1993) and other households (income per capita of the remaining percentiles). That is, we construct a dummy variable ($Top20_{93}$), with 1 representing rich households and 0 representing others. We start with Equation (5) but add the interaction of the dummy variable $Top20_{93}$ with spousal weekly working hours *SWH*. We use the interaction of the dummy variable for the spouse being employed in 1993 ($Employed_{93}^{spouse}$) and the 1997 dummy ($Year_{97}$) as an IV for *SWH*. Therefore, $Employed_{93}^{spouse} * Year_{97} * Top20_{93}$ is used as an IV for $SWH * Top20_{93}$.[27]

Results are shown in Table 8. Columns 1 and 3 are for the weekly working hours and columns 2 and 4 are for the weekly housework hours. The coefficients of $SWH * Top20_{93}$ are 0.730 and 0.569 for the male (column 1) and female (column 3) samples, respectively, with the former and latter significant at the 5% and 1% levels. Note that the coefficient of SWH is −0.573 (column 1, significant at the 10% level) and −0.233 (column 3, significant at the 1% level). Therefore, for the male and female samples, the impact of spousal labor supply on an individuals' own labor supply is positive for households with an income per capita in the top 20 percentile (see the summation of the coefficients of $SWH * Top20_{93}$ and *SWH*) but negative for the remaining households (see the coefficient of *SWH*). This result provides a possible explanation for the different findings in our study as opposed to that of Goux et al. (2014).

Note also that for the male and female samples, none of the coefficients of $SWH_{it} * Top20_{i93}$ were significant for the weekly housework hours (columns 2 and 4). This result suggests that the substitutability of time spent by spouses on housework is similar among all households. The possible reason is that the total time needed for housework is fixed. Therefore, regardless of household wealth, the increase of one spouse's time spent on housework leads to the same amount of decrease to the other's housework time.

8.2. Intensive margin versus extensive margin

Table 5 shows that male's working hours tended to increase when their spouses' working hours decreased. We explore whether an intensive or extensive margin leads to this pattern. That is, we seek to determine whether the dominant change was in working hours within each job or in the number of jobs held. This section investigates how spousal working hours affected male's working hours in a primary job and the probability of having a second job. The results are shown in Table 9. The outcome

[23] SOE workers include individuals employed by state institutes because CHNS does not differentiate between these two types of workers.

[24] The matching is based on several observable variables in 1993, including age, years of schooling, an indicator for living in urban area, individual income, household demographic structure (i.e., family size, ratios of male family members aged 0–6, 7–18, 19–60, and over 60; and ratios of female family members aged 0–6, 7–18, and 19–60), and a set of dummies for different provinces. The STATA command psmatch2 is used.

[25] From the World Bank database (https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=FR).

[26] From the World Bank database (https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=CN).

[27] In the regression, we control $Year_{97} * Top20_{93}$, but we do not control $Employed_{93}^{spouse} * Top20_{93}$, $Employed_{93}^{spouse}$, and $Top20_{93}$ because they are absorbed by the individual fixed effect.

Table 8
Investigating the source of substitutability of spousal labor supplies.

Dependent variables (per week)	(1)	(2)	(3)	(4)
	Male Sample		Female Sample	
	Working hours	Housework hours	Working hours	Housework hours
Spousal working hours (Spouse employed in 1993*Year1997 as an IV)	−0.573*	0.317	−0.233***	0.257
	(0.294)	(0.199)	(0.088)	(0.158)
Spousal working hours*Top 20 in 1993 (Spouse employed in 1993*Year1997*Top 20 in 1993 as an IV)	0.730**	−0.056	0.569***	0.195
	(0.295)	(0.218)	(0.205)	(0.201)
Year1997*Top 20 in 1993	3.757***	−3.558***	4.525***	−1.491*
	(0.643)	(0.707)	(0.650)	(0.881)
Employed in 1993*Year1997	−8.640***	2.789***	−6.716***	3.935***
	(0.401)	(0.456)	(1.239)	(1.431)
Year1997	14.827***	−7.985***	16.549***	−14.010***
	(3.234)	(1.813)	(2.528)	(1.204)
Age squared	0.008	0.007	−0.051***	0.074***
	(0.020)	(0.005)	(0.006)	(0.006)
Spousal age squared	−0.058**	0.020**	−0.004	−0.032***
	(0.027)	(0.008)	(0.007)	(0.006)
Constant	87.183***	−73.567***	101.524***	−63.285***
	(8.882)	(16.578)	(19.421)	(24.402)
Observations	2286	2212	2286	2110
R-squared	0.241	0.291	0.492	0.559

Note: Top 20 in 1993 is a dummy variable which equals to one for households having income per capita in the top 20 percentile in 1993 and zero otherwise. In all regressions, individual fixed effects are controlled. Household demographic structure, including family size, ratios of male family members aged 0–6, 7–18, 19–60, 60 plus, and ratios of female family members aged 0–6, 7–18, 19–60 are also included in all regressions. Ratio of female family members aged above 60 is omitted to avoid collinearity.

variable in columns 1 is working hours in the primary job, and the outcome variable in columns 2 is an indicator of having a second job. Table 9 shows that a decrease in spousal working hours did not significantly affect male's working hours in the primary job but significantly increase the probability of having a second job.

One explanation for our findings could be that the work schedule for employed workers is often regulated. Therefore, they have to take a second job if they would like to work more. By contrast, the time input in the primary job of some self-employed workers could have been optimal before the policy change that a higher time input in the same job may reduce their marginal productivity. Therefore, these self-employed workers chose to engage in a second job instead. In our sample, for those males who did not have a second job in 1993 and whose spouses were affected by the policy, 9.09% of employed individuals worked a second job by 1997, while 4.56% of self-employed individuals worked a second job.[28]

8.3. Effects on the different housework components

The preceding analysis shows that decreased spousal working hours have significant negative effects on the other spouse's housework hours. The CHNS data include detailed information on time spent on different housework duties. We investigate which housework duties were most affected by the changes in spousal working hours. This question is interesting itself, and enables us to understand time allocation within households. Table 10 shows the results. We investigate four outcome variables: time spent obtaining food, cooking, doing laundry, and caring for children. Panels A and B show the male and female samples, respectively. Evidently, decreased spousal working hours had a significant negative effect on the time that males spent cooking and caring for children. For females, decreased spousal working hours significantly decreased the time they spent washing clothes.

[28] For employed workers, the second jobs they took include work related to service (50%), agriculture (12.5%), driving (6.25%), junior professional/technical (6.25%), and others (25%). For self-employed workers, the second jobs include non-skilled work (15.38%), service (30.77%), and agricultural (53.85%) work.

Table 9
Decomposition of the effects of spousal working time on Male's own working time.

Dependent variables	Primary Working Hours	Having a Second Job
	(1)	(2)
Spousal working hours (Spouse employed in 1993*Year1997 as an IV)	0.114	−0.011***
	(0.137)	(0.003)
Employed in 1993*Year1997	−6.498***	−0.064***
	(0.542)	(0.004)
Year1997	8.661***	0.214***
	(2.333)	(0.047)
Age squared	0.003	−0.001***
	(0.008)	(0.000)
Spousal age squared	−0.028**	0.001***
	(0.014)	(0.000)
Constant	64.027***	2.184***
	(12.966)	(0.391)
Observations	2286	2224

Robust standard errors in parentheses are calculated by clustering over community. ***p < 0.01, **p < 0.05, *p < 0.1.
Note: In all regressions, individual fixed effects are controlled. Household demographic structure, including family size, ratios of male family members aged 0–6, 7–18, 19–60, 60 plus, and ratios of female family members aged 0–6, 7–18, 19–60 are also included in all regressions. Ratio of female family members aged above 60 is omitted to avoid collinearity.

9. Conclusion

By exploiting a policy change in 1994–1995 that reduced the workweek for employed workers from six days to five and by using a panel of individuals collected by the CHNS, we identify the effects of one spouse's labor supply on the other spouse's and on their time spent doing housework. We find a significant increase in males' labor supply in response to a 1-h decrease in their wives' labor supply. However, a decrease in the husbands' labor supply had no significant effect on their wives' labor supply. By contrast, a 1-h decrease in spouses' labor supply led to a significant decrease in the time spent on housework by males and females.

Unlike the positive relationship between the spousal labor supplies that Goux et al. (2014) find using the French data, our results show a

Table 10
Decomposition of the effects of spousal working hours on own housework hours.

Dependent variables (hours/week)	Buy food	Cook food	Wash clothes	Care for children
Panel A. Male Sample				
Spousal working hours (Spouse employed in 1993*Year1997 as an IV)	0.046	0.107*	0.008	0.251**
	(0.031)	(0.056)	(0.017)	(0.118)
Employed in 1993*Year1997	0.639***	0.340	0.183**	1.321***
	(0.132)	(0.223)	(0.072)	(0.222)
Year1997	−0.937*	−3.060***	0.184	−6.114***
	(0.518)	(0.855)	(0.212)	(1.923)
Age squared	0.002**	0.004	−0.000	0.005
	(0.001)	(0.003)	(0.001)	(0.004)
Spousal age squared	0.000	0.005	0.000	0.015***
	(0.002)	(0.005)	(0.001)	(0.004)
Constant	−6.440*	−21.760***	0.772	−60.131**
	(3.720)	(5.291)	(1.862)	(24.320)
Observations	2212	2212	2212	2212
Panel B. Female Sample				
Spousal working hours (Spouse employed in 1993*Year1997 as an IV)	0.010	0.057	0.142***	0.149
	(0.011)	(0.039)	(0.015)	(0.127)
Employed in 1993*Year1997	0.319	1.155***	0.187	1.832*
	(0.213)	(0.427)	(0.182)	(1.098)
Year1997	0.796**	−2.416***	0.083	−12.190***
	(0.332)	(0.392)	(0.223)	(0.876)
Age squared	0.006***	0.016***	0.009***	0.037***
	(0.001)	(0.006)	(0.003)	(0.005)
Spousal age squared	−0.007***	−0.014**	−0.007**	0.000
	(0.002)	(0.006)	(0.003)	(0.004)
Constant	8.800***	24.674**	4.815	−95.474***
	(3.129)	(9.749)	(7.036)	(6.439)
Observations	2110	2110	2110	2110

Robust standard errors in parentheses are calculated by clustering over community. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Note: In all regressions, individual fixed effects are controlled. The household demographic structure, including family size, the ratios of male family members aged 0–6, 7–18, 19–60, and 60 plus, and the ratios of female family members aged 0–6, 7–18, and 19–60 are also included in all regressions. The ratio of female family members aged above 60 is omitted to avoid collinearity.

negative relationship between spousal labor supplies. We have shown that one possible reason for our findings could be the disparity in economic development between France and China. Higher incomes in France may make couples value leisure more. Therefore, complementarity between their leisure time will dominate their time allocation decisions.

Our findings suggest that disregarding the negative relationship between spousal labor supplies can lead to overestimating the aggregate effects of government policies that target specific groups in the general population. A simple back-of-the-envelope calculation shows that the government may need to project 1.6 times more resources to achieve its goals if the interdependency of spousal labor supplies is considered.

Disclosure Statement

The statement is for the paper entitled “Are Spousal Labor Supplies Substitutes? Evidence from the Workweek Reduction Policy in China” to be considered for publication in the *Journal of Development Economics*, written by Yueyuan Ma and Xinzheng Shi.

Yueyuan Ma is a graduate student of the Department of Economics in the University of Pennsylvania.

Yueyuan Ma declares that she has no relevant or material financial interests that relate to the research described in this paper, and that no party had the right to review the paper prior to its circulation.

Xinzheng Shi is an associate professor of Economics of the School of Economics and Management in Tsinghua University.

Xinzheng Shi thanks China Natural Science Foundation for financial support (Project ID: 71673155).

Xinzheng Shi declares that he has no relevant or material financial interests that relate to the research described in this paper, and that no party had the right to review the paper prior to its circulation.

Acknowledgements

Yueyuan Ma is a graduate student in the Department of Economics, University of Pennsylvania. Xinzheng Shi is an associate professor in the School of Economics and Management, Tsinghua University. Xinzheng Shi is also affiliated with National Institute for Fiscal Studies at Tsinghua University and China Data Center at Tsinghua University. We thank the editor (Andrew Foster) and two referees for insightful comments. We thank Junjian Yi for the beneficial discussion in the early stages of this study. We also acknowledge the participants of the Third China Labor Economist Forum and 18th NBER-CCER Conference, and the seminar participants in Jinan University and Fudan University for their comments. Xinzheng Shi thanks the China Natural Science Foundation for its financial support (Project ID: 71673155). All remaining errors are our own.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jdeveco.2020.102472.

References

Ashenfelter, Orley, Heckman, James, 1974. The estimation of income and substitution effects in a model of family labor supply. Econometrica 42 (1), 73–85.
Berger, Mark C., Black, Dan A., Chandra, Amitabh, Scott, Frank A., 2003. Children, non-discriminatory provision of fringe benefits, and household labor market decisions. Res. Labor Econ. 22 (1), 309–349.
Blau, David, 1998. Labor force dynamics of older married couples. J. Labor Econ. 16 (3), 595–629.
Chetty, Raj, 2012. Bounds on elasticities with optimization frictions: a synthesis of micro and macro evidence on labor supply. Econometrica 80 (3), 969–1018.
Chetty, Raj, Friedman, John N., Olsen, Tore, Pistaferri, Luigi, 2011a. Adjustment costs, firm responses, and micro vs. macro labor supply elasticities: evidence from Danish tax records. Q. J. Econ. 126 (2), 749–804.
Chetty, Raj, Adam, Guren, Day, Manoli, Weber, Andrea, 2011b. Are micro and macro labor supply elasticities consistent? A review of evidence on the intensive and extensive margins. Am. Econ. Rev. 101 (3), 471–475.
Cullen, Julie Berry, Gruber, Jonathan, 2000. Does unemployment insurance crowd out spousal labor supply? J. Labor Econ. 18 (3), 546–572.
Dinkelman, Taryn, 2011. The effects of rural electrification on employment: new evidence from South Africa. Am. Econ. Rev. 101 (7), 3078–3108.
Gelber, Alexander, 2014. Taxation and the earnings of husbands and wives: evidence from Sweden. Rev. Econ. Stat. 96 (2), 287–305.
Goldberg, Jessica, 2016. Kwacha gonna do? Experimental evidence about labor supply in rural Malawi. Am. Econ. J. Appl. Econ. 8 (1), 129–149.
Goux, Dominique, Maurin, Eric, Petrongold, Barbara, 2014. Working time regulations and spousal labor supply. Am. Econ. Rev. 104 (1), 252–276.
Greenwood, Jeremy, 2018. Evolving Households: the Imprint of Technology on Life. The MIT Press, Cambridge, Massachusetts.
Gustman, Alan, Steinmeier, Thomas, 2000. Retirement in dual-career families: a structural model. J. Labor Econ. 18 (3), 503–545.
Hamermesh, Daniel, 2002. Timing, togetherness and time windfalls. J. Popul. Econ. 15 (4), 601–623.
Hsieh, Chang-tai, Zheng, Song, 2015. Grasp the Large, Let Go of the Small: the Transformation of the State Sector in China. Brookings Papers on Economic Activity, Spring, pp. 295–346.
Hu, Ping, Xie, Wenxiong, 2009. How was the five-working day policy made? (in Chinese). Bai Nian Chao 12, 108–111.
Huang, Yasheng, 2008. Capitalism with Chinese Characteristics. Cambridge University Press, New York.
Jara-Diaz, Sergio R., Munizaga, Marcela A., Greeven, Paulina, Guerra, Reinaldo, Kay, Axhausen, 2008. Estimating the value of leisure from a time allocation model. Transport. Res. Part B 42, 946–957.

Li, Haizheng, Zax, Jeffrey S., 2003. Labor supply in urban China. J. Comp. Econ. 31, 795–817.
Lundberg, Shelly, 1988. Labor supply of husbands and wives: a simultaneous equations approach. Rev. Econ. Stat. 70 (2), 224–235.
McKenzie, David, 2017. How effective are active labor market policies in developing countries? A critical review of recent evidence. In: Policy Research Working Paper 8011. World Bank.
Robinson, John, Godbey, Geoffrey, 1999. Time for Life. University Park, PA: Pennsylvania State University Press.