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Healthy time, home production, and labor supply: The effect of health shocks on time use in China

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Healthy Time, Home Production, and Labor Supply: The Effects of Health Shocks on Time Use in China

By

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Abstract

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Doctor of Philosophy in Health Services and Policy Analysis

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In the absence of widespread social safety nets during China's economic transition, households were often left to self-insure against the risk of adverse health events. I investigate the impacts of health shocks to oneself and to one's spouse on time contributions to home production activities, which are often overlooked, but may have important opportunity cost, as well as time in market labor. Using six waves of the China Health and Nutrition Survey (1991 – 2006), I estimate the short-run effect of a health shock—defined as a transition from non-poor self-reported health status to poor health status—on hours per day spent in home production and market work.

Results show that experiencing a negative health shock corresponds with about a 1.5 hour per day reduction in market time for men and the elderly. Decomposing the labor supply decision into participation and conditional hours shows that much of the reduction in hours is due to a 10 percentage point increase in the likelihood of dropping out of the labor force. A health shock also reduces the likelihood of continuing home production by 4 percentage points for all people. When spouses become ill, market labor time increases for employed individuals, driven by a significant 2 percentage point increase in the likelihood of continuing to work for both husbands and wives. Men also significantly increase home production by 0.5 hours per day when wives become sick and total household production time is unaffected. However, when husbands suffer health problems, wives are more likely to continue working by 5 percentage points, but it is not enough to offset the loss in the husband's market time and total household market time significantly declines by 2.3 hours per day. Large reductions in total household production time are also observed for poorer households, those of the elderly and of private sector workers, which suggests some benefits to weathering health shocks associated with household savings and employment in state-owned enterprises and collectives.

Given that individuals spend an average of 9.2 hours in market labor and 2.7 hours in home production each day if they participate in both activities, these effects on market labor hours may also be economically significant while the smaller effects on home production time may be substantively less important. Implications for social welfare policies are discussed.

CONTENTS

List of Figures

LIST OF TABLES

Acknowledgements

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EXECUTIVE SUMMARY

In the absence of widespread social safety nets in many developing countries, households are often left to self-insure against the risk of adverse health events. This was particularly true during China's economic transition when many of the former iron rice bowl social systems were dismantled and economic reforms introduced. While employees of the public sector still had access to some of these benefits (e.g. housing, health insurance, disability, pensions), comparable benefits packages were generally unavailable in the private sector. Coupled with population aging and transitions toward smaller nuclear families, households may find it increasingly difficult to compensate for lost productivity due to ill health. Studies of income and consumption smoothing in the face of health shocks often ignore the opportunity costs associated with home production activities and focus only on lost time in the labor market.[1] Thus, the indirect costs of ill health may be much higher than previously estimated when accounting for lost productivity in both the market and home sectors. Understanding the magnitude of such losses has direct implications not only for designing the generosity of social insurance schemes, but also for the targeting of benefits to sub-populations, such as women, who may have fewer labor market opportunities.

This study seeks to quantify the costs of adverse health events in terms of time supplied to market labor and home production activities among working adults. Health capital has the unique feature that, by decreasing time spent in sickness, the total time available for other activities increases (Grossman, 1972). However, ill health can also affect productivity in these activities, and the total effect on time spent in the market and home sectors is theoretically ambiguous. Within the household, poor health can affect the time use tradeoffs of other members who may need to care for the sick and compensate for lost productivity. It may also deter individuals from transitioning to new jobs if for public sector workers earn economic rents associated with the generosity of employment benefits, which may help to mitigate the effects of health shocks in the household.

Using data from six waves (1991–2006) of the China Health and Nutrition Survey, I estimate the short-run effects of negative health shocks affecting individuals and their spouses on time spent in market labor and home production. The estimation framework combines individual fixed effects with propensity score matching and weighted least squares techniques to control for time-invariant unobserved heterogeneity across individuals and selection into health risk classes based on observable characteristics. Results show that experiencing a negative health shock—a transition in self-reported health status from excellent, good, or fair health to poor health in adjacent survey waves—corresponds with a 1.5 hour per day reduction in market time for men and the elderly during the previous year. Decomposition of the labor supply decision into participation and conditional hours shows that much of the reduction in daily hours worked is due to a 10 percentage point increase in the likelihood of dropping out of the labor force. These estimates are larger than those found in previous studies of health and labor supply in China that estimate longer-run effects with individual level fixed effects (Benjamin et al. 2003, Yi and Dow

[1] Although a number of studies have examined health-related productivity in agricultural labor, which are often largely comprised of self-employed individuals, I use the term market to include this realm of activities. Thus, market labor refers to all income-generating activities, including farming, fishing, and running household businesses. This is distinct from home production activities which refers to goods or services that do not generate income, such as cooking, cleaning, and child care.

2005, Lindelow and Wagstaff 2005). Moreover, I find that a negative health shock reduces the likelihood of continuing home production by 4 percentage points for all people. When a spouse becomes ill, market hours increase for employed individuals, driven by significant declines in the likelihood of dropping out of the labor force (2 percentage points) for both husbands and wives. Men also significantly increase home production time by 0.5 hours per day when wives become sick, leaving total household production time unaffected. Even though wives are more likely to continue working (5 percentage points) when husbands suffer health problems, it is not enough to offset the loss in the husband's market time, and total market time in the household significantly declines by 2.3 hours per day. Large reductions in total household production time are also observed for poorer households, those of the elderly, and of private sector workers, which suggests some benefits to weathering health shocks associated household savings and employment in state-owned enterprises and collectives.

This is the first study to document the effects of *negative* health shocks on time supplied to home production in a developing country. Previous empirical studies either examine this relationship in developed countries where social protection programs are more complete, study the relationship in developing countries in reference to health improvements, or ignore the opportunity costs of home production altogether. This study also builds on previous studies of health and labor supply conducted in China by estimating the combined effects of health on labor force participation and hours worked for all adults, not just the elderly, and by estimating the cross-effects of health shocks between spouses on these outcomes and time use outcomes for the entire household.

Finally, the relationships uncovered in the CHNS data suggest that current policy efforts to expand health insurance coverage may be insufficient to diminish the full opportunity costs of ill health. The government has recently implemented a number of new health insurance programs directed toward increasing access to and the affordability of health services (Liu 2002, Zhang et al. 2006). Although implementation of these programs has encountered set backs due to low take-up and incomplete coverage (Wang et al. 2005, Xu et al. 2007), ensuring access to affordable treatment or disease management can help to assure functionality and slow further health deterioration, ultimately facilitating transitions back into the labor force. However, as individuals age, the depletion of health stock suggests that individuals may never fully recover from illnesses and reductions in labor supply may become permanent. Particularly when men suffer health problems, productivity losses, perhaps associated with physically demanding jobs, appear to be large and households may need to adjust to permanent reductions in income. Even though women may respond by increasing their labor supply, lower wages for women also mean that income losses cannot be entirely compensated for. While private transfer mechanisms from family members may help to offset income losses, particularly as remittances from migrant workers have become more salient, there human capital investments for younger generations may be diverted, affecting the household's long-run welfare. Previous studies have found that even among wealthier urban households, there is a limited capacity to smooth consumption when there is a shock income and investments from education are diverted (Meng 2003). Hence, an argument can be made for not only expanding the provision of disability or unemployment benefits to address temporary reductions in labor supply, but also social security measures to ease transition into retirement. Without social transfer mechanisms, the burden of caring for retirees and the elderly largely rests on family members, and particularly for wives who must take care of sick husbands too ill to work.

These empirical results are robust to different coding schemes for health status and hours worked and tests for reverse causality. However, the empirical approach limits the ability to examine longer-run dynamic effects of health on individual and household welfare, even though the scope for bias from time-invariant heterogeneity and reserved causality is reduced. Moreover, the CHNS sample only covers nine provinces in China and results cannot be generalized to the larger population. Therefore, the implications are restricted to more short-run, possibly temporary responses to health shocks for a sample that is predominantly rural and uneducated. Nevertheless, the findings show that healthy time is more costly than previously measured and that social safety net programs may be critical for easing the impacts of health degeneration.

CHAPTER 1: INTRODUCTION, BACKGROUND, AND SIGNIFICANCE

In the absence of widespread social safety nets in many developing countries, households are often left to self-insure against the risk of adverse health events. This was particularly true during China's economic transition when many of the former iron rice bowl social systems were dismantled and market-based economic reforms introduced. While employees of the state and collective sectors still had access to some of these benefits (e.g. housing, health insurance, disability, pension), comparable benefits packages were generally unavailable in the private sector. Coupled with population aging and trends toward smaller nuclear families, households may find it increasingly difficult to compensate for lost productivity due to ill health.

Studies of income and consumption smoothing in the face of health shocks often ignore the opportunity costs associated with home production activities and focus only on lost time in the labor market.[2] The indirect costs of ill health may be much higher than previously estimated when accounting for lost productivity in both sectors. Understanding the magnitude of such losses has direct implications, not only for designing the generosity of social insurance schemes, but also for the targeting of benefits to sub-populations, such as women, who may have fewer labor market opportunities. The government has recently implemented a number of new health insurance programs, but rollout and take-up has been slow and insurance schemes have yet to reach large segments of the population (Wang et al. 2005, Zhang et al. 2006, Xu et al. 2007). Although access to affordable medical care may serve to mitigate some of these time costs, these reforms may have limited ability to address the full economic costs of ill health, motivating the rationale for disability and other social insurance protection mechanisms.

This study seeks to quantify the costs of adverse health events in terms of time supplied to market labor and home production activities among working adults. Health capital has the unique feature that, by decreasing time spent in sickness, the total time available for other activities increases (Grossman, 1972). However, ill health can also affect productivity in these activities, and the total effect on time spent in the market and home sectors is theoretically ambiguous. Within the household, poor health can affect the time use tradeoffs of other members who may need to care for the sick and compensate for lost income from market labor and lost productivity at home. It may also deter individuals from transitioning to new jobs if for public sector workers earn economic rents associated with the generosity of employment benefits, which may help to mitigate the effects of health shocks in the household. Studying the consequences of health shocks on time use, and particularly on home production time, requires stringent data parameters. I use health and time use data from six waves (1991–2006) of the China Health and Nutrition Survey (CHNS) and employ an estimation framework that combines individual fixed effects with propensity score methods. This approach controls for both time-invariant unobserved heterogeneity across individuals and selection into health risk classes based on observable characteristics.

This is the first study to document the effects of *negative* health shocks on time supplied to home production in a developing country. Previous empirical studies either examine this

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relationship in developed countries where social protection programs are more complete, study the relationship in developing countries in reference to health improvements, or ignore the opportunity costs of home production altogether. Results show that experiencing a negative health shock—defined as a transition in self-reported health status from non-poor to poor health in adjacent survey waves—correspond with a 1.5 hour per day reduction in market time for men and the elderly during the previous year. Decomposition of the labor supply decision into participation and conditional hours shows that much of the reduction in daily hours worked is due to a 10 percentage point increase in the likelihood of dropping out of the labor force. This estimate is larger than those found in previous studies in China (Benjamin et al. 2003, Yi and Dow 2005, Lindelow and Wagstaff 2005). Moreover, I find that a negative health shock reduces the likelihood of continuing home production by 4 percentage points for all people. When a spouse becomes ill, market hours increase for employed individuals, driven by significant declines in the likelihood of dropping out of the labor force (5 percentage points) for both husbands and wives. Men also significantly increase home production time by 0.5 hours per day when wives become sick, leaving total household production time unaffected. Even though wives are more likely to continue working (5 percentage points) when husbands suffer health problems, it is not enough to offset the loss in the husband's market time and total market time in the household significantly declines by 2.3 hours per day. Large reductions in total household production time are also observed for poorer households, those of the elderly and of private sector workers, which suggests some beneficial effects associated household savings and employment in state-owned enterprises and collectives. Given that individuals spend an average of 9.2 hours in market labor and 2.7 hours in home production each day if they participate in both activities, these effects on market labor hours may also be economically significant while the smaller effects on home production time may be substantively less important.

This dissertation proceeds with the following structure. First, I introduce the concepts of health capital and healthy time to highlight their importance for individual and household welfare. Then, I describe the China context in which the analysis is conducted. In Chapter 2, I sketch out a utility maximization framework that combines Grossman's (1972) concept of health capital with Gronau's (1977) depiction of home production. Combining the model's predictions with evidence from previous literature, I state the hypotheses to be tested. Chapter 3 presents a flow chart model of the relationship between health and time use, describes the data from the China Health and Nutrition Survey, and explains how quantitative measures are operationalized. Chapter 4 focuses on the econometric specifications for estimating a model of hours worked in each sector—market and household—with a subsequent decomposition of the estimated marginal effect into a participation and conditional hours response for corner solutions. The empirical results for the analysis of own individual health on time use outcomes is presented in Chapter 5 while the results for the analysis of spousal health are presented in Chapter 6. Chapter 7 presents the findings related to employer type to investigate possible buffering effects associated with working in public sector jobs. This is followed by a discussion of findings and their significance in Chapter 8.

1.1 Health capital and healthy time

At a conceptual level, increases in a person's stock of health human capital are assumed to raise productivity in the market sector of the economy, where money earnings are produced, and in the non-market or household sector, where other commodities are produced that enter the utility function (Grossman, 1972). The stock of health today depends on past investments in health, and on the rate of depreciation of health capital. Health is valued by consumers both for its own sake and because being sick is assumed to take time away from market and non-market activities. Family members may also be affected if they need to reduce their time for income-generating activities to care for the sick. Added to the cost of medical care, the full economic costs of poor health may place household welfare in jeopardy, especially when insurance markets have not yet developed to provide any meaningful measure of risk coverage.

This motivates a strong rationale to invest resources into improving people's health—not only because good health is important for people's welfare, but also because of its economic benefits. For developing countries, investments in health may yield large returns. Like other forms of human capital, such as education, good health can increase productivity and interact synergistically with education accumulation. Better health reduces the dependency ratio, attracts foreign investments, and enables private capital to be used for other entrepreneurial endeavors (Bloom and Canning, 2003). This has longer-run implications for economic growth (Bloom et al. 2004). Improving health may also be more important in developing countries because the marginal productivity of health is likely to be higher compared to the populations of higher-income countries (Strauss and Thomas, 1998). Equity issues can also arise. Labor market consequences of poor health are also likely to be more serious for the poor, who may also be more likely to suffer from severe health problems and to be working in jobs for which strength, and therefore good health, has a payoff (Strauss and Thomas, 1998). However, there may also be good reason for investing in other types of social protection to address the effects of ill health. For example, if intra-household cross-effects of health significantly determinant fewer hours worked, dropping out of the labor force, or early retirement, then social insurance schemes may want to also consider increasing social security at older ages for workers transitioning into retirement.

1.2 Economic development and social transition in China

There are three advantages to studying China for assessing the role of health on time use. First, China's development process presents a unique opportunity to test the fundamental premise of health as a human capital investment. Substantial improvements in population health occurred decades before economic reform. Life expectancy at birth improved from 36 years in 1960 to 67 years in 1980, and infant mortality rates declined from 84 per 1,000 live births in 1970 to 37 in 1990 (World Bank, 2007).[3] These relatively high health capital stocks may have large investment returns, particularly when labor markets are allowed to operate more freely and wages can correspond more directly to productivity.

China's drastic departure from a socialist command economy began in the late 1970s when agricultural communes were dismantled and privatization of industry was ushered in. Structural reforms introduced free market principles that spurred competition and efficiency. Reform also decentralized power and resources from the hands of central planners to local governments in the primary task of "building the material base for socialism." In rural areas,

[3] Improvements in sanitation, water supplies, pest control, food distribution and nutrition, and control of some communicable diseases contributed to a decline in mortality (Naughton, 2002). Moreover, access to basic health care was an integral part of the iron rice bowl of social services; even in rural areas, a large cadre of barefoot doctors was trained in immunizations, basic hygiene practices, and family planning (Zhang and Unschuld, 2008).

communes and state-owned enterprises were dismantled as early as 1979, devolving into collectively-owned township and village enterprises. These hybrid entities served as a springboard for entrepreneurship in household-based farming and individual business ownership by leveraging collectively owned capital assets while streamlining production processes and resource utilization for profit earnings. In urban areas, private firms became more prevalent as the state sector declined during the 1990s and foreign direct investment flooded into commercial centers, such as those designated as Special Economic Zones (Naughton 2002). By 2003, industrial production by state-owned enterprises fell to 38% (Fung, Kummer, and Shen 2006). In the post-reform period, per capita incomes surged from a mere $320 in 1990 to $2000 in 2006 and economic growth was rapid. The average annual growth rate of gross national income per capita from 1962 to 1990 was about 5% compared to 10% from 1991 to 2006 (World Bank, 2007). Combined employment in agriculture and industry declined from over 90% in 1980 to about 60% in 2002 while employment in the service sector has grown from 11% to 16% (World Bank 2007).

A number of recent studies have honed in on China's dramatic economic boom, focusing on the link to population health. Bloom et al. (2006) argue that China's life expectancy advantage is the largest contributor to economic growth when compared to India's macroeconomic trajectory. And there is growing evidence to support this claim at the micro-level. Using CHNS data, Yi and Dow (2006) generally find a positive effect of health on labor force participation (LFP) during the 1989-1997 period[4] and Benjamin et al. (2003) also find a significant effect of a change in perceived self-reported health status on LFP and hours for the elderly population under some specifications.[5] Liu et al. (2008) find that worsening self-reported health status significantly reduces household income. However, the effects on home production are still unknown, the combined effects of health on LFP and hours for all adults (not just the elderly) have not been estimated, and the cross-effects of health shocks on these outcomes between spouses has also not been explicitly examined. This dissertation seeks to address these specific gaps.

Second, the policy implications of this study are directly relevant to recent efforts at re-establishing social insurance schemes in China. While the aforementioned micro level studies have found generous returns to good health in the maturing labor market (Benjamin et al. 2003, Yi 2005, Liu et al. 2008), this evidence also implies that poor health may have serious consequences for individuals and households who cannot adequately self-insure. A portion of this dissertation will attempt to assess whether access to such benefits (e.g. unemployment, disability, sick leave, health insurance) mitigates the economic losses associated with poor health. In particular, employer type—state, collective, and private—may have been important for easing the effects of illness since social protection programs were delivered primarily through state sector employers, but also some collective enterprises that inherited such features.

A recent wave of new reforms aimed at increasing health insurance began in the late 1990s in response to the collapse of social safety nets during economic reform period. Prior to

[4] For example, men reporting poor or fair health were less likely to work, women who improved their ability to walk a kilometer were more likely to work, and women who became obese were less likely to work four years later.

[5] However, their first stage regressions using objective health indicators to predict self-reported health status are only strong when using random effects. The difference between fixed effects and random effects estimates suggest that omitting individual fixed effects introduces substantial bias. Consequently, using weak instruments in the fixed effects specification is likely to produce inconsistent results when applying IV estimations procedures. Moreover, it is likely that objective health, especially in the form of disabilities, has a direct effect on LFP rather than through perceived health status, thus violating the necessary exclusion restrictions.

this, and as a legacy of the socialist system, workers of government bureaucracies and state-owned enterprises have access to comprehensive social benefits, including housing, child care, unemployment, and medical care. For health insurance specifically, urban workers (and often of their dependents) were covered by the government employee insurance scheme (GIS), funded through general revenues, or the labor insurance scheme (LIS), a work unit-based self-insurance system. In rural areas, health benefits were provided through the Rural Cooperative Medical System (RCSM) financed by commune revenues. Other benefits of employment in the state sector include temporary sick-leave wages, free medical care for work-related injuries, or commensurate lifetime monetary compensation for injuries preventing work (Solinger 1995). However, such benefits depend on the profitability level of the enterprise and were not commonly offered in the private sector (Solinger 1995). Rural systems essentially collapsed when agricultural collectives were transitioned to household-based agriculture systems, but emergent township and village enterprises retained some institutional features of their former organizations. Commercial insurance schemes have not developed to any significant extent to cover workers who are no longer with state-owned enterprises or collectives (Akin et al., 2004; Henderson et al., 1995; Hu et al., 1999). As a result, the economic transition period is characterized by a rise in illness-induced poverty, plunging rates of health insurance coverage, and skyrocketing health care costs (Yuan and Wang 1998, Hu et al. 1999, Akin et al. 2004, Liu 2004, Blumenthal and Hsiao 2005).[6] Despite recent health insurance reforms, coverage rates have continued to decline according to early assessments (Wang et al. 2005, Zhang et al. 2006, Xu et al., 2007).[7]

Therefore, workers holding state and collective sector jobs stand to disproportionately benefit from the lingering social protection programs offered through government and collective enterprises during the economic transition period. Family members may also benefit substantially due to reduced financial burden of medical care. The increased linkage between wages and productivity in the private sector labor market also suggest that access to insurance is of critical importance for tempering the effects of shocks to an individual's productivity. In fact, workers who are less healthy or who have less healthy family members may opt to remain in public sector jobs to ensure access to social safety nets. As efforts to increase health insurance coverage rates continue the effectiveness of these new programs for ameliorating the cost of illness is yet unknown. It is likely that benefits will be sufficient to avoid large losses for at least some portion of people. However, because serious illness is often linked to early retirement for more elderly working age adults, there may be additional need for other targeted social insurance protection (e.g. disability, pension) mechanisms that provide longer-term security into old age. Evidence on the indirect costs of health shocks directly informs ongoing efforts at revising, expanding, and targeting such programs.

The third reason for studying China is the depth of the data available for rigorous econometric analysis. Data from the CHNS enables the construction of a panel over a large number of waves with consistent information on both health and time use. Utilizing a panel data set is critical for controlling for unobserved heterogeneity in health. Time use surveys, such as

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[6] From 1989 to 1997, the proportion of CHNS sampled city residents with some type of health insurance decreased from 70% to 51% and rural coverage hovered around 10% in the 1990s. See Akin et al. (2004) and Liu (2004).

[7] Differences in local government capacities slowed the rollout of the Urban Employee Basic Health Insurance Scheme while optional enrollment provisions stymied broad-based take-up (Xu et al. 2007). Similarly in the Rural Cooperative Medical System, only the wealthy initially chose to participate in community-defined schemes which typically had low premiums and high copayments (Wang et al. 2005, Zhang et al. 2006).

the American Time Use Survey, are only cross-sectional, while other quality panel datasets with health measures, such as the Health and Retirement Study, do not typically collect information on time use.[8] Hence, CHNS offers a unique opportunity for studying the dynamic effects of health on time use that is both timely and relevant to current policy considerations.

1.3 Significance

The aims of this study are three-fold: (1) document the effect of health shocks on individual's and household's time spent in market labor and home production, (2) quantify the effects of spousal health shocks on husbands' and wives' time use, and (3) investigate possible buffering effects of gender, age, wealth, and public sector employment.

Currently, there is very little information on the role of health in relation to home production activities. As the theoretical framework will show, this distinction is particularly important for predicting individual responses to health shocks due to substantial specialization across sectors between members with the household. Limiting analyses to only a labor-leisure dichotomy discounts the value of home production activities and over-simplifies the complex decisions and constraints that individuals and households face when illness occurs. Although there may be important substantive and economic differences between different types of activities (e.g. cleaning versus taking care of children), I collectively analyze all home production activities in this study as a first step to understanding the tradeoffs that are made across production sectors under time and productivity constraints.[9] Only a handful of studies have touched upon this and only a small subset is conducted in developing countries where social insurance mechanisms are more problematic.

In addition, there are a number of existing studies that document the relationship between health and labor supply in China using the same survey data. However, their estimates of the effect of health on labor supply may suffer from biases related to observed differences across individuals in their risk for health shocks. The empirical approaches employed in this study seek to explicitly address issues related to strict exogeneity assumptions in using fixed effects over long time frames and differences in the risk of adverse health events across individuals according to observed characteristics. I address these issues by combining fixed effects first-differencing with additional linear controls for baseline characteristics. Propensity score matching and weighted least squares techniques are further applied to assess bias due to nonlinearities among observables. Moreover, previous studies have only examined LFP and hours worked outcomes separately and/or only for the elderly. This study estimates the effects of health for all adults on both individual and household hours supplied to work activities, as well as estimates the cross-effects of health among spouses.

Finally, an investigation into the effects of limited social protection by employer type and possible imperfections in the labor market due to such a bifurcation offers a chance to assess the impacts of wholesale privatization without commensurate restructuring of social programs. As efforts to increase social insurance in China continue, evidence grounded in sound scientific

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[8] The Panel Study of Income Dynamics has stopped collecting information on time use.

[9] Home production refers to goods or services that do not generate money income, such as cooking, cleaning, and child care. This is distinct from market labor which refers to all income-generating activities, including farming, fishing, and running household businesses.

approaches is critical for shaping these programs and achieving greater security for individuals and households.

CHAPTER 2: THEORETICAL FRAMEWORK

In order to understand the total effect that ill health may have on time use, the theoretical framework combines Grossman's (1972) development of health capital and Gronau's (1977) distinction between market work and work at home. In the standard labor-leisure tradeoff, all non-market time is considered leisure regardless of activity. This simplification undervalues commodities produced at home—goods that may entail significant time costs to produce and that may have imperfect market substitutes. The individual utility maximization model outlined here highlights the ambiguous effect that ill health has on time allocation. I modify Gronau's (1977) home production and time allocation model to account for additional time lost to illness originally elucidated by Grossman (1972) as well as the health determinants of wages from Strauss and Thomas (1998). Apart from these earlier models, I also introduce health into the home production function as an exogenous technology input. It can be shown that sickness can affect time use through the loss of healthy time, productivity declines in market labor, as well as productivity declines in work at home. I then review the relevant literature regarding previous findings on these topics. This is followed by a formal statement of the hypotheses to be tested based on the theoretical predications and existing evidence.

2.1 Individual utility maximization

2.1.1 The model

This exposition of the model closely follows Solberg and Wong (1977) who analyze the effect of fixed time costs on time allocation, but is adapted to assess the specific implications of health. Individuals can be viewed as having preferences over consumption goods (*X*) and leisure time (*l*):

$$U = U(X, l). \tag{1}$$

Utility exhibits diminishing marginal returns ($U'<0,\ U''>0$) assume that consumption and leisure are complementary in the utility function ($U_{Xl}>0$). Consumption goods can either be purchased on the market or produced at home, which are perfectly substitutable. Let X^M represent the value of goods purchased on the market and X^N denote the market value of goods produced at home.

$$X = X^M + X^N. \tag{2}$$

Goods produced at home are the result of labor supplied to non-market production (*g*) according to technology (*F*) that is subject to decreasing marginal productivity ($F'>0,\ F''<0$). Also incorporating health status (*H*) into the model, I assume that health will affect the efficiency with which such tasks are completed:

$$X^N = F(g; H) \tag{3}$$

Market goods can be purchased with income generated from hours spent in market work (*m*) at the prevailing wage rate (*w*) and other non-labor income (Y):

$$X^M = w(H)m + Y. \tag{4}$$

Wages may also be a function of health if employers set compensation according to productivity. For all commodities, the budget constraint incorporating home production can be expressed as

$$X = F(g; H) + w(H)m + Y. \tag{5}$$

Total time, normalized to one, can be allocated to either work in the market (*m*), work at home (*g*), or leisure (*l*), less the amount allotted for illness (*s*):

$$1 = g + l + m + s. \tag{6}$$

Hence, healthy time (*T*) can be defined as time not spent in sickness (*1-s*). The individual's decision is then to choose *l*, *X*, *m*, and *g* to maximize utility (1) subject to the income (5) and time constraints (6).

The Lagrangian for this optimization problem can be written as

$$\mathcal{L} = U(l, X) + \lambda_1(1 - l - g - m - s) + \lambda_2(w(H)m + Y + F(g; H) - X) \tag{7}$$

In addition to the time and income constraints themselves, the first order conditions with respect to the choice variables are as follows:

$$\frac{\partial \mathcal{L}}{\partial l} = U_l - \lambda_1 = 0 \tag{8a}$$

$$\frac{\partial \mathcal{L}}{\partial X} = U_X - \lambda_2 = 0 \tag{8b}$$

$$\frac{\partial \mathcal{L}}{\partial g} = -\lambda_1 + \lambda_2 f_h = 0 \tag{8c}$$

$$\frac{\partial \mathcal{L}}{\partial m} = -\lambda_1 + \lambda_2 w = 0 \tag{8d}$$

Hence, the following equilibrium condition holds:

$$\frac{U_L}{U_X} = f_g = w. \tag{9}$$

In other words, the marginal rate of substitution between leisure and consumption goods is equated with the marginal value of home production and the shadow price of time.

At equilibrium, time becomes a function of wages and income. The derived demands for consumption goods and leisure time can be expressed as

$$l = l(w, I) \tag{10a}$$

$$X = X(w, I) \tag{10b}$$

where I represents the full wealth constraint when the budget and time constraints are combined:

$$wl + X = F(g) - wg + w(1 - s) + Y \equiv I. \tag{11}$$

In this expression, we can also more easily identify the profits from home production, $\pi = F(g) - wg$, as well as the value of lost time due to illness, ws.

2.1.2 Three health pathways for employed individuals

To examine the effects of health on time allocation, we begin the analysis by looking at employed individuals who participate in both home production and market labor (i.e. $m, g>0$). Notice that health enters into this framework in three distinct places. First, health affects time spent in sickness and, thus, the total amount of healthy time remaining that can allocated toward market labor, home production, and leisure. Second, health can affect the productivity with which market labor is performed, reflected in the wage. Finally, health can enhance the efficiency of the home production function, improving the profitability of time spend in home production.

Let us first take a look at leisure time. Calculating the partial derivatives of leisure time with respect to s, w, and F, we obtain the following:

$$\frac{\partial l}{\partial s} = \frac{\partial l}{\partial I} \cdot \frac{\partial I}{\partial s} < 0 \tag{12a}$$

$$\frac{\partial l}{\partial w} = \left(\frac{\partial l}{\partial w} \right)_s + \frac{\partial l}{\partial I} \cdot \frac{\partial I}{\partial w} \tag{12b}$$

$$= \left(\frac{\partial l}{\partial w} \right)_s + T \frac{\partial l}{\partial I} + \frac{\partial l}{\partial I} \cdot \frac{\partial \pi}{\partial w} \tag{12b'}$$

$$\frac{\partial l}{\partial F} = \frac{\partial l}{\partial I} \cdot \frac{\partial I}{\partial F} > 0 \tag{12c}$$

where the subscript s refers to the income-compensated effects. Because $\partial I / \partial s < 0$ (i.e. illness decreases income by reducing healthy time), the effect of sick time on leisure time is negative since leisure is also assumed to be a normal good. However, the effect of health through wages on leisure is indeterminate. The first term in (12b) reflects the usual substitution effect and is negative. The second, however, can be further broken down. Note that $\partial I / \partial w = \partial \pi / \partial w + (1 - s)$ from equation (11). Hence, the second term in (12b') reflects the usual income effect and is positive. However, the third term, which relates the change in wage to the profitability of home production is negative since $\partial\pi/\partial w = -g < 0$ from the home production profit expression. Thus, the profit effect on home production exerts an extra negative substitution effect away from leisure. The net effect of wages is then ambiguous. The third pathway for health to affect leisure time is through the efficiency gains in the home production function itself (3). This effect is unambiguously positive since efficiency gains correspond to an increase in overall income ($\partial I/\partial F > 0$).

The same analysis of health pathways can be done for market labor time. The time constraint can be rearranged in terms of market labor time and expressed as

$$m = 1 - l(w, I) - g(w, I) - s \tag{13}$$

Calculating the partial derivatives of market labor time with respect to *s*, *w*, and *F*, the following is obtained:

$$\frac{\partial m}{\partial s} = -\frac{\partial l}{\partial I}\cdot\frac{\partial I}{\partial s} - \frac{\partial g}{\partial I}\cdot\frac{\partial I}{\partial s} - 1 \tag{14a}$$

$$\frac{\partial m}{\partial w} = -\left(\frac{\partial l}{\partial w}\right)_s - \frac{\partial l}{\partial I}\cdot\frac{\partial I}{\partial w} - \left(\frac{\partial g}{\partial w}\right)_s - \frac{\partial g}{\partial I}\cdot\frac{\partial I}{\partial w} \tag{14b}$$

$$= -\left(\frac{\partial l}{\partial w}\right)_s - \left(\frac{\partial g}{\partial w}\right)_s - T\frac{\partial l}{\partial I} - T\frac{\partial g}{\partial I} - \frac{\partial l}{\partial I}\cdot\frac{\partial \pi}{\partial w} - \frac{\partial g}{\partial I}\cdot\frac{\partial \pi}{\partial w} \tag{14b'}$$

$$\frac{\partial m}{\partial F} = -\frac{\partial l}{\partial I}\cdot\frac{\partial I}{\partial F} - \frac{\partial g}{\partial I}\cdot\frac{\partial I}{\partial F} \tag{14c}$$

Now, the effects of health on market labor time through each of these pathways are indeterminate. For sick time (14a), the first term is the usual income effect, which is positive since $\partial I/\partial s < 0$. The second term is negative, arising from the fact the home production time is an inferior good and a decrease an income will increase time in home production at the expense of market time. The last term reflects time lost purely due to illness. Overall, the net effect of sick time is ambiguous. For a change in wages (14b'), there is a substitution effect away from both leisure and toward market labor ($-\partial l/\partial w > 0$), but the increase in wages also induces an additional positive effect on market labor time since home production time is assumed to be an inferior good ($-\partial g/\partial w < 0$). However, the income effect working through leisure time decreases market labor (i.e. $-T(\partial l/\partial w) < 0$) while the income effect working through lower home production time increases time available for market labor (i.e. $-T(\partial g/\partial w) > 0$). Moreover, there is also a substitution effect through home production profitability (the last two terms in 14b'). Since home production is relatively less profitable when wages increase, there is a possible substitution toward market time (i.e. $-(\partial l/\partial I)(\partial\pi/\partial w) > 0$) offset by a possible reduction in market time due to increased overall income (i.e. $-(\partial g/\partial I)(\partial\pi/\partial w) < 0$). The effect of a change in home productivity on market time is also ambiguous because of a negative effect resulting from increased leisure time, but a positive effect due to greater income that reduces home production time and increases the available time for other activities.

It should be noted that the strength of the effect through wages will depend on the nature of the job. For piece-meal labor, wage compensation may indeed be more strongly linked with individual productivity (e.g. farm work). However, wages for salaried workers will not respond as readily to productivity changes, and in many cases are downward sticky. Salaried workers' hours may also be constrained to the normal work week (e.g. 40 hours) and any increased productivity beyond the allowable time will not be reflected in market hours worked. Thus, the pathway of health through wages may be muted for these types of workers.

Finally, we can examine the health pathways for home production time. Again, rearranging the time constraint in terms of home production time, we have

$$g = 1 - l(w, I) - m(w, I) - s \tag{15}$$

Calculating the partial derivatives of home production time with respect to s and w, we obtain the following:

$$\frac{\partial g}{\partial s} = -\frac{\partial l}{\partial I}\cdot\frac{\partial I}{\partial s} - \frac{\partial m}{\partial I}\cdot\frac{\partial I}{\partial s} - 1 \tag{16a}$$

$$\frac{\partial g}{\partial w} = -\left(\frac{\partial l}{\partial w}\right)_s - \frac{\partial l}{\partial I}\cdot\frac{\partial I}{\partial w} - \left(\frac{\partial m}{\partial w}\right)_s - \frac{\partial m}{\partial I}\cdot\frac{\partial I}{\partial w} \tag{16b}$$

$$= -\left(\frac{\partial l}{\partial w}\right)_s - \left(\frac{\partial m}{\partial w}\right)_s - T\frac{\partial l}{\partial I} - T\frac{\partial m}{\partial I} - \frac{\partial l}{\partial I}\cdot\frac{\partial \pi}{\partial w} - \frac{\partial m}{\partial I}\cdot\frac{\partial \pi}{\partial w} \tag{16b'}$$

$$\frac{\partial g}{\partial F} = -\frac{\partial l}{\partial I}\cdot\frac{\partial I}{\partial F} - \frac{\partial m}{\partial I}\cdot\frac{\partial I}{\partial F} \tag{16c}$$

Again, the effects of health through sick time (16a) are indeterminate as in the market labor case. The effects of health through wages are also indeterminate. Since market labor time is more valuable, there is a positive substitution effect away from leisure, freeing more time for home production, but there is also a negative substitution away from home production time and toward market labor (the first two terms in 16b'). There are two income effects that also point in opposite directions as greater income increases leisure time, reducing home production time, but also decreases market time, making more time available for home production. The wage effects through home production profitability similarly point in different directions; lower relative profitability of home production compared to market labor induces a shift away from home production time (i.e. $-(\partial m/\partial I)(\partial \pi/\partial w) < 0$), but lower profitability also reduces income, inducing a shift toward increasing time at home (i.e. $-(\partial l/\partial I)(\partial \pi/\partial w) > 0$). Similarly, for a change in efficiency of the home production function due to health, the total effect is ambiguous due to a negative effect of income through leisure time, but a positive effect due to greater income that reduces the need for market time and increases the available time for home production.

Therefore, the sum of these effects—through healthy time, productivity in market labor, and productivity in home production—on time use is ambiguous for leisure, market labor, and home production times. A summary of these effects and their pathways is given in Table 1, Panel A. Since this dissertation deals with the effects of negative health shocks on time use, the theoretical predictions given in the table represent the time response for a health decline. While the exposition here has differentiated between each pathway, assuming the others remain constant, it is unlikely that in reality each of the pathways will occur in isolation.

2.1.3 Health pathways for the unemployed

The effects of health for unemployed individuals are somewhat easier to define since the pathway through market labor productivity can be eliminated for the most part. The real market wage rate (w^*) may greater than the shadow price of time for these individuals and, by extension, the marginal value of home production (i.e. $w^*>w=f_g$), leading them not to supply any time to market labor (i.e. $m=0$). When the home productivity of unemployed individuals is sufficiently lower than the wage rate, the individual has only to decide between leisure and home production time. The change in leisure time with respect to sick time remains negative; illness reduces leisure. However, the change in home production with respect to sick time is still ambiguous. Even though market labor time is not considered and the second term in (16a) drops out, the usual income effect increases home production time but this is offset by the reduced total healthy time available. For a change in home production productivity due to health, home production time increases due to a substitution away from leisure that is now relatively more expensive, but is offset by an income effect that reduces time for home production, resulting in a net ambiguous effect.

For the unemployed, changes in wages are irrelevant for the most part unless productivity in home production begins to approach the reservation wage (w^*), at which point the individual could enter the labor force. This point is perhaps better illustrated graphically as depicted in Figure 1. The home production function, F_h, represents the feasible set of goods produced by time supplied to work at home when healthy. The existence of a labor market expands this set, as represented by the straight line budget constraint (BC_h). Time is then allocated between home production (g_hT_h), market labor (l_hg_h), and leisure (Ol_h) for employed individuals with utility U_h^U. Note that home production time ends when the value of home production equals the wage rate ($F_g=w$). For unemployed individuals with utility U_h^U, time is only allocated between home (l_hT_h) and leisure (Ol_h), and the person does not participate in the labor force. However, we can see that if an individual experiences an increase in health which expands the home production function and increases overall time (from $F(H_s)$ to $F(H_h)$, the marginal value of home production may increase such as to approach the wage rate and individuals may opt to enter the labor force. This positive effect on market labor is more likely to occur when an individual is recovering from an earlier health shock and is poised to re-enter the labor force after health and productivity are restored. Since I am examining the effects of a health *decline*, this possibility can be ruled out. Therefore, a health shock for an unemployed person will not affect market labor hours and may even reduce the likelihood that the individual return to the market labor force.

2.1.4 Cross-effects of spousal health

Thus far, the theoretical model has linked an individual's health with her time allocation decision and assumes health to be exogenous. Health can endogenously determined through a production function depending on spousal time inputs. When a health shock strikes a family member, there are two possible pathways to consider. First, illness may not only reduce household consumption due to medical care expenditures, but also reduce the production contributions of sick members to the collective resource pool (as elucidated in the previous section). The dependency ratio within the household increases, at least temporarily. Therefore, a decrease in spousal productivity due to ill health reduces non-labor income, Y, and shifts the budget constraint and production curve downward, generating a pure in income effect. The comparatives statics of leisure, market labor time, and home production time with respect to a change in non-labor income involve pure income effects:

$$\frac{\partial l}{\partial Y} = \frac{\partial l}{\partial I} \cdot \frac{\partial I}{\partial Y} > 0 \tag{17a}$$

$$\frac{\partial m}{\partial Y} = -\frac{\partial l}{\partial I} \cdot \frac{\partial I}{\partial Y} - \frac{\partial g}{\partial I} \cdot \frac{\partial I}{\partial Y} < 0 \tag{17b}$$

$$\frac{\partial g}{\partial Y} = -\frac{\partial l}{\partial I} \cdot \frac{\partial I}{\partial Y} - \frac{\partial m}{\partial I} \cdot \frac{\partial I}{\partial Y} < 0 \tag{17c}$$

Since leisure is a normal good by definition, a pure income effect increases leisure (17a), which comes at the expense of market labor and home production time. The first terms in (17b) and (17c) show the normal income effect and are negative. The second term, however, is positive, reflecting the increased available time, for example, for market labor when home production time is reduced. However, given that the marginal value of home production and wages have not changed, (i.e. F_g=w), the reduction in leisure time should be allocated proportionally across market and home times, resulting in a net negative effect on each. For the unemployed, a decrease in income leads to an increase in home production time at the expense of leisure.

There is a second pathway through which spousal health may affect individual time allocation. Sick members require extra care, increasing the demand for home-produced goods (X^N). Higher demand is reflected in greater productivity at home and this effectively raises the home production curve, reflecting greater output (Evenson 1977, Gronau 1976, Gronau 1980). The comparative statics with respect to a change in home production function have already been laid out in (12c), (14c), and (16c). Due to a pure income effect resulting from higher productivity, leisure time is increased, but the effects on market and home time are ambiguous stemming from the fact that increases in one will necessarily reduce the amount of time available for the other, the extent to which will depend on how much productivity has changed in relation to wages. For the unemployed, if the demand for home production is high enough, individuals may opt to enter the labor force and be compensated in wages for the equivalent level of productivity.

2.1.5 Differences in health effects across sub-populations

The relative size of these effects will depend on the severity of the shock and the extent to which income and time contributions to the household production capacity are affected. This is also shaped by specialization within the household and economic factors (e.g. wage differences) that may reinforce differential responses between men and women. In the usual case, men hold a comparative advantage in market work while women may be more specialized in home production activities. This may be especially relevant for the case of caring for the sick, which is a home-time intensive activity and is likely to have few market substitutes in low income settings. Increased demand for care-taking at home may disproportionately affect women's time at home rather than men's. Income losses from reduced labor supply for men may be much greater than for women and the size of the income effect will depend on the opportunity cost of time for the sick individual. Similarly, there may be differential effects according to age. Particularly as health depreciates over time, the impact of health shocks may be more severe and productivity losses become more permanent. Deteriorating health can lead to early retirement and greater demand for care-taking at home. Moreover, the extent to which spouses are able to augment labor supply may be limited by institutional features. Salaried workers, in particular, may be prevented from increasing hours worked unless they choose to find an additional job. Self-employed and piece-meal laborers may have more leeway with which to increase income through hours worked.

Yet, the consequences of health shocks may be mitigated by savings, access to private transfers, and/or the presence of social insurance programs. Savings may be used to finance the direct and indirect costs of illness. Households with greater permanent income or a larger network of personal relations may fare better when health problems occur. Social insurance programs that allow for sick time away from the job, temporary disability or unemployment benefits, or access to medical care can reduce the illness recovery period. The particular characteristics of China's labor market during the economic transition suggest that such benefits, if any, were primarily associated with employment in public sector enterprises. The emerging private sector also allows for more competitive wage setting, making productivity key for compensation. In contrast, public sector wages may be less sensitive to output and characterized by standardized salaries and work hours. Therefore, workers in state-owned firms and large collective enterprises may be less impacted by illness.

2.1.6 Labor mobility and compensating wage differentials

Such differentials in fringe benefits tied to public sector jobs may give rise to significant job lock as workers sort based on health status or anticipated health status for themselves and their family members. Through a compensating wage differentials setup, one can see that if wages do not perfectly offset differences in the valuation of health insurance premiums across different jobs, then insured workers may be less inclined to change jobs. Assume individuals *i* have preferences over health or other type of insurance ($INS = [0,1]$) and wages (w) at firm j:

$$V_{ij} = V(w_{is}, INS_{ij}). \tag{18}$$

Workers will desire health insurance if there exists a compensating wage differential (Δw_{ij}) such that

$$V(w_{ij} - \Delta w_{ij}, INS_{ij}{=}1) - V(w_{ij}, INS_{ij}{=}0) \geq 0. \tag{19}$$

If the labor market is perfectively competitive, firms that must pay the cost of insurance for each worker (C_j) will provide insurance only if $\Delta w_{ij} \geq C_j$. This suggests that, in equilibrium, firms will bid wage differentials down to C_j such that all workers covered by insurance in any job they work in will earn exactly $(w_{ij} - \Delta w_{ij}) = (w_{ij} - C_j)$. In other words, lower wages will be offered to those workers whose insurance premiums are higher and total compensation will be the same regardless of employer. In this case, each worker will be able to shop around to different employers and find a wage offer that compensates for the exact value that she places on having the same insurance benefits. Furthermore, firms pass off the full cost of such benefits to workers resulting in a fully efficient outcome.

However, insurance offerings are not the same across employers, and particularly during China's economic transition period. Employers are unable to set employee-specific compensation packages and coverage is tied to employment in the state or collective sector jobs where insurance offerings are more likely to be available. Public sector employees who value insurance above its cost earn rents from the particular employer match whereas premiums in the private sector are set at cost and these workers do not gain any rents. For example, suppose firms in one sector (1) offer health insurance and firms in another sector (2) do not, but the worker could be more productive in sector 2 than in sector 1 where she currently works. The worker may not switch jobs even if she would earn a higher wage because

$$V(w_{i1} - \Delta w_{i1}, INS_{i1}=1) - V(w_{i2}, INS_{i2}=0) > 0. \quad (20)$$

In this case, wage offerings in the alternative sector—even if the full distribution of offerings is assumed to be known—are not high enough to offset the valuation of non-wage benefits, leading to job lock.

2.2 Literature review

In a transitional economy setting, stocks of health capital may finally see returns when labor markets are allowed to operate freely. A number of studies have shown a positive relationship between privatization and growth in developing countries (for a review, see Kikeri and Nellis, 2004; Plane, 1997) and between firm ownership type and job creation in transitional economies (Bilsen and Konings, 1998). At the micro level, there is a large body of evidence supporting the pathways through labor supply and productivity, but relatively less empirical evidence regarding home production activities and health-related productivity in the household sector.

2.2.1 Health and home production time

Although studies of health and time supplied to labor are plentiful, the empirical evidence for the effect of health on home production is sparse. In many cases, studies do not separate out home production activities and assume all nonmarket time is leisure. However, there are a few notable exceptions. From iron supplementation experiments with Chinese female cotton mill workers, treatment resulted in increased vigor after work hours and women spent about 30 minutes more time in their kitchen and in shopping (Li et al. 1994). Among Indonesian wage workers who received similar iron supplementation treatment, sleep time was reduced by about 20 minutes and was reallocated toward leisure (Thomas et al. 2003). Bhargava (1997) finds that higher BMI corresponds to spending a greater proportion of time in house work for women in Rwandan households. These studies suggest that health may also improve productivity in home production activities or enjoyment of leisure time. Moreover, increased time in such activities without reducing labor speaks to the value of healthy time in expanding the production frontier. However, this is not always the case. Parsons' (1977) finds that poor health reduces market work time, but not home production time, for both men and women in the U.S. The differences in findings suggest that health improvement may induce different time responses than health degeneration. It may also be the case that preferences for leisure and consumption goods depend on income levels and the availability (or lack thereof) of market substitutes for home produced goods in less developed countries.

2.2.2 Health and labor supply

There is a plethora of evidence supporting the positive effect of health on labor supply, wages, and incomes. Currie and Madrian (1999) conclude from their literature review that health has a greater effect on hours of work than on wages, which may partially be due to the unobservability of productivity by employers and the more proximate effects of health on work effort. However, in piecemeal work in low-income settings, effects on productivity have been documented. For example, Thomas et al. (2006) find that iron supplementation increases the probability of working for men with very low levels of hemoglobin at baseline while similar treatment for Sri Lankan female tea plantation workers led to increased productivity in the fields (Edgerton et al. 1979). Rather than investigating health improvements, many studies assess the impacts of health shocks on labor outcomes. Health shocks reduced labor supply in Ghana and Cote d'Ivoire (Schultz and Tansel 1997) and illness reduced LFP and earnings in Indonesia (Gertler and Gruber 2002). In more experimental approaches, Dow et al. (1997) find that a decline in functional status significantly depressed labor supply in Indonesia. In Germany, Riphahn (1999) estimated that a health shock trebles the probability of leaving the labor force and doubles the unemployment risk. In Spain, Gomez and Nicolas (2006) found that those who had suffered a health shock were 5% less likely to remain employed after conditioning on past health and other factors. These findings show that the substitution effect away from labor time appears to dominate in the event of ill health. Moreover, it is well documented that the effects of deteriorating health appear to influence transitions out of the labor force for the elderly. This result has been found across developed and developing countries alike (e.g. see Sammartino 1987, Quinn and Burkhauser 1994, Martin and Kinsella 1994). However, Martin and Kinsella (1994) note that the rate of decline in labor supply with respect to age in developing countries is much lower and labor force participation rates rarely reach the low levels seen in developed countries due to the predominance of self-employed agricultural work.

The findings from China also generally indicate that health is advantageous for supplying labor to market activities. Using 1989-1997 CHNS data, Yi and Dow (2006) find a positive effect of health on labor force participation using a variety of objective and subjective health measures.[10] They employ fixed effects to account for unobserved heterogeneity and isolate the effect of a change in health on a change in LFP within individuals. However, health may still be endogenous due to possible reverse causality and the authors recognize this, but are unable to

[10] For example, men with poor or fair self-reported health were less likely to work, women who improved their ability to walk a kilometer were more likely to work, and women who became obese were less likely to work four years later.

find sufficient instrumental variables for health. Benjamin et al. (2003) choose to focus on the elderly and also find a significant effect of a change in perceived self-reported health status on labor force participation and hours for the elderly using individual fixed effects. They instrument perceived health with an index of objective health indicators and fail to find any effects of health in these specifications. However, first stage regressions reveal relatively weak predictive power of the objective health index. Moreover, some types of objective health indicators, such as some physical disabilities, may have a direct effect on labor force participation rather than through perceived health status, which violates the necessary exclusion restrictions. Lindelow and Wagstaff (2005) show that negative health shocks are associated with substantial declines in income, largely due to reductions in labor supply for household heads. These authors also employ individual fixed effects and estimate an equation that uses changes in self-reported health status between past and current periods to predict outcomes in current periods while controlling for changes in observed characteristics. Liu et al. (2008) find that household income is strongly influenced by individual self-reported health status, particularly in rural areas. Although point estimates in this paper may be biased due to potential endogeneity between income and health, the authors argue that this bias is small for the case of transitory income.

All of these studies have employed fixed effects to control for time-invariant heterogeneity which cannot directly address the possibility of reverse causality. In the short-run, the direction of causality is more likely to run from health to labor outcomes as health requires longer-term investments to maintain. However, over the longer-run, the potential for reverse causality may increase as labor and income limit the extent to which health investments can be made. While longer panel data allows for better study of longer-run effects, the potential for reverse causality also increases. Finally, all of these studies in China have ignored the consequences of health for home production activities, which may also be economically significant for household income and consumption smoothing.

2.2.3 Intra-household cross-effects of health

Evidence on the effects of health on the time use of other household members is less generalizable and often only focuses on labor market outcomes. Parsons' (1977) early study using data from the U.S. is notable in that it separately accounts for home production time spent in cooking, cleaning, and home maintenance. He finds that husband's home production hours increase in response to poor health in his wife, but not his own health. On the other hand, husband's poor health forces a reduction in his market work hours and his wife's health problems induce a modest, but insignificant increase in his work hours. For married women, poor health reduces their own market hours, but not home work hours, but poor health of the husband leads to an increase in market work and a small, insignificant decrease in home hours.

Other studies of health cross-effects tend to only examine labor supply responses. Berger (1982) finds that both men and women reduce market hours in response to their own health problems, but when spouses become ill, wives decrease market work while husbands' work hours declined only in response to the wife's disability or death (Berger 1983). However, wives increased market work when the husband died or his health deteriorated (Berger 1983). Unlike previous studies, Berger and Fleisher (1984) and Haurin (1989) use longitudinal data and find conflicting results for the effect of husbands' health problems on wives' labor supply. However, Blau (1998) and Berger and Pelkowski (2004) both find that poor health of the husband reduces the wife's exit rate from the labor force[11] and poor health of the wife decreases the rate at which the husband enters the labor force. Among elderly married couples in Germany, a longitudinal study by Blau and Riphahn (1999) found that wives were less likely to exit the labor force and more likely to enter the labor force if the husband had a chronic condition and was still working, and were more likely to exit and less likely to enter if the husband had left the labor force. On the other hand, husbands were less likely to stop employment and less likely to reenter employment if the wife had a health condition, a response that was independent of the wife's labor force status.

The empirical evidence from developing countries is less abundant and appears to vary by context. Coile (2004) found that women decreased their labor supply after their husbands became sick. In contrast, Thirumurthy et al. (2006) found that improvements in body mass index and CD4 counts for HIV/AIDS patients in Western Kenya increased treated men's labor supply, but reduced the labor supply of untreated women and young boys in the household. In China, Benjamin et al. (2003) find that husbands increase work hours in response to wives' health degeneration, but increases in work hours for wives are even larger when husbands become sick. However, these results are not consistent across specifications and home production time is not examined. Indeed, Liu et al. (2008) do not find any statistically significant differences in health effects on household income between rural men and women, but these estimates may also be downward biased as household members augment labor supply to prevent any subsequent shocks to income.

2.2.4 Health and labor mobility

Even though increases in returns to human capital may spur growth, there could be important distributional consequences if workers with higher abilities disproportionately leave the public sector. The literature on economic growth and inequality finds a positive relationship (for a review, see Adelman et al., 1989). However, these studies typically focus on disparities across industries (e.g. agriculture versus manufacturing) or geographic differences (e.g. rural versus urban). Little is known about differences across ownership type—namely between firms in the public and private sectors—a distinction which is arguably the key motivation for transitioning to privatization.

Benefits, such as health insurance, may also play a critical role in sector choice and job mobility. "Job lock" may arise when such benefits are delivered through employers and workers do not switch jobs because of undesirable benefits in alternative job offerings. Most studies have relied on a variety of difference-in-difference estimators, using spousal coverage, fertility, health conditions, and policy changes as sources of comparison (for a review, see Gruber et al., 2000).

Using data on married men of working age, Madrian (1994) finds mobility reductions of 25%-30% when analyzing differences by spousal coverage, but 32%-54% when analyzing differences by family size. Also using spousal coverage, Buchmueller and Valletta (1995) find significant reductions of for women, but only weak indications of job-lock among men when comparing by spousal coverage, and Adams (2004) finds similar estimates using Current Population Survey data covering a 12-year time span. Anderson (1997) estimates hazard models using the National Longitudinal Survey of Youth and finds that job lock among men with a pregnant spouse lowers mobility by about 34%. Stroupe et al. (2001) also estimate a hazard model for job duration and find that employer-based health insurance reduces the probability of

[11] Blau attributes this to the provision of employer-provided health insurance ad evidence of job lock.

departure by about 40% for those confronting a chronic illness for themselves or their children. Perhaps the most convincing evidence comes from studies that use policy changes to compare outcomes for different groups. Gruber and Madrian (1994) examine mandated continuation health coverage and show that such a policy increases turnover by about 10%. Bansak and Raphael's (2005) study of the State Children's Health Insurance Program (SCHIP) show a large significant increase in public coverage rates among the children of adults who do not have independently insured spouses, a 6 percentage point increase in the likelihood that the worker separates from their current employer within one year, and no effects on wages.

In developing countries, the implementations of insurance programs have found some effects in alleviating attachment to the labor force. For example, in Mexico, expansion of health insurance through Seguro Popular led to a decline in hours worked for secondary workers and lower LFP for young men aged 15 to 24 (Knox 2008). However, there was also an increase in the number of weeks worked for workers aged 45 to 65 (Knox 2008), suggesting that access to health care may bolster stamina for those already working. Whether health or insurance status causes differential sorting across employers or sectors of employment in China is unknown.

2.3 Hypotheses

Based on the theoretical models and previous findings in the literature, several testable hypotheses can be specified.

H1. A health shock is negatively related to own market labor time.

H2. A health shock is negatively related to own home production time.

H3. A health shock affecting a spouse is positively related to own market labor time.

H4. A health shock affecting a spouse is positively related to own home production time.

Even though the own market labor supply and home production time responses are theoretically ambiguous, previous research has found a positive correlation between market labor supply and health and home production time and health (e.g. Li et al. 1994). This suggests that a negative health shock is likely to reduce time supplied to both work at home and work on the market. In the extreme case where a severe health shock renders the individual completely dependent, then all contributions to market work and home production may end as the amount of healthy time available approaches zero. Unhealthy workers may be terminated from employment. In more intermediate cases, a negative effect on time in both sectors may result from a large substitution effect away from market labor if productivity on the job declines and employers respond to this by lowering wages or limiting hours. Lower productivity in home production tasks also may induce a substitution effect away from time spent in these activities. The negative directions may also be reinforced by the decline in overall healthy time, resulting in absolute reductions in time to both sectors. However, there may be proportionally greater impacts, for example, on market labor time if productivity losses for market labor are greater than productivity losses for home production.

The theoretical model also predicts that for individuals who are initially unemployed, there is no effect on market labor time. For labor force non-participants, the effect of a health shock is unlikely to induce entry into the labor force for the majority of individuals since they are initially poised to only work in the household sector. For those who have temporarily exited the labor force, a health shock will likely reduce the chances of re-entry. On the other hand, time may be reduced from home production activities to the extent that ill health limits productivity in these activities.

When a health shock affects a member of the household, the loss of income due to less work and increased household expenses (e.g. for medical care) may induce an increase in own market labor supply. However, increased demand for home production goods in relation to caring for the sick may also drive an increase in time spent at home. Both of these increases may come at the expense of leisure. Although some time may be shifted away from work in order to care for the sick, the need to smooth income for the household may generate a larger absolute effect on market labor time than on home production time. It may also be relatively easier to obtain in-kind transfers of care-taking time or home production time from other family members and relatives, leaving more time to supply toward market labor.

H1a. The effect of a health shock on own market labor time will be larger for men than for women.

H2a. The effect of a health shock on own home production time will be larger for women than men.

H3a. The effect of a spouse's health shock on own market labor time will be larger for women than men.

H4a. The effect of a spouse's health shock on own home production time will be larger for men than women.

There are likely to be differences in time impacts of health shocks between men and women resulting from division of labor within the household. Traditional gender roles would suggest that men are specialized in the market sector and women in the household sector, although individuals may participate in both. For men, the effect of a health shock may disproportionately impact productivity at work, generating a proportionally greater decline in market labor supply compared to their home production time and an absolute greater decline in market labor supply compared to women. Men are also more likely to be employed in physically demanding jobs which require robust physical health to maintain high productivity. Women, on the other hand, may experience greater decline in productivity in their home production function relative to their market labor productivity if engaged in less strenuous occupations. This would result in a proportionally greater reduction in home production hours compared to their own market labor hours, and a greater absolute reduction in home production hours compared to men. Because men generally command higher wages on the labor market, shocks affecting husbands may lead to larger declines in income than shocks affecting women. Thus, the size of the income effect toward increasing market labor may be quite large for wives. Wives may also be more efficient in home production tasks, necessitating a smaller increase in time spent at home to meet the increased demand for home care. Hence, market labor hours may see a greater absolute increase than home production hours, but the proportional increase in hours may be somewhat skewed toward home production. On the other hand, household income may suffer less when wives become ill, although losses in home production may be relatively greater. Thus, size of the income effect for husbands may be smaller while the demand to compensate for wives' lost home-produced goods (i.e. an increase in the shadow price of home production for men) may generate a large substitution effect toward increasing time at home.

H1b. The effect of a health shock on own market labor time will be larger for the elderly compared to younger individuals.

H2b. The effect of a health shock on own home production time will be larger for the elderly compared to younger individuals.

H3b. The effect of a spouse's health shock on own market labor time will be larger for the elderly compared to younger individuals.

H4b. The effect of a spouse's health shock on own home production time will be larger for the elderly compared to younger individuals.

There may also be differences observed by age. As health deteriorates over the life cycle, changes in health are more likely to result in permanent declines in health stock. Relative to younger workers, older workers may experience greater productivity losses, generating a greater substitution effect. They may also have relatively less healthy time as they find it more difficult to recover from illnesses. Older workers are also more likely to transition into retirement as they near the eligibility age, have accumulated greater savings, and be covered by government pension programs associated with pre-reform employment. Lost experience in the labor market generally also entails lower costs for elderly workers. Therefore, the impact of health shocks on both market labor time and home production time for the elderly may be greater than for younger workers in absolute terms. Because health shocks occurring among the elderly may lead to greater income losses as well as greater demand for care at home, the effects on spouses' time to increase both market labor time and home production time in absolute terms.

H1c. The effect of a health shock on own market labor time will be larger for the poor than the rich.

H2c. The effect of a health shock on own home production time will be larger for the rich than the poor.

H3c. The effect of a spouse's health shock on own market labor time will be larger for the poor than the rich.

H4c. The effect of a spouse's health shock on own home production time will be larger for the rich than the poor.

Wealth may be one of the most important household assets that help to buffer against the impacts of health shocks. Household savings may be able to defray the cost of medical care, helping to shorten the recovery period and increase the amount of healthy time available. Treatment of health conditions may also limit the extent to which productivity is affected, leading to smaller substitution effect away from market labor and home production activities. Wealthier individuals may also be able to better afford higher quality of care whereas poorer individuals may choose lower quality, less efficacious treatments, or have stronger preferences for traditional medicine. Household savings also buffer spouses from having to compensate for lost income from the sick individuals. Instead, there may be a greater relative increase in home production hours to meet the increased demand to care for the sick, which may also be greater than market labor hours in absolute terms.

H1d. The effects of a health shock on own market labor time will be larger for private sector workers compared to state/collective sector workers.

H2d. The effect of a health shock on own home production time will be larger for state/collective sector workers compared to private sector workers.

H3d. The effect of a spouse's health shock on own market labor time will be larger for private sector workers compared to state/collective sector workers.

H4d. The effect of a spouse's health shock on own home production time will be larger for state/collective sector workers compared to private sector workers.

H5. The effects of health shocks will reduce the likelihood that individuals transition into private sector employment (increase the likelihood that workers will remain in public sector employment).

Because social insurance programs are channeled through employment in the public sector, the effects of negative health events should be muted for workers in state owned enterprises. The rigidity of wages, availability of health insurance, and allowances for sick leave associated with public sector jobs suggests that the size of the healthy time effect and of any income effects should be limited. On the other hand, private sector workers' wages may be more responsive to changes in health-induced productivity while the lack of paid time off or subsidized medical expenses result in larger income and healthy time effects. Poor health may also prevent would-be entrepreneurs from taking risky ventures into the private sector. The reduction in labor supply for these workers may also induce healthy spouses to augment their time contributions to production activities. Moreover, the availability of such benefits through the public sector may give rise to job lock and reduce the likelihood that sick workers or those with sick spouses will leave their job, even though wage compensation in the private sector may be higher. For employees of collective enterprises, the effect of remaining mutual insurance mechanisms may offer some protection against health risks for workers and their family members. However, the emphasis on productivity and profit maximization may offer fewer protections for guaranteed salary compensation, employment status, and hours worked. Therefore, the effects of health for employees of collectives may fall somewhere in between the effects for public and private workers.

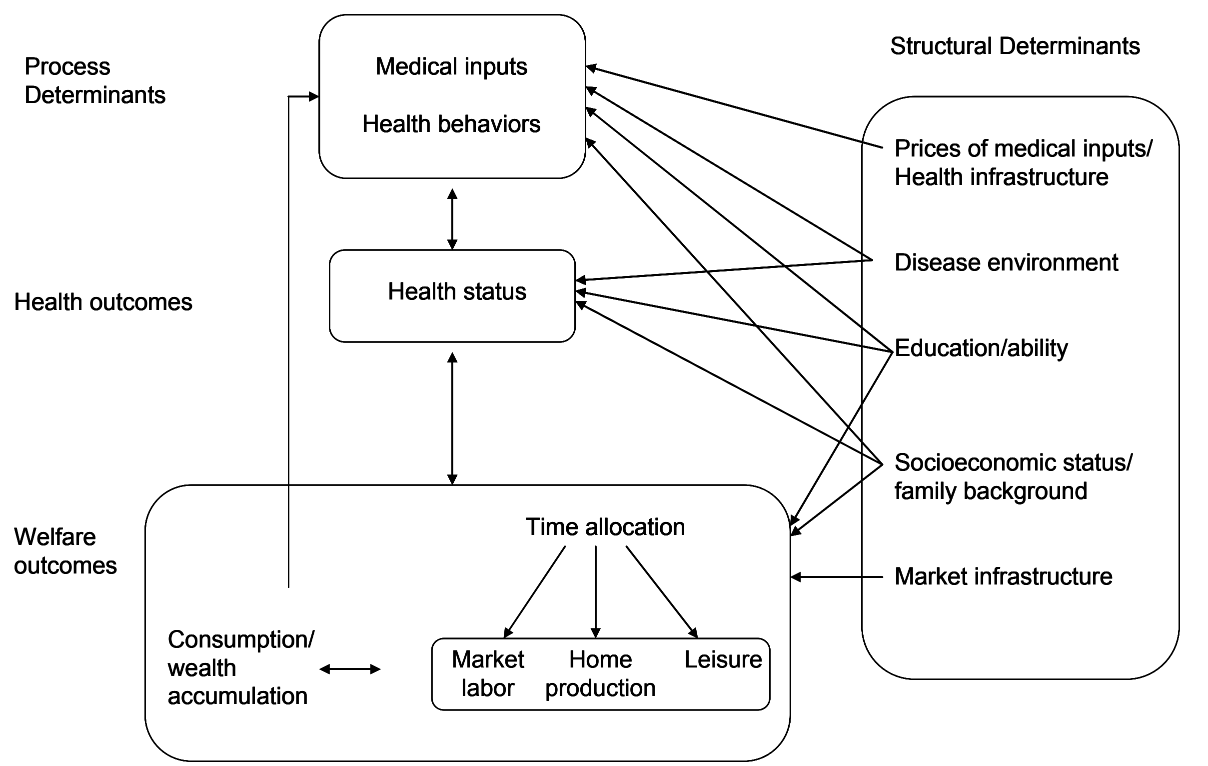
CHAPTER 3: DATA AND MEASUREMENT

To test the hypotheses, quantitative data reflecting the various determinants of health and time use outcomes are taken from the longitudinal China Health and Nutrition Survey. I present a conceptual flow chart to illustrate the various factors involved, describe the survey data, and explain how such variables are to be operationalized for the econometric analysis.

3.1 Conceptual flow chart

The relationship between health and time use outcomes and their determinants are depicted in Chart 1 (see below). Following Grossman's (1972) model of health capital, health is produced with inputs that include medical care as well as behaviors that affect health, such as diet, exercise, and smoking. An individual's level of health then directly affects their productivity and the division of time between market labor, home production, and leisure, as sketched out in the utility maximization framework in Chapter 2. Health status can enter the utility function directly if individuals derive consumption benefits from being physically healthy. The ability of individuals to work also facilitates income generation, which then can be used to purchase health inputs. However, the relationship between health and welfare outcomes is moderated by a number of community level environmental factors. These include the local

Chart 1. The relationship between health and time use.



infrastructure for health services, the labor market, and the general level of development, prices of medical goods and wages, and the prevailing disease environment. Individual's education and/or innate ability, their genetic endowment, and level of household resources also will influence how health determines time allocation. The econometric analysis will need to control for these various structural determinants. In addition, particular attention will be paid to the roles of gender, age, household wealth, and public versus private sector employment in buffering the effects of health on time allocation.

3.2 China Health and Nutrition Survey data

Information from six waves of the China Health and Nutrition Survey (CHNS) conducted from 1991 to 2006 is used in this analysis. The CHNS is a multistage, random cluster sample of households in nine provinces. Although the CHNS is not a nationally representative sample, the counties within provinces were chosen to represent a range of income levels, and provinces vary substantially in geography, economic development, public resources, and health indicators. More details of the survey are available from the CHNS web site (http://www.cpc.unc.edu/projects/china/).

In addition to basic demographics, the CHNS collects information related to work activities, time use, and health for all individuals within each household. In particular, the CHNS asks about various home-based tasks and chores, such as cooking and cleaning, hours spent in various work activities (e.g. wage work, household gardening and farming). In addition, the questionnaire focuses extensively on health and nutrition measures, such as dietary intake, anthropometrics, and health-related behaviors (e.g. smoking, alcohol consumption, preventive care utilization). Because health and nutritional data were only collected from preschoolers and adults aged 20-45 in the first wave of the CHNS conducted in 1989, this year is excluded from the analysis. Repeat visits to the same household in subsequent waves allow for the construction of a panel subset. However, attrition and migration contribute to missing data. New households were added in certain waves to address this issue and were re-interviewed in subsequent waves.[12] There are about 200 communities in each wave and roughly one-third are located in urban areas.

Analysis of individual-level own time allocation outcomes is restricted to adults (age 18+) who appear in two consecutive waves (to construct a panel). This yields about 40,000 observations across all survey years. Due to attrition and missingness, the analytic sample differs considerably from all respondents surveyed in the CHNS. Table 2 compares the observable characteristics for all adult survey respondents (N=91,701) to those observations included in the pooled OLS analyses (N=43,648) and those in the first-differenced fixed effects specifications (30,729). Observations dropped from the pooled OLS sample generally work fewer hours, are less likely to be in the labor force working in the state/collective sector rather than the private sector, work fewer hours and participate at a lower rate in home production. More importantly, a significantly higher percentage of those who were dropped from the analytic sample reported being in poor health (7%) and experiencing health shocks (7% negative and 5% positive) than those remaining in the pooled OLS sample (of which only 5% reported being in poor health and

[12] In 1997, new households and communities were added to replace those no longer participating and Heilongjiang province replaced Liaoning province. In 2000, newly-formed households, replacement households, and replacement communities were again added, and Liaoning province was added back to the study. Through all waves, there are 152 and 83 unique rural and urban communities, respectively.

4% and 3% experience negative and positive health shocks, respectively). Excluded individuals are also considerably younger, more likely to be single, come from households with a larger number of adults, fewer children, and less asset wealth. Interestingly, there were not any differences in education between included and excluded individuals. The differences between respondents included and excluded in the first-differenced fixed effects specification are generally similar. However, those included are somewhat less educated (52% with less than a primary school education) and less engaged in farming (58%) compared to those who were excluded (47% with less than primary school education and 51% farmers). These systematic differences indicate that missingness and attrition are unlikely to be random, contributing to a more selective analytical sample. The implications of this selectivity for empirical estimates are discussed in Chapter 8. Analysis of spousal health effects is limited to the subset of all married couples from the individual analytic sample, yielding about 28,000 observations.

3.3 Dependent variables: Average hours worked per day

The main dependent variables are constructed in the following manner:

- Average hours worked per day in market labor: This is constructed from a question that asks, "How many hours in a day on the average, did you work?" in reference to the previous year. In the income survey module, this question is asked for each of the following activities: primary and secondary occupations, home gardening, household farm or farming collective, raising livestock/poultry, collective and household fishing, and small handicraft or small commercial household businesses. The variable is calculated as the sum of hours reported for all income-generating activities. Some corrections for hours were made in obvious cases of double-reporting (e.g. farmer reports same hours worked in household business as farming and wage job) and any total hours over 20 were top-coded.[13] However, some measurement error may still remain due to mis-reporting or mis-coding, particularly for less formal occupations that blur the lines between wage work and household-based businesses. Average hours per day over the previous year may better capture the longer-term market labor supply rather than shorter-term fluctuations.
- Average hours worked per day in home production: In the time allocation and home activities survey module, individuals were asked about how much time they spent performing the following activities in the past week: buying food, preparing and cooking food, washing and ironing clothes, cleaning the house, taking care of the children. Time was recorded in various units (hours per day, hours per week, minutes per day, and minutes per week) across questions and across survey years. All units of time were converted to hours per day. The shorter recall time for home activities questions may decrease recall bias, but may also introduce measurement error based on short-term fluctuations. Time caring for a spouse or a sick member of the household is not asked. This is a significant limitation, particularly for assessing the intra-household cross-effects of health. However, to the extent that caring for sick members is complementary to other household tasks, increased time for home care can partially be captured by the reported

[13] Alternatively, reported hours that exceed the threshold can be coded as missing and subsequently dropped from the analysis. Robustness checks are conducted to assess the extent that results are sensitive to such coding differences and do not find any difference in estimates using either coding method.

hours for these other activities. The direction of the effect of spousal health shocks on home production time will be correct, but the magnitude will be under-estimated. Alternatively, if caring for the sick substitutes for other tasks, then the direction of the effect of spousal health shocks on home production time will again by under-estimated and may even be in the wrong direction. Although there is little empirical evidence to determine whether caring for the sick is complementary to other household tasks, the complementary case seems more likely, particularly given that health shocks may reduce the home production contributions of the sick person, requiring healthy persons to compensate for this loss and increase their own home production contributions.

Total and individual time contributions to household production activities are also included as additional dependent variables:

- Total production time: This is calculated as the sum of hours worked per day in market labor and home production.
- Division of time: The distribution of total production time between market labor and home production is expressed as the percentage of total production time spent in market labor.
- Total household market labor hours: This is calculated as the sum of hours per day spent in market labor for all household members.
- Total household home production hours: This is calculated as the sum of hours per day spent in home production for all household members.
- Total household production hours: This is calculated as the sum of hours per day spent in market labor and home production for all members of the household.
- Proportion of household market labor time worked: This is calculated as the percentage of total household market labor hours per day contributed by the individual's reported market labor hours per day.
- Proportion of household home production time worked: This is calculated as the percentage of total household home production hours per day contributed by the individual's reported home production hours per day.
- Proportion of household total production time worked: This is calculated as the percentage of total household production time (market labor and home production combined) contributed by the individual's reported total production time (market labor and home production combined).

3.4 Independent variable: Health status

The main independent health indicator is derived from self-reported health status. A dummy variable is created to indicate "poor" health status versus reports of "fair", "good", or "excellent" health that are collectively considered non-poor or good health. Admittedly, and as pointed out in the literature review, one of the biggest limitations of previous studies is the ability to address the simultaneity of health and welfare outcomes and this may be more severe with subjective measures of health. For example, some have argued that this measure may suffer from justification bias if individuals rationalize labor outcomes in terms of health status (Chirikos 1993). This may also explain why self-reported measures generally have a larger effect than the more objective impairment and functional limitations indicators (Bound 1991) and have led to efforts to instrument for objective measures with limited success in finding convincing instruments and exclusion restrictions (e.g. Benjamin et al. 2003). However, to the extent that self-assessed health also embodies mental health status, this measure may be a more holistic and comprehensive measure that reflects work capacity than other measures that are limited to functional status (Bound 1991). If objective measures affect outcomes through perceived health status, then self-reported status represents the most proximate health status measure to activity outcomes. In addition, the bias arising from the endogeneity of self-reported health will tend to be offset by downward bias related to measurement errors (Bound 1991).

On strategy to address the possibility of simultaneity and limit measurement error is to focus on large changes in health status which may eliminate fixed measurement errors within any given individual and are more likely to represent exogenous changes in health. The occurrence of health shocks are defined as a change in health status in two adjacent survey waves. A negative health shock reflects a change from non-poor health status to poor health status while a positive health shock reflects a change from poor health to non-poor health. Note that in regressions that do not distinguish the direction of the health status change, the effects of both positive and negative health shocks are constrained to be uniform. However, summary statistics show that incidence of negative health shocks is much higher than positive health shocks, consistent with the deterioration of health capital over the life course. While this is an imperfect strategy, robustness checks show that these "large" changes in health do generate larger effects than smaller one-step health status transitions. Accordingly, the empirical analysis largely focuses on the effects of negative health shocks on hours of production activities.

3.5 Control variables

The empirical analyses also include a variety of control variables to reflect structural determinants of the health-time use relationship. Since the empirical analyses employ longitudinal information, an important distinction is made between time-varying characteristics and time-invariant characteristics.

Time-invariant controls include the following:

- Height is included as an indicator of nutritional status during childhood. Height may be a good indicator of the stock of health an individual has, the product of investments in health made early on in life. [14]
- Age and its square are included as continuous variables. The second order term is included to account for possible curvilinear relationships with time allocation outcomes. For example, working hours may peak for adults of prime age whereas hours may taper off as individual reach retirement age. Age ranges from 18 to 101 in the analytic sample, in which 34% of adults are over the age of 50.
- Gender is coded as a dummy indicator for male. Men are likely to contribute less to home production while women may contribute less to market labor is there is significant division of labor across couples.
- Educational attainment is coded as a series of dummy variables reflecting the highest level of education achieved: less than primary school (reference group), primary school,

[14] Other research has found significant relationships between height and wages. For example, see Thomas and Strauss (1997) and Chen and Zhou (2007).

lower middle school, upper middle school or technical/vocational school, and some college or higher.

- Primary occupation is used to control for differences in work time requirements for different types of jobs that may also be correlated with health. For example, day laborers may work longer hours and also be in worse health compared to business managers. These are coded into five categories: farmer (includes fishermen and hunters), laborer (i.e. all unskilled labor), professional (e.g. doctor, lawyer), skilled worker (i.e. craftsmen), and service worker (e.g. clerical office worker). Because health shocks may result in job changes, the primary occupation is constrained to the occupation that is reported in the respondent's first year of participation in the survey. This limits the endogenous aspects of occupational definitions.
- Urbanicity is included to control for important differences between urban and rural areas. China historically has an urban bias in terms of wealth and service provision; rural areas are less developed and poorer. Therefore, rural residents may have fewer employment opportunities as well as less access to health care.
- Province in included to control for average differences in health and labor outcomes across administrative regions.
- Survey year controls for fixed differences over time.
- Employer type is coded as dummy variables for the sector—state, collective, or private—of an individual's work unit or firm of employment based on the individuals' reported primary occupation. In all waves of the CHNS, respondents are asked to identify the type of work unit they work at. For the purposes of this study, private sector work includes family contract farming, private (individual) enterprises, and three-capital enterprises that are owned by foreigners, overseas Chinese, and joint ventures. This category would also encompass most self-employed individuals. On the other hand, governmental units or state-owned enterprises are defined as the state sector. Finally, collective enterprises owned and organized by persons at different levels of administration (e.g. township, county, city, province) are separately coded to distinguish an intermediate brand of ownership that is specific to the economic transition in China. Such entities were immediately borne from initial efforts to privatize communes and state-owned enterprises, allowing surplus goods to be sold on the open market. As reforms took hold, they also served as a springboard for entrepreneurship in household-based farming and individual business ownership (Naughton, 2002). Therefore, although many of these types of organizations retained some features of their former state-owned status, such as mutual insurance mechanisms for employees and their family members, they were also more streamlined to increase efficiency and worker productivity. Because of the large number of missing observations for this variable, it was excluded from the main empirical analyses and included separately in the analyses of possible interactions by employer type,

Time-varying controls include the following:

- Marital status is included as a single dummy indicator for married individuals versus single, divorced, or widowed people. Although labor force participation rates are generally high in China, single people will likely participate at a higher rate compared to married individuals who may opt out of the labor force and rely on their spouse's income. For this reason, marital status is also allowed to vary over time since marriage often comes with a change of living situation that will change the division of labor within the household between market labor and home production activities. Only 0.6% of adults are divorced, 0.1% separated, and 3.3% widowed. Due to the small numbers, I include these statuses in the single category. Only 1.4% of married women have remarried, 50% of which have followed divorce and 18% following widowhood. The CHNS does not ask men about remarriage. Due to the small numbers and inconsistency across gender, I do not separately account for remarriage.

- Household size is included as a time-varying control to reflect the size of non-labor income for the individual in the budget constraint (depending on the number of producers) and the demand for home produced goods. Because production activities primarily fall on the adult generation and children are primarily consumers in the household, three continuous variables are used: the number of adults, girls, and boys in the household. Girls and boys are separately coded due to the possibility that son preferences may influence decisions about health and work time.
- Wealth per capita is included to control for differences in asset income adjusted for the number of individuals within the household. This is a more direct measure of non-labor income for the household budget constraint. Controlling for changes in assets on the right hand side allows the econometric model to focus on changes in time use net of decisions to accumulate or spend down asset wealth. This measure is constructed from an index of 12 household items at the average community purchase price: motorcycle, car, radio, vcr, black/white tv, color tv, washing machine, refrigerator, air conditioner, electric fan, camera, microwave. All prices are deflated to 2006 yuan.

In the analysis of the spousal cross-effects of health shocks, several additional controls are needed to address possible confounding from differences in characteristics of household members. Variables for the spouse's age (and its square), education, and occupation were included, coded in the same manner as the individual analysis.

Coding definitions of all variables is summarized in Table 3.

CHAPTER 4: RESEARCH DESIGN AND METHODS

The econometric approach to estimating the effect of health shocks on time use combines individual fixed effects (FE) with propensity score (PS) matching and weighted least squares (WLS) techniques. Individuals FE are used to control for unobserved heterogeneity across individuals that are correlated with both levels of health status and levels of time use in market labor and home production. Moreover, FE estimation is implemented via first-differences (FD) to isolate short-run effects, minimize reverse causality, and additionally controlling for differences in health risk classes based on observables. PS matching and WLS regressions are further implemented to additionally control for any non-linearities among the observable controls.

4.1 Econometric specification

A priori, it is theoretically unclear if hours should be modeled in levels or logs as responses to health shocks may produce a level response regardless of initial hours worked (e.g. full-time versus part-time) or a proportional response (e.g. 10% cut back). Because I am interested in the total effect of health on hours worked, I use levels and estimate a one-part model that includes observations with zero reported hours. However, due to the possibility of a corner solution for individuals who do not participate in any activities of a particular sector, the marginal effect can be decomposed into a participation decision (i.e. to work or not work) and a conditional hours response (i.e. hours worked given participation). Estimating these decisions separately yields a better understanding of where changes in hours are occurring across the distribution of hours. Therefore, I construct dummy variables for participation in each sector based on reporting positive hours and also run separate analyses the predicts participation and hours worked conditional on participation. Conditional hours are left as levels in order to facilitate comparison of point estimates with the one-part model of unconditional hours.

4.1.1 Pooled OLS and individual fixed effects

The supply of time (Y_{it}) to each sector—market labor or home production—as function of poor health (P_{it}) can be estimated using a single equation. For all individuals (i) observed at time (t):

$$\mathrm{E}(Y_{it}) = f(P_{it}, X_{it}, V_i, \eta_t, e_{it}) \qquad (21)$$

where η_t represents a vector of survey year dummies, X_{it} represent time-varying individual and household characteristics (i.e. household size, asset wealth per capita, marital status), and V_i represents time-invariant characteristics (i.e. height, education, age, occupation, gender, urbanicity, employer type, and province), and e_{it} is the error term. After controlling for observed individuals and household characteristics (X_{it}) that may be both correlated with health and the outcome, the estimated coefficient on health will be unbiased provided that the error term (e_{it}) is independent of health (i.e. cov(e_{it}, P_{it})=0). However, because the production of health often involves unobserved influences, such as risk behaviors and genetic endowment, which may also be correlated with time allocation, this condition is violated and unobserved heterogeneity across individuals may bias estimates of the effect of health.

By taking advantage of the longitudinal nature of the CHNS data, time-invariant unobserved differences across individuals can be additionally controlled for with the inclusion of individual fixed effects. The error term (e_{it}) can be decomposed into an individual-specific component (μ_i) and a time-varying component (v_{it}): $e_{it} = \mu_i + v_{it}$. Then,

$$\mathrm{E}(Y_{it}) = f(P_{it}, X_{it}, \eta_t, \mu_i, v_{it}) \tag{22}$$

The individual FE specification essentially uses only within-individual variation across survey waves. The coefficient on health can be interpreted as the effect of a *change* in health on a *change* in hours worked. While this purges the estimate on health of confounding due to between-individual variation, there are two main drawbacks to this approach. First, some time-invariant individual and household characteristics of interest (e.g. education, age, gender) are collinear with the fixed effect and cannot be separately estimated. Thus, variables contained in V_i are dropped from the equation and only time-varying control variables (X_{it}) are retained. Second, in a panel setting that uses six survey waves spanning 16 years, the fixed effect for any given individual will reflect an average deviation from an individual mean across all survey years. In other words, differences across short time periods are averaged with differences across longer time periods, producing an average deviation across all time periods. Under a strict exogeneity assumption on the explanatory variables, the idiosyncratic error (v_{it}) should be uncorrelated with each explanatory variable across all time periods. In other words, for all time periods t≠s, cov(v_{it}, $v_{is}|X_i$, μ_i)=0. This is unlikely to be the case because of possible endogenous feedback between health and time use outcomes that may become more pernicious with greater time differences. For example, even though a health shock may cause an immediate reduction in labor supply, lost income may further decrease health in future years in negative feedback loop.

To minimize endogenous feedback, I limit the analysis to focus on immediate changes on both these dimensions and use only a one-period difference across adjacent survey waves. The major drawback to this approach is that only short-term changes are examined and longer-run effects of health are not captured. On the one hand, if the effects of past health continue to persist over time, then only focusing on short-term differences will underestimate the full effect of health. On the other hand, individuals may also recover from health over the longer-run and the immediate "shock" effect of health on individuals will be dissipated. With this in mind, this analysis only seeks to estimate the immediate impact of health shocks and will leave more sophisticated modeling of longer-run effects to future work. The individual FE model is first-differenced to isolate the effects of a one-time-period change in health ($\Delta P_{it} = P_{i,t+1} - P_{it}$) on a one-time-period change in time allocation ($\Delta Y_{it} = Y_{i,t+1} - Y_{it}$).

$$\mathrm{E}(\Delta Y_{it}) = f(\Delta P_{it}, \Delta X_{it}, \eta_t, \Delta v_{it}) \tag{23}$$

Time-varying variables (ΔX_{it}) are also differenced and remain in the specification.[15]

[15] These include household size, asset wealth per capita, and marital status.

Because fixed characteristic differences across individuals may affect both the likelihood of experiencing a health shock and a change in time allocation, time-invariant controls (V_i) are added back to the equation.

$$\mathrm{E}(\Delta Y_{it}) = f(\Delta P_{it}, \Delta X_{it}, V_i, \eta_t, \Delta v_{it}) \qquad (24)$$

Particularly with changes in health, age is one time-invariant characteristic which is likely to affect both changes in health and changes in time use. As health depreciates over time, older people generally have higher risks for experiencing health shocks while they are also more likely to reduce market labor supply as retirement nears. Similarly, because of traditional gender roles, it is likely to case that women may devote more time to home production activities and have more elastic labor supply functions than men. Including time-invariant characteristics will control for these additional sources of variation that may bias estimates of the effect of a change in health.

Estimates of a change in health status will be unbiased if there is no remaining correlation between changes in health and changes in time-varying unobservables (i.e. cov(ΔP_{it}, Δv_{it})=0). Admittedly, this is a strong assumption as health shocks can be correlated with changes in preferences for labor and leisure or changes in household resource allocation across members. In the absence of appropriate instrumental variables to address this remaining source of unobserved time-varying heterogeneity, I can at least ensure that observed differences across individuals are controlled for to the extent possible with the application of propensity score methods.

4.1.2 Propensity score techniques

Causal inference may still be limited by the lack of adequate counterfactuals for less healthy individuals if the underlying distribution of "treated" individuals who experience a health shock is very different from that of "control" individuals who remain healthy, even after controlling for observable differences in linear regression.[16] Selection of individuals into particular health risk classes may bias estimates if certain combinations of observable individual and household characteristics are systematically correlated with the likelihood of experiencing a health shock. Therefore, propensity score (PS) techniques can be applied to correct for this additional source of variation. The identification strategy relies on the assumption that, after controlling for a non-linear combination of observable characteristics correlated with a change in health, the experiencing a health shock is exogenous to changes in time use outcomes.

The propensity score is first estimated with a vector of observable pre-shock characteristics (X_{it}, V_i). The likelihood of experiencing a negative health shock ($\Delta P_{it}=1$) conditional on being in non-poor health at baseline (P_{it}=0) is predicted as

$$\Pr(\Delta P_{it} = 1 \mid P_{it} = 0) = f(X_{it}, V_i, \eta_t). \qquad (25)$$

[16] In other words, it is unknown if and how time use would have changed had a given ill individual not experienced the health shock. Because this hypothetical situation cannot be observed, alternative comparisons within the pool of individuals who remain healthy over time can be made provided that such individuals have the same likelihood of experiencing a negative health event.

The specification choice of the propensity score was guided by two criteria: (1) the specification test proposed by Shaikh et al. (2009) which compares the distribution of the PS for the shock group to a weighted distribution of the propensity score for the no-shock group, and (2) the ability to achieve balance across observable characteristics between the groups. To achieve better balance across comparison groups, it is recommended that the PS be estimated as flexibly as possible (Imbens and Wooldridge 2007). Therefore, age is included as a vector of one-year dummy variables as well as higher order terms of continuous variables (e.g. wealth per capita) and province and survey year interactions.[17, 18] The sample is then trimmed twice. First, within each one-year age group, observations with PS values outside the region of common support within that specific age are excluded; this step is critical for achieving balance on age in the final sample. Second, the overall sample of all individuals is trimmed and observations with PS values outside the range of overlap were excluded.

To further ensure that individuals in the baseline period are as comparable as possible, I condition on baseline health status and participation status (in market labor and home production) for all estimation methods using the propensity score. This also relaxes the assumption that health deterioration and health improvements impact time allocation in the same way. Because of the resulting smaller samples sizes after conditioning, I only estimate the effect of a negative health shock (i.e. all individuals in non-poor health, P_{it}=0) for active participants in the activity of interest (i.e. all individuals who report positive hours, Y_{it}>0) at baseline.[19] The resulting marginal effect,

$$\frac{\partial E[\Delta Y_{it} \mid Y_{it} > 0, P_{it} = 0, X_{it}]}{\partial \Delta P_{it}}, \tag{26}$$

reflects the change in hours in response to transitioning into poor health, after controlling for a linear combination of observable characteristics, being in non-poor health, and actively participating in market labor or home production (all measured at baseline).

The estimated PS is then used in two ways for estimating the effect of a negative health shock on time: (1) matching on the PS, and (2) WLS. Both methods are likely to produce similar estimates, providing an additional check that the propensity score is estimated correctly (Imbens and Wooldridge 2007).[20]

(1) Matching on the propensity score: Individuals experiencing a health shock are matched to one or more individuals that do not experience a health shock based on the value of the

[17] After including one-year age dummies, higher order terms of continuous variables, and a vector of province*year fixed effects, time-varying observable characteristics (ΔX_{it}) did not significantly predict the likelihood of a health shock. Moreover, the specification fit of the propensity score distribution using time-varying observables resulted in inferior fit. Therefore, these were excluded from the final specification.

[18] Emphasis is placed on age since it is arguably the most critical risk factor associated with general health status and because age is where the largest imbalance between the shock and no-shock groups occurs.

[19] In theory, the effect of a positive health shock can similarly be estimated. However, the small sample size resulting from restricting the analysis to individuals who are in poor health at baseline does not permit a thorough analysis.

[20] Point estimates are reported, but standard errors are not shown. Ongoing work will estimate standard errors through a bootstrapping procedure.

propensity score. I employ one-to-one matching, which arguably leads to the most credible inference with the least bias, but sacrifices some precision (Imbens and Wooldridge 2007). However, because of the large number of comparison units available in the no-shock group, I also match to the nearest three neighbors and employ kernel density estimation (with the bi-weight kernel) using entire distribution of comparison units. All three results will be shown. The effect of a health shock on a change in time allocation is calculated as

$$\hat{\tau} = \frac{1}{N_{\Delta P_{it}=1}} \sum_{i \in \Delta P_{it}=1} \left(\Delta Y_{it} - \sum_{j \in \Delta P_{it}=0} w_{i,j} \Delta Y_{it} \right). \tag{27}$$

where $w_{i,j}$ represents the weight placed on comparison units j based on the Euclidean distance.

(2) Weighted least squares: Adjusting for differences between shock and no-shock units can be employed by weighting by the PS and controlling for all covariates (time-varying and time-invariant) in a regression framework. :

$$\Delta Y_{it} = \alpha + \beta \Delta P_{it} + X_{it}\gamma + V_i \delta + \lambda_{it} \tag{28}$$

where the regression weights are defined as

$$w_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{ti})} + \frac{1 - \Delta P_{it}}{1 - \hat{p}(X_{it})}} \tag{29}$$

and λ_{it} represents the idiosyncratic error term. All control variables can are included as an additional check for confoundedness. In this case, the estimate on a health shock is consistent if either the PS or the regression function is correctly specified, and is thus, “doubly robust” (Imbens and Wooldridge 2007) provided that cov(ΔP_{it}, λ_{it})=0.

4.2 Decomposing the marginal effect

Because hours worked can have corner solutions based on participation status (as evidenced by the mass of zero hours reported for non-participants), the choice of hours can further be decomposed into separate equations for participation and hours conditional on participation. Adapted to a FD specification (which is restricted to the sample of individuals who participate in the activity and report good health status in the baseline period), the expected change in total hours due to a negative health shock is given by:

$$E[\Delta Y_{it} \mid Y_{it} > 0] = \underbrace{\Pr(Y_{i,t+1} = 0 \mid Y_{it} > 0)}_{(a)} * \underbrace{E[\Delta Y_{it} \mid Y_{i,t+1} = 0, Y_{it} > 0]}_{(b)}$$

$$+ \underbrace{\Pr(Y_{i,t+1} > 0 \mid Y_{it} > 0)}_{(c)} * \underbrace{E[\Delta Y_{it} \mid Y_{i,t+1} > 0, Y_{it} > 0]}_{(d)} \tag{30}$$

In other words, when a health shock occurs, individuals can either stop participating (a), resulting in a reduction of hours previously worked at baseline (b), or continue to participate (c), but with reduced hours (d). Note that the probability of dropping out is equal to one minus the probability of continuing to work:

$$\Pr(Y_{i,t+1} = 0) = 1 - \Pr(Y_{i,t+1} > 0)\,. \tag{31}$$

Moreover, hours in the follow up period are zero for those who drop out of the labor force and

$$\begin{aligned} E[\Delta Y_{it} \mid Y_{i,t+1} = 0, Y_{it} > 0] &= E[Y_{i,t+1} - Y_{it} \mid Y_{i,t+1} = 0, Y_{it} > 0] \\ &= E[-Y_{it} \mid Y_{i,t+1} = 0, Y_{it} > 0] \end{aligned} \tag{32}$$

which is not a function of a change in health and is thus equivalent to the mean hours worked at baseline for individuals who drop out. Substituting (31) and (32) into (30), we have

$$\begin{aligned} E[\Delta Y_{it} \mid Y_{it} > 0] = &\big(1 - \Pr(Y_{i,t+1} > 0 \mid Y_{it} > 0)\big) * E[-Y_{it} \mid Y_{i,t+1} = 0, Y_{it} > 0] \\ &+ \Pr(Y_{i,t+1} > 0 \mid Y_{it} > 0) * E[\Delta Y_{it} \mid Y_{i,t+1} > 0, Y_{it} > 0] \end{aligned} \tag{33}$$

Hence, the marginal effect can be found by taking the derivative with respect to a change in health:

$$\begin{aligned} \frac{\partial E[\Delta Y_{it} \mid Y_{it} > 0]}{\partial \Delta P_{it}} = &-E[-Y_{it} \mid Y_{i,t+1} = 0, Y_{it} > 0] * \left(\frac{\partial \Pr(Y_{i,t+1} > 0 \mid Y_{it} > 0)}{\partial \Delta P_{it}} \right) \\ &+ \Pr(Y_{i,t+1} > 0 \mid Y_{it} > 0) * \left(\frac{\partial E[\Delta Y_{it} \mid Y_{i,t+1} > 0, Y_{it} > 0]}{\partial \Delta P_{it}} \right) \\ &+ E[\Delta Y_{it} \mid Y_{i,t+1} > 0, Y_{it} > 0] * \left(\frac{\partial \Pr(Y_{i,t+1} > 0 \mid Y_{it} > 0)}{\partial \Delta P_{it}} \right). \end{aligned} \tag{34}$$

To investigate the separate contributions of the components in equation (30), I run additional regressions for participation (30c) and conditional hours (30d) and report the coefficients on a negative change in health. Note that conditional hours are measured in levels. Participation equations are estimated using a linear probability model (LPM) for regression-based techniques; PS matching and WLS approaches are similarly applied.

4.3 Analysis of sub-populations

The regression and PS techniques will be conducted for the full sample of individuals aged 18 or older who appear in at least two consecutive waves of the CHNS. In addition, to test for interaction effects by employment status, gender, age, and wealth, and employer type, all analyses will be separately repeated for each sub-group. Age is separated into two categories:

under 50 and 50 or above. Age 50 is chosen because previous studies have show that the average retirement age is 56 for men and 50 for women (James 2002). Although legal retirement age in China is 60 for men and 55 for women, earlier retirement is possible for workers in the bureaucracy, hazardous occupations, or firms undergoing bankruptcy or restructuring. Wealth per capita is separated into tertiles and separate analyses are conducted comparing those in the lowest third of the distribution to those in the higher two-thirds of the wealth distribution. Because the sample of unemployed individuals is relatively small, analyses by gender, age, wealth, and employer type is restricted to all initially employed individuals. A fully interacted model is used to test the significance of the coefficient on the sub-population indicator for the FD FE specification run on the full sample.

In addition, for the analysis by employer type, the likelihood that a worker will remain in their sector of employment is used as a market labor outcome. After conditioning on the employment type observed in the baseline period, this analysis seeks to assess the extent of job lock (e.g. whether public sector workers are more likely to remain employed by their state or collective as a result of a shock to health).

4.4 Spousal health effects

The analysis of spousal cross-effects of health shocks proceeds in generally the same manner as the individual analysis. The sample is further restricted to individuals who are reported to be the household head and the head's spouse. Therefore, only married couples are included in the final sample. The key dependent time use outcomes are the same. The key predictor variable is now the spouse's health status or change in health status. In addition, controls for own health and the spouse's age, educational status, and occupation are included.

Application of PS techniques necessitate that the PS be re-estimated to predict the likelihood of one's spouse experiencing a negative health shock. Included in the vector of predictors is the individual's own health status measured at baseline (which is ultimately not statistically significant after controlling for all other confounders). Again, age was the most important factor to control for. Instead of trimming within each one-year age category for the individual, the distribution of the PS was trimmed within each one-year age category for the spouse while controlling for the individual's age. Matching methods and WLS regressions are conducted for this trimmed sample.

CHAPTER 5: ESTIMATED EFFECTS OF OWN HEALTH ON TIME USE

The analysis of the effect of individual own health shocks on time use begins with a description of the sample and some cross-sectional relationships between health transitions and changes in time use. I then report the results of econometric analyses of total production time before proceeding to separate analyses of hours worked in the market and home sectors.

5.1 Sample descriptive statistics

Summary statistics for each wave of the pooled OLS sample of individuals aged 18+ appearing in at least two consecutive CHNS survey waves (NT=43,648) are provided in Table 4. About one-third of the sample resides in urban communities. The average age is 44 years, which increases over time (likely due to the longitudinal nature of the data). Although educational attainment increases over time, 80% still have a primary school level education or less in 2006. The vast majority of people are married. On average, individuals live in households with three adults and one child; however, the proportion of children declines over time. Almost 60% of individuals are farmers. Real per capita asset wealth rises nearly 10-fold over this time period. The proportion of people reporting poor health increases from 3% in 1991 to 7% in 2006; the incidence of negative changes in health are greater than positive changes, but both increase over time. The increase in poor health may be related to aging. Figure 2 shows that the incidences of poor health (Panel A) and health shocks (Panel B) increase considerably with age, particularly with negative health transitions.

Individuals spend an average of 8.9 hours per day working: 6.9 hours are spent in market labor and 2.0 hours in home production. Over time, LFP declines (86% to 68%), driven by increasing exits, but average market time increases from 9.4 to 9.9 hours per day when conditioned on LFP. LFP is higher for men (83%) compared to women (73%), and men work longer hours with the gap increasing over time. Average hours per day worked at home initially declines from 2.5 to 1.5 between 1991 and 1997, but increase thereafter to 2.4. The increasing hours at home may partially be due to the increasing proportion of women in the sample (52% in 2006). While almost all women work in home production, participation for men increases from 55% to nearly 100% in 2004, driven by increased participation in buying food, cooking, laundry, and cleaning.[21] Across the age distribution (Figure 2), hours worked in the labor market (Panel C) and LFP (Panel D) begin to drop off steeply around age 50, but hours and participation in home production remain fairly constant until around age 75.

When sector time use is parsed by health shocks, larger differences appear for market hours than for home production. More workers with a negative health shock reduce market hours worked per day compared to their healthy counterparts (Figure 3, Panel A). The two bumps in the negative range likely correspond to part- or full-time labor force drop outs. Larger reductions in market hours in relation to negative health shocks are seen at older ages (Panel C) and are greater for men (Panel E) than for women (Panel F). Few differences in changes in home production hours by health are observed (Panel B). Compared to their healthy counterparts,

[21] Both men and women report increased participation in these activities in the 2004 and 2006 survey waves compared to previous waves. However, the increase is greater for men. There does not appear to be any change to the survey instrument or data collection process that could explain such a dramatic increase in participation.

reductions in home production hours worked per day for the sick are much larger for younger workers and slightly larger for men, but smaller for older people and women.

Participation also appears to vary by health status across the age distribution. Compared to those who do not experience a change in health, a lower proportion of individuals with a negative health shock remain in the labor force for nearly all age categories (Figure 4, Panel A), but lower retention of individuals with a negative health shock in home production is observed only for ages 55+ (Panel B). Fewer men with a negative change in health continue to work in the labor force for most of the age distribution compared to their healthy counterparts (Panel C); the pattern for continued participation in home production is inconsistent (Panel D). For women, lower proportions of women with a negative health shock stay in the labor force and in home production on average, but differences across the age distribution are not readily apparent (Panels E and F).

5.2 Total production time

5.2.1 One-part model of hours

Regression analyses of total hours spent in production activities—combined market labor and home production hours—are presented in Table 5. Cross-sectional pooled OLS estimates (column 1) show that poor health is significantly related to a 0.9 hour reduction in the work day. Hours worked per day exhibits a curvilinear relationship with age and increases significantly for individuals with higher education, women, those who are married, farmers, professionals and skilled workers, and who reside in rural communities. Hours worked per day significantly decreases when there are more adults in the household, but significantly increase when there are more children. When individual fixed effects are added as dummy variables, poor health is estimated to be significantly related to a 0.6 decrease in hours per day (column 2). This suggests that unobservable time-invariant differences in characteristics across individuals are correlated with both health and hours worked, and cross-sectional estimates are upward biased compared to the FE dummy specification. However, the standard error of the coefficient on health remains fairly similar, indicating little loss of efficiency when individual fixed effects are added.[22] Changes in marital status and the number of households are also significantly and positively related to hours worked per day.

When individual FE are transformed using first-differences, the estimate on poor health again decreases, but remains significant (column 3). Poor health status is related to about a half-hour decrease in total hours per day spent in some production capacity. A change in marital status is also significantly and positively related. For panel data with two time periods, individual FE and FD specifications are identical and produce the same point estimate. With panel data covering longer time frames, the individual FE specification averages deviations from individual means across the six CHNS waves (spanning 16 years). Note that both specifications are run on the same balanced sample of individuals and any differences in estimate magnitudes reflect the difference between estimates using average deviations in the dummy variable specification

[22] For all outcomes—hours, participation, conditional hours, household hours, and the percentage of household hours worked—the standard errors for OLS and fixed effects estimates are very similar. The large differences in point estimates indicate that fixed effects estimates are subject to less bias from unobserved heterogeneity, without sacrificing efficiency.

(column 2) versus transformation into FD (column 3).[23] When FD estimates are compared to longer-differenced estimates (summarized in Table 6), the effect size increases as the time between survey years increases. Panel A displays these results for total production hours while Panels B and C display the results for market labor and home production time, respectively. If health is exogenous to time use outcomes, the progressively larger magnitudes across longer time frames may reflect the true longer-run effects. However, health is unlikely to be entirely exogenous and its initial effects on time use outcomes may limit further investments into health and longer-run estimates may suffer from reverse causality. To minimize the possibility of reverse causality, I use only differences between adjacent survey years (first-differences) to estimate the short-run effects of health.

In column 4 of Table 5, time-invariant covariates that are differenced out with individual FE are added back into the specification. As suggested by cross-sectional plots and regression estimates, some time-invariant characteristics are significantly related to experiencing both a change in health and a change in time use. In particular, changes in total production hours worked per day exhibit a significant curvilinear relationship with age. Married individuals and men also show significantly greater changes in hours worked, while farmers, laborers, and skilled workers show significantly smaller changes in hours worked compared to members of other occupations.

Regressions in columns 5-8 further condition on participation and health status at baseline to disaggregate the direction of different transitions. For individuals who actively work in some production activity at baseline, the effect of a negative health shock (i.e. individuals in good health at baseline) corresponds to a marginally significant decline in 0.4 hours per day. On the other hand, a positive health shock for active workers leads to a significant 1.1 increase in hours per day (column 6).[24] For individuals who do not work in either market labor or home production at baseline, a negative health shock is related to a 0.5 reduction in hours per day while a positive shock is related to a 0.3 decrease in hours per day (columns 7 and 8). However, both estimates are insignificant and results must be taken with caution as sample sizes are small after conditioning. Healthy workers comprise the largest group of observations after conditioning (N=24,000+); this group is used in the following PS matching and WLS regression analyses.

The importance of controlling for baseline characteristics (V_i) is further illustrated in Table 7 which compares estimates on a change in health using first differences with time-invariant covariates to a FD regression that excludes them. Without covariates (row 3), the estimate on health, conditional on baseline health and participation, is much higher (-0.636) than the estimate when covariates are included (row 1), which is only marginally significant. The magnitude differences suggest that observable individual characteristics are correlated with *both* the likelihood of experiencing a change in health status and a change in production hours worked; failing to control for them produces biased estimates on health. Moreover, when time-varying covariates are constrained to their baseline values (row 2), estimates are nearly identical to the specification that allows them to vary over time (row 1). This suggests that allowing these variables to vary over time does not affect point estimates on a change of health.

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[23] Only individuals who appear in consecutive waves are included in the dummy variable individual FE specification. Therefore, when transformed to first-differences, only the last time observation is dropped. For example, if an individual appeared in three consecutive waves, then the first-differenced transformation will include two consecutive wave differences.

[24] When conditioned on having poor baseline health status, the negative coefficient on a change in poor health status (-1.093) is interpreted as a positive effect if viewed as a positive health change.

Additionally employing propensity score matching and regression techniques helps to ensure that individuals who do not experience a health shock are comparable to individuals who do in terms of the likelihood of experiencing a health shock. The specification of the propensity score is displayed in Table 8. Higher order terms are included to increase the flexibility of the function. The likelihood of a negative health shock is significantly higher for those with less than primary school education, farmers, and laborers, higher per capita wealth, and has a curvilinear relationship with the number of daughters in a household. Although not shown, age (included as a vector of dummy variables) is highly significant, as are dummies controlling for survey year and province interactions, which account for much of the variation in predicting a negative health shock.

This specification of the PS achieves balance across groups as well as a good fit according to the specification test developed by Shaikh et al. (2009). The PS distribution for each group is displayed in Figure 6. As expected, individuals who do not experience a health shock are concentrated toward the lower end of the distribution while the distribution for individuals who do suffer a negative health shock is less skewed. Table 9 compares means of observed characteristics between the shock and no-shock groups before and after trimming of the sample.[25] Prior to trimming, the negative health shock group is considerably older and less educated on average than the no-shock group.[26] These differences are eliminated after trimming and the remaining observations comprise a sample that is 48 years old on average and who are predominantly less educated, married, and are farmers. The congruence between the predicted PS distribution of the shock group and the adjusted predicted propensity score distribution of the no-shock group (Shaikh et al. 2009) was also superior compared to alternative specifications (Figure 7).

The results of PS matching and WLS regressions generally corroborate FD estimates. For comparison purposes, row 1 in Table 10 repeats estimates from FD regressions with time-invariant characteristics for the full sample that is similarly conditioned on good health and actively working at baseline. In row 2, the same FD specification is run for the smaller PS trimmed and balanced sample and rows 3-6 show estimates from propensity score matching and WLS methods. The estimated coefficients from the smaller PS sample are all in the negative direction and similar in magnitude to FD FE estimates on the larger full sample of workers.

5.2.2 Participation, conditional hours, and effect decomposition

The marginal effect on total daily production hours can be decomposed into two parts: continued participation and conditional hours. Columns 2 and 3 in Table 10 present the FD, matching, and WLS estimates for these outcomes. Regression techniques predicting the likelihood of continued participation are estimated using linear probability models. For active participants at baseline, a negative health shock corresponds to a statistically significant 4 percentage point lower likelihood of continuing to work (row 1); the estimated magnitude is slightly smaller for PS methods, but still negative. For individuals who continue to work (column 3), the estimate is not statistically insignificant, but still negative.

[25] The sample is trimmed twice: within each age strata and for the overall sample.

[26] The test statistic used is the difference in group means divided by the standard deviation of the treatment group statistic. This measure is preferred to the t-stat because it is independent of sample size. According to Imbens and Wooldridge (2007), a value greater than 0.25 is considered unbalanced.

These estimates of participation and conditional hours can be used to quantify the contributions of different responses to a negative health shock to the total effect on hours, shown in Table 11. Estimated derivatives with respect to a negative change in health are taken from FD FE regressions with the full sample (see Table 10, row 1, columns 2 and 3). The reduction in hours for those who discontinue all production activity is 6.3 hours on average, which accounts for nearly half the total negative effect. The other half is primarily driven by the effect of reduced hours for individuals who continue to perform some type of production activity. The total effect from this decomposition is a -0.47 hours, which is slightly larger than the regression estimated total effect of -0.39 hours (see Table 10, row 1, column 1).

5.2.3 Effects on household production hours

Total production hours for all members of the household and the percentage contributed by the individual are examined in columns 4 and 5 of Table 10. The effect on aggregate daily household production hours is negative, -1.1 hours, and is marginally significant. Compared to a decline of 0.2-0.4 hours worked per day for an individual (column 1), the effect on total household hours worked per day is larger in absolute terms, suggesting that other members may also reduce production time in response to a health shock in the household. Similar reductions in hours for other members may explain why the percentage of household hours contributed by the individual does not change in response to a health shock; estimates are very near zero and statistically insignificant (column 5).

5.2.4 Differences by gender

Separate analyses for men and women show important gender differences in time responses to health shocks. Results from FD regressions and PS methods are displayed in Table 12.[27] The estimated effects for men (Panel A) are generally larger in magnitude when compared to the entire sample. In column 1, a negative health shock corresponds with a decrease of over one hour per day in total production time for men and is statistically significant. Men are also 6 percentage points significantly less likely to continue production activities when experiencing a health shock (compared to 4 percentage points for the entire sample), and of those who continue to work, time is significantly reduced by 0.9 hours per day. Moreover, total household production time decrease by a significant 1.9 hours per day and men's contributions to household production decreases by a significant 4 percentage points.

In contrast, results for women (Table 12, Panel B) show that a health shock does not significantly affect total production hours, but does affect the likelihood of continued participation. A negative health shock is not related to total production hours (column 1) and the estimated magnitude is near zero, even when conditioned on continued participation (column 3). However, women are significantly less likely to continue working, but only by 2 percentage points, which is much smaller in magnitude when compared to men. In fact, estimates for total production hours (one-part model), continued participation, and conditional hours are all significantly different between men and women. Men also significantly decrease their time contributions to household production when affected by a health shock.

[27] For the trimmed and balanced sample, 343 men and 580 women experience a negative health shock.

5.2.5 Differences by age

Table 13 displays the results of analyses by age group. Overall, results show that the elderly aged 50 and over are significantly more likely to discontinue all production activities in response to a health shock than younger individuals under aged 50. The effects on total production hours worked per day are negative, but statistically significant only for the elderly (column 1), showing a 0.6 hour per day reduction. This is driven by a significant 6 percentage point lower likelihood of continuing to work (column 2), which is significantly larger than the 1 percentage point lower likelihood for the younger group. Although the effect on total household production time is larger for the elderly, the estimates are neither statistically significant nor significantly different from those of younger individuals. Point estimates from PS methods generally produce similar estimates obtained from FD FE regressions.[28]

5.2.6 Differences by wealth

A comparison of own health effects by wealth is summarized in Table 14. Individuals from the lowest wealth tertile show a significantly larger response of total production hours to health shocks of about 0.9 hours per day compared to only 0.4 hours for wealthier individuals (column 1). The effect on the likelihood of continuing to work (column 2), however, is slightly larger for wealthier individuals (-0.035) compared to poorer ones (-0.029). Although the estimates are not significantly different from each other, the qualitative difference suggests that wealthier individuals may be less concerned about unemployment status. In fact, for those who continue to work (column 3), poorer individuals significantly reduce time by about 0.8 hours per day, while there is little effect for wealthier individuals. PS methods generally show similar estimated magnitudes and directions.[29]

Total household production hours in poorer households are significantly more affected by a health shock than wealthier households (column 4). There is a significant decrease of 2.7 hours per day in poorer households compared to only a 1.1 hour per day decrease in richer households. The effect on individual contributions to household production time, however, is insignificant and near zero for individuals of both wealth groups, suggesting that health shocks in poorer households may also reduce the production time contributions of other household members. In fact, the 2.7 hour per day reduction for the entire poor household is much larger than the 0.9 hour per day individual reduction in production time.

5.3 Market labor time

5.3.1 One-part model of hours

Analyses of time supplied to the market sector show a strong relationship between health and labor force hours. These results are summarized in Table 15. In pooled OLS (column 1), poor health is significantly related to working about one fewer hours per day. Shorter height,

[28] Within the PS-trimmed sample, 592 individuals aged 50 and over experience a negative health shock compared to 488 within the younger age group.

[29] For the trimmed propensity score sample, 466 individuals in the lowest wealth tertile and 251 individuals in the highest wealth tertile experience negative health shocks.

older age, higher education, being married, being male, having fewer adults in the household, being a farmer, and residing in rural areas are significantly related to working longer hours in market labor. The effect size on poor health decreases once individual FE are added as dummy variables (column 2), suggesting that time-invariant unobservables are correlated with both health and labor supply, but standard errors remain fairly similar. When the FE model is estimated in first-differences, the effect of health shrinks further (column 3), indicating that differences over longer time periods have larger effects and pull the average effect upward (see Table 6, Panel B). In column 4, the inclusion of time-invariant covariates shows that changes in market hours are significantly higher for men and negatively related to age, the number of children, and being a skilled worker. The significance of these covariates and the fact that the magnitude of the estimate on poor health becomes slightly smaller indicates that demographic characteristics are correlated with both changes in health and changes in market labor supply and should be controlled for.

Regressions in columns 5-8 further condition on baseline participation and health status. For individuals who are employed at baseline, a negative change in health status significantly decreases market labor time by 0.7 hours per day, while a positive change in health increases hours, but is not significant. For those who are unemployed at baseline, there is a significant decrease of 0.5 hours per day in relation to a negative health shock (compared to individuals who do not experience a change in health). Meanwhile, a positive health shock corresponds to a significant increase of 0.7 hours worked per day. Point estimates for FD FE and PS methods for the effect of negative health shocks are shown in Table 16 for initially employed and unemployed individuals. All PS methods yield similar point estimates to the FD FE specification. Tests comparing point estimates by employment status using a fully interacted model show that estimates on health are not significantly different from each other.

5.3.2 Participation, conditional hours, and effect decomposition

Table 16 also reports results for participation and conditional hours outcomes. Results across different estimation methods are generally similar. Estimates for employed individuals (Panel A) show that total effect of a negative health shock on market time is primarily driven by a decreased likelihood of continued LFP. In other words, working individuals in good health are 7 percentage points significantly more likely to drop out of the labor force when experiencing a negative health shock (column 2). For individuals who remain in the labor force (column 3), there is a decrease in work time of about 0.4 hours, but this is only marginally significant. For unemployed individuals (Panel B), results for entry into the labor force (column 2) show that a negative health shock significantly reduces the likelihood of entry by 7 percentage points.[30]

For initially employed workers, the negative effect of a health shock on total market labor time from the one-part model can be decomposed (Table 17). Lost work hours from labor force dropouts—about 7.1 hours per day on average—account for a greater proportion of the total effect than the change in daily hours observed for workers who remain in the labor force. Even though estimates for conditional hours are generally insignificant, the reduction in time for individuals continuing to work accounts for a sizable portion of the total effect. The sum of these effects (-0.8 hours per day) is comparable to the estimated total effect from the one-part model (-0.7 hours per day).

[30] There are no results for conditional hours due to the fact that unemployed individuals do not register positive hours at baseline.

5.3.3 Contributions to household market labor hours

The effect of a negative health shock on total daily household market labor time and the percentage of daily household market labor time worked are shown in Table 16, columns 4 and 5, respectively. For the initially employed, the effect on household market hours is similar to the effect on individual hours: a negative health shock reduces household production time by 0.8 hours per day, but is this estimate is not statistically significant. Therefore, even though a health shock significantly decreases market labor hours for the individual, it does not significantly affect the combined market labor time across all household members. In comparison, the point estimates for the initially unemployed are larger, showing a significant reduction in total household market labor time of 1.8 hours per day. This suggests that other household members may reduce market labor time when an unemployed member experiences a shock. However, estimates are not statistically different from those of the employed, indicating an overall insignificant negative effect for all people. Employed individuals also show a significant 3 percentage point reduction in market labor time contributions to total household market labor time, but this also not significantly different from the unemployed.

5.3.4 Differences by gender

Table 18 summarizes the estimates for men and women who are initially employed at baseline. For men, a health shock significantly lowers total market labor time by 1.5 hours per day, significantly lowers the likelihood of staying in the labor force by 10 percentage points, and significantly lowers daily hours worked by 0.9 hours for those who remain in the labor force (Panel A, columns 1-3). The effect on household market hours is somewhat larger in magnitude than individual market hours. There is a significant reduction of 2.2 total daily household market labor hours. The larger magnitude suggests that other household members may also reduce their market hours somewhat in response to a health shock in the household. The percentage of household hours worked also decreases by a statistically significant 6 percentage points. For women, the estimate effect of a negative health shock on total market labor time is insignificant and the point estimate is near zero. All other estimates are also insignificant and near zero. Using a fully interacted model, all estimated coefficients on health are significantly different between men and women (indicated by bold type).

5.3.5 Differences by age

Results comparing health effects by age are shown in Table 19. The estimated magnitudes are higher for the elderly for all outcomes. A negative health shock corresponds with a significant 1.4 hours per day reduction in market labor, which is significantly different from younger workers (column 1). The elderly are also more likely to drop out of the labor force by 10 percentage points, but this is not statistically significantly different from the 5 percentage drop out likelihood for younger workers (column 2). However, for those who continue to work, the elderly significantly reduce market labor time by 1.1 hours per day, which is also significantly greater than the estimate for younger workers (column 3). Total household market labor time is also significantly reduced for the elderly by 1.8 hours per day. This is only slightly larger than the 1.4 hours reduction in the person’s own hours and is not significantly different from younger workers. Similarly, the percentage of household market hours worked are significantly reduced for both elderly and younger workers, but point estimates are not significantly different between age groups.

5.3.6 Differences by wealth

A comparison of health effects across the income distribution shows that, compared to poorer workers, wealthier workers are significantly twice as likely to drop out of the labor force when experiencing a health shock (Table 20). A negative health shock increases the likelihood of exit by 7 percentage points for workers in the poorest wealth tertile compared to 14 percentages points for those in the upper two-thirds of the wealth distribution (column 2). However, poorer workers significantly reduce market labor hours when they continue to work (column 3), but this point estimate is not significantly different from that of richer workers. The combined effect on LFP and conditional hours for poorer workers results in a significant decline in total market labor hours of 1.1 hours per day, but this is also not statistically different from the total effect for richer workers. There is also no difference in effects across wealth groups for total household market labor time and the percentage of market time contributed to the household by the individual.

5.4 Home production time

5.4.1 All individuals

The OLS and FE estimates for home production hours (one-part model) are displayed in Table 21. OLS estimates (column 1) show that poor health is related to an insignificant 0.05 hour reduction in daily time spent at home. Home production hours are significantly higher for those with less education, who are married, women, those with more children, skilled workers, and urbanites. With individual FE (column 2), the effect on home production hours becomes positive, but is nearly zero and still statistically insignificant. In first-differences (column 3), the estimate is positive and slightly larger in magnitude, but still small and statistically insignificant. The estimate does not appreciably change when time-invariant covariates are added back in (column 4). However, a positive change in home production hours is significantly related to being male, getting married, having larger households (particularly with respect to more children), and living in urban areas; it is significantly negatively related to being a farmer and professional. Farmers and professionals seemingly may have few occupational similarities, but they may both have the most flexibility with regard to work hours, and thus, may be able to provide relatively more home production hours. When isolating negative shocks for individuals who were active home producers at baseline (column 5), the effect on health returns to the expected negative sign and is larger in magnitude, but still statistically insignificant. Positive health shocks, on the other hand, increases work at home by an insignificant 0.14 hours per day for active home producers (column 6). For initial non-participants, a negative shock increases daily hours by 0.03 hours and a positive shock increases daily hours by 0.18 hours; both are statistically insignificant. Results of PS methods, summarized in Table 22, show that point estimates for total home production hours point in both the positive and negative direction, indicating some inconsistency and possibly large standard errors.

Proceeding with the remaining columns of Table 22, a negative health shock appears to be significantly related to a lower likelihood of continued participation by 5 percentage points (column 2). However, there is an insignificant effect on conditional hours and total home production time in the household. Reduced participation may be responsible for the significant 4 percentage point reduction in the percentage of household home production hours worked.

5.4.2 Differences by employment status

Results of analyses by employment status are displayed in Table 23. Point estimates are not significantly different across groups. However, the effect on continued participation for employed individuals is negative and statistically significant—a 4 percentage point decrease in the likelihood of continuing to do home production (column 2)—which is slightly smaller than the significant 6 percentage point decrease for unemployed individuals.

The decomposition of the total home production hours effect for employed individuals is shown in Table 17. For those who discontinue home production activities, there is a loss of 1.5 hours on average, which drives the total negative effect of -0.04 on home production hours. This is slightly smaller in magnitude than the one-part model estimate of -0.08 hours per day.

5.4.3 Differences by gender

Negative effects on continued home production participation found in the sample of employed workers are primarily driven by the effects for women, although estimates are not significantly different from those for men. For men (Table 24, Panel A), the effects of a negative health shock on all outcomes are insignificant. For women (Panel B), the effects of a negative health shock are concentrated among those who stop working in home production. There is a significant 4 percentage point lower likelihood of continuing home production for women, which may drive the 3 percentage point lower contribution of women's time to total household home production time (column 5).

5.4.4 Differences by age

The effect of negative health shocks on home production time outcomes also do not differ across the age groups (Table 25). Estimates for both younger and older age groups show that there is a 4-5 percentage point decrease in the likelihood of continuing to perform home production and a corresponding 3-4 percentage point decrease in individual time contributions to household home production time.

5.4.5 Differences by wealth

There are also few differences in health effects on home production time outcomes across the income distribution. Table 26 shows that effect sizes are similar between the poorer and wealthier groups and few are independently significant.

5.4.6 Distribution of time between sectors

The apportionment of time between the market and home sectors is measured as the percent of total production hours worked in market activities. The same sets of econometric analyses were conducted for this outcome for all employed individuals and the results are presented in Table 27. Point estimates show that there is little change in the distribution of time across market and home production sectors as a result of negative health shocks (column 1). Separate analyses for men and women, older and younger individuals, and across wealth groups also yield insignificant results. These findings suggest that there is little re-apportionment of time between market and home activities.

5.5 Robustness checks

5.5.1 Reverse causality

There may be concern that estimates on a health shock may be biased due to reverse causality. Changes in market labor or home production outcomes may cause a change in health status, perhaps mediated by reductions in income. The negative coefficient estimate on poor health may be overestimated if there is a negative bias due to reverse causality. To test for the existence of reverse causality, I insert a one time period lead of poor health status into the each of the hours worked regression equations. If the effect is indeed in the direction of health to labor, then a future value of health should not predict past labor outcomes. For both market labor and home production hours, the coefficient on a future change in health is insignificant (Table 28). However, the resulting confidence intervals are large and we can not definitely rule out the possibility of some reverse causality.

5.5.2 Coding of health shocks

There may also be concern regarding the coding of the key independent variable. I have defined a health shock as transitioning from "excellent," "good," or "fair," health status to "poor" health. Because poor health is the worst outcome on the four-point scale, the ordinal value is perhaps most readily understood across a variety of settings. However, one could argue that a transition from excellent to poor health represents a more severe shock than a transition from fair to poor health. In order to investigate possible differences in the severity of health shocks on activities, I rerun FD FE regressions using two indicators of health shocks: (1) a mild shock defined as experiencing a one-step worsening of health status (e.g. "excellent" to "good," "good" to "fair," "fair" to "poor"), and (2) a severe shock defined as experiencing a two- or three-step worsening of health status (i.e. "excellent" to "good" or "fair," "good" to "poor"). Estimates summarized in Table 28 show that experiencing a mild shock significantly reduces total market work hours (column 1), with marginally significant effects of a severe shock on total market hours and LFP. The effect of both mild and severe shocks on total home production hours is positive; individuals do not appear to change participation in home production, but actually augment home production hours by a statistically significant 0.18 hours per day (about 10 minutes), perhaps due to health-constrained productivity declines. However, standard errors are large for both mild and severe shocks, making it difficult to distinguish severity between finer gradations of health statuses. Together, these results suggest that defining a health shock as the transition from non-poor to poor health may represent the most serious cases of worsening health since these estimates are generally larger and statistically significant compared to estimates for a severe shock. On the other hand, the results for a mild shock suggest that even small changes in health may have economically significant implications on time use.

5.5.3 Coding of hours variables

Finally, because of various methods in recording hours in the CHNS, I have top-coded outliers are 20 hours per day. The mass of such observations at the top end of the distribution may introduce an upward bias in estimate results if health shocks are also more concentrated in this group. Instead of top-coding these outliers, I convert these to missing observations and drop them from the analyses to assess the sensitivity of the result; estimates on health or changes in health status do not change.

5.5.4 Controlling for health behaviors

It can be argued that health risk behaviors should be additionally controlled for as determinants of time use outcomes. Some researchers consider such risk factors as exogenous determinants (for example, see Smith 1999), while others view such behaviors as endogenous to the health-time allocation relationship. In order to assess the extent to which the omission of such behaviors affects the results of the econometric analyses, I include three additional dummy variables for any smoking, regular alcohol consumption, and having sought preventive care in the past year. Not only do point estimates remain the same, but coefficient estimates show that these factors do not significantly predict time use outcomes. Due to the prevalence of missing responses within these survey questions that considerably reduce the analytic sample size, I exclude these variables from the final specification.

Chapter 6: Estimated Effects of Spousal Health on Time Use

This chapter presents the results of the analysis of spousal health shocks on individual time use outcomes. It commences with a description of the sample of married couples, followed by the results of econometric analyses of total production time, market time, and home production time.

6.1 Sample descriptive statistics

The summary statistics for the sample of married couples used for the spousal analyses is presented in Table 30. In general, this sample is somewhat older and less educated than the sample of all individuals aged 18+. The average age is 46 years, 82% have a primary school level education or lower in 2006, and 62% are farmers. Households are typically comprised of one child and three adults. Per capita wealth, urbanicity, and incidences of poor health and changes in health are also similar to that of the larger sample of all adults.

Married individuals supply somewhat more hours to both market and home production activities than do single people. Again, there is a general decline in LFP over time for all people, with men's participation declining from 91% in 1991 to 76% in 2006 and women's participation declining from 86% to 60%. However, hours worked in market labor increases for labor force participants: the average 9.8 hours per day spent at market work for men increases to 10.3 over this time frame while the average for women stays nearly the same. There is also a dramatic increase in home production participation for men between 2000 and 2004. However, conditional on participation, men's hours in home production decline by 0.6 hours per day over time and women's hours decline by 1.4 hours per day.

There is a distinct spike in the distribution of changes in market hours in relation to a spouse's negative health shock that corresponds to a decrease of an 8-hour work day, or an exit from the labor force (Figure 7, Panel A). On the other hand, the distribution of changes in home production hours for a spouse's negative health shock lies slightly to the right of the distribution of changes in hours for a positive spousal health shock (Panel B), suggesting that more individuals with an ill spouse increase hours at home. Across the age range, there does not appear to be a distinct pattern for changes in market hours worked (Panel C), but for home production, there is a noticeable increase in daily hours for individuals aged 50+ in relation to a negative spousal health shock (Panel D). For men, the decrease in market hours is greater for those with an unhealthy wife compared to those with healthy wives (Panel E), but little difference in home production hours worked per day is observed. For women, the decrease in market labor time is less dramatic for those with an unhealthy husband compared to those with healthy husbands, but the decrease in home production time is greater for those with healthy husbands (Panel F). Amid the general decline in home production time over time, this suggests that women may be relatively less inclined to cut back hours at home when husbands become ill. Panels in Figure 8 display cross-sectional results for changes in participation by change in health status across the age distribution. A clear pattern does not emerge for continued LFP (Panel A), but a negative shock to a spouse corresponds to increases in continued participation in home production for individuals aged 50+ (Panel B). The same observation can be made for men's continued LFP (Panel C), but their increased continued participation in home production in relation to a negative spousal health shock seems to hold over most of the age distribution (Panel

D). For women, the pattern with respect to LFP is more pronounced (Panel E); increased likelihood of continuing to work in the market is observed for most age groups, but large differences in home production participation are only seen for elderly women (Panel F).

6.2 Total production time

6.2.1 All individuals

Table 31 displays the results of pooled OLS and FE estimates of the effect of spousal health shocks on individual total production hours per day for the full sample of married couples. The pooled OLS regression (column 1) shows that a spouse's poor health status corresponds to working about half an hour longer each day (0.5 hours). In contrast, one's own poor health status is related to working over one hour less (-1.1 hours). Both estimates are statically significant. For comparison, regressions in the individual analysis in Chapter 5 that did not include spousal variables show that own poor health status corresponds to a 0.9 hour reduction in the work day. The difference in estimates suggests that health status between spouses may be somewhat correlated and that spousal health may mediate the effect of own health on hours worked. The simple correlation in health status and changes in health status between spouses is weak (r=0.15, r=0.12, respectively). Hours worked in all production activities are also significantly related to the spouse's age, his/her having a college level education, and being a farmer. While the effect of own health is still significant in the individual FE specification (column 2), the effect of spousal health is reduce to only 0.1 hours per day and is insignificant. FE standard errors for both health indicators are similar to OLS estimates. The point estimate for spousal health increases somewhat when estimated in first-differences (column 3), but is still insignificant. Time-invariant covariates do not appear to be strongly correlated with changes in a spouse's health status as the point estimate does not change appreciably when they are added back into the regression (column 4). However, disaggregating health transitions by the individual's baseline participation status and the spouse's health status shows that negative spousal shocks reduce hours worked per day while positive spousal shocks increase hours, but all estimates are statistically insignificant (columns 5-7). Although estimates on a change in own health are significant for a negative spousal health shock for initially employed individuals (column 5), estimates are not directly comparable to estimates from the individual analysis because regressions are conditioned on baseline spousal health status rather than the individual's own health status. Results for positive health shocks for non-participants are unavailable because of insufficient sample size after conditioning on health and work status.

Similar to the individual analysis, PS matching and WLS are further applied to additionally control for observable differences across individuals in terms of their spouse's risk for experiencing a health shock. The specification of the PS is displayed in Table 32. Men are significantly more likely to have a spouse become sick and spousal occupation variables are also significant predictors. Although few other variables shown are statistically significant, the vector of included spousal one-year age dummies is highly significant and, together with a vector of provincial-survey year interactions, account for much of the variation in predicting a negative spousal health shock. An interaction between urbanicity and an individual's own poor health was included to increase the flexibility of the PS distribution. A comparison of observable sample characteristics between the full sample used for the OLS and FE analyses and the PS trimmed sample is shown in Table 33. Prior to trimming, individuals with healthy spouses are younger and less educated and their spouses are also younger and less educated compared to individuals with unhealthy spouses who experience a shock. After trimming, both groups of individuals are similar across all measures. Figure 9 displays the distribution of the estimated PS for the spousal shock and no spousal shock comparison groups. Application of the specification test developed by Shaikh et al. (2009) shows that the adjusted predicted PS distribution of the no shock group is very similar to the distribution of the shock group. Table 34 summarizes the results of various PS applications and compares them to FD FE estimates generated from the full sample of married people. The sign of the coefficient for total hours worked per day (column 1) and conditional hours (column 3) is positive in the trimmed sample, suggesting that the composition of the smaller sample can result in some changes in the direction of estimated coefficients.

Table 34 also displays results for other time use outcomes for the individual and household. A negative health shock of a spouse is related to a significant *increase* in continuing to perform some production activity by 2 percentage points—a qualitatively small change. A spousal health shock also corresponds to a marginally significant decrease in total household production hours of 1.3 hours per day, which is qualitatively large. This reduction in household production hours is likely to be due the lost production time of the sick spouse. In fact, this estimate is comparable to the own health effect on total household production time of -1.1 hours per day (see Chapter 5).

When the marginal effect of spousal health on total production hours is decomposed (Table 35), the overall negative effect estimated from the FD FE one-part model (-0.111) is driven by the reduction of hours for those who continue to work in production activities. Even though nearly 98% of all individuals continued to work, production time is generally reduced. This is offset by a positive effect in production hours for those who increased their likelihood of continuing work that would have otherwise ceased working. The sum of these effects (-0.147) is similar to the one-part model estimate.

6.2.2 Differences by gender

The results from analyses by gender suggest that men and women respond differently to spousal health shocks, summarized in Table 36. For men (Panel A), the effect on hours is positive (column 1), driven by a significant 4 percentage point increase in continued participation (column 2), which is also significantly different from the zero point estimate for women. Estimated effects for all other outcomes among men are insignificant and generally small in magnitude. For women (Panel B), there is a negative but insignificant effect on total production hours, suggesting little effect of a husband's health shock. However, total production hours in the household are significantly reduced by 2.5 hours per day when husband's health is affected (column 4), which is significantly larger than the effect on household production hours when wives' health is affected. This estimate is also similar to the estimated 1.9 hour reduction in total household production hours for men's own health shock (see Section 5.2.4).

6.2.3 Differences by age

Comparisons of health effects across older and younger age groups show that the elderly are more likely to continue production activities in response to a spousal health shock. These results are summarized in Table 37. Among the elderly (Panel B) the effect of a spousal health shock on total production time is positive but insignificant. This is driven by a significant 3 percentage point increase in the likelihood of continuing production activities (column 2), but no effect on conditional hours (column 3). In contrast, the total effect on hours for younger individuals (Panel A) is negative and insignificant (column 1), driven by a marginally significant decrease in conditional hours (column 3), but no effect on the likelihood of continued participation (column 2). Only point estimates for participation are significantly different across age groups. Point estimates from PS methods generally corroborate FD FE estimates.[31]

6.2.4 Differences by wealth

Table 38 summarizes the analysis of spousal health effects between the richer and poorer household. Similar to the differences observed across age groups, the total effect on production time is negative for poorer individuals and positive for wealthier ones, but estimates are not significantly different from one another. However, those among the wealthier group have a significantly higher likelihood of continue production activities when spouses become ill compared to poorer individuals; they are 3 percentage points more likely to continuing participating while no change is observed for poorer individuals (column 2). Instead of changing participation, poorer individuals reduce work hours (column 3), but this estimate is not statistically significant. Moreover, household production hours are reduced by 2.4 hours per day when a spouse becomes ill, but standard errors are large and the estimate is also not significantly different from the positive estimate for wealthier households. Again, point estimates from various PS methods are similar to FD FE estimates.[32]

6.3 Market labor time

6.3.1 All individuals

Total production hours worked per day can be differentiated into hours worked in the market sector and hours worked at home. The pooled OLS and FE estimates for daily market hours are shown in Table 39. The pooled OLS regression (column 1) shows that a spouse's poor health status is significantly related to working 0.4 more hours per day. Similar to pooled cross-sectional results for total production hours, market hours also exhibits a significant curvilinear relationship with the spouse's age, with college education status, and with occupation as a farmer. With individual FE (column 2), spouse's poor health status becomes insignificant and is nearly zero. The magnitude of the effect increases slightly with FD (column 3) and with time-invariant characteristics (columns 4-8), but is still insignificant.

Conditioning on baseline work status allows for a comparison of results between the employed and unemployed, shown in Table 40. For the employed (Panel A), the effects of a spousal health shock is insignificant for all outcomes except for household market labor time contributions where there is a significant 3 percentage point increase, but this is not significantly different from that of the unemployed. The decomposition of the total effect on hours worked per day (0.07) for those who were initially employed is shown in Table 41. The net positive effect on

[31] Within the propensity score-trimmed sample, 354 individuals age 50 and over and 363 individuals younger than age 50 have a spouse who experiences a health shock.
[32] Within the lowest one-third of the wealth distribution, 319 individuals have a spouse that experience a negative health shock compared to 155 individuals within the highest two-thirds of the wealth distribution.

hours worked is driven by the 8.0 hours (about a full work day) not lost from those that continue to work when they otherwise would have dropped out of the labor force. This positive effect swamps the smaller negative effects on hours from workers who did not change their LFP likelihood, but rather decreased market time.

Results for individuals who are initially unemployed are shown in Panel B of Table 40. Spousal health shocks reduce the likelihood that an unemployed individual will re-enter the labor force by 4 percentage points (column 2). Even though this estimate is marginally significant, it is significantly different from the positive estimate obtained for employed individuals. There is also a marginally significant decline of 1.9 hours in total household market labor time (column 4). Thus, even though total daily market hours in the household decline as a result of a health shock, unemployed individuals are not more likely to begin contributing market hours.

6.3.2 Differences by gender

Analysis by gender shows that health shocks affecting men generally have a greater impact on households than shocks affecting women. The analysis is restricted to all initially employed individuals. In Table 42, Panel A, wives' health shocks have a positive, but insignificant effect on all time outcomes for men. However, Panel B shows that health shocks affecting husbands lead to a significant increase in the likelihood of women continuing to work by 5 percentage points (column 2), which is marginally significantly different from the null effect found on husbands LFP in response to wives' health shocks. The total effect on market time is negative for wives (column 1), driven by insignificant decreases in market time for those who continue to work (column 3). Combined with reductions in the husband's work hours in response to his own health shock, the total household hours worked in the market declines by 2.5 hours per day (column 4), which is significantly different from the effect of wives' health shocks. The percentage of the wife's daily market hours within the household also increases by a significant 6 percentage points (column 5). Therefore, husbands do not appear to adjust market hours in response to changes in wives' health, but women increase LFP but with fewer hours worked when husbands become ill.

6.3.3 Differences by age

Although estimates for older and younger aged workers show substantively different results, they are not statistically significantly different from each other. Table 43 summarizes these results. For the elderly (Panel B), the effect of spousal health shocks corresponds to an insignificant increase in market hours worked per day and likelihood of continued LFP (columns 1 and 2). In contrast, the effect on continued LFP among younger workers is much smaller and statistically insignificant, (Panel A, column 2) while the effect on conditional hours is actually negative (also statistically insignificant, column 3). Spousal health shocks also relate to an increase in the percentage of daily household market hours worked for younger workers (column 5), but is not statistically significantly different from the estimate for older workers.

6.3.4 Differences by wealth

A comparison across the wealth distribution also shows some substantive differences in spousal health effects, but none that are statistically significantly different between income groups. These results are summarized in Table 44. For those the poorest one-third (Panel A), spousal health shocks have a positive effect on market labor hours (column 1) driven by a significant 4 percentage point increase in the likelihood of continuing to work (column 2). There is also an insignificant 1.3 hour decline in total household market time, but a significant 5 percentage point increase in the percentage of household market hours worked by the individual (likely due to lost market labor hours for the sick member). In contrast, for the wealthier two-thirds, there is an overall negative, but insignificant effect on market labor hours (column 1) and a very small and insignificant effect on total household market time (column 4).

6.4 Home production hours time

6.4.1 All individuals

Health shocks affecting spouses do no appear to affect hours worked at home in the full sample of all married persons. Table 45 displays the results of pooled OLS and FE regressions. Having a spouse in poor health is not significantly related to daily home production hours, but a spouse's age and occupation as a farmer is significantly and inversely related (column 1). However, after controlling for individual FE (column 2), a spouse's poor health status corresponds to a significant 0.2 increase in hours worked per day at home. This estimate remains significant when estimated in first-differences (column 3), but becomes insignificant once differences in time-invariant characteristics are taken into account (columns 4-8); this occurs regardless of the direction of the change in spousal health or baseline home production status of the individual.

Results for all time outcomes show that the effects of spousal health are generally insignificant. Table 46 displays the results of FD FE and point estimates from PS methods. The effect on total hours per day is in the positive direction (column 1), though estimates for continued participation (column 2) are generally near zero. The estimated effects on total household home production hours are also near zero and insignificant (column 4). However, there is a significant 4 percentage point increase the individual contributions to household hours (column 5).

6.4.2 Differences by employment status

Analyses by employment status do not show any significant differences in home production time between the employed and unemployed. These results for all time outcomes are shown in Table 47. Again, the sample is restricted to individuals who are initially active home producers. Effect sizes are generally larger for the unemployed (Panel B), but there are few substantive or significant differences between these groups.

6.4.3 Differences by gender

Further analysis of employed individuals by gender shows that husbands' and wives' responses to health shocks are significantly different. Panel A in Table 48 shows that men significantly increase time at home by 0.5 hours per day in response to a wife's health shock (column 1). However, women do not significantly change hours at home when husbands become ill (Panel B, column 1) and these estimates are also significantly different from each other.

Results also show that men significantly increase their contributions to all household home production time by 7 percentages point while there is no change for women (column 5), but these estimates are not significantly different from each other.

6.4.4 Differences by age

A comparison of spousal health effects on home production time outcomes by age are summarized in Table 49. There are not any significant differences across younger and older age groups even though point estimates show a generally positive effect on home production time for the elderly and a negative effect for younger individuals.

6.4.5 Differences by wealth

Table 50 shows the analysis by higher and lower wealth groups. Estimates for poorer and richer individuals are not statistically significantly different from each other.

6.4.6 Distribution of time between sectors

In assessing the effect of spousal health shocks on the apportionment of time between the market and home sectors, the results show little change in the percentage of all production hours worked in market labor. Column 1 in Table 51 shows that all estimates are positive, but insignificant. Moreover, there are not any significant differences found by gender, age, and wealth.

6.5 Robustness checks

The same tests for the sensitivity of results to reverse causality and coding of health shock and hours variables were conducted for the spousal health analysis. Results show that future spousal health status is unrelated to an individual's current time use and that estimates are not sensitive to coding variations.

CHAPTER 7: RESULTS OF ANALYSES BY EMPLOYER TYPE

To investigate possible buffering effects of employer type against the impacts of health shocks, separate analyses are conducted for private, collective, and state sector workers. Although results show that the effect of negative health shocks for individuals and their spouses are concentrated among private sector workers and that there may be important effects for household production time for workers of different employers.

7.1 Own health effects

7.1.1 Descriptive statistics

The analyses of health effects by firm type are restricted to all employed individuals. However, due to missing information for firm type, over 9,000 observations are lost from the sample, resulting in 34,465 individual observations from all survey waves. The descriptive statistics for this sample are displayed in Table 52. The average age is now 42 years. The proportion of people reporting poor health does not increase as much compared to the larger sample, rising from 3% in 1991 to 5% in 2006. There is not much of a decline in the proportion of men as seen in the larger sample; there is actually a slight increase in the percentage of men, reaching 54% in 2006. Other summary measures are comparable to those reported for the larger individual sample.

However, there are notable differences across state, collective, and private sectors for time use outcomes. Labor force participants in this sample work an average of 9.3 hours in market labor and 2.6 hours in home production (conditional on participating in each activity), but those employed with the state work 7.4 and 1.8 hours, respectively, while those employed in collectives work 8.1 and 1.7 hours, respectively, and those in the private sector work 9.0 and 2.0 hours, respectively. Thus, there is a gradient with respect to work hours, particularly in market labor, with state employees working the least and private sector employees working the most. The proportion of individuals employed in the private sector increases from 65% to 78% over the survey waves, driven by higher transitions of working individuals into the private sector from the state/collective sector. While state employment declines somewhat from 21% to 17% during the same period, employment in collectives declines from 15% to only 5%. This highlights the intermediate hybrid role that collective enterprises played in the transition period.

Across the age distribution (Figure 11), hours worked in the labor market (Panel A) is highest for private sector workers for nearly all ages while workers in collectives seem to work an intermediate number of hours during prime working ages. However, the decline in hours into retirement age is much more dramatic for state and collective sector workers. In fact, private sector participation increases with age, as does employment in collectives, but the latter is less pronounced (Panel B). Moreover, a greater proportion of workers aged 50 and over transition into the private sector than into unemployment (Panel C). Few private sector workers transition into state and collective sector employment at older ages, but rather transition out of the labor force altogether (Panel D). On the other hand, state and collective sector workers transition into unemployment in greater numbers, particularly when nearing retirement age (Panel E); relatively few transition into private sector employment.

There are also some notable cross-sectional differences in time use by health shock occurrences, as shown in Figure 12. For both private and state/collective sector workers (Panels A and B), there are a greater number of individuals who experience a negative health shock that reduce their market work hours compared to the distribution of change in market hours for their healthier counterparts. The distributions for state and collective workers are combined as they are nearly identical, showing two distinct density masses which likely correspond to part- and full-time employment. Also, when compared to healthy workers, a lower proportion of ill workers remain in the labor force across most of the age range for employees in all sectors, but the difference is more dramatic at older ages for private sector workers (Panels C and D). The cross-tabs for market hours and home production hours in Panels E and F also show that health shocks are related to a larger decline in market hours and a smaller decline in hours at home for private sector workers. In fact, negative health shocks correspond to an increase in hours at home (conditional on continued participation in home production) for state/collective sector workers.

7.1.2 Econometric specification testing

There are several reasons to include controls for firm type in the econometric analysis. First, due to economic reforms, the change in ownership type of former state owned enterprises into private hands meant that workers changed employer types virtually overnight, resulting in shifting samples of workers during the privatization process. Second, on the labor supply side, employer type may be systematically related to both individual health status, depending on the physical demands of work and hours worked. For example, employees of public sector firms may be salaried and have set work hours and wage compensation packages whereas workers in the private sector may be compensated more directly for productivity and have less security in terms of guaranteed work hours. Therefore, I include baseline firm type—indicators for private, collective, and state sector employment—in regression models.

Additionally controlling for baseline firm type in the individual analysis does not change the substantive results of OLS and FE regressions for all time outcomes. However, the estimates on poor health and a change in health do change somewhat for all regression specifications using the full sample of workers. This indicates that employer type does indeed affect both health status and time use, introducing some omitted variables bias. Pooled OLS results show that private and collective sector employees significantly work more total production hours and market hours than state sector employees, corroborating the pattern observed in the descriptive statistics. In FD FE estimates that include time-invariant characteristics and that are conditional on good health and being employed at baseline, baseline private and collective sector employment are both significantly related to a 0.5 hours decline in total hours worked while the estimate on a change in health increases in magnitude to -0.5 (compared to -0.4 in the results excluding sector indicators). For market labor, the same specification also yields a significant -0.5 hours worked per day for private and collective sector employment, but the magnitude on a change in health remains at -0.7 hours worked per day. The similarities in magnitudes on the effect of poor health suggest that the omitted variables bias from excluding sector indicators is small in the FD FE specification controlling for baseline covariates. Sector indicators were not significant in regressions for home production hours.

The proportion of individuals working in each sector is balanced across shock and no shock groups after trimming of the sample according to the PS distribution (see Table 9). When firm type is included as a predictor in the propensity score, it is not statistically significant and consequently, is excluded from the final PS specification. However, it should be noted that the number of individuals who experience a negative health shock and initially work in the state and collective sectors is relatively small (N_{state}=90, $N_{collective}$=42) compared to similarly shocked workers in the private sector (N=620). Therefore, in the final PS analyses by employer type, I analyze state and collective sector workers together. While this introduces some measurement problems, the similarities in hours worked and LFP participation rates of state and collective sector workers suggest that they may face more similar organizational constraints that determine market labor supply compared to workers in the private sector.

7.1.3 Total production time

Regression and matching estimates for the effect of negative health shocks on total production hours are displayed in Table 53. For state/collective sector employees (Panel A), FD FE estimates controlling for baseline covariates (row 1) show that a negative health shock does not have a significant effect on total production time. In fact, point estimates from PS matching techniques and WLS (rows 2-6) generate both positive and negative values. The effect on continue LFP is negative, but insignificant (column 2). However, there is a marginally significant increase of 1.3 hours for the household (column 4). Combined with a significant 7 percentage point decline in time contributions to the household (column 5), this suggests that other household members may augment their hours worked when there is a health shock in the family.

The estimates for private sector employees are shown in Panel B. The effect of a negative health shock on total hours is consistently negative (column 1), and is statistically significant showing a decline of 0.6 hours. There is also a significant 3 percentage point decline in continued LFP (column 2). Total household production hours significantly decrease by 1.6 hours while individual time contributions do not change. The larger household response indicates that other household members also reduce their production time when a health shock occurs. In fact, estimates for total household production time and the percentage of household time worked are significantly different between private and state/collective sector employees.

7.1.4 Market labor time

Individual and household market labor supply

The analysis of market labor time indicates that the effects of negative health shocks on time use is similar across employer types. These results are displayed in Table 54. For both state/collective (Panel A) and private (Panel B) sector employees, there is an overall negative effect on market hours, which is only statistically significant for private sector workers, but is not significantly different between groups. There is also a similar significant 7-8 percentage point decline in the likelihood of continued LFP for both groups of workers. The effect on total household market hours is positive for state/collective workers and negative for private sector workers, but both estimates are insignificant and not significantly different from each other (column 4).

Transitioning across sectors

Table 54 also presents estimation results for the effect of a negative health shock on the likelihood of transitioning to a new sector of employment. These results can be found in column 3 where the dependent variable now indicates that the individual continues to work in the same sector observed at baseline, conditional on remaining in the labor force. For example, in Panel A, for state/collective workers, the likelihood of continuing to work for a state/collective employer ranges from 0-8 percentage points across different estimation methods. However, the estimate from the FE FD specification (row 1) is not statistically significant. In Panel B, for workers who were initially in the private sector during the baseline period, the likelihood of continuing to work in the private sector given that the worker does not exit the labor force as a result of a negative health shock is only 1 percentage point and is marginally significant. Point estimates are not significantly different across employer types.

7.1.5 Home production time

The estimated effects for home production hours show few differences across employer types as displayed in Table 55. For both state/collective and private sector workers, there is a similar decline in the likelihood of continued participation in home production of about 4-5 percentage points. Only for time contributions to total household home production is there is a significant difference across employer types, showing that state/collective workers significantly reduced contributions by 7 percentage points compared to the insignificant 3 percentage point decline for private sector workers.

7.1.6 Distribution of time between sectors

Analysis of the proportion of hours worked across market and home sectors show that there are not any differences across workers of different employer types. These results are shown in columns 8 and 9 of Table 27. The estimated effects on the proportion of hours worked in the market for state/collective sector workers is near zero and insignificant. The estimated effects for private sector workers is larger in magnitude, indicating a 2 percentage point decline in market hours, but these coefficients are also not statistically significant.

7.2 Spousal health effects

7.2.1 Descriptive statistics

The sample size for the spousal health analysis by firm type becomes even smaller when further restricted to only married workers and their spouses. After dropping observations with missing information on employer ownership type, there are 20,626 observations across all survey waves. The summary statistics for this analytic sample are displayed in Table 56. This average worker is slightly younger than the overall spousal sample (45 years compared to 46 years), but slightly older than the full sample of all adults (44 years). Farmers comprise a higher percentage of this spousal sample (65%) while the percentage of urban residents falls to 26%. However, the incidence of poor health and changes in health are similar to the larger samples of married people and all adults.

Similar to the sample of all individuals, workers of private sector firms work more hours (conditional on participation) on average in both market labor and home production compared to workers of state and collective sector firms. For married labor force participants, the average day for state sector employees is comprised of 8.1 hours on the job and 2.5 hours at home compared to 9.3 and 2.5 hours, respectively, for collective sector employees and 9.9 and 2.8 hours, respectively, for private sector workers. The proportion of individuals employed in the private sector increases from 68% to 82% over the survey waves, driven by transitions of workers out of the state and collective employers.

The panels in Figure 13 show the cross-sectional differences in time use and sector participation by spouse's health shock occurrences. For private sector workers (Panel A), the distribution of hours for workers with healthy spouses dominates the distribution of hours for workers with spouses that experience worsening health. Similarly, for state/collective sector workers, there is a greater mass of individuals with negative changes in market hours for those with sick spouses compared to those with healthy spouses (Panel B). However, there is also a noticeable increase in the positive direction toward the right tail, suggesting that some workers may increase hours worked when spouses become ill. Across the age distribution, the proportion of private sector workers who remain in the labor force is generally greater when spouses become sick (Panel C), but the differences are not as consistent by age for state sector workers (Panel D). The cross-tabs for market hours and home production hours in Panels E and F also show that spouses' negative health shocks are related to a larger decline in market hours and a smaller decline in hours at home for private sector workers. In fact, negative spousal health shocks correspond to an increase in hours at home (conditional on continued participation in home production) for state/collective sector workers.

7.2.2 Econometric specification testing

The inclusion of baseline employer type for both the individual and the spouse do not change the substantive results of pooled OLS and FE regressions. For total production hours, the point estimates for spousal health do not change appreciably across regression specifications and the direction of effect and statistical significance remain the same. For market labor hours, pooled OLS estimates for spousal health do not change, but FE estimates show an increase in magnitude from 0.02 hours (sector indicators excluded) to 0.12 hours (sector indicators included), but both estimates remain insignificant. However, when using FD FE specifications for market labor hours, the effect of a change in spousal health becomes negative and is nearly zero, but remains statistically insignificant. For home production hours, estimates for both own health and spousal health do not change. Similarly to the individual analysis by employer type, a worker's own sector type is significantly related to hours worked, but only in pooled OLS estimates for market hours is spousal sector type a significant determinant. These pooled OLS estimates show that private and collective sector workers spend an average of 0.3 more hours per day on the job compared to state employees. However, neither baseline individual nor spousal employer type is a significant predictor of changes in hours in the market or at home.

For PS estimation techniques, the PS was not re-estimated with employer type variables. The estimated effect of baseline employer type status was insignificant and nearly zero in predicting the likelihood of a spousal negative health shock, after controlling for age and province-by-year fixed effects. The proportion of individuals and spouses working in each sector is balanced across shock and no shock groups both before and after trimming of the sample according to the PS distribution (see Table 33). In the final trimmed and balanced PS sample, there are 80 state and 49 collective sector workers whose spouses experience a negative health shock compared to 454 for private sector workers. Again, state and collective sector workers were combined because of the low number of treated cases.

7.2.3 Total production time

The estimated effects of negative spousal health shocks on total production time are summarized in Table 57. Results show that the effects are not significantly different between state/collective and private sector employees for all time use outcomes. For both types of workers, having a spouse become ill does not significantly affect total production time (column 1). The effect on the likelihood of continued production activity is also significantly positive for both groups, ranging from 1-2 percentage points, but not different from each other. The effect on conditional hours is also positive, but insignificant (column 3). Similar to results of own health analyses, spousal health shocks appear to increase total household production hours for state/collective sector workers but decrease hours for private sector workers. However, all of these estimates are only suggestive as they are not statistically significant.

7.2.4 Market labor time

Individual and household labor supply

The lack of differences across employer types is also seen for market labor time, displayed in Table 58. Estimates for state/collective sector workers (Panel A) are all insignificant and near zero. Estimates for private sector workers (Panel B) show that there is a significant 3 percentage point increase in the likelihood of continuing LFP when a spouse becomes sick (column 2), a significant 1.9 hour decline in total household market time (column 5), and a significant 4 percentage point increase in the percentage of household market hours worked by the healthy spouse (column 6). However, all estimates are not significantly different from those of state/collective sector workers.

Transitioning across sectors

Table 58 also displays the results for estimating the likelihood of remaining in the current sector of employment for workers whose spouses become ill in column 3. For both groups of workers, there is little effect of spousal health on the likelihood of a transition. All point estimates are near zero and statistically insignificant.

7.2.5 Home production time

The results for the effect of negative spousal health shocks on home production time are all insignificant and not statistically different between employer types, shown in Table 59. Point estimates are also similar for both groups across all home production time outcomes.

7.2.6 Distribution of time between sectors

There are also no differences across employer types for spousal health effects on the distribution of time between market and home sectors. These results are shown in columns 8 and

9 of Table 51. Estimates show that that state/collective sector workers reduce the percentage of market hours more than private sector workers, but neither estimate is statistically significant nor different from each other.

CHAPTER 8: DISCUSSION

This study has sought to estimate the short-run effects of own health and spousal health on home production and market labor time. I employ individual fixed effects via first-differencing and additionally control for the likelihood of experiencing a health shock based on observable differences. Point estimates from various propensity score methods corroborate linear regression estimates, which are preferable because of efficiency gains (e.g. Table 16, row 1). Results show that experiencing a negative health shock for employed individuals leads to significant declines in market labor time for men (1.5 hours per day) and the elderly (1.4 hours per day), while workers in the upper two-thirds of the wealth distribution are twice as likely to drop out of the labor force as those in the poorest one-third. A significant reduction in participation in home production activities (4 percentage points) is observed for all. Individuals who are initially unemployed are also significantly less likely to enter the labor force by 7 percentage points. However, when a spouse becomes ill, market hours increase for employed individuals, driven by significant increases in the likelihood of continuing to work (2 percentage points) for both husbands and wives. Men also significantly increase home production time by 0.5 hours per day when wives become sick, but total household production time is unaffected. Even though wives are more likely to continue working by 5 percentage points when husbands suffer health problems, it is not enough to offset the loss in the husband's market time, and total market time in the household significantly declines by 2.3 hours per day while the wife's share of household market time significantly increases by 6 percentage points. Given that individuals spend an average of 9.2 hours in market labor and 2.7 hours in home production each day if they participate in both activities, these effects on market labor hours may also be economically significant while the smaller effects on home production time may be substantively less important. Large reductions in total household production time are also observed for poorer households, those of the elderly and of private sector workers, which suggests some benefits to weathering health shocks associated household savings and employment in state-owned enterprises and collectives. These effects are summarized in Tables 60 and 61.

8.1 Market labor supply

Across all initially employed individuals, there is a 0.7 decline in market hours worked per day when own health is negatively affected. This is primarily due to lost work time for those who drop out of the labor force, the likelihood of which increases by 7 percentage points. This confirms Hypothesis 1.[33] However, analyses by gender show that the time consequences of ill health are concentrated among men who are 10 percentages points more likely to drop out of the labor force when a health shock occurs, while those who continue to work reduce market time by 0.9 hours per day. In contrast, the effect of own health shocks for women's market time is near zero and insignificant. This confirms Hypothesis 1a: men's market time is impacted more when health problems arise.[34] Hypothesis 1b with respect to age is also affirmed: labor supply for the elderly are more affected than labor supply for younger workers. The elderly are 10 percentage points more likely to drop out of the labor force in the event of a health shock, resulting in 1.4

[33] H1: A health shock is negatively related to labor supply.
[34] H1a: The effect of a health shock on own market labor time will be larger for men than for women.

hours per day reduction in market hours, compared to only a 5 percentage point increase in the likelihood of exiting the labor market for younger workers which results in an insignificant change in market labor hours. There is equivocal support for Hypothesis 1c for income classes. While poorer workers significantly reduce their market labor time if they continue to work, wealthier individuals are twice as likely to drop out of the labor force, exhibiting a stronger substitution effect and possibly greater preferences for leisure. Daily hours worked and the likelihood of continue labor force participation are also significantly lower for the unemployed. This also supports Hypothesis 1, indicating that health shocks may prevent workers from re-entering the labor force.

These estimates for LFP are larger than those found in previous studies. Yi and Dow (2006) find a smaller 6.5 percentage point decline in LFP only among men (compared to the 10 percentage point decline in men's LFP found here) when applying individual FE[35] and Benjamin et al. (2003) do not find any significant effects of health on labor supply or LFP for either elderly men or women in FE specifications.[36] However, there is one important difference in estimation methods that is likely to contribute to these differences. Both studies control for individual FE using a dummy variable specification, essentially estimating longer-run effects of health. While health may indeed have long-term effects, there is also the potential for reverse causality as time differences increase. The FD FE specification used here isolates a short-run effect of health, generating a larger estimate if the effect dissipates over time as individuals recover. In addition, the analytical samples used in those previous studies are likely to be considerably different from the analytic sample used here. Restricting the data to only individuals observed in consecutive waves may exclude workers who are seasonally absent from the residence (e.g. migrant workers). If these types of workers are generally healthier, then the true effects of health may be overstated. This may be further exacerbated by the smaller propensity-score trimmed sample that is disproportionately female, comprised of farmers, rural residents, and the less educated—groups are also more likely to engage in physically demanding jobs and perhaps are also disproportionately unhealthy or vulnerable to health shocks. However, the comparison of observable characteristics for excluded observations show that included respondents are actually generally less healthy and work more in both market labor and home production. This suggests that the estimated health effects may actually be understated.

The overall negative effect of health on labor supply for men and the elderly suggests that the substitution effect induced by declining productivity outweighs any income effects from reduced consumption. The difference by gender may be related to men holding jobs that require greater physical strength which may also be inherently more risky for experiencing a health shock. It is well known that the legal rights of workers are limited in China and that occupational safety standards lack enforcement (Pringle and Frost 2003). Consequently, productivity declines may translate into greater loss of market time. The strong effects for men may also be related to gender-based wage discrimination that values men's time over women's in terms of human capital. For men, the returns to health may be greater and there may also be a steeper wage gradient with respect to health. Consequently, change in health may induce a larger change in wages, and hence, a larger substitution effect away from market labor. In fact, women still lag in

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[35] Yi and Dow (2006) aggregate three waves of the CHNS (1991, 1993, 1997). While the effect size for men, -0.065, compared to the -0.10 estimate found here, both estimates point in the same direction.

[36] Benjamin et al. (2003) also use three waves of the CHNS (1991, 1993, 1997). They do find significant effects on hours worked for elderly men when subjective self-reported health status is instrumented with objective health indicators. However, first stage regressions show that instruments have weak predictive power.

education compared to men, despite early efforts by the Chinese government toward achieving gender equality (Bauer et al. 1992). Moreover, in the early days of the economic reform, gender wage gaps were greater in the market sector than the state sector, suggesting that returns to human capital may disproportionately accrue to men (Meng 1998, Maurer-Fazio and Hughes 2002, Zhang et al. 2002). As the labor market has increasingly developed to allow for competitive wage-setting, these wage gaps may widen, increasing the opportunity cost of men's time. Although women's wages may be lower on average, the fact that they may not be as sensitive to health-induced productivity changes suggests that women's labor supply or employment may actually be somewhat shielded from the effects of adverse health events.

However, even though income losses associated with women's health shocks may be small in comparison to income losses from men's health shocks, husbands and wives both increase market labor time when their spouses becomes sick. The positive effect is driven by a 2 percentage point increase in the likelihood of continuing to work; no change in hours is observed conditional on working. This confirms Hypothesis 3.[37] However, point estimates for men and women are not significantly different from each other, which fails to support Hypothesis 3a even though the effect for women is slightly higher (5 percentage points) and statistically significant.[38] This indicates that the need for income generation outweighs the higher demand for home production time and men and women both increase market labor when spouses become sick. The slightly larger effect for women is likely related to the large market labor time reductions observed for men experiencing health shocks. Women may also find it easier to enter and exit the labor force as needed while most men already work and may find it difficult to augment hours beyond full-time employment. These findings accord with previous findings from Benjamin et al. (2003) using data from China.

The larger effects of ill health on men's own labor supply impact households more severely than health shocks to women. Even though wives may augment their market time in response to husbands' poor health, there is a net decline in total household market time of 2.3 hours per day. The combination of fewer hours for the husband and greater market time for wives results in a significant increase in wives' contributions to total household market time by 6percentage points and a corresponding decrease in men's own contributions to total household market time by 6 percentage points. In contrast, husband's market time and total household market time does not significantly change when wives become ill.

Analyses of interaction effects by age show that the negative effects of health on labor supply are also concentrated within the elderly population aged 50 and over. About half of the total 1.5-hour reduction in market labor time can be attributed to the significant increase in dropping out of the labor force. Therefore, an adverse health event may serve as an impetus for early retirement. However, because much of the sample is comprised of rural residents and farmers, official retirement may only partially explain the strong health effect found. The LFP of the elderly in rural China has been characterized as "ceaseless toil" (Davis 1991, Benjamin et al. 2003). Particularly given the lack of social security, pensions, or unemployment insurance for rural residents, the elderly continue to work well into old age. Productivity declines due to ill health at older ages may be more permanent as health deteriorates and ability to work is more severely impacted. Moreover, elderly spouses may have limited ability to increase market labor time and compensate for the ill member. Spousal health did not have a significant effect on own market time within the elderly group and total household market time fell by 1.8 hours. However,

[37] H3: A health shock affecting a spouse is positively related to own market labor time.
[38] H3a: The effect of a spouse's health shock on own market labor time will be larger for women than men.

these estimates were not significantly different from those of younger individuals, which fail to support Hypothesis 3b.[39]

Alternatively, the lack of a spousal market time response to health shocks among the elderly may be related to the size of accumulated savings and household wealth. Lifetime savings are likely to be much higher among the elderly, stemming the need to continue working. Indeed, the likelihood of dropping out of the labor force was twice as high among the wealthy compared to only 7 percentage points for poorer workers. Instead, poorer workers reduce hours worked. This lends some support to Hypothesis 3c and highlights the importance of analyzing participation and hours worked separately.[40] In addition, spouses among the poorer group significantly increase LFP by 4 percentage points, but total household market time still fell by 1.3 hours. Although the same effects among the wealthier group are negligible, these point estimates are not statistically significantly different. Nevertheless, the direction of estimated effect on market time suggests that spousal responses may be somewhat stronger, but unable to make up for all lost market time among low income households.

8.2 Home production

One of the main contributions of this study is the finding regarding health and home production. Although negative health shocks do not have a significant effect on daily hours worked at home, disaggregating the effect shows that there is a significant 4 percentage point decline in the likelihood of continuing home production for all individuals. For those who drop out, there is an average loss of 1.8 hours per day previously worked at home. This affirms Hypothesis 2.[41] However, even though estimates for women are significant, the point estimate is not significantly different from the 4 percentage point reduction observed for men. Moreover, point estimates across younger and older age groups and high and low relative wealth categories are all similar and not statistically different from each other. The lack of an interaction with gender, age, and wealth fails to support Hypotheses 2a, 2b, and 2c.

The lack of a significant difference in estimates by gender may be due to several factors. First, even though the number of men performing home production activities has risen over the survey years, men still spend less time on home production activities compared to women. This may partially be due to relative market returns and efficiency that contributes to specialization of tasks and division of labor within the household. Possible systematic attrition of migrant men further reduces the number of observations for men with which to generate consistent estimates and the power to detect a difference from women is lowered. Second, home production technology rapidly changed during the economic transition period as consumers rising incomes allowed them to purchase market substitutes for work previously performed by household members, leaving more time for leisure. These technologies may require less physical input from individuals and hence, efficiency gains from health may be less important. Third, estimates for home production hours may suffer may be less precise due to measurement error, consequently increasing standard errors. Hours were recorded in various units of measurement (e.g. hours per day, hours per week), which were not consistent across tasks and waves. In addition, the five tasks surveyed may not represent all time-intensive home production activities (e.g. fetching

[39] H3b: The effect of a spouse's health shock on own market labor time will be larger for the elderly compared to younger individuals.
[40] H3c: The effect of a spouse's health shock on own market labor time will be larger for the poor than the rich.
[41] H2: A health shock is negatively related own home production time.

water). Nonetheless, the small, but significant findings do support the theoretical notion that health can play a pivotal role in determining productivity in all work tasks, even those performed at home. As Gronau (1977) first expounded, the lack of a one-to-one correspondence between the effects on market and home time also shows that home production is a critically different process than merely the enjoyment of leisure. This corroborates evidence from Bhargava et al. (1997) who also distinguish home production from leisure activities and find a significant effect of health.

However, these reductions in home production due to illness do not appear to severely impact the household's ability to complete such tasks. There is an insignificant effect of health shocks—either for oneself or for the spouse—on total household home production time. The spousal health analysis shows that husbands significantly increase work at home by 0.5 hours per day when wives' fall ill, but women do not significantly change their time at home when husbands become sick. This affirms Hypotheses 4 and Hypothesis 4a for gender.[42] This indicates that women may be much more efficient than men in home production tasks. Other studies have found that women continue to shoulder the burden of the housework in China, although men have begun to help, more so in urban areas (Lu et al. 2000, Chen 2005). They may be able to easily make up for husbands' inactivity at home without spending significantly more time in such tasks while husbands require much more time to compensate for the lost productivity due to wives' illnesses. In fact, the combination of greater time for the husband and less time for the wife results in a significant 7 percentage point increase in husbands' contributions to total household home production time. There may be reason to believe that these estimates are biased downward. The CHNS does not ask about time spent caring for sick individuals, which is a considerable limitation to testing hypotheses about caretaking time for analyses of spousal cross-effects. However, to the extent that caretaking time is complementary to other household tasks, particularly when compensating the lost productivity of sick members, the positive effect for husbands may be even larger when taking into account time caring for sick wives.

There are few differences in home production time by age or wealth, failing to support Hypotheses 2b, 2c, 4b, and 4c. These null findings, however, are very interesting when taking into consideration that home production productivity is relatively less influenced by market dynamics compared to market labor time. Therefore, home production time may better reflect functional limitations which discriminate less based on age or wealth status.

8.3 Employer type and labor mobility

Although employment in public sector jobs during China's economic transition period can be hypothesized to ease the impacts of adverse health events, the empirical findings generally do not find significant differences on workers' time use across employer types. While the overall negative effects on market hours for all initially employed workers are partly driven by a significantly lower likelihood of continued labor force participation among private sector workers—8 percentage points in response to own health shocks, 3 percentage points in response to spousal health shocks—the estimates are similar for state and collective sector workers. There are also few differences in home production time use across sectors. However, when total

[42] H4: A health shock affecting a spouse is positively related to own home production time. H4a: The effect of a spouse's health shock on own home production time will be larger for men than women.

production time (market + home production) is considered, there a significant decline of 1.6 hours per day in total household production hours for private sector workers. These findings do not fully support Hypotheses 4a-4d, but do suggest that there may be some protection offered to employees of state enterprises and collectives that may also extend to their family members. In fact, total household production time increased by 1.3 hours per day among these households, even though individual market and home production hours decline. Whereas workers in public sector jobs may be given allowances for sick leave or medical care subsidies, alleviating income losses and the need for household members to make up for lost market time, households of private sector employees without access to such benefits may be placed at higher risk of subsequent income shock. Thus, while ill health may affect individuals' ability to perform tasks equally, there may be adverse outcomes for income when insurance against such risks is lacking. Indeed, separately including these indicators for these three forms of organizations into pooled OLS and FE regressions showed that employer type did have significant effects on hours worked for individuals during the transition period. Yet, the similarities in estimates on health between regression that included these indicators and those that excluded them indicate that there may be little correlation with changes in health.

Future work will seek to assess the extent of benefits available to workers of different employers using more complete information on total compensation. However, there is good reason to believe that the benefits associated with state/collective sector employment may have eroded over time as state-owned enterprises struggled to increase efficiency and compete with emerging private sector industries. Hu et al (1999) note that continued obligations to provide health insurance benefits under limited risk pooling contributed to a drastic worsening of state sector enterprises' financial positions during the 1990s. Eventually, many of these enterprises were forced to default on paying workers' medical bills, leaving workers to pay as much as 25% of annual income out-of-pocket (Hu et al. 1999). Indeed, Wagstaff and Lindelow (2008) have found that health insurance coverage was a risk factor for high medical expenditures as newly privatized providers sought to generate revenues by stimulating utilization of expensive drugs and technologies (Blumenthal and Hsiao, 2005).

The results of these analyses also do not find compelling evidence of job lock in the public sector. The effect of either own or spousal health shocks on the likelihood of continuing to work in the same sector is small, statistically insignificant, and not different across employer types. These results not only fail to support Hypothesis 5[43], but also generally indicate that workers are unlikely to make any type of transitions across sectors in the event of a health shock in the household. Rather, labor force participation is impacted more strongly and there is increased likelihood of discontinuing market work activities in response to own health shocks and increased market labor time in response to spousal health shocks. The gradual deterioration of the generosity of benefits in public sector jobs over time may reduce the incentives to stay in such jobs. Or it may also be the case that health insurance premiums are a less valued benefit amid generally rising incomes and wages, creating less of a wedge in the labor market.

[43] The effects of health shocks will reduce the likelihood that individuals transition into private sector employment (increase the likelihood that workers will remain in public sector employment).

8.4 Household welfare and policy implications

When the results for market labor and home production time are combined, results show that households are more severely impacted when men suffer health shocks. Total production time in the household significantly declines by nearly 2 hours per day. Even though wives are less likely to drop out of the labor force when this occurs, their small increase in market hours cannot make up for the husbands' lost market time. On the other hand, husbands increase home production when wives' become sick and, in combination with a limited effect of poor health on women's own market time, total household production time in unaffected. Thus, the opportunity costs to ill health for men include the reductions to their own market time, their own home production time, and the increased market time for their wives. The opportunity costs to ill health for women include the reductions to their own home production time and the increased home production time for their husbands.

Moreover, total household time within elderly, low income, and private sector households are more severely affected when a health shock occurs. Even though the effects on total household market time were only marginally significantly different across age groups, the 1.8 hours reduction observed for the elderly suggests that elderly households may be placed at higher risk of subsequent income shocks. In addition, total production time also fell by 2.7 hours per day for poor workers compared to only 1.1 hours per day for wealthier people; the decline is primarily due to reductions in market labor time. Similarly for private sector workers, total household production time fell by 1.6 hours per day whereas it actually increased for state/collective sector workers by 1.3 hours per day (although this latter estimate is marginally significant). The magnitude of these time losses are substantial if we consider the daily loss compounded over months and years lapsed between survey years.

Estimates of the health effects on household time use may suffer from considerable measurement error as evidenced by the large estimated standard errors, which may result in incorrect inferences. Hours worked is a composite variable created from the summation of reported hours worked in different activities. This summation may exacerbate the measurement error if each component activity also contains error, which may become even worse when summed across all individuals in the household. This may especially be the case for self-employed or agricultural workers who are involved in a number of different income-generating activities or home production tasks throughout any given year. These same individuals may also be more severely affected by adverse health outcomes. Therefore, the limited findings regarding total household time use may be partially attributed to measurement error.

Even though the health effects on home production time are statistically significant and a unique contribution of this dissertation, the magnitude of these effects are small and may be less economically significant compared to the large effects on market labor time. Although this dissertation did not examine the intergenerational effects of health shocks, the labor supply effects may be even larger if young children were to suffer health shocks. This may also apply to elderly parents, and particularly elderly grandmothers who are likely to outlive their husbands and rely on adult children for support. The demand for home care may be greater for these dependent members of the household, leading the adult generation to take more time away from work and substitute toward time at home. This will also be affected by remarriage rates, which will affect the extent to which adult children may live with and support elderly fathers and mothers. It is likely that such patterns of living arrangements will become ever more important as the dependency ratio rises in China. Furthermore, household resources may be diverted from more optimal longer-term investments into child human capital or household-based farm or business production technology. Unfortunately, the number of children and elderly parents in the CHNS did not comprise a sufficiently large enough sample to examine these intergenerational effects and this will be left for future investigation.[44] Further analysis of this elderly population is necessary and current efforts are already underway to collect better quality data on late-life welfare with the China Health and Retirement Longitudinal Survey.

China has generally had high savings rates and systems of informal social network support to insure against income risks. As restrictions on mobility have been lifted, remittances have become commonplace. Unfortunately, the CHNS provides little information on remittances separately from transfers, but an examination of private transfers shows that they constitute a critical income stream for many households. For those workers in the FE sample who responded to these questions and remained healthy, 45% received transfers from relatives and friends in the following survey year. In comparison, the percentage of workers who became ill and received subsequent transfers was 7 percentage points higher. Although the prevalence of missing data prevents a thorough analysis of transfers, this descriptive differences suggest that private sources of borrowing may be used to offset household shocks.

The importance of private transfers can be put into context when contrasted with the limited number of individuals and households that have access to public transfers. The majority of workers in the FE are self-employed (64%) and likely to have less job security and access to benefits compared to salaried workers. However, of those workers who experienced a health shock, 75% were self-employed. Therefore, only about a quarter of ill workers may be employed in jobs with more steady salaried compensation packages, employment protection, and benefits in general (including pensions). For example, only 29% of all workers had any sort of health insurance coverage, but coverage among those who suffered health shocks was only 22%. While studies of health insurance during the economic transition period have shown that the benefit generosity, and particularly coverage for dependents, through the existing health insurance programs eroded over time (Hu et la. 1999), workers who suffer large productivity hits risk unemployment and the loss of coverage for all members of the household. There is little direct evidence in the CHNS on how much of this coverage is bundled.[45] Of workers who experienced a health shock and were covered by insurance, 35% had access to free medical care provided by GIS (i.e. for government workers), 32% were covered by their cooperative medical program, 18% were covered by LIS (i.e. for state-owned enterprises), and 11% had privately purchased commercial insurance. In the spousal health sample, about 9% households have at least one spouse working in the state sector. This may serve as an upperbound on the risk of losing coverage for the entire household if we assume state sector workers have full dependent coverage. There are also about 10% of households with at least one spouse working in collectives who may be at risk for losing all coverage in the household if workers become unemployed.[46] And because men are more likely to be employed in the state and collective

[44] I tried to do analyses of children's health shock effects on adult time allocation and elderly parental health shock effects similar to the spousal analyses, but there were not enough observations in the final samples to even run robust fixed effects estimates.

[45] Only 1 person wave covered by benefits extended to family members. This does not quite seem correct in my opinion and I think that there is some mis-recording with respect to the identification of dependents and their health insurance status

[46] I attempted to examine the continuation of health insurance coverage after health shocks occurred for individuals and their spouses. However, there is a lot of missing information on health insurance, making it difficult to compare across time and across spouses. In addition, there are also secular trends in declining health insurance coverage over time, which cannot be controlled for in a mere descriptive analysis.

sectors,[47] health shocks affecting men may put households at greater risk of losing comprehensive coverage if productivity losses prevent a return to the labor force. On the other hand, the threat of losing coverage for the entire family would likely depend on the financial health of the employer, and employees of state- or collectively-owned enterprises may still have retained such benefits even after termination.

We can try to examine the extent of generosity of public transfers indirectly through the receipt of pension benefits following the onset of the health shock for labor force dropouts. Nearly 75% of these labor force drop outs in the health shock group were from the private sector and only 14% of these workers reported receiving pension income in the following survey wave. This is compared to the 12% of workers in the state sector who dropped out, 90% of which received pensions, and the 5% of workers in the collective sector among whom 63% received pensions. While it should also be noted that this pension information is incomplete in the CHNS, these disparities are likely to remain even after accounting for systematic non-responses and the fact that some workers may not be near retirement age. Little is known about other more temporary measures, such as sick leave and disability compensation.

From these simple descriptive numbers, we might infer that access to public sources of transfers—either in the way of medical care benefits or pension income—is limited for self-employed and private sector workers. As privatization continues to take shape in China, the lack of such benefits for the growing numbers of private sector workers suggest that health shocks may place households at high risk for subsequent income shocks. Consumption smoothing may be more difficult, especially among poorer and rural households. Consumption may even be affected among better-off household for some types of spending. In one study of urban households, Meng (2003) finds that households are able to smooth most consumption in the face of income risk, but there were some adverse effects on educational expenditures.

Recently, there has been a wave of new social safety net programs directed toward increasing access to and the affordability of health services (Liu 2002, Zhang et al. 2006). Although implementation of these programs have encountered set backs due to take-up low and incomplete coverage (Wang et al. 2005, Xu et al. 2007), ensuring access to affordable treatment or disease management can help to assure functionality and slow further health deterioration, ultimately facilitating transitions back into the labor force or a return to normal working hours. A recent analysis of the New Rural Cooperative Medical System in Jiangsu and Anhui provinces suggests that the program does help to lower spending on food as a share of total consumption (Brown et al. 2007), suggesting that consumption may have been otherwise impacted without the program benefits. However, as individuals age, the depletion of health stock suggests that individuals may never fully recover from health shocks and reductions in labor supply may become permanent. Particularly when men suffer health problems, households may need to adjust to permanent reductions in income. Even though women may respond by increasing their labor supply, lower wages for women also mean that income losses cannot be entirely compensated for. Similarly, the large market labor time effects observed for the elderly suggest that early retirement due to permanent health deterioration may place greater strains on elderly spouses who must continue to work and/or on adult children. Although increased labor mobility has enabled workers to achieve higher wages in distance labor markets, remittances and greater savings may have limited capacity to compensate for permanent income reductions, and an argument can be made for implementing broader social security measures to ease transitions into

[47] About 62% of state sector employees and 60% of workers in collective enterprises are men, compared to 50% of workers in the private sector.

retirement. There may also be need for more temporary measures, such as disability insurance, as over 75% of the shocks occurring among employed individuals aged 50 and over were associated with a new impairment of performing activities of daily living.

8.5 Contributions

This dissertation makes several notable contributions to the academic literature. First, I have developed a theoretical framework for elucidating the effects of health on home production as distinct from market labor by adapting the Grossman (1972) and Granau (1977) models. Although health has been hypothesized to play a role in time allocation and time use, the specific effects associated with healthy time, labor productivity, and home production productivity have never been explicitly outlined. Second, the methodological approaches that I have taken serve to highlight the strong assumptions made with the use of individual fixed effects in long panels. Estimates using first-differences are different from those using individual fixed effects with dummy variables even though both specifications are run on the same observations. While the dummy variable specification may better reflect longer run effects of health, the likelihood of reverse causality also increases and maintaining the assumption that health is exogenous over all time periods is tenuous. By first-differencing, I focus on immediate short-run effects of health; although I cannot answer questions about long-run welfare, I can be more confident that estimates for the short-run are subject to lesser bias from reverse causality. Additionally including time-invariant observables controls for confounders, such as age, that are correlated with both changes in health and changes in time outcomes; specifications without these controls generate much larger effects. Using propensity score techniques to account for non-linearities within the observables does not appear to substantially improve point estimates, but does sacrifice considerable efficiency. The direction of the effects from pooled OLS are generally consistent with the hypothesized effects of health, even though the inclusion of fixed effects shows that there is significant bias from unobserved heterogeneity with comparatively little loss in inefficiency. This suggests that OLS may provide a crude, but reliable estimate of the direction of the effect of health, while point estimates may be more consistent with fixed effects.

Third, the significant findings relating both own health and spousal health to home production time confirms an important theoretical relationship and adds to the existing thin body of empirical evidence on the topic. Parson's (1977) study using U.S. data is the only other study that systematically documents the effects of own health and spousal health on market and home production time. Other studies do not explicitly examine home production or spousal cross-effects. The findings suggest that the health effects on home production may be substantively less important compared to the large effects observed for market labor time. Finally, the relationships uncovered in the CHNS data suggest that current policy efforts to expand health insurance coverage may be insufficient to diminish the full opportunity costs of ill health. Spouses appear to have limited ability to fully compensate for lost market time, which may translate into difficulty with consumption smoothing, as some previous studies have found (Meng 2003, Brown et al. 2007). As health deteriorates with age, broader social security mechanisms may be needed to ease the transition of workers into retirement, particularly for more vulnerable groups of poor, elderly, and private sector households.

8.6 Limitations and directions for future research

Studying health capital involves some unique analytical challenges, particularly due to the long-run nature of investments into health capital, unobservable factors that influence health, and measurement problems. To the extent that this paper is able to address some of these aspects, there remain areas where the analysis encounters notable limitations. First, time-varying unobservables may still bias estimates if they are correlated with both a change in health status and a change in time use (e.g. household resources may be allocated away from the elderly). While no satisfactory instruments within the CHNS have yet been identified, estimates generally show a strong relationship in the negative direction for market hours that accord with previous findings in the research literature.[48]

Second, self-reported health may be measured with considerable error (Strauss and Thomas 1998). However, applying individual FE will eliminate subjectivity bias if the error is constant within individuals, and ameliorate attenuation bias from subjectivity. Estimates on ΔP_{it} may not capture the total effect of health if past health shocks have a direct effect on current labor outcomes. If past health status is positively correlated with current health status, but negative correlated with labor supply, then estimates will be downward biased. There is also the inability to assess longer time frame dynamic responses to health shocks because first-differencing restricts the analysis to only changes across one time period. Long-run effects of health shocks may be equally important for household welfare, but such analyses will require more careful modeling of lagged independent variable structures. This will be left to future work.

There are a number of other sources of measurement error which have been described throughout the dissertation, including errors in the reporting of hours. However, oftentimes the primary concern with Chinese survey data centers around politically influenced responses. While it is difficult to say to what extent this is prevalent in the CHNS, if this is occurring, it is more likely to have occurred during early waves when the political and social regime was much more restrictive, and for employees of state enterprises who may be more attuned to political intrusion into private affairs. Non-responses to the survey from workers in state-owned enterprises may also contribute to the selectivity of the final sample. If healthier workers are inclined to do so, then estimated effects of health may be overstated. Although this cannot be verified, it may be even more likely that selective response rates are correlated with income as higher income individuals opt out of time-consuming surveys. While the distribution of income does show a large skew, indicating that some extremely wealthy individuals are captured in the CHNS, the effects of health may also be overstated if such wealthier people are also healthier. With increasing obesity rates in China, which is also correlated with income, particularly for men, this may be the case. Nevertheless, estimates generated from a sample of rather poor individuals provide more of an insight into the target population that social insurance policies would aim to cover.

Third, the analysis by employer type involves a number of empirical challenges. First, estimates may suffer from possible endogeneity between sector choice and health status. Especially with respect to the valuation of health insurance, health may be a primary motivation

[48] A valid IV must be highly correlated with health status, but not a direct determinant of time use outcomes. I have investigated the use of food intake volume and meals eaten, household water source and sanitary conditions, community prices of medical services and treatments, the number of facilities in a household's vicinity, time travel costs to such facilities, availability of medication, and smoking history as possible instrumental variables for health. However, all of these variables are not strongly predictive of experiencing a health shock and thus, fail the requirements for valid instruments.

for choosing employers based on the generosity of benefits packages. Although propensity score matching ensures comparability of observations based on health risk, it does not address the fact that individuals may have different likelihoods of being in the sector that they are observed in during the baseline period. Second, even though it is shown that sector choice is not a significant predictor of experiencing a health shock after controlling for a variety of other observables, there may be other unobserved factors that influence both sector choice and health. Third, sector transitions may also be a longer-run response that cannot be captured in this short-run analysis. Lastly, due to the small number of observations, the unique characteristics of township and village enterprises as a hybrid entity between state-owned enterprises and private sector employers could not be captured. Although the distribution of hours worked between state and collective sector workers is very similar, indicating similar organizational features (i.e. full-time, part-time), the higher LFP rates for collective sector workers suggest that pension benefits may not be as generous and workers may need to continue working into old age. Combining these categories may be inappropriate because of the greater emphasis on profit maximization in collectives. If better information about incentive structures becomes available at the firm level, this is one important area to study the relationship between worker health, compensation, and benefits.

Fourth, one important drawback of using the CHNS is the limited external generalizability of the sample and the application of matching methods that further restricts this. Although the statistical methods employed were targeted toward generating consistent and reliable estimates, their real world applicability to a broader population in China may be undermined. When taking into consideration the large number of migrant workers who generally are not entitled to the same social and legal protections as permanent residents, this limitation is nontrivial. Capturing this population in longitudinal surveys is also particularly difficult and more attention will be needed to assess the contributions and welfare of these individuals in future research. Nevertheless, the relationships found within the data support the significance of a previously under-studied fundamental relationship between health and home production for a large segment of the Chinese population. Extending the findings to other contexts will be left to future work when more data regarding time use are available

Finally, there is still little quantitative evidence on household consumption patterns. Previous studies of consumption behavior are localized and less generalizable to the population (Meng 2003, Brown et al. 2007). While private transfers may continue to play a buffer against household shocks, poorer household may find these resources inadequate to counter all consumption risk. Important modifiers for the degree of consumption risk include household composition and living arrangements. The limited numbers of elderly and young children in the CHNS limit the ability to study these intergenerational linkages. Future analyses will need to take into account the contributions of these household members.

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FIGURES

Figure 1. Optimization of time use for employed and unemployed individuals

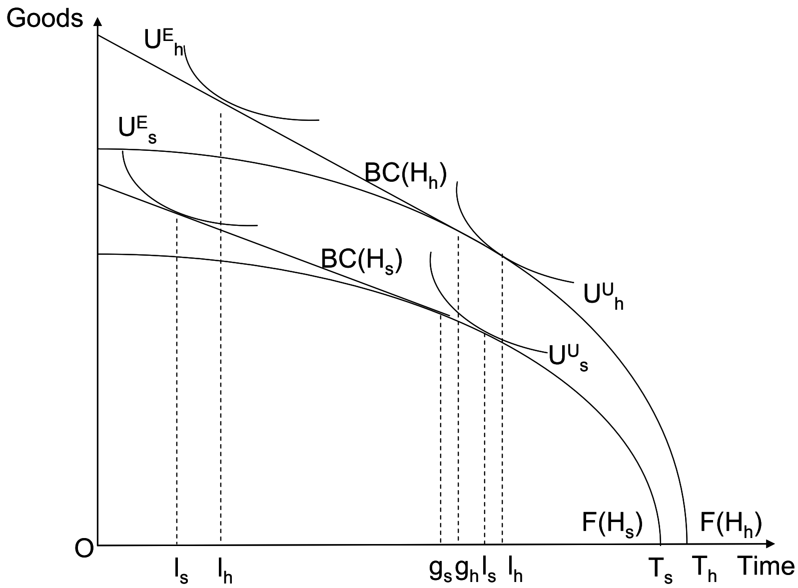
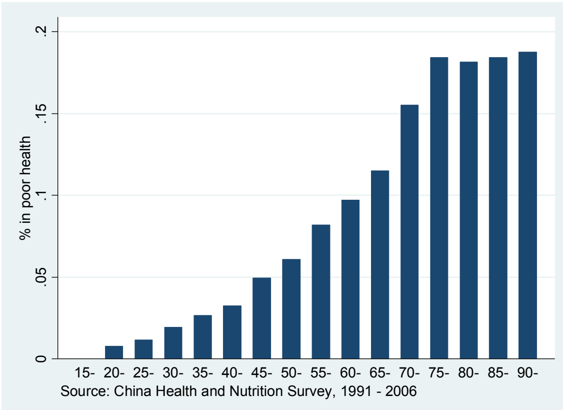
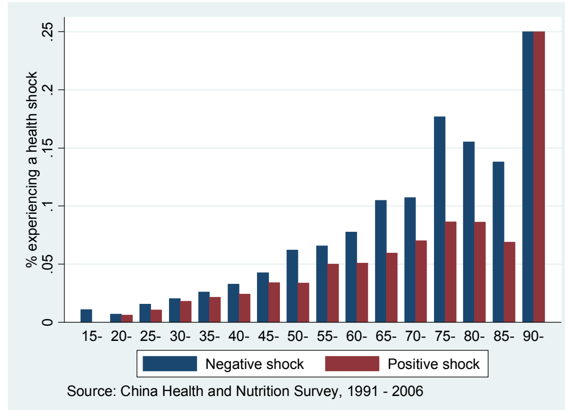


Figure 2. Health status and health shocks across the age distribution

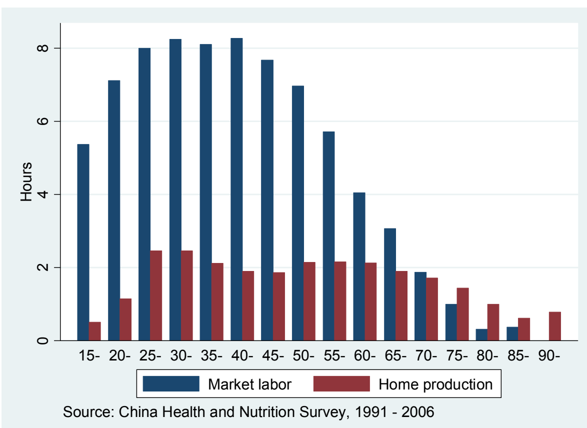
Panel A. Poor health status



Panel B. Health shocks



Panel C. Hours worked



Panel D. Production activity participation

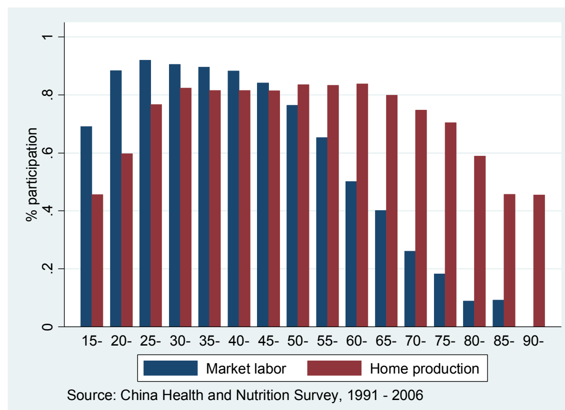
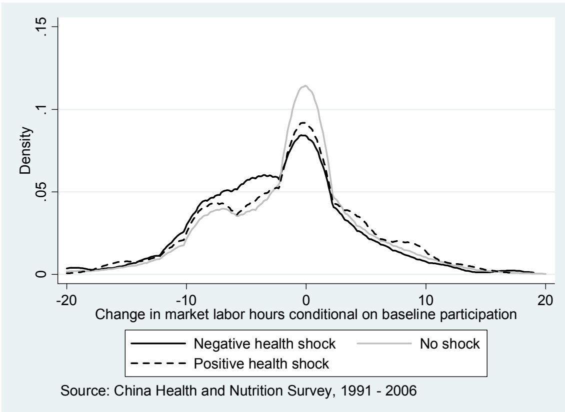
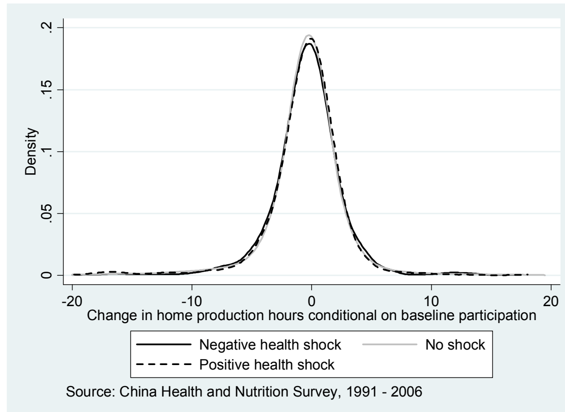


Figure 3. Change in market labor and home production hours

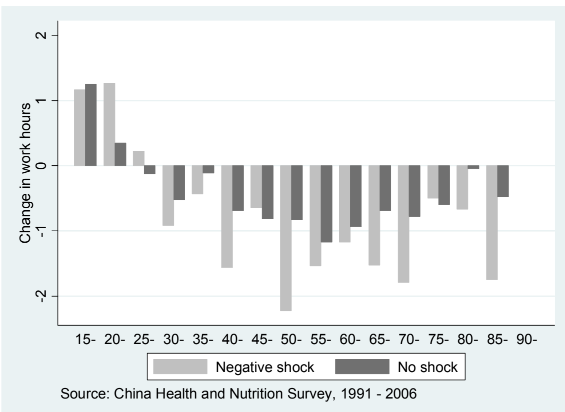
Panel A. Distribution of change in market hours



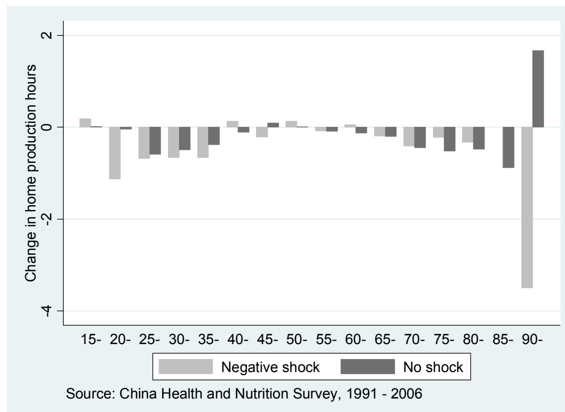
Panel B. Distribution of change in home production hours



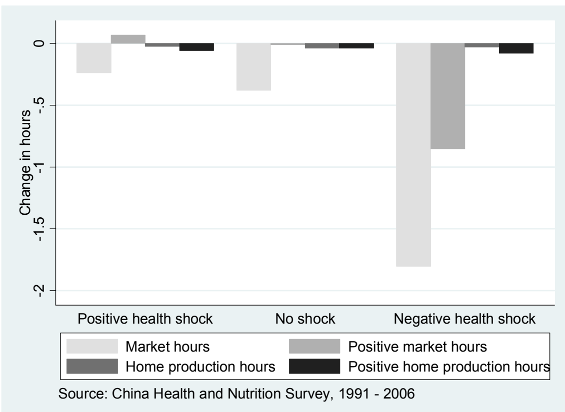
Panel C. Mean changes in market labor hours by age



Panel D. Mean changes in home production hours by age



Panel E. Mean changes in hours for men



Panel F. Mean changes in hours for women

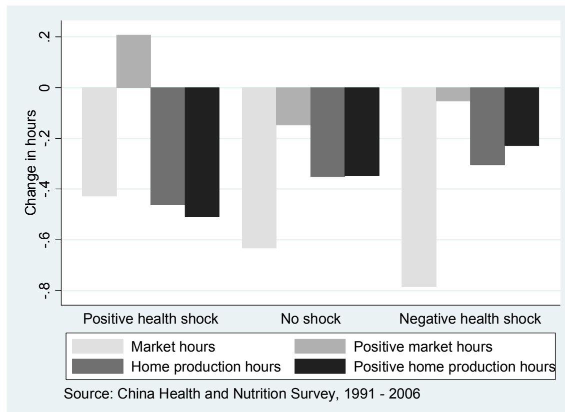
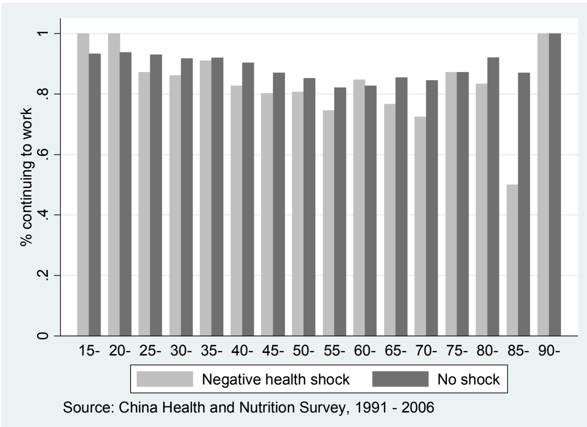
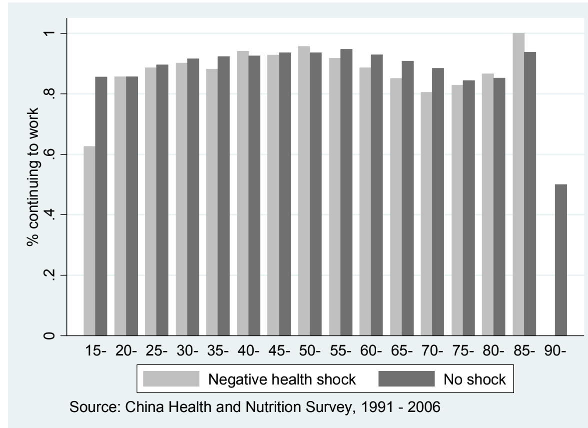


Figure 4. Continued participation by health shock

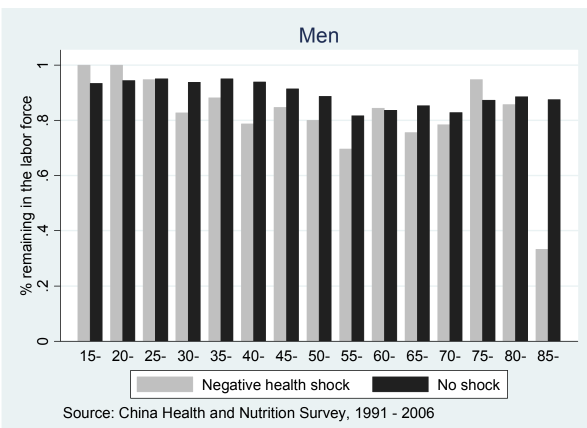
Panel A. Change in labor force participation by age



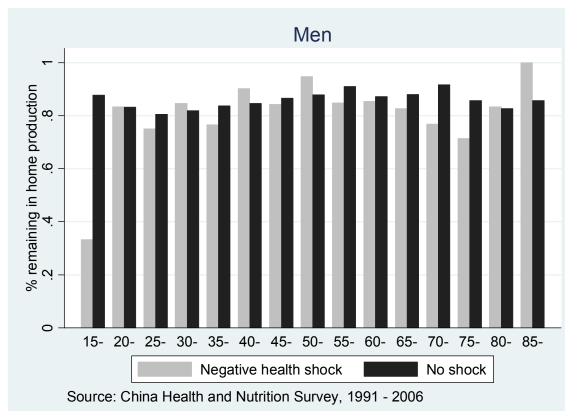
Panel B. Change in home production participation by age



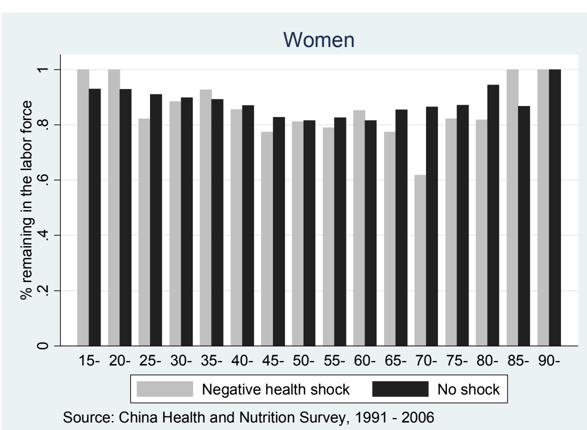
Panel C. Change in labor force participation for men



Panel D. Change in home production participation for men



Panel E. Change in labor force participation for women



Panel F. Change in home production participation for women

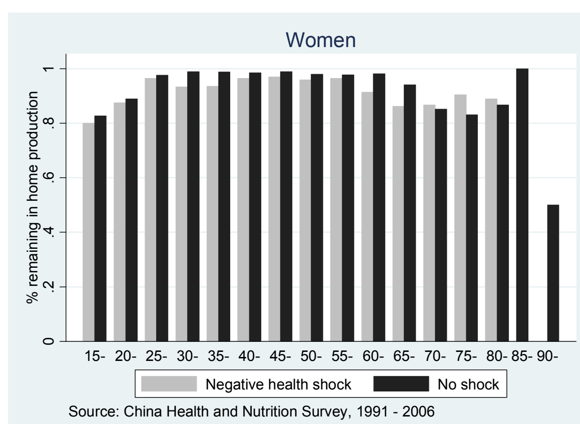


Figure 5. Distribution of the propensity score for the individual analysis

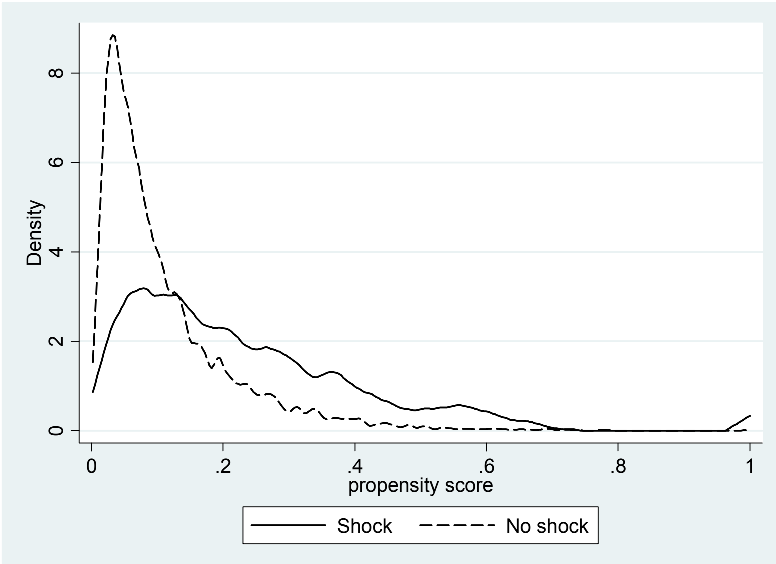
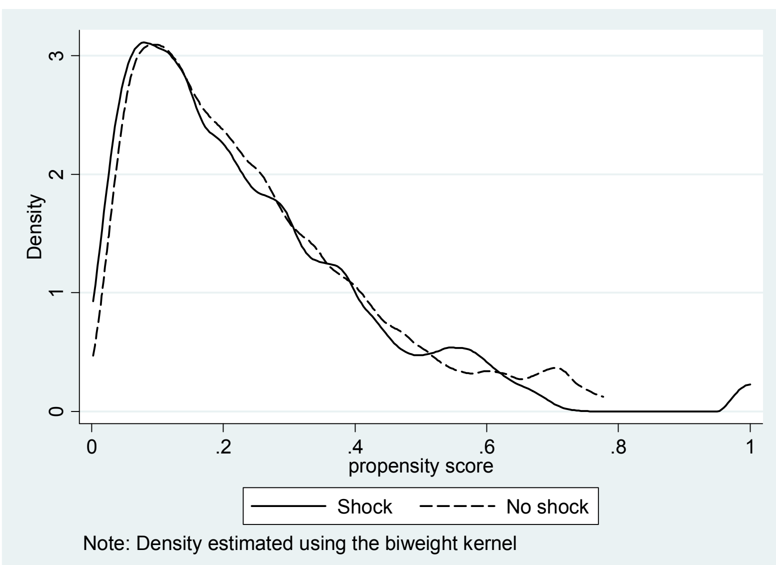


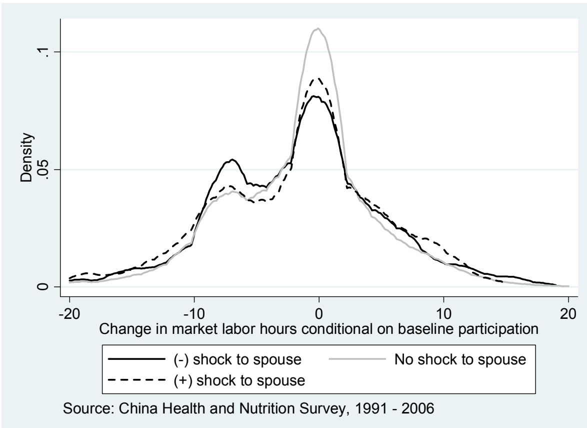
Figure 6. Specification test of the estimated propensity score for the individual analysis



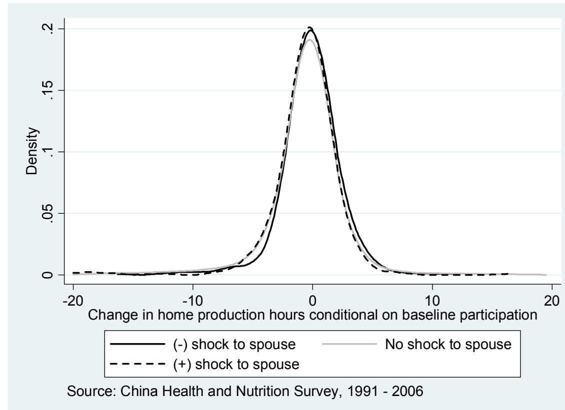
— $\hat{f}_1(p)$ ---- $\hat{\alpha}\frac{p}{1-p}\hat{f}_0(p)$, where $\hat{\alpha} = \frac{\Pr\{\Delta H_{it} = 0\}}{\Pr\{\Delta H_{it} = 1\}}$

Figure 7. Change in market labor and home production hours by spouse's health shock

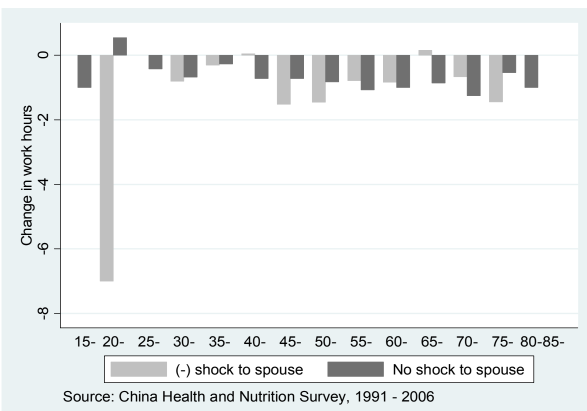
Panel A. Distribution of change in market hours



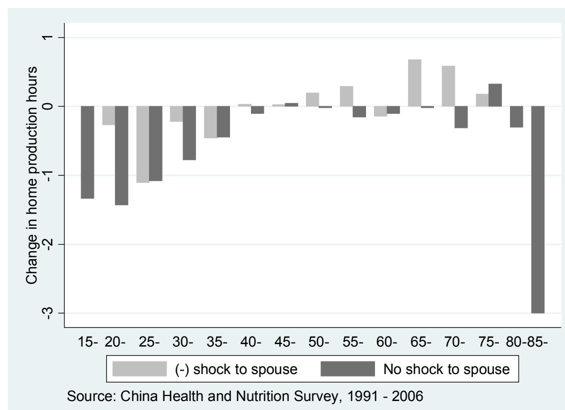
Panel B. Distribution of change in home production hours



Panel C. Mean market labor hours changes by age



Panel D. Mean home production hours changes by age



Panel E. Mean hours changes for men

Panel F. Mean hours changes for women

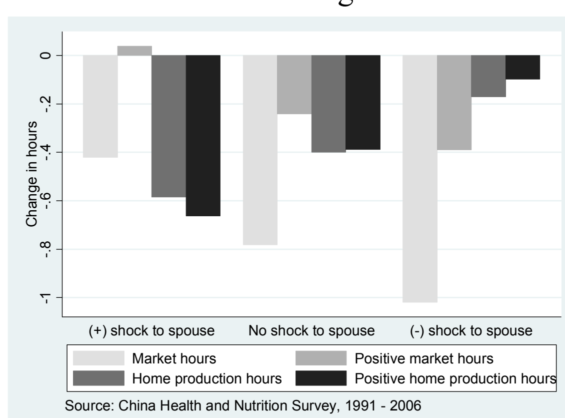
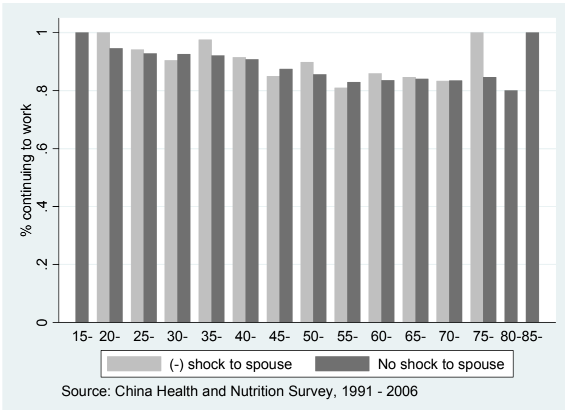
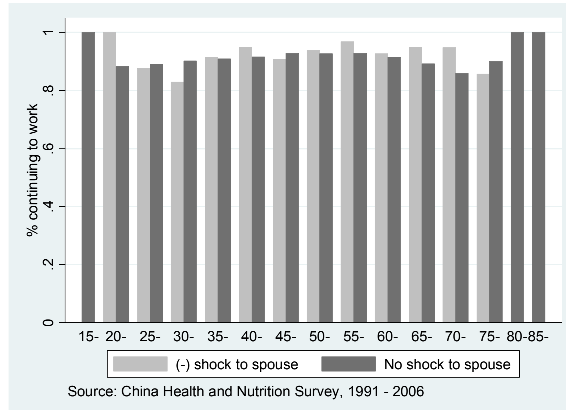


Figure 8. Continued participation by spouse's health shock

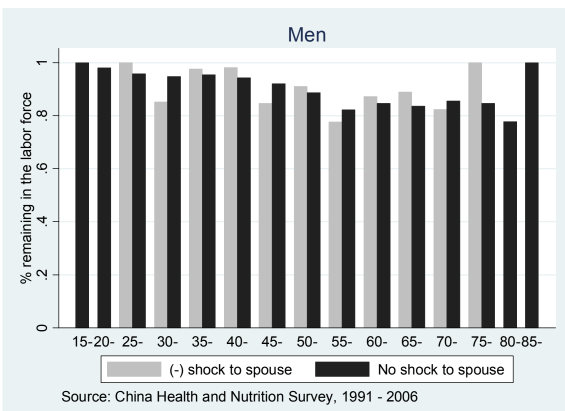
Panel A. Change in labor force participation by age



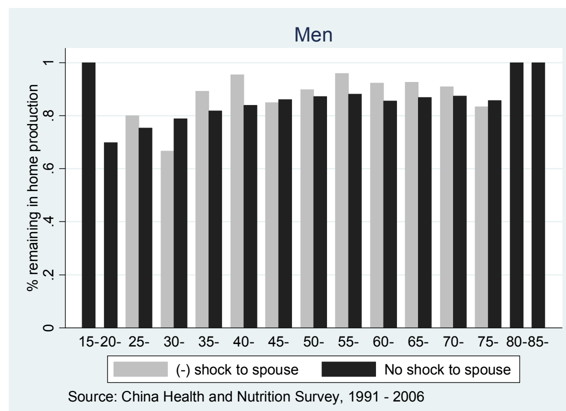
Panel B. Change in home production participation by age



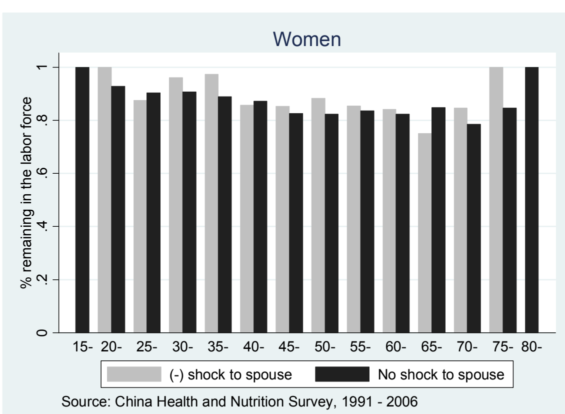
Panel C. Change in labor force participation for men



Panel D. Change in home production participation for men



Panel E. Change in labor force participation for women



Panel F. Change in home production participation for women

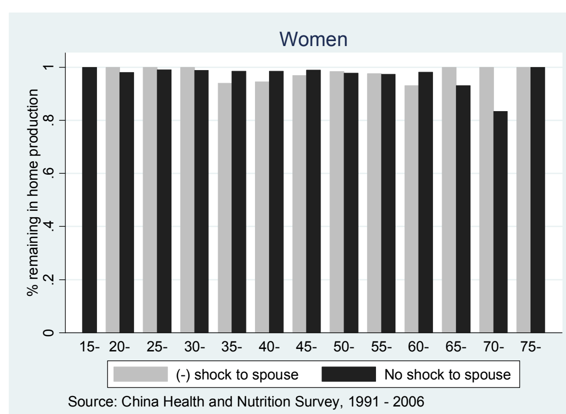


Figure 9. Distribution of the propensity score for the spousal analysis

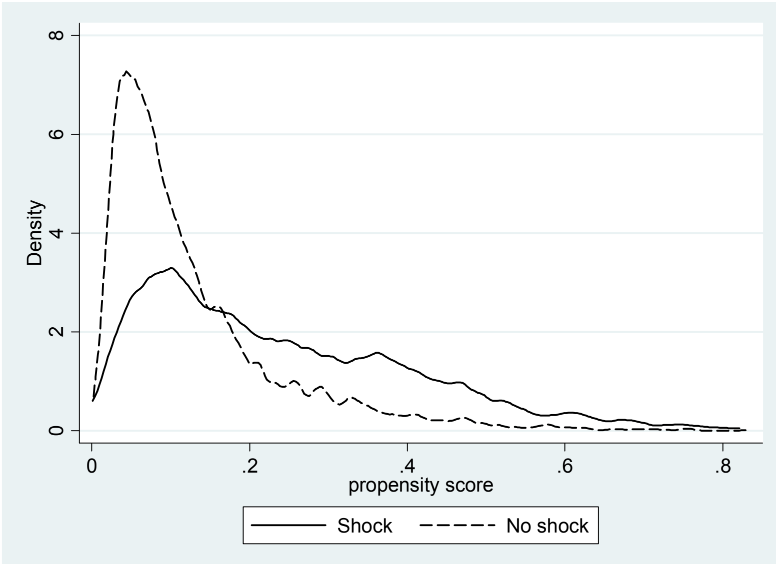
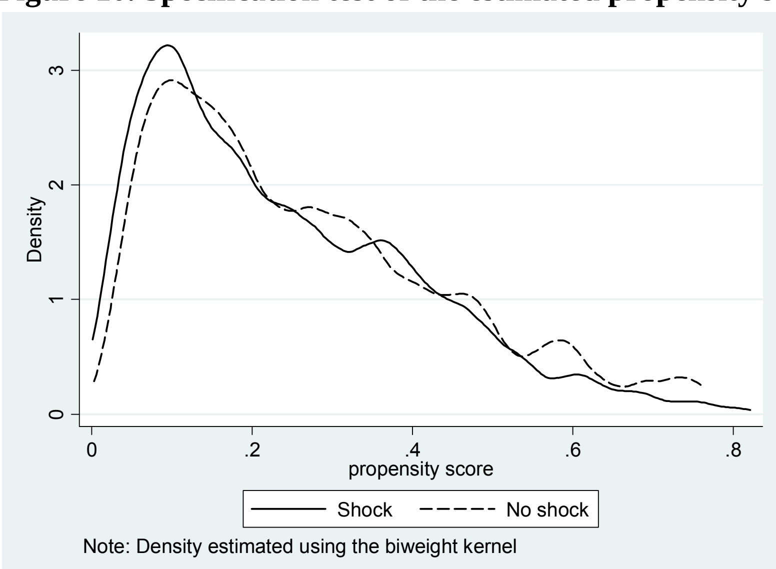


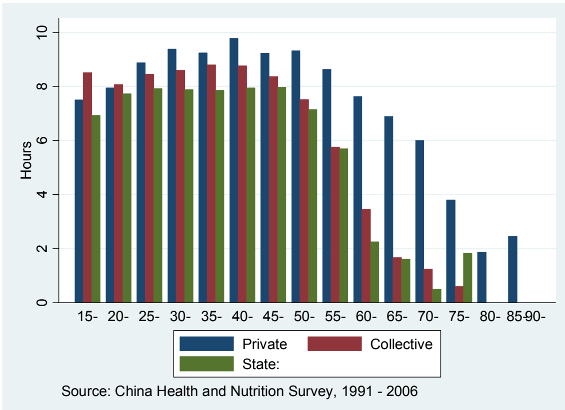
Figure 10. Specification test of the estimated propensity score for the spousal analysis



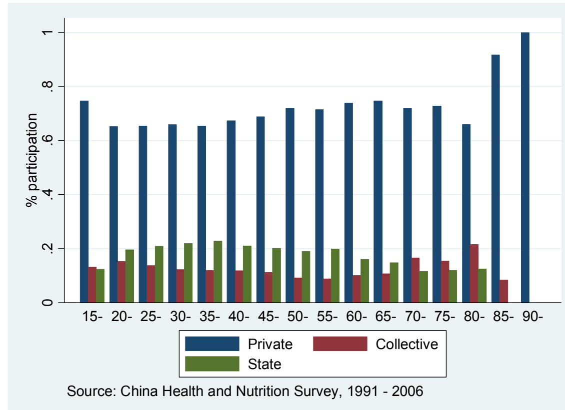
— $\hat{f}_1(p)$ ---- $\hat{\alpha}\frac{p}{1-p}\hat{f}_0(p)$, where $\hat{\alpha} = \frac{\Pr\{\Delta H_{it} = 0\}}{\Pr\{\Delta H_{it} = 1\}}$

Figure 11. Employment and hours worked by firm type

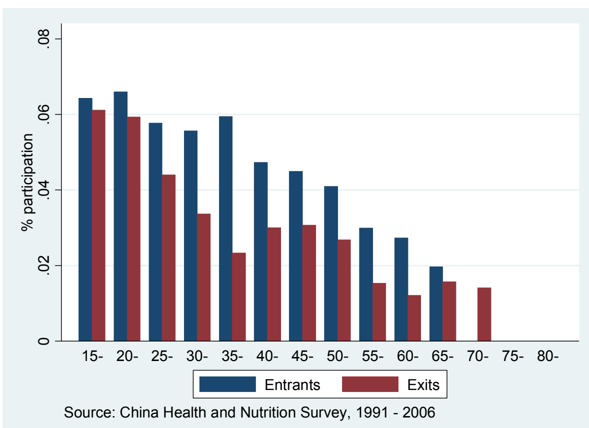
Panel A. Market hours worked by age



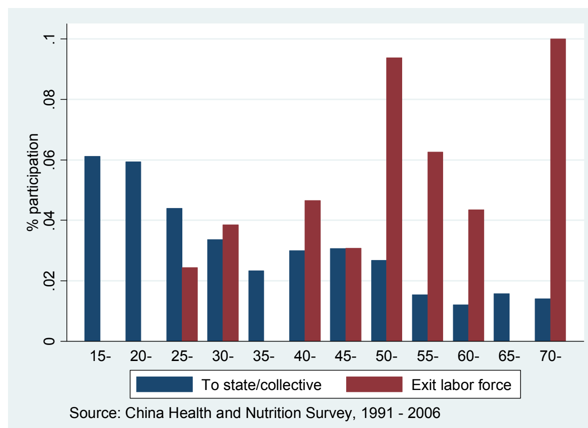
Panel B. Proportion of employment by age



Panel C. Private sector transitions for employed individuals



Panel D. Transitions from the private sector



Panel E. Transitions from the state/collective sector

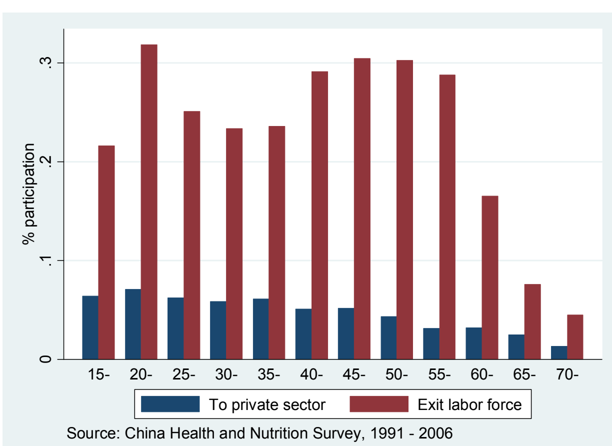
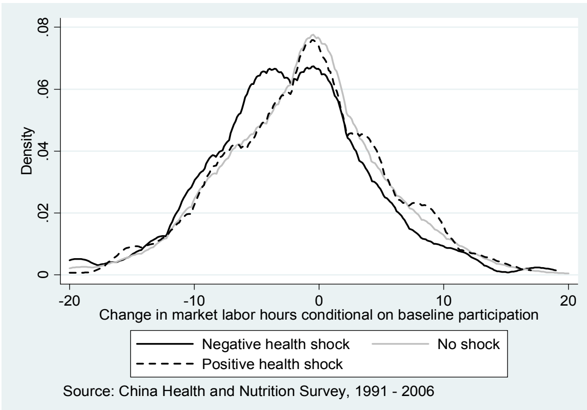
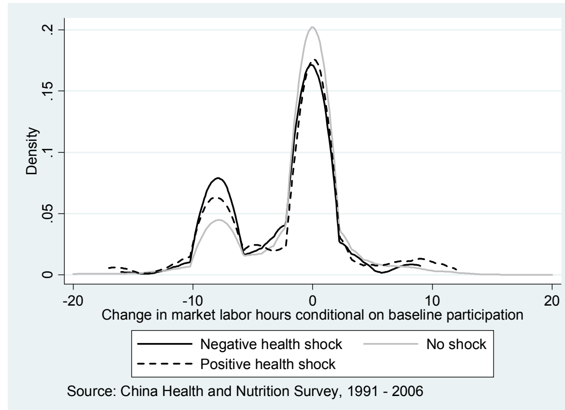


Figure 12. Employment and hours worked by firm type and own health

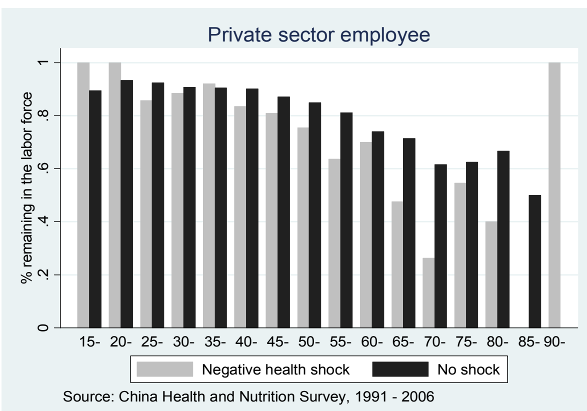
Panel A. Change in market hours for private sector employees



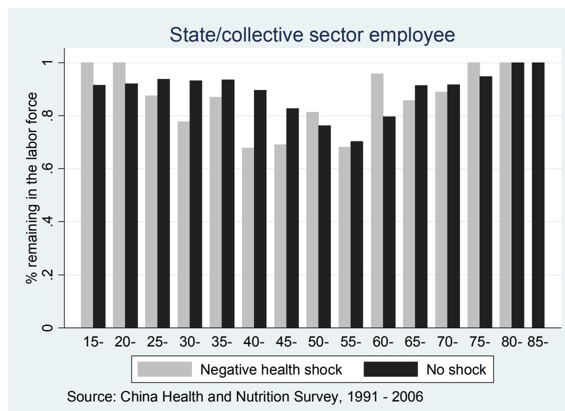
Panel B. Change in market hours for state/collective sector employees



Panel C. Change in labor force participation for private sector employees



Panel D. Change in labor force participation for state/collective sector employees



Panel E. Change in market and home production hours for private sector employees

Panel F. Change in market and home hours for state/collective sector employees

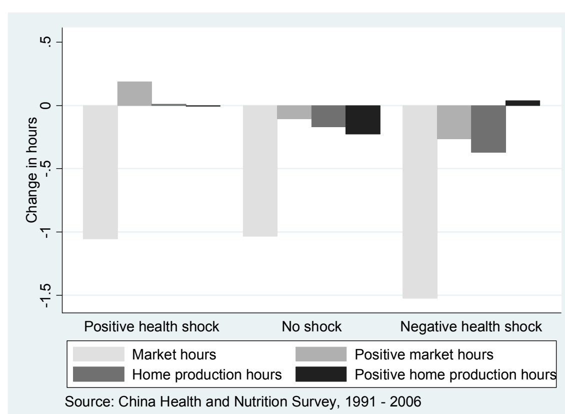
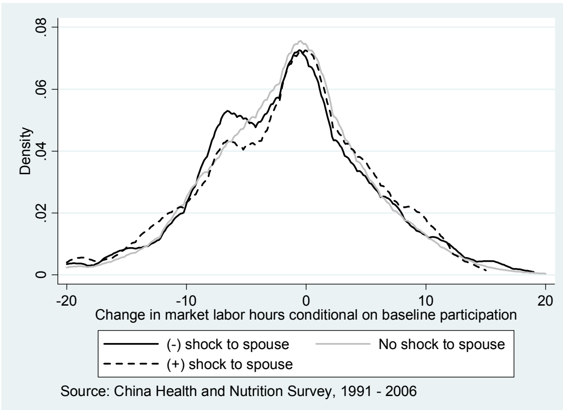
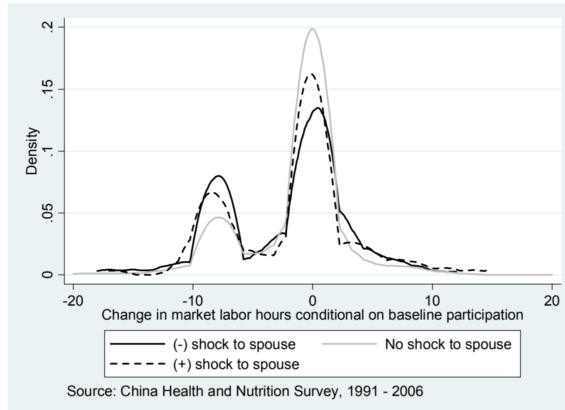


Figure 13. Employment and hours worked by firm type and spousal health

Panel A. Private sector employees

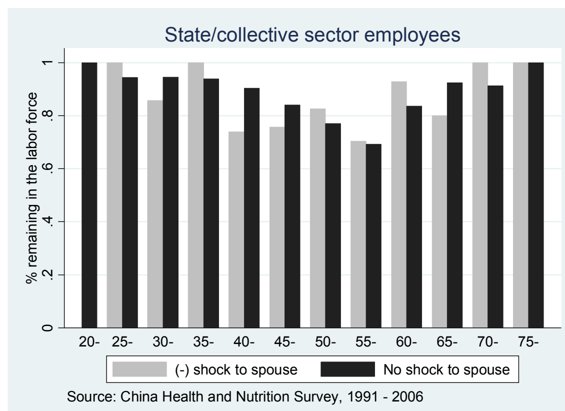


Panel B. State/collective sector employees

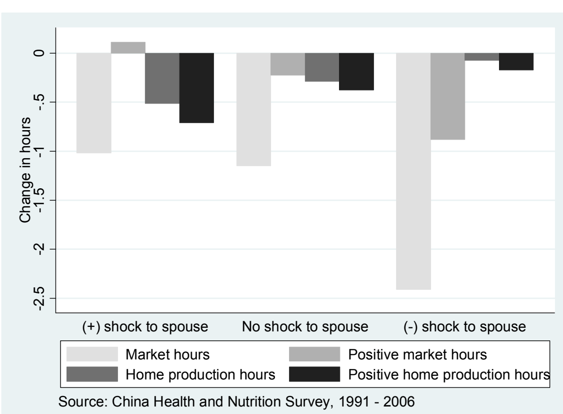


Panel C. Change in labor force participation for private sector employees

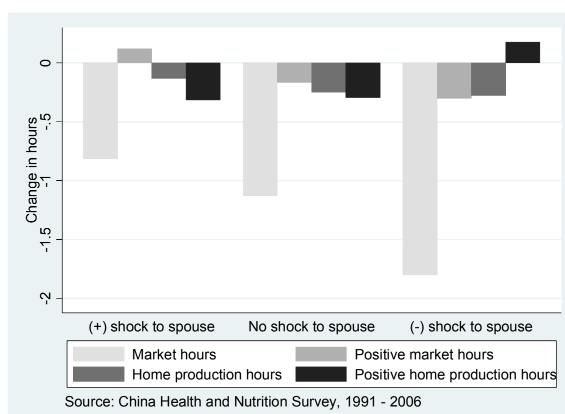
Panel D. Change in labor force participation for state/collective sector employees



Panel E. Change in market and home production hours for private sector employees



Panel F. Change in market and home hours for state/collective sector employees



TABLES

Table 1. Theoretical predictions in response to a health shock

Panel A. Individual sickness and time use: employed

Pathways	Work	Home	Leisure
Lower healthy time (↓*T* or ↑*s*)	?	?	-
Decrease in wages (↓*w*)	?	?	?
Lower productivity in home production (↓*F*)	?	?	-
Total effect	?	?	?

Panel B. Individual sickness and time allocation: unemployed

Pathways	Work	Home	Leisure
Lower healthy time (↓*T* or ↑*s*)	N/A	?	-
Decrease in wages (↓*w*)	N/A	N/A	N/A
Lower productivity in home production (↓*F*)	N/A	?	?
Total effect	N/A	?	?

Panel C. Cross-member sickness effects and time use: employed

Pathways	Work	Home	Leisure
Lower non-labor income (↓*T*)	+	+	-
Higher demand for home care (↑*F*)	?	?	+
Total effect	?	?	?

Panel D. Cross-member sickness effects and time use: unemployed

Pathways	Work	Home	Leisure
Lower non-labor income (↓*T*)	N/A	+	-
Higher demand for home care (↑*F*)	?	?	+
Total effect	?	?	?

Table 2. Analysis of missing and dropped observations

	XS Pooled OLS sample					FE FD sample				
	Excluded (N=48,053)		Included (N=43,648)		T-test	Excluded (60,927)		Included (N=30,729)		T-test
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Market labor										
Hours	4.34	4.75	6.95	5.20	***	5.09	5.11	7.20	5.08	***
ΔHours[1]	0.32	4.25	-0.55	5.78	***	0.17	4.39	-0.53	5.79	***
Participates	0.65	0.48	0.78	0.41	***	0.67	0.47	0.81	0.39	***
Enter labor force[1]	0.05	0.22	0.06	0.24	***	0.05	0.23	0.06	0.24	**
Exit labor force[1]	0.09	0.29	0.11	0.32	***	0.10	0.29	0.11	0.32	***
State sector	0.23	0.42	0.20	0.40	***	0.22	0.42	0.20	0.40	***
Enter state sector[1]	0.04	0.20	0.03	0.18	***	0.04	0.20	0.03	0.18	**
Exit state sector[1]	0.04	0.19	0.04	0.19		0.04	0.19	0.04	0.19	
Collective sector	0.16	0.37	0.12	0.32	***	0.14	0.35	0.12	0.33	***
Enter collective sector[1]	0.05	0.21	0.04	0.20		0.05	0.21	0.04	0.20	
Exit collective sector[1]	0.08	0.28	0.06	0.23	***	0.08	0.27	0.06	0.23	***
Private sector	0.61	0.49	0.68	0.47	***	0.64	0.48	0.68	0.47	***
Enter private sector[1]	0.07	0.25	0.05	0.22	*	0.07	0.25	0.05	0.22	**
Exit private sector[1]	0.04	0.19	0.03	0.18		0.04	0.19	0.03	0.18	
Home production										
Hours	1.85	2.59	2.02	2.59	***	1.87	2.52	2.06	2.69	***
ΔHours[1]	0.13	3.34	-0.21	2.86	***	0.09	3.25	-0.21	2.90	***
Participates	0.70	0.46	0.79	0.41	***	0.74	0.44	0.78	0.41	***
Enter home production[1]	0.12	0.32	0.10	0.30	***	0.12	0.32	0.10	0.30	***
Exit home production[1]	0.10	0.30	0.08	0.28	***	0.10	0.31	0.08	0.27	***
Health										
Poor health	0.07	0.26	0.05	0.21	***	0.07	0.25	0.04	0.20	***
Negative health shock[1]	0.07	0.26	0.04	0.20	***	0.07	0.26	0.04	0.20	***
Positive health shock[1]	0.05	0.21	0.03	0.17	***	0.05	0.21	0.03	0.17	***
Height	160.95	9.01	161.65	8.28	***	161.29	8.80	161.52	8.25	**
Age	39.97	19.12	43.72	13.77	***	41.38	18.37	42.72	13.25	***
Education										
< Primary	0.48	0.50	0.49	0.50		0.47	0.50	0.52	0.50	***
Primary	0.31	0.46	0.30	0.46		0.31	0.46	0.30	0.46	***
Lower middle	0.12	0.33	0.13	0.33		0.13	0.33	0.12	0.33	
Upper middle/technical	0.05	0.21	0.04	0.20		0.05	0.22	0.04	0.19	***
College+	0.04	0.20	0.04	0.19	*	0.04	0.21	0.03	0.17	***
Married	0.66	0.47	0.84	0.36	***	0.71	0.46	0.85	0.35	***
Male	0.48	0.50	0.50	0.50	***	0.48	0.50	0.50	0.50	***
Household size										
No. adults	3.23	1.67	3.17	1.36	**	3.27	1.63	3.08	1.30	***
No. boys	0.39	0.60	0.50	0.64	***	0.39	0.60	0.55	0.66	***
No. girls	0.36	0.61	0.45	0.65	***	0.36	0.61	0.50	0.68	***
Occupation										
Farmer	0.51	0.50	0.56	0.50	***	0.51	0.50	0.58	0.49	***
Laborer	0.14	0.35	0.11	0.31	***	0.13	0.34	0.10	0.30	***
Professional	0.10	0.30	0.12	0.32	***	0.11	0.31	0.12	0.32	**
Skilled worker	0.11	0.31	0.09	0.29	***	0.11	0.31	0.09	0.28	***
Service worker	0.14	0.35	0.12	0.33	***	0.14	0.35	0.11	0.31	***
Wealth per capita[2]	1334.88	6124.62	1700.28	7021.27	***	1555.68	6983.80	1439.00	5760.02	*
Urban	0.32	0.46	0.31	0.46		0.32	0.47	0.30	0.46	

* significant at 10%; ** significant at 5%; *** significant at 1%

[1]Transitions calculated as x(t+1) - x(t).

[2]Deflated to 2006 yuan.

Sample is restricted to all adults, age 18+.

Source: China Health and Nutrition Survey, 1991 - 2006.

Table 3. Variable coding and definitions

Variable	Definition
Total production hours	sum of hours/day spent in market labor and home production
Any work	=1 if currently does some production work either in market labor or home production; =0 if performs neither
Total household production hours	sum of hours/day spent in market labor and home production for all individuals in the household
% of total household production hours	Hours/day spent in any work activity as a percentage of the total household hours spent/day in any work activity
Market hours	Hours/day spent in all income-generating activities, top-coded at 20 hours/day; zero hours for non-participants
Market work	=1 if currently works in market labor and market hours>0; =0 if does not currently work in market labor
Household market hours	sum of hours/day spent in market labor for all individuals in the household
% of household market hours	Hours/day spent in market labor as a percentage of household hours spent in market labor
Home hours	Hours/day spent in all home production activities (buying food, cooking, washing, cleaning, childcare), top-coded at 20 hours per day; zero hours for non-participants
Home production work	=1 if performs some home production activity and home hours >0; =0 if does not perform any activities
Household home hours	sum of hours/day spent in home production for all individuals in the household
% of household home hours	Hours/day spent in home productions a percentage of total household hours/day spent in home production
% market hours	Hours/day spent in market labor as a percentage of total hours spent in both market labor and home production
Poor health	=1 if reports poor health; =0 if reports excellent, good, or fair health
Spousal poor health	=1 if spouse reports poor health; =0 if spouse reports excellent, good, or fair health
Height	measured height in centimeters
Age	age of person in years
< Primary school	=1 if less than primary school; =0 otherwise
Primary school	=1 if primary school; =0 otherwise
Lower middle school	=1 if lower middle school; =0 otherwise
Upper middle/technical school	=1 if upper middle school or technical/vocational school; =0 otherwise
College+	=1 if some college or higher degree; =0 otherwise
Married	=1 if married; =0 otherwise
Male	=1 if male; =0 otherwise
No. adults	number of adults aged 18+ in household
No. boys	number of boys aged <18 in household
No. girls	number of girls aged <18 in household
Farmer	=1 if primary occupation is a farmer, fisherman, or hunter (measured in the first year of survey participation)
Laborer	=1 if primary occupation is a non-skilled worker (measured in the first year of survey participation)
Professional	=1 if primary occupation is a professional or technical worker, administrator, executive, or manager (measured in the first year of survey participation)
Skilled worker	=1 if primary occupation is a skilled profession (measured in the first year of survey participation)
Service worker	=1 if primary occupation is clerical, staff, etc. (measured in the first year of survey participation)
Wealth per capita	value of asset wealth defined by 12 household items (motorcycle, car, radio, vcr, black/white tv, color tv, washing machine, refrigerator, air conditioner, electric fan, camera, microwave), contant 2006 yuan
Urban	=1 if community of residence is in an urban area; =0 otherwise
State sector	=1 if works in a primary occupation that is owned by the state.
Collective sector	=1 if works in a primary occupation that is cooperatively owned by different levels of government
Private sector	=1 if works in a primary occupation that is privately owned (including family contract farming, three-capital enterprises, and joint ventures)

Table 4. CHNS individual sample summary statistics

	1991 (N=7541)		1993 (N=8041)		1997 (N=7429)		2000 (N=6961)		2004 (N=7292)		2006 (N=6384)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Market labor												
Hours	8.083	4.783	7.045	4.778	7.005	4.743	6.381	4.867	6.612	5.911	6.462	5.913
Men	8.405	4.620	7.342	4.657	7.424	4.656	6.777	4.793	7.547	5.900	7.350	5.883
Women	7.753	4.924	6.739	4.881	6.572	4.795	5.999	4.908	5.704	5.779	5.630	5.820
ΔHours[1]	-0.929	5.171	-0.446	5.384	-1.031	5.408	-0.051	6.401	-0.161	6.453		
Men	-0.939	5.228	-0.260	5.472	-1.023	5.448	0.495	6.459	-0.245	6.484		
Women	-0.919	5.111	-0.639	5.285	-1.039	5.368	-0.560	6.304	-0.083	6.424		
Participates	0.859	0.348	0.831	0.374	0.823	0.381	0.794	0.404	0.690	0.463	0.676	0.468
Men	0.891	0.311	0.863	0.344	0.861	0.346	0.837	0.369	0.764	0.424	0.753	0.431
Women	0.826	0.379	0.799	0.401	0.785	0.411	0.752	0.432	0.617	0.486	0.604	0.489
Transition into[1]	0.045	0.206	0.054	0.227	0.055	0.228	0.057	0.232	0.109	0.311		
Men	0.032	0.177	0.049	0.216	0.045	0.208	0.052	0.221	0.092	0.289		
Women	0.057	0.232	0.060	0.238	0.065	0.246	0.062	0.241	0.124	0.330		
Transition out of[1]	0.067	0.250	0.096	0.295	0.106	0.308	0.193	0.394	0.124	0.329		
Men	0.053	0.225	0.076	0.264	0.089	0.284	0.151	0.358	0.110	0.313		
Women	0.081	0.273	0.118	0.323	0.124	0.329	0.231	0.422	0.137	0.344		
Hours|Participating	9.423	3.748	8.828	3.587	8.744	3.588	8.488	3.691	9.919	4.427	9.893	4.425
Men	9.443	3.765	8.873	3.553	8.887	3.597	8.590	3.680	10.235	4.437	10.098	4.449
Women	9.400	3.729	8.777	3.625	8.584	3.571	8.379	3.702	9.540	4.387	9.653	4.386
ΔHours|Participating	-0.555	4.466	-0.211	4.699	-0.483	4.585	1.280	5.431	0.025	5.284		
Men	-0.482	4.585	-0.130	4.764	-0.478	4.574	1.484	5.442	-0.112	5.325		
Women	-0.639	4.323	-0.308	4.622	-0.489	4.600	1.038	5.411	0.201	5.228		
Household hours	23.539	13.254	20.622	13.104	19.797	12.488	17.280	12.194	16.464	12.952	15.674	12.207
ΔHousehold hours	-3.019	12.716	-2.402	13.873	-3.626	13.147	-2.134	14.461	-1.475	13.880		
%Household hours	0.385	0.237	0.386	0.255	0.393	0.248	0.411	0.273	0.444	0.325	0.451	0.326
Δ%Household hours	0.006	0.218	-0.005	0.246	0.004	0.255	0.029	0.331	0.006	0.333		
Home production												
Hours	2.516	3.501	1.853	2.899	1.500	1.732	1.547	1.752	2.514	2.399	2.416	2.363
Men	0.983	2.085	0.655	1.771	0.535	1.060	0.613	1.149	1.322	1.487	1.326	1.638
Women	4.085	3.935	3.090	3.292	2.509	1.724	2.458	1.759	3.216	2.552	3.032	2.485
ΔHours[1]	-0.622	3.629	-0.453	2.900	-0.090	1.785	0.571	2.463	-0.143	2.791		
Men	-0.305	2.566	-0.134	1.919	0.029	1.321	0.605	1.789	-0.002	2.061		
Women	-0.948	4.443	-0.794	3.638	-0.217	2.165	0.551	2.782	-0.199	3.030		
Participates	0.738	0.440	0.687	0.464	0.716	0.451	0.754	0.430	0.995	0.074	0.989	0.105
Men	0.542	0.498	0.457	0.498	0.497	0.500	0.550	0.498	0.990	0.099	0.979	0.143
Women	0.938	0.242	0.922	0.268	0.941	0.236	0.950	0.218	0.997	0.054	0.994	0.075
Transition into[1]	0.089	0.284	0.119	0.323	0.110	0.313	0.152	0.359	0.005	0.072		
Men	0.137	0.344	0.193	0.395	0.190	0.392	0.364	0.481	0.011	0.104		
Women	0.039	0.194	0.041	0.198	0.027	0.163	0.031	0.172	0.003	0.055		
Transition out of[1]	0.135	0.342	0.113	0.317	0.107	0.309	0.003	0.058	0.008	0.087		
Men	0.220	0.414	0.179	0.384	0.167	0.373	0.004	0.066	0.014	0.119		
Women	0.048	0.214	0.044	0.206	0.045	0.207	0.003	0.054	0.005	0.070		
Hours|Participating	3.465	3.687	2.888	3.180	2.207	1.690	2.166	1.719	2.667	2.387	2.597	2.352
Men	1.884	2.576	1.647	2.501	1.197	1.312	1.232	1.375	1.468	1.497	1.515	1.667
Women	4.369	3.914	3.459	3.295	2.718	1.629	2.654	1.679	3.324	2.525	3.155	2.457
ΔHours|Participating	-0.762	4.206	-0.752	3.424	-0.122	2.009	0.477	2.568	-0.135	2.800		
Men	-0.189	3.227	-0.347	2.637	-0.026	1.743	0.300	1.949	0.036	2.135		
Women	-0.950	4.465	-0.868	3.611	-0.156	2.093	0.537	2.744	-0.194	2.994		
Household hours	7.003	6.281	5.336	5.335	4.107	2.617	3.909	3.209	5.075	4.815	4.833	4.800
ΔHousehold hours	-1.657	7.462	-1.351	5.835	-0.257	3.856	0.860	5.197	-0.349	5.237		
%Household hours	0.378	0.375	0.375	0.394	0.390	0.387	0.426	0.386	0.560	0.349	0.572	0.355
Δ%Household hours	0.003	0.293	0.006	0.306	0.006	0.282	0.053	0.323	0.009	0.305		

%Market hours	0.741	0.316	0.742	0.339	0.742	0.332	0.699	0.358	0.541	0.399	0.533	0.406
Men	0.868	0.253	0.877	0.269	0.878	0.265	0.838	0.305	0.670	0.391	0.664	0.399
Women	0.612	0.321	0.611	0.348	0.610	0.338	0.574	0.356	0.465	0.385	0.460	0.392
Δ%Market hours	0.000	0.291	-0.021	0.322	-0.053	0.330	-0.132	0.403	-0.001	0.408		
Men	0.006	0.243	-0.017	0.276	-0.050	0.292	-0.158	0.392	0.000	0.398		
Women	-0.006	0.331	-0.025	0.360	-0.055	0.361	-0.119	0.409	-0.002	0.412		
Poor health	0.034	0.180	0.038	0.192	0.040	0.195	0.049	0.215	0.063	0.243	0.070	0.254
Negative health shock[1]	0.031	0.173	0.036	0.187	0.042	0.201	0.056	0.230	0.048	0.214		
Positive health shock[1]	0.025	0.155	0.024	0.154	0.027	0.162	0.030	0.171	0.040	0.196		
Height	160.95	8.26	161.04	8.28	161.43	8.29	161.96	8.26	162.37	8.26	162.34	8.19
Age	39.91	13.85	41.01	14.25	42.80	13.81	44.12	13.06	46.73	12.77	48.81	12.45
Education												
< Primary	0.586	0.493	0.573	0.495	0.553	0.497	0.517	0.500	0.502	0.500	0.508	0.500
Primary	0.272	0.445	0.282	0.450	0.279	0.449	0.293	0.455	0.301	0.459	0.299	0.458
Lower middle	0.096	0.295	0.100	0.300	0.116	0.320	0.119	0.324	0.118	0.322	0.113	0.316
Upper middle	0.025	0.158	0.025	0.157	0.033	0.179	0.043	0.202	0.047	0.213	0.048	0.214
College+	0.020	0.140	0.020	0.139	0.019	0.136	0.029	0.167	0.033	0.178	0.033	0.178
Married	0.822	0.383	0.804	0.397	0.825	0.380	0.850	0.357	0.875	0.330	0.894	0.308
Male	0.507	0.500	0.507	0.500	0.508	0.500	0.491	0.500	0.493	0.500	0.484	0.500
Household size												
No. adults	3.107	1.382	3.138	1.391	3.139	1.370	3.033	1.247	3.071	1.220	3.613	1.457
No. boys	0.656	0.699	0.602	0.677	0.520	0.655	0.458	0.608	0.382	0.559	0.351	0.550
No. girls	0.610	0.753	0.537	0.710	0.474	0.660	0.419	0.617	0.339	0.548	0.317	0.537
Occupation												
Farmer	0.577	0.494	0.574	0.494	0.599	0.490	0.576	0.494	0.575	0.494	0.582	0.493
Laborer	0.130	0.336	0.133	0.340	0.112	0.316	0.103	0.304	0.096	0.295	0.095	0.294
Professional	0.092	0.289	0.091	0.287	0.093	0.291	0.110	0.313	0.112	0.315	0.111	0.315
Skilled worker	0.093	0.291	0.093	0.290	0.087	0.282	0.091	0.288	0.089	0.285	0.084	0.277
Service worker	0.087	0.282	0.112	0.316	0.116	0.320	0.125	0.330	0.158	0.365	0.168	0.374
Wealth per capita[1]	299	553	590	1385	1980	7092	2371	7754	2460	7628	2830	11721
Urban	0.307	0.461	0.304	0.460	0.303	0.460	0.311	0.463	0.312	0.464	0.303	0.460

[1]Transitions calculated as x(t+1) - x(t).

[2]Deflated to 2006 yuan.

Sample is restricted to all adults, age 18+, appearing in at least two adjacent survey waves (NT = 43648)

Source: China Health and Nutrition Survey, 1991 - 2006.

Table 5. Effect of own health on total production hours: OLS and individual FE estimates

				FD + time-invariant covariates				
					Works at baseline		Doesn't work at baseline	
	Pooled OLS	Individual FE	FD		(-) shock	(+) shock	(-) shock	(+) shock
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	y	y	Δy	Δy	Δy|y>0, p=0	Δy|y>0, p=1	Δy|y=0, p=0	Δy|y=0, p=1
Poor health	-0.944	-0.628						
	(0.164)***	(0.160)***						
ΔPoor health			-0.505	-0.471	-0.393	-1.093	-0.465	0.277
			(0.169)***	(0.168)***	(0.207)*	(0.448)**	(0.373)	(0.812)
Height (cm)	-0.224			-0.013	0.048	-0.515	-0.240	-0.771
	(0.125)*			(0.090)	(0.106)	(0.845)	(0.515)	(0.806)
Height^2 (cm)	0.001			0.000	-0.000	0.001	0.001	0.002
	(0.000)*			(0.000)	(0.000)	(0.003)	(0.002)	(0.003)
Age	0.325			-0.128	-0.068	-0.073	0.057	0.218
	(0.018)***			(0.014)***	(0.015)***	(0.111)	(0.057)	(0.105)**
Age^2	-0.005			0.001	0.000	0.000	-0.002	-0.003
	(0.000)***			(0.000)***	(0.000)**	(0.001)	(0.001)***	(0.001)**
Primary school	0.055			-0.005	-0.021	0.441	0.648	1.024
	(0.098)			(0.085)	(0.085)	(0.593)	(0.647)	(2.042)
Lower middle	-0.004			0.117	0.044	0.843	0.699	-0.660
school	(0.127)			(0.106)	(0.107)	(0.972)	(0.730)	(2.438)
Upper middle	0.644			0.190	0.182	0.945	1.646	-6.419
school	(0.171)***			(0.128)	(0.133)	(1.198)	(1.007)	(2.595)**
College+	0.512			0.085	0.069	2.233	0.623	3.577
	(0.211)**			(0.198)	(0.217)	(1.087)**	(1.002)	(1.797)*
Married	1.056	1.148						
	(0.095)***	(0.164)***						
Δmarried			0.746	0.382	0.335	0.052	1.895	1.526
			(0.178)***	(0.184)**	(0.190)*	(0.945)	(0.705)***	(2.249)
Male	-0.799			0.521	0.362	0.536	-0.208	0.724
	(0.119)***			(0.080)***	(0.087)***	(0.553)	(0.551)	(1.155)
No. adults	-0.166	0.139						
	(0.034)***	(0.047)***						
ΔNo. adults			0.027	0.000	0.013	-0.160	-0.034	-0.195
			(0.056)	(0.056)	(0.057)	(0.221)	(0.228)	(0.491)
No. girls	0.210	0.153						
	(0.061)***	(0.090)*						
ΔNo. girls			0.085	-0.015	0.027	-0.590	1.074	-0.040
			(0.117)	(0.117)	(0.117)	(0.503)	(0.426)**	(0.858)
No. boys	0.152	0.087						
	(0.064)**	(0.093)						
ΔNo. boys			0.045	-0.076	-0.014	-0.156	0.015	-0.582
			(0.111)	(0.113)	(0.115)	(0.385)	(0.374)	(0.983)
Farmer	1.755			-0.273	-0.258	0.685	1.462	2.033
	(0.201)***			(0.106)**	(0.114)**	(0.766)	(0.467)***	(1.025)*
Laborer	-0.042			-0.234	-0.270	-0.272	0.746	1.508
	(0.139)			(0.105)**	(0.114)**	(0.944)	(0.563)	(1.275)
Professional	0.614			-0.182	-0.135	-0.717	-0.132	2.959
	(0.133)***			(0.121)	(0.123)	(0.959)	(0.532)	(1.958)
Skilled worker	0.317			-0.292	-0.286	0.501	-0.246	1.039
	(0.151)**			(0.117)**	(0.125)**	(0.943)	(0.508)	(1.363)
Urban	-0.518			-0.045	-0.092	1.111	-0.391	-1.144
	(0.202)**			(0.091)	(0.097)	(0.541)**	(0.381)	(1.111)
Wealth per capita	-0.000	-0.000						
	(0.000)*	(0.000)						
ΔWealth per capita			-0.000	-0.000	-0.000	-0.000	0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)*	(0.000)*
Constant	23.848	9.367	-1.355	3.257	-3.045	44.166	28.614	68.523
	(10.146)**	(0.251)***	(0.139)***	(7.244)	(8.548)	(68.074)	(41.633)	(62.865)
Observations	37585	37585	25944	25944	24240	944	686	74
R-squared	0.20	0.51	0.01	0.02	0.02	0.04	0.25	0.57

Robust standard errors in parentheses, clustered at the community level. All regressions include controls for year and province.
* significant at 10%; ** significant at 5%; *** significant at 1%
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 6. Comparison of short- and long-differenced FE estimates of own health

	Change in hours (Δy)				
	(1)	(2)	(3)	(4)	(5)
Panel A: Total production hours					
Δpoor health (t,t+1)	-0.471				
	(0.168)***				
Δpoor health (t,t+2)		-0.623			
		(0.172)***			
Δpoor health (t,t+3)			-0.664		
			(0.211)***		
Δpoor health (t,t+4)				-0.715	
				(0.317)**	
Δpoor health (t,t+5)					-0.829
					(0.499)*
Constant	3.257	-2.123	-3.243	-3.073	-3.626
	(7.244)	(0.152)***	(0.193)***	(0.260)***	(0.245)***
Observations	25944	17797	11307	6157	3138
R-squared	0.02	0.02	0.03	0.02	0.02
Panel B: Market labor hours					
	(1)	(2)	(3)	(4)	(5)
Δpoor health (t,t+1)	-0.464				
	(0.140)***				
Δpoor health (t,t+2)		-0.790			
		(0.143)***			
Δpoor health (t,t+3)			-1.012		
			(0.189)***		
Δpoor health (t,t+4)				-1.133	
				(0.244)***	
Δpoor health (t,t+5)					-1.352
					(0.393)***
Constant	10.637	-1.447	-2.397	-2.394	-2.878
	(6.425)*	(0.140)***	(0.189)***	(0.261)***	(0.238)***
Observations	30729	21253	14240	8608	4347
R-squared	0.01	0.01	0.02	0.02	0.02
Panel C: Home production hours					
	(1)	(2)	(3)	(4)	(5)
Δpoor health (t,t+1)	0.011				
	(0.079)				
Δpoor health (t,t+2)		0.009			
		(0.091)			
Δpoor health (t,t+3)			0.048		
			(0.116)		
Δpoor health (t,t+4)				0.271	
				(0.174)	
Δpoor health (t,t+5)					0.087
					(0.264)
Constant	-4.943	-1.057	-1.254	-0.857	-0.880
	(3.769)	(0.078)***	(0.087)***	(0.127)***	(0.120)***
Observations	27770	18994	12021	6564	3365
R-squared	0.03	0.06	0.05	0.02	0.02

Robust standard errors in parentheses, clustered at the community level.
All regression include controls for survey year and province, and differences in marital status, the number of adults, girls, and boys in the household, and household wealth per capita across the respective difference intervals.

* significant at 10%; ** significant at 5%; *** significant at 1%

Data Source: China Health and Nutrition Survey, 1991-2006.

Table 7. Comparison of FD estimates of own health with time-invariant covariates

	Total production hours		Market labor hours		Home production hours	
		participates and in good health at baseline		participates and in good health at baseline		participates and in good health at baseline
	(1)	(2)	(3)	(4)	(5)	(6)
	Δy	$\Delta y \mid y_t>0, p_t=0$	Δy	$\Delta y \mid y_t>0, p_t=0$	Δy	$\Delta y \mid y_t>0, p_t=0$
(1) With time-invariant baseline covariates and time-varying covariates						
ΔPoor health	-0.471	-0.393	-0.464	-0.717	0.011	-0.075
	(0.168)***	(0.207)*	(0.140)***	(0.209)***	(0.079)	(0.110)
R-squared	0.02	0.02	0.01	0.03	0.03	0.03
(2) With time-invariant baseline covariates and constraining time-varying covariates to baseline values						
ΔPoor health	-0.447	-0.392	-0.461	-0.735	0.021	-0.084
	(0.164)***	(0.201)*	(0.136)***	(0.207)***	(0.077)	(0.105)
R-squared	0.02	0.02	0.01	0.03	0.03	0.04
(3) Without time-invariant baseline covariates						
ΔPoor health	-0.505	-0.636	-0.505	-1.153	0.013	-0.052
	(0.169)***	(0.205)***	(0.141)***	(0.216)***	(0.079)	(0.108)
R-squared	0.01	0.01	0.01	0.01	0.02	0.03
Observations	25944	24240	30729	24102	27770	20668

Robust standard errors in parentheses, clustered at the community level.

* significant at 10%; ** significant at 5%; *** significant at 1%
All regressions include controls for survey year and province.

Data Source: China Health and Nutrition Survey, 1991-2006.

Table 8. Propensity score estimation for the analysis of own health effects

	OR
Height (cm)	0.928
	(0.097)
Height^2 (cm)	1.000
	(0.000)
< Primary school	2.023
	(0.646)**
Primary school	1.480
	(0.484)
Lower middle school	1.288
	(0.437)
Upper middle/technical school	1.373
	(0.487)
Married	1.025
	(0.103)
Male	0.953
	(0.079)
No. adults	1.271
	(0.383)
No. adults^2	0.923
	(0.074)
No. Adults^3	1.007
	(0.007)
No. girls	0.707
	(0.141)*
No. girls^2	1.480
	(0.291)**
No. girls^3	0.924
	(0.041)*
No. boys	0.985
	(0.253)
No. boys^2	0.873
	(0.237)
No. boys^3	1.066
	(0.072)
Farmer	1.319
	(0.174)**
Laborer	1.388
	(0.215)**
Professional	1.229
	(0.239)
Skilled worker	1.320
	(0.197)*
Wealth per capita	1.000
	(0.000)***
Wealth per capita^2	1.000
	(0.000)***
Wealth per capita^3	1.000
	(0.000)***
Urban'	1.070
	(0.102)
Observations	30571

Robust standard errors in parentheses, clustered at the community level.

* significant at 10%; ** significant at 5%; *** significant at 1%

All regression include a vector of dummy variables for age, survey year, province, and survey year*province interactions..
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 9. Trimmed sample characteristics for the analysis of own health effects

Variables	Full sample					Propensity score trimmed sample				
	No shock N=29997		Shock N=1386		Diff/SD	No shock N=7689		Shock N=1072		Diff/SD
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Height	161.75	8.22	158.94	8.40	**-0.33**	160.18	8.05	159.18	8.22	-0.12
Age	42.01	13.34	51.85	13.62	**0.72**	47.72	8.95	50.13	10.30	0.23
< Primary school	0.54	0.50	0.76	0.43	**0.51**	0.70	0.46	0.75	0.43	0.12
Primary school	0.29	0.45	0.16	0.37	**-0.36**	0.21	0.41	0.17	0.38	-0.10
Lower middle	0.11	0.32	0.05	0.22	**-0.28**	0.07	0.25	0.05	0.22	-0.07
Upper middle	0.03	0.18	0.02	0.14	-0.10	0.02	0.13	0.02	0.14	0.01
College+	0.02	0.15	0.01	0.10	-0.13	0.01	0.09	0.01	0.09	0.01
Married	0.84	0.36	0.84	0.37	-0.01	0.93	0.25	0.90	0.30	-0.10
Male	0.50	0.50	0.43	0.50	-0.14	0.46	0.50	0.43	0.50	-0.05
No. adults	3.08	1.31	3.12	1.33	0.03	3.19	1.24	3.18	1.28	-0.01
No. boys	0.50	0.68	0.45	0.68	-0.07	0.45	0.66	0.43	0.67	-0.03
No. girls	0.55	0.66	0.48	0.66	-0.11	0.50	0.64	0.46	0.63	-0.07
Farmer	0.59	0.49	0.69	0.46	0.21	0.70	0.46	0.70	0.46	0.01
Laborer	0.11	0.31	0.10	0.30	-0.03	0.09	0.29	0.09	0.29	0.00
Professional	0.10	0.30	0.07	0.26	-0.10	0.07	0.26	0.08	0.26	0.02
Skilled worker	0.09	0.28	0.07	0.25	-0.09	0.07	0.25	0.06	0.25	-0.01
Service worker	0.11	0.32	0.07	0.25	-0.18	0.08	0.28	0.06	0.24	-0.08
State sector	0.20	0.40	0.14	0.35	-0.15	0.14	0.35	0.15	0.35	0.01
Collective sector	0.13	0.33	0.08	0.27	-0.18	0.10	0.30	0.07	0.26	-0.10
Private sector	0.68	0.47	0.78	0.41	0.25	0.76	0.43	0.78	0.43	0.05
Wealth per capita	1451	5738	1238	5335	-0.04	880	2360	1026	4440	0.03
Urban	0.30	0.46	0.28	0.45	-0.03	0.27	0.44	0.29	0.45	0.04
1991	0.25	0.43	0.18	0.38	-0.18	0.21	0.41	0.19	0.39	-0.07
1993	0.19	0.39	0.16	0.37	-0.07	0.17	0.37	0.16	0.37	-0.01
1997	0.19	0.39	0.19	0.39	0.00	0.17	0.38	0.19	0.39	0.04
2000	0.18	0.38	0.24	0.43	0.15	0.22	0.41	0.24	0.43	0.06
2004	0.19	0.39	0.22	0.42	0.07	0.23	0.42	0.22	0.42	-0.02
Liaoning	0.06	0.24	0.07	0.26	0.02	0.08	0.27	0.08	0.27	-0.01
Heilongjiang	0.06	0.25	0.05	0.21	-0.09	0.06	0.24	0.05	0.22	-0.04
Jiangsu	0.13	0.33	0.10	0.30	-0.08	0.11	0.31	0.10	0.30	-0.01
Shandong	0.11	0.32	0.07	0.26	-0.15	0.08	0.28	0.07	0.26	-0.05
Henan	0.12	0.33	0.13	0.34	0.03	0.13	0.33	0.13	0.34	0.01
Hubei	0.12	0.33	0.16	0.37	0.11	0.15	0.35	0.17	0.37	0.05
Hunan	0.12	0.33	0.10	0.30	-0.07	0.11	0.31	0.11	0.31	0.00
Guangxi	0.14	0.34	0.16	0.37	0.07	0.15	0.36	0.15	0.36	0.02
Guizhou	0.13	0.34	0.15	0.36	0.06	0.14	0.35	0.14	0.35	-0.01

Data source: China Health and Nutrition Survey, 1991-2006

Table 10. Effect of own health on total production hours: OLS and PS method estimates

Estimation method		(1) Δy	(2) $Pr(y_{t+1}>0)$	(3) $\Delta y \mid y_{t+1}>0$	(4) $\Delta \sum y_i$	(5) $\Delta(y_i/\sum y_i)$
		Any production activity				
Full sample N		24240	24239	22855	24240	23831
(1)	Individual FE FD with baseline covariates	-0.393	-0.035	-0.275	-1.117	-0.009
		(0.207)*	(0.007)***	(0.218)	(0.597)*	(0.010)
Trimmed & balanced sample N		6902	6902	6547	6902	6785
(2)	Individual FE FD with baseline covariates	-0.248	-0.034	-0.166	-1.002	-0.001
(3)	1:1 Matching on the p-score	-0.330	-0.267	-0.311	-1.123	-0.005
(4)	1:3 Nearest neighbor matching	-0.325	-0.027	-0.213	-1.082	0.007
(5)	Kernel density estimator[1]	-0.294	-0.031	-0.187	-0.621	0.001
(6)	WLS Regression with covariates[2]	-0.353	-0.033	-0.306	-1.638	0.008

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $Weight_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 11. Total production hours: Own health marginal effect decomposition

Total production hours		
Sample mean	Estimated effect[1]	Product
$-E[-y_{it} \mid y_{i,t+1}=0]$	$\frac{\partial \Pr(y_{i,t+1}>0)}{\partial \Delta P_{it}}$	
6.258	-0.035	-0.219
$\Pr(y_{i,t+1}>0)$	$\frac{\partial E[\Delta y_{it} \mid y_{i,t+1}>0]}{\partial \Delta P_{it}}$	
0.978	-0.275	-0.269
$E[\Delta y_{it} \mid y_{i,t+1}>0]$	$\frac{\partial \Pr(y_{i,t+1}>0)}{\partial \Delta P_{it}}$	
-0.666	-0.035	0.023
Total effect	$\frac{\partial E[\Delta y_{it}]}{\partial \Delta P_{it}}$	-0.465

[1] Estimates used in the calculation are taken from first-differenced fixed effects regressions for the full sample of individuals (see Table 10, row 1).
Data Source: China Health and Nutrition Survey, 1991-2006

Table 12. Effect of own health on total production hours by gender

Estimation method	(1) Δy	(2) $Pr(y_{t+1}>0)$	(3) $\Delta y \mid y_{t+1}>0$	(4) $\Delta \sum y_i$	(5) $\Delta (y_i / \sum y_i)$
	Any production activity				
Panel A: Men					
Full sample N	10844	10844	9871	10844	10617
(1) Individual FE FD with baseline covariates	**-1.164**	**-0.059**	**-0.940**	-1.870	**-0.038**
	(0.330)***	(0.014)***	(0.361)***	(0.817)**	(0.015)**
Trimmed & balanced sample N	2687	2687	2458	2687	2633
(2) Individual FE FD with baseline covariates	-1.102	-0.057	-0.930	-1.664	-0.037
(3) 1:1 Matching on the p-score	-0.998	-0.052	-1.137	-1.846	-0.051
(4) 1:3 Nearest neighbor matching	-0.926	-0.055	-0.745	-1.691	-0.026
(5) Kernel density estimator[1]	-1.047	-0.050	-0.732	-1.844	-0.031
(6) WLS Regression with covariates[2]	-1.008	-0.073	-0.785	-2.087	-0.026
Panel B: Women					
Full sample N	13396	13395	12983	13395	13213
(1) Individual FE (FD) with baseline covariates	**0.045**	**-0.021**	**0.055**	-0.625	**0.005**
	(0.279)	(0.006)***	(0.289)	(0.645)	(0.013)
Trimmed & balanced sample N	4215	4215	4089	4215	4152
(2) Individual FE FD with baseline covariates	0.248	-0.021	0.218	-0.587	0.019
(3) 1:1 Matching on the p-score	0.197	-0.017	0.058	0.171	0.008
(4) 1:3 Nearest neighbor matching	0.181	-0.018	0.138	-0.035	0.017
(5) Kernel density estimator[1]	0.126	-0.021	0.107	0.206	0.018
(6) WLS Regression with covariates[2]	0.086	-0.009	-0.006	-1.335	0.031

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between men and women at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $Weight_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 13. Effect of own health on total production hours by age

		Any production activity				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta\sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Under 50						
Full sample N		17508	17507	16739	17507	17248
(1)	Individual FE FD with baseline covariates	-0.219	**-0.012**	-0.122	-0.973	0.000
		(0.300)	(0.006)*	(0.296)	(0.623)	(0.013)
Trimmed & balanced sample N		4062	4062	3913	4062	4005
(2)	Individual FE FD with baseline covariates	0.115	-0.018	0.181	-0.475	0.007
(3)	1:1 Matching on the p-score	-0.063	-0.009	0.237	-0.509	0.001
(4)	1:3 Nearest neighbor matching	-0.213	-0.015	-0.118	-0.615	0.019
(5)	Kernel density estimator[1]	-0.095	-0.015	-0.023	-0.350	0.012
(6)	WLS Regression with covariates[2]	-0.099	-0.014	-0.057	-0.997	0.019
Panel B: 50 and over						
Full sample N		6732	6732	6115	6732	6582
(1)	Individual FE FD with baseline covariates	-0.567	**-0.060**	-0.429	-1.318	-0.017
		(0.257)**	(0.012)***	(0.276)	(0.870)	(0.014)
Trimmed & balanced sample N		2840	2840	2634	2840	2780
(2)	Individual FE FD with baseline covariates	-0.626	-0.052	-0.535	-1.704	-0.008
(3)	1:1 Matching on the p-score	-0.277	-0.040	-0.314	-0.840	-0.017
(4)	1:3 Nearest neighbor matching	-0.018	-0.051	0.016	-0.764	0.000
(5)	Kernel density estimator[1]	-0.400	-0.049	-0.266	-0.765	-0.008
(6)	WLS Regression with covariates[2]	-0.710	-0.057	-0.659	-2.638	-0.004

* significant at 10%; ** significant at 5%; *** significant at 1%
Robust standard errors in parentheses, clustered at the community level.
Estimates in **BOLD** are significantly different between older and younger groups at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.
Participation is estimated using a linear probability model.
All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006
[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 14. Effect of own health on total production hours by wealth

Estimation method	(1) Δy	(2) $Pr(y_{t+1}>0)$	(3) $\Delta y \mid y_{t+1}>0$	(4) $\Delta\sum y_i$	(5) $\Delta(y_i/\sum y_i)$
	Any production activity				
Panel A: Lower wealth					
Full sample N	8098	8097	7634	8097	7946
(1) Individual FE FD with baseline covariates	**-0.899**	-0.029	-0.786	**-2.652**	0.005
	(0.297)***	(0.009)***	(0.303)**	(0.904)***	(0.015)
Trimmed & balanced sample N	2545	2545	2426	2545	2502
(2) Individual FE FD with baseline covariates	-0.861	-0.022	-0.795	-2.160	0.017
(3) 1:1 Matching on the p-score	-0.926	-0.018	-0.716	-2.098	0.014
(4) 1:3 Nearest neighbor matching	-0.612	-0.019	-0.590	-1.473	0.019
(5) Kernel density estimator[1]	-0.779	-0.021	-0.662	-1.400	0.010
(6) WLS Regression with covariates[2]	-0.889	-0.020	-0.900	-2.496	0.027
Panel B: Higher wealth					
Full sample N	24240	24239	22854	24239	23830
(1) Individual FE FD with baseline covariates	**-0.393**	-0.035	-0.275	**-1.117**	-0.009
	(0.207)*	(0.007)***	(0.218)	(0.597)*	(0.010)
Trimmed & balanced sample N	3145	3145	3145	3104	3020
(2) Individual FE FD with baseline covariates	-0.016	-0.039	-0.068	-0.023	0.117
(3) 1:1 Matching on the p-score	-0.204	-0.036	-0.220	-1.000	-0.019
(4) 1:3 Nearest neighbor matching	-0.012	-0.040	0.061	-0.038	-0.030
(5) Kernel density estimator[1]	-0.140	-0.038	0.059	-0.019	-0.020
(6) WLS Regression with covariates[2]	0.035	-0.054	0.223	-0.569	-0.018

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between wealth groups at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.
Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 15. Effect of own health on market labor hours: OLS and individual FE estimates

	Pooled OLS	Individual FE	FD	FD + time-invariant covariates				
					Works at baseline		Doesn't work at baseline	
					(-) shock	(+) shock	(-) shock	(+) shock
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	y	y	Δy	Δy	Δy|y>0, p=0	Δy|y>0, p=1	Δy|y=0, p=0	Δy|y=0, p=1
Poor health	-1.025	-0.752						
	(0.146)***	(0.132)***						
ΔPoor health			-0.505	-0.464	-0.717	-0.830	-0.514	-0.686
			(0.141)***	(0.140)***	(0.209)***	(0.523)	(0.178)***	(0.337)**
Height (cm)	-0.235			-0.092	0.051	-0.496	-0.633	-1.346
	(0.116)**			(0.080)	(0.109)	(0.833)	(0.212)***	(0.645)**
$Height^2$ (cm)	0.001			0.000	-0.000	0.001	0.002	0.004
	(0.000)*			(0.000)	(0.000)	(0.003)	(0.001)***	(0.002)**
Age	0.308			-0.141	0.055	-0.003	-0.134	-0.121
	(0.018)***			(0.012)***	(0.016)***	(0.143)	(0.026)***	(0.113)
Age^2	-0.004			0.001	-0.001	-0.001	0.000	0.000
	(0.000)***			(0.000)***	(0.000)***	(0.001)	(0.000)	(0.001)
Primary school	0.079			0.015	0.033	-0.166	0.107	0.287
	(0.094)			(0.067)	(0.076)	(0.666)	(0.216)	(0.648)
Lower middle school	0.103			0.012	0.040	0.636	0.108	0.679
	(0.116)			(0.091)	(0.111)	(1.053)	(0.274)	(0.993)
Upper middle school	0.518			-0.010	0.544	-0.229	0.128	1.686
	(0.170)***			(0.131)	(0.176)***	(1.240)	(0.302)	(1.264)
College+	0.505			0.176	0.785	2.791	0.100	1.130
	(0.205)**			(0.161)	(0.195)***	(1.374)**	(0.327)	(0.873)
Married	0.531	1.071						
	(0.087)***	(0.145)***						
Δmarried			0.585	0.207	0.293	0.246	0.022	0.044
			(0.154)***	(0.159)	(0.184)	(0.995)	(0.234)	(0.585)
Male	1.477			0.297	0.813	0.880	1.336	0.104
	(0.124)***			(0.072)***	(0.090)***	(0.584)	(0.209)***	(0.393)
No. adults	-0.117	0.079						
	(0.033)***	(0.045)*						
ΔNo. adults			-0.042	-0.071	-0.039	-0.150	-0.012	-0.034
			(0.050)	(0.051)	(0.059)	(0.268)	(0.063)	(0.111)
No. girls	0.021	-0.046						
	(0.054)	(0.083)						
ΔNo. girls			-0.156	-0.257	-0.236	-0.912	0.160	0.074
			(0.107)	(0.108)**	(0.118)**	(0.507)*	(0.196)	(0.355)
No. boys	0.062	0.010						
	(0.064)	(0.088)						
ΔNo. boys			-0.107	-0.227	-0.169	-0.762	-0.074	-0.203
			(0.100)	(0.102)**	(0.112)	(0.478)	(0.178)	(0.364)
Farmer	1.726			-0.174	0.430	1.685	0.926	0.992
	(0.198)***			(0.093)*	(0.140)***	(0.959)*	(0.229)***	(0.441)**
Laborer	-0.102			-0.137	-0.112	0.138	-0.316	0.274
	(0.137)			(0.098)	(0.147)	(1.187)	(0.181)*	(0.586)
Professional	0.496			-0.055	0.594	0.815	-0.541	-0.076
	(0.130)***			(0.094)	(0.134)***	(1.158)	(0.226)**	(0.625)
Skilled worker	0.182			-0.278	-0.053	1.429	-0.459	0.278
	(0.145)			(0.094)***	(0.135)	(1.050)	(0.214)**	(0.685)
Urban	-0.793			-0.106	-0.521	0.307	-0.552	-0.483
	(0.207)***			(0.090)	(0.131)***	(0.619)	(0.218)**	(0.341)
Wealth per capita	-0.000	-0.000						
	(0.000)	(0.000)						
ΔWealth per capita			-0.000	-0.000	-0.000	-0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	23.211	7.536	-0.945	10.637	-5.655	38.547	62.064	115.157
	(9.458)**	(0.239)***	(0.127)***	(6.425)*	(8.701)	(67.032)	(16.891)***	(50.349)**
Observations	43648	43648	30729	30729	24102	802	5347	478
R-squared	0.20	0.50	0.01	0.01	0.03	0.07	0.21	0.18

Robust standard errors in parentheses, clustered at the community level.
* significant at 10%; ** significant at 5%; *** significant at 1%
All regressions include controls for survey year and province.
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 16. Effect of own health on market labor hours: FE and PS method estimates

	Market labor				
	(1)	(2)	(3)	(4)	(5)
Estimation method	Δy	$Pr(y_{t+1}>0)$	$Δy \mid y_{t+1}>0$	$Δ\sum y_i$	$Δ(y_i/\sum y_i)$
Panel A: Employed					
Full sample N	24102	24102	19558	24102	21796
(1) Individual FE FD with baseline covariates	-0.717	-0.069	-0.363	-0.840	-0.031
	(0.209)***	(0.016)***	(0.204)*	(0.539)	(0.011)***
Trimmed & balanced sample N	6739	6739	5325	6739	6039
(2) Individual FE FD with baseline covariates	-0.560	-0.072	-0.242	-0.594	-0.025
(3) 1:1 Matching on the p-score	-0.843	-0.099	-0.348	-0.527	-0.014
(4) 1:3 Nearest neighbor matching	-0.464	-0.066	-0.149	-0.695	-0.006
(5) Kernel density estimator[1]	-0.572	-0.070	-0.282	-0.365	-0.026
(6) WLS Regression with covariates[2]	-0.607	-0.068	-0.393	-1.010	-0.014
Panel B: Unemployed					
Full sample N	5347	5347		5347	2847
(1) Individual FE FD with baseline covariates	-0.514	-0.066		-1.776	-0.023
	(0.178)***	(0.020)***		(0.769)**	(0.016)
Trimmed & balanced sample N	1593	1593		1593	777
(2) Individual FE FD with baseline covariates	-0.599	-0.075		-1.410	-0.036
(3) 1:1 Matching on the p-score	-0.592	-0.080		-1.389	-0.020
(4) 1:3 Nearest neighbor matching	-0.661	-0.086		-2.207	-0.024
(5) Kernel density estimator[1]	-0.541	-0.063		-1.772	-0.020
(6) WLS Regression with covariates[2]	-0.546	-0.070		-1.651	-0.042

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between the employed and the unemployed at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $Weight_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 17. Own health marginal effect decomposition for employed workers

Market labor (1)			Home production (2)		
Sample mean	Estimated effect[1]	Product	Sample mean	Estimated effect[1]	Product
$-E[-y_{it} \mid y_{i,t+1}=0]$	$\frac{\partial \Pr(y_{i,t+1}>0)}{\partial \Delta P_{it}}$		$-E[-y_{it} \mid y_{i,t+1}=0]$	$\frac{\partial \Pr(y_{i,t+1}>0)}{\partial \Delta P_{it}}$	
7.128	-0.069	-0.492	1.546	-0.038	-0.059
$\Pr(y_{i,t+1}>0)$	$\frac{\partial E[\Delta y_{it} \mid y_{i,t+1}>0]}{\partial \Delta P_{it}}$		$\Pr(y_{i,t+1}>0)$	$\frac{\partial E[\Delta y_{it} \mid y_{i,t+1}>0]}{\partial \Delta P_{it}}$	
0.862	-0.363	-0.313	0.880	0.007	0.006
$E[\Delta y_{it} \mid y_{i,t+1}>0]$	$\frac{\partial \Pr(y_{i,t+1}>0)}{\partial \Delta P_{it}}$		$E[\Delta y_{it} \mid y_{i,t+1}>0]$	$\frac{\partial \Pr(y_{i,t+1}>0)}{\partial \Delta P_{it}}$	
-0.095	-0.069	0.007	-0.266	-0.038	0.010
Total effect	$\frac{\partial E[\Delta y_{it}]}{\partial \Delta P_{it}}$	-0.798	Total effect	$\frac{\partial E[\Delta y_{it}]}{\partial \Delta P_{it}}$	-0.042

[1] Estimates used in the calculation are taken from first-differenced fixed effect regressions for the full sample of individuals conditional on being employed and in good health at baseline (see columns 2 and 3 of Table 16, Panel A, row 1 and Table 23, row 1).

Data Source: China Health and Nutrition Survey, 1991-2006

Table 18. Effect of own health on market labor hours by gender

Estimation method	Market labor (1) Δy	(2) $Pr(y_{t+1}>0)$	(3) $\Delta y \mid y_{t+1}>0$	(4) $\Delta \sum y_i$	(5) $\Delta(y_i/\sum y_i)$
Panel A: Men					
Full sample N	12669	12669	10605	12669	11410
(1) Individual FE FD with baseline covariates	**-1.482**	**-0.104**	**-0.878**	**-2.154**	**-0.058**
	(0.314)***	(0.022)***	(0.294)***	(0.700)***	(0.016)***
Trimmed & balanced sample N	3279	3279	2724	3279	2927
(2) Individual FE FD with baseline covariates	-1.452	-0.116	-0.885	-1.908	-0.062
(3) 1:1 Matching on the p-score	-1.735	-0.121	-1.159	-1.587	-0.078
(4) 1:3 Nearest neighbor matching	-1.180	-0.107	-0.710	-1.415	-0.068
(5) Kernel density estimator[1]	-1.372	-0.110	-0.891	-1.729	-0.062
(6) WLS Regression with covariates[2]	-1.432	-0.122	-1.002	-2.360	-0.052
Panel B: Women					
Full sample N	11433	11433	8953	11433	10386
(1) Individual FE FD with baseline covariates	**-0.009**	**-0.032**	**0.087**	**0.350**	**-0.005**
	(0.293)	(0.020)	(0.302)	(0.697)	(0.014)
Trimmed & balanced sample N	3460	3460	2601	3460	3112
(2) Individual FE FD with baseline covariates	0.241	-0.030	0.321	0.534	0.009
(3) 1:1 Matching on the p-score	0.222	-0.045	0.429	0.967	0.006
(4) 1:3 Nearest neighbor matching	0.240	-0.017	0.193	0.790	0.021
(5) Kernel density estimator[1]	0.060	-0.039	0.238	0.766	0.003
(6) WLS Regression with covariates[2]	0.190	-0.017	0.212	0.246	0.021

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between men and women at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 19. Effect of own health on market labor hours by age

	Estimation method	Market labor (1) Δy	(2) $Pr(y_{t+1}>0)$	(3) $\Delta y \mid y_{t+1}>0$	(4) $\Delta \sum y_i$	(5) $\Delta(y_i/\sum y_i)$
Panel A: Under 50						
	Full sample N	18597	18597	15721	18597	17041
(1)	Individual FE FD with baseline covariates	**-0.247**	-0.051	**0.030**	-0.301	-0.027
		(0.287)	(0.018)***	(0.222)	(0.573)	(0.013)**
	Trimmed & balanced sample N	4260	4260	3525	4260	3871
(2)	Individual FE FD with baseline covariates	0.110	-0.048	0.223	0.129	-0.013
(3)	1:1 Matching on the p-score	-0.193	-0.044	0.009	-0.410	-0.002
(4)	1:3 Nearest neighbor matching	-0.027	-0.038	-0.029	-0.598	0.008
(5)	Kernel density estimator[1]	0.029	-0.038	0.171	0.007	-0.008
(6)	WLS Regression with covariates[2]	-0.051	-0.045	0.008	-0.274	-0.005
Panel B: 50 and over						
	Full sample N	5505	5505	3837	5505	4755
(1)	Individual FE FD with baseline covariates	**-1.407**	-0.098	**-1.089**	-1.819	-0.038
		(0.296)***	(0.026)***	(0.335)***	(0.876)**	(0.018)**
	Trimmed & balanced sample N	2479	2479	1800	2479	2168
(2)	Individual FE FD with baseline covariates	-1.485	-0.105	-1.026	-1.823	-0.041
(3)	1:1 Matching on the p-score	-1.536	-0.137	-0.853	-1.123	-0.032
(4)	1:3 Nearest neighbor matching	-1.547	-0.113	-1.081	-0.572	-0.034
(5)	Kernel density estimator[1]	-1.305	-0.112	-0.935	-0.823	-0.047
(6)	WLS Regression with covariates[2]	-1.481	-0.101	-1.132	-2.436	-0.025

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between younger and older age groups at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $Weight_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 20. Effect of own health on market labor hours by wealth

		Market labor				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Lower wealth						
Full sample N		8578	8578	7116	8578	7767
(1)	Individual FE FD with baseline covariates	-1.104	**-0.070**	-0.627	-1.339	-0.040
		(0.312)***	(0.021)***	(0.286)**	(0.759)*	(0.015)***
Trimmed & balanced sample N		2997	2997	2442	2997	2695
(2)	Individual FE FD with baseline covariates	-0.914	-0.065	-0.541	-1.291	-0.031
(3)	1:1 Matching on the p-score	-0.561	-0.029	-0.433	-0.790	-0.031
(4)	1:3 Nearest neighbor matching	-0.728	-0.041	-0.498	-0.654	-0.039
(5)	Kernel density estimator[1]	-0.761	-0.057	-0.570	-0.807	-0.031
(6)	WLS Regression with covariates[2]	-0.948	-0.058	-0.925	-1.447	-0.023
Panel B: Higher wealth						
Full sample N		15524	15524	12442	15524	14029
(1)	Individual FE FD with baseline covariates	-0.986	**-0.141**	-0.159	-1.236	-0.046
		(0.308)	(0.024)***	(0.324)	(0.690)*	(0.016)***
Trimmed & balanced sample N		3755	3755	2434	3755	3352
(2)	Individual FE FD with baseline covariates	-0.337	-0.082	0.088	-0.061	-0.024
(3)	1:1 Matching on the p-score	-0.482	-0.094	-0.221	-0.367	-0.004
(4)	1:3 Nearest neighbor matching	-0.347	-0.076	-0.158	0.012	0.004
(5)	Kernel density estimator[1]	-0.402	-0.084	0.016	0.171	-0.026
(6)	WLS Regression with covariates[2]	-0.279	-0.079	-0.039	-0.370	-0.009

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between wealth groups at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.
Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 21. Effect of own health on home production hours: OLS and individual FE estimates

				FD + baseline covariates				
	Pooled	Individual			Works at baseline		Doesn't work at baseline	
	OLS	FE	FD		(-) shock	(+) shock	(-) shock	(+) shock
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	y	y	Δy	Δy	$\Delta y \mid y>0$, p=0	$\Delta y \mid y>0$, h=1	$\Delta y \mid y=0$, h=0	$\Delta y \mid y=0$, h=1
Poor health	-0.047	0.006						
	(0.063)	(0.081)						
ΔPoor health			0.013	0.011	-0.075	-0.144	0.028	-0.176
			(0.079)	(0.079)	(0.110)	(0.206)	(0.124)	(0.249)
Height (cm)	0.060			0.046	0.042	-0.169	-0.106	0.538
	(0.050)			(0.046)	(0.060)	(0.347)	(0.093)	(0.318)*
Height^2 (cm)	-0.000			-0.000	-0.000	0.001	0.000	-0.002
	(0.000)			(0.000)	(0.000)	(0.001)	(0.000)	(0.001)*
Age	-0.004			0.013	0.058	0.192	0.048	0.015
	(0.008)			(0.006)*	(0.010)***	(0.060)***	(0.006)***	(0.038)
Age^2	0.000			-0.000	-0.001	-0.002	-0.000	-0.000
	(0.000)			(0.000)	(0.000)***	(0.001)***	(0.000)***	(0.000)
Primary school	-0.067			-0.050	-0.112	0.101	0.035	0.578
	(0.038)*			(0.039)	(0.051)**	(0.350)	(0.041)	(0.509)
Lower middle school	-0.192			-0.076	-0.147	1.244	0.051	-0.289
	(0.049)***			(0.051)	(0.071)**	(0.459)***	(0.076)	(0.343)
Upper middle/	0.009			0.173	0.165	1.260	0.195	-0.348
technical school	(0.089)			(0.100)*	(0.122)	(0.402)***	(0.209)	(0.437)
College+	-0.151			-0.044	-0.010	-0.344	-0.081	2.216
	(0.104)			(0.109)	(0.148)	(0.435)	(0.156)	(2.003)
Married	0.711	0.210						
	(0.055)***	(0.055)***						
Δmarried			0.140	0.123	0.136	0.285	-0.022	-0.624
			(0.058)**	(0.061)**	(0.083)	(0.339)	(0.060)	(0.424)
Male	-2.215			0.377	0.014	0.365	-1.190	-0.883
	(0.058)***			(0.047)***	(0.059)	(0.218)*	(0.126)***	(0.392)**
No. adults	-0.050	0.101						
	(0.012)***	(0.023)***						
ΔNo. adults			0.070	0.075	0.079	-0.054	0.032	-0.053
			(0.024)***	(0.024)***	(0.027)***	(0.096)	(0.025)	(0.100)
No. girls	0.265	0.286						
	(0.024)***	(0.043)***						
ΔNo. girls			0.212	0.212	0.292	-0.051	0.181	-0.230
			(0.053)***	(0.054)***	(0.065)***	(0.358)	(0.066)***	(0.157)
No. boys	0.148	0.089						
	(0.025)***	(0.042)**						
ΔNo. boys			0.194	0.198	0.259	0.057	0.212	-0.185
			(0.041)***	(0.042)***	(0.051)***	(0.254)	(0.050)***	(0.305)
Farmer	0.045			-0.124	-0.153	0.215	-0.083	-0.047
	(0.052)			(0.050)**	(0.062)**	(0.315)	(0.073)	(0.357)
Laborer	0.013			-0.062	-0.117	-0.068	0.078	0.017
	(0.053)			(0.060)	(0.079)	(0.402)	(0.083)	(0.429)
Professional	0.111			-0.134	-0.166	-0.174	0.058	0.056
	(0.066)*			(0.064)**	(0.075)**	(0.403)	(0.123)	(0.456)
Skilled worker	0.169			-0.054	-0.105	-0.637	0.037	1.180
	(0.075)**			(0.073)	(0.101)	(0.627)	(0.089)	(0.969)
Urban	0.223			0.074	0.139	0.402	0.103	0.429
	(0.044)***			(0.044)*	(0.054)**	(0.268)	(0.057)*	(0.301)
Wealth per capita	-0.000	0.000						
	(0.000)	(0.000)						
ΔWealth per capita			0.000	0.000	0.000	-0.000	-0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.937	2.035	-0.596	-4.943	-5.891	5.901	9.521	-41.179
	(4.092)	(0.120)***	(0.077)***	(3.769)	(4.884)	(27.903)	(7.710)	(25.227)
Individual FE	no	yes	yes	yes	yes	yes	yes	yes
Observations	39881	39881	27769	27769	20667	866	6023	213
R-squared	0.29	0.60	0.02	0.03	0.20	0.22	0.21	0.27

Robust standard errors in parentheses, clustered at the community level.
* significant at 10%; ** significant at 5%; *** significant at 1%
All regression include controls for survey year and province.
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 22. Effect of own health on home production hours: FE and PS method estimates

		Home production				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Full sample N		20668	20667	17055	20668	19912
(1)	Individual FE FD with baseline covariates	-0.075	-0.045	0.003	0.019	-0.036
		(0.110)	(0.012)***	(0.122)	(0.192)	(0.012)***
Trimmed & balanced sample N		6048	6048	5207	6048	5837
(2)	Individual FE FD with baseline covariates	-0.070	-0.039	0.026	0.042	-0.028
(3)	1:1 Matching on the p-score	-0.033	-0.032	0.094	-0.069	0.003
(4)	1:3 Nearest neighbor matching	0.086	-0.023	0.174	-0.151	0.004
(5)	Kernel density estimator[1]	-0.066	-0.035	0.027	0.074	-0.018
(6)	WLS Regression with covariates[2]	0.020	-0.039	0.118	0.147	-0.025

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 23. Effect of own health on home production hours by employment status

		Home production				
		(1)	(2)	(3)	(4)	(5)
	Estimation method	Δy	$Pr(y_{t+1}>0)$	$Δy \mid y_{t+1}>0$	$Δ\sum y_i$	$Δ(y_i/\sum y_i)$
Panel A: Employed						
	Full sample N	16721	16720	13671	16720	16137
(1)	Individual FE FD with baseline covariates	-0.070	-0.038	0.007	0.067	-0.037
		(0.134)	(0.012)***	(0.149)	(0.206)	(0.015)**
	Trimmed & balanced sample N	4794	4794	3894	4794	4632
(2)	Individual FE FD with baseline covariates	-0.038	-0.041	0.066	0.142	-0.032
(3)	1:1 Matching on the p-score	0.023	-0.045	0.242	0.307	-0.023
(4)	1:3 Nearest neighbor matching	0.037	-0.032	0.204	0.140	0.000
(5)	Kernel density estimator[1]	-0.074	-0.041	0.050	0.109	-0.028
(6)	WLS Regression with covariates[2]	0.085	-0.050	0.230	0.246	0.007
Panel B: Unemployed						
	Full sample N	3888	3888	3344	3888	3722
(1)	Individual FE FD with baseline covariates	-0.057	-0.063	0.017	-0.140	-0.029
		(0.183)	(0.021)***	(0.190)	(0.366)	(0.022)
	Trimmed & balanced sample N	1245	1245	1090	1245	1197
(2)	Individual FE FD with baseline covariates	-0.123	-0.033	-0.055	-0.245	-0.012
(3)	1:1 Matching on the p-score	-0.167	-0.029	-0.351	-0.272	0.015
(4)	1:3 Nearest neighbor matching	-0.109	-0.029	-0.111	-0.228	0.004
(5)	Kernel density estimator[1]	-0.242	-0.031	-0.139	-0.376	0.016
(6)	WLS Regression with covariates[2]	-0.136	-0.004	-0.149	-0.224	-0.013

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between the employed and unemployed at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in home production and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $Weight_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 24. Effect of own health on home production hours by gender

		Home production				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta (y_i/\sum y_i)$
Panel A: Men						
Full sample N		6827	6827	4215	6827	6491
(1)	Individual FE FD with baseline covariates	-0.182	-0.028	-0.059	-0.083	-0.033
		(0.168)	(0.028)	(0.189)	(0.367)	(0.020)
Trimmed & balanced sample N		1462	1462	947	1462	1404
(2)	Individual FE FD with baseline covariates	0.025	-0.015	0.230	0.058	-0.026
(3)	1:1 Matching on the p-score	-0.295	-0.039	0.003	-0.885	-0.068
(4)	1:3 Nearest neighbor matching	-0.210	-0.039	-0.052	-0.692	-0.043
(5)	Kernel density estimator[1]	-0.173	-0.057	0.068	-0.167	-0.047
(6)	WLS Regression with covariates[2]	0.036	-0.027	0.334	0.170	0.046
Panel B: Women						
Full sample N		13841	13840	12841	13840	13420
(1)	Individual FE FD with baseline covariates	-0.049	-0.040	-0.003	0.079	-0.033
		(0.143)	(0.011)***	(0.149)	(0.208)	(0.015)**
Trimmed & balanced sample N		3332	3332	3145	3332	3228
(2)	Individual FE FD with baseline covariates	-0.041	-0.040	0.040	0.232	-0.030
(3)	1:1 Matching on the p-score	0.057	-0.040	0.272	0.505	-0.027
(4)	1:3 Nearest neighbor matching	0.085	-0.037	0.244	0.374	0.001
(5)	Kernel density estimator[1]	-0.028	-0.037	0.060	0.271	-0.022
(6)	WLS Regression with covariates[2]	0.126	-0.048	0.226	0.297	-0.013

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between men and women at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 25. Effect of own health on home production hours by age

		Home production				
		(1)	(2)	(3)	(4)	(5)
	Estimation method	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Under 50						
	Full sample N	14697	14696	12008	14696	14177
(1)	Individual FE FD with baseline covariates	-0.220	-0.036	-0.142	-0.221	-0.032
		(0.153)	(0.015)**	(0.178)	(0.229)	(0.016)**
	Trimmed & balanced sample N	3525	3525	3028	3525	3411
(2)	Individual FE FD with baseline covariates	-0.129	-0.038	-0.021	-0.002	-0.030
(3)	1:1 Matching on the p-score	-0.052	-0.030	0.156	-0.331	-0.014
(4)	1:3 Nearest neighbor matching	-0.135	-0.032	0.107	-0.094	-0.010
(5)	Kernel density estimator[1]	-0.207	-0.036	-0.037	-0.058	-0.013
(6)	WLS Regression with covariates[2]	-0.068	-0.030	0.082	0.101	-0.023
Panel B: 50 and over						
	Full sample N	5971	5971	5048	5971	5734
(1)	Individual FE FD with baseline covariates	0.046	-0.050	0.117	0.197	-0.039
		(0.140)	(0.016)***	(0.148)	(0.287)	(0.017)**
	Trimmed & balanced sample N	2523	2523	2179	2523	2426
(2)	Individual FE FD with baseline covariates	0.001	-0.042	0.079	0.060	-0.026
(3)	1:1 Matching on the p-score	-0.002	-0.027	0.043	0.084	0.017
(4)	1:3 Nearest neighbor matching	0.055	-0.028	0.125	0.087	0.000
(5)	Kernel density estimator[1]	0.080	-0.034	0.082	0.149	-0.014
(6)	WLS Regression with covariates[2]	0.117	-0.051	0.159	0.155	-0.026

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between younger and older age groups at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 26. Effect of own health on home production hours by wealth

		Home production				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Lower wealth						
Full sample N		5687	5686	4675	5686	5474
(1)	Individual FE FD with baseline covariates	-0.211	-0.040	-0.143	0.032	-0.032
		(0.167)	(0.018)**	(0.175)	(0.246)	(0.022)
Trimmed & balanced sample N		2092	2092	1796	2092	2020
(2)	Individual FE FD with baseline covariates	-0.170	-0.041	-0.079	0.154	-0.030
(3)	1:1 Matching on the p-score	0.031	-0.027	0.079	0.606	0.014
(4)	1:3 Nearest neighbor matching	-0.033	-0.033	-0.019	0.279	0.022
(5)	Kernel density estimator[1]	-0.242	-0.037	-0.168	0.059	0.008
(6)	WLS Regression with covariates[2]	-0.112	-0.033	0.033	0.109	-0.009
Panel B: Higher wealth						
Full sample N		11034	11034	8996	11034	10663
(1)	Individual FE FD with baseline covariates	0.064	-0.037	0.164	0.097	-0.042
		(0.193)	(0.015)**	(0.228)	(0.300)	(0.020)**
Trimmed & balanced sample N		2711	2711	2304	2711	2620
(2)	Individual FE FD with baseline covariates	0.049	-0.041	0.162	0.126	-0.038
(3)	1:1 Matching on the p-score	0.038	-0.043	0.038	0.333	-0.042
(4)	1:3 Nearest neighbor matching	0.074	-0.043	0.074	0.381	-0.032
(5)	Kernel density estimator[1]	0.125	-0.042	0.259	0.218	-0.024
(6)	WLS Regression with covariates[2]	0.249	-0.065	0.399	0.428	-0.052

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between wealth groups at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 27. Effect of own health on the percent of all production hours spent on market labor

Estimation method	% total production hours spent working in market labor: all (1)	men (2)	women (3)	<50 (4)	≥50 (5)
Full sample N	22855	9871	12983	16739	6115
(1) Individual FE FD with baseline covariates	-0.008	-0.020	-0.003	0.005	-0.019
	(0.013)	(0.021)	(0.016)	(0.017)	(0.021)
Trimmed & balanced sample N	6547	2458	4089	3913	2634
(2) Individual FE FD with baseline covariates	-0.006	-0.017	-0.001	0.007	-0.022
(3) 1:1 Matching on the p-score	0.000	-0.006	-0.004	0.015	0.006
(4) 1:3 Nearest neighbor matching	0.001	-0.009	0.008	0.005	0.008
(5) Kernel density estimator[1]	-0.006	-0.007	-0.005	0.003	-0.014
(6) WLS Regression with covariates[2]	-0.016	-0.029	-0.012	-0.011	-0.028

Estimation method	lower wealth (6)	higher wealth (7)	state/collective sector employee (8)	private sector employee (9)
Full sample N	7634	22854	5931	12755
(1) Individual FE FD with baseline covariates	-0.014	-0.008	-0.003	-0.020
	(0.019)	(0.013)	(0.032)	(0.015)
Trimmed & balanced sample N	2274	2780	945	3325
(2) Individual FE FD with baseline covariates	-0.030	0.003	-0.001	-0.002
(3) 1:1 Matching on the p-score	-0.001	-0.021	0.046	-0.012
(4) 1:3 Nearest neighbor matching	-0.006	-0.003	0.014	-0.017
(5) Kernel density estimator[1]	-0.010	-0.010	0.003	-0.017
(6) WLS Regression with covariates[2]	-0.031	-0.010	-0.023	0.002

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between sub-groups at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.
All regressions are conditional on being employed and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 28. Effects of future own health on current time use

	Any production activity	Market labor	Home production
	(1)	(2)	(3)
	Δy	Δy	Δy
ΔPoor health (t+1)	0.081	0.103	-0.054
	(0.198)	(0.159)	(0.078)
Observations	16230	18143	17406
R-squared	0.02	0.02	0.03

Robust standard errors in parentheses, clustered at the community level.
* significant at 10%; ** significant at 5%; *** significant at 1%
All regression include controls for time-invariant characteristics (height, height squared, age, age squared, educational attainment, gender occupation, urbanicity, survey year, and province) and changes in marital status, the number of adults, boys, and girls in the household, and wealth per capita.
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 29. Effects of mild and severe own health shocks on time use

	Any production activity			Market labor			Home production		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$
Mild shock[1]	-0.128	-0.003	-0.043	-0.363	-0.007	-0.180	0.121	-0.001	0.182
	(0.117)	(0.002)	(0.107)	(0.107)***	(0.006)	(0.103)*	(0.060)*	(0.005)	(0.067)***
Severe shock[2]	-0.088	-0.009	-0.049	-0.414	-0.025	-0.255	0.069	-0.001	0.104
	(0.224)	(0.005)	(0.229)	(0.236)*	(0.013)*	(0.213)	(0.100)	(0.010)	(0.111)
Observations	19235	19558	18101	19122	19122	15453	16381	16380	13488
R-squared	0.02	0.07	0.01	0.04	0.14	0.02	0.03	0.20	0.03

Robust standard errors in parentheses, clustered at the community level.

* significant at 10%; ** significant at 5%; *** significant at 1%

Regressions with binary dependent variables are estimated using a linear probability model. All regressions are conditional on reporting good health status at baseline and include controls for time-invariant characteristics (height, age, gender, education, occupation, urbanicity, survey year and province) as well as first-differenced controls for time-varying characteristics (marital status, the number of adults, girls, and boys in the household, and household wealth per capita).

Data Source: China Health and Nutrition Survey, 1989-2006.

[1] A mild shock is defined as experiencing a 1-step change in self-reported health status (excellent to good, good to fair, fair to poor).

[3] A severe shock is defined as experiencing a 2- or 3-step change in self-reported health status (excellent to good or poor, good to poor).

Table 30. Descriptive statistics for the sample of married individuals

	1991 (N=5078)		1993 (N=5302)		1997 (N=4892)		2000 (N=4326)		2004 (N=4722)		2006 (N=4152)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Market labor												
Hours	8.579	4.772	7.437	4.901	7.309	4.756	6.626	4.997	6.767	6.029	6.658	6.032
Men	8.912	4.663	7.711	4.747	7.729	4.661	7.088	4.946	7.842	5.997	7.629	6.012
Women	8.246	4.856	7.163	5.035	6.889	4.813	6.163	5.005	5.693	5.868	5.688	5.895
ΔHours[1]	-1.137	5.290	-0.633	5.471	-1.150	5.436	-0.279	6.428	-0.194	6.500		
Men	-1.211	5.344	-0.424	5.484	-1.149	5.489	0.262	6.470	-0.326	6.494		
Women	-1.063	5.235	-0.836	5.452	-1.151	5.386	-0.803	6.346	-0.065	6.505		
Participates	0.884	0.320	0.844	0.363	0.841	0.366	0.806	0.396	0.694	0.461	0.681	0.466
Men	0.912	0.284	0.876	0.329	0.878	0.328	0.850	0.357	0.779	0.415	0.759	0.428
Women	0.856	0.351	0.812	0.391	0.804	0.397	0.761	0.426	0.609	0.488	0.603	0.489
Transition into[1]	0.034	0.180	0.043	0.203	0.043	0.204	0.051	0.219	0.101	0.302		
Men	0.020	0.139	0.035	0.184	0.030	0.171	0.041	0.199	0.075	0.263		
Women	0.048	0.213	0.051	0.220	0.057	0.231	0.060	0.237	0.127	0.333		
Transition out of[1]	0.073	0.260	0.098	0.298	0.101	0.302	0.197	0.398	0.122	0.327		
Men	0.054	0.226	0.075	0.264	0.085	0.279	0.148	0.355	0.105	0.307		
Women	0.092	0.289	0.121	0.326	0.117	0.322	0.245	0.430	0.138	0.345		
Hours|Participating	9.713	3.842	9.178	3.695	8.910	3.648	8.712	3.827	10.074	4.559	10.060	4.555
Men	9.792	3.908	9.175	3.658	9.041	3.680	8.868	3.849	10.425	4.569	10.337	4.579
Women	9.630	3.770	9.182	3.735	8.767	3.607	8.540	3.796	9.628	4.510	9.711	4.501
ΔHours|Participating	-0.600	4.587	-0.371	4.786	-0.539	4.604	1.171	5.472	-0.031	5.455		
Men	-0.620	4.741	-0.257	4.805	-0.472	4.612	1.364	5.418	-0.170	5.465		
Women	-0.578	4.412	-0.496	4.764	-0.615	4.596	0.924	5.533	0.167	5.437		
Household hours	22.489	11.879	19.637	12.095	19.112	11.636	17.164	11.671	16.585	12.436	16.209	11.962
ΔHousehold hours	-2.774	12.117	-1.705	13.149	-3.182	12.676	-2.125	13.767	-1.165	13.509		
%Household hours	0.407	0.207	0.403	0.225	0.407	0.222	0.408	0.241	0.426	0.301	0.424	0.294
Δ%Household hours	-0.006	0.210	-0.009	0.243	-0.003	0.246	0.027	0.320	0.004	0.326		
Home production												
Hours	2.836	3.602	2.109	3.027	1.672	1.787	1.610	1.726	2.540	2.282	2.418	2.274
Men	1.126	2.252	0.708	1.865	0.545	1.038	0.633	1.202	1.264	1.407	1.243	1.479
Women	4.540	3.877	3.524	3.305	2.820	1.654	2.599	1.609	3.279	2.364	3.109	2.374
ΔHours[1]	-0.736	3.716	-0.475	2.985	-0.097	1.792	0.550	2.456	-0.140	2.654		
Men	-0.418	2.720	-0.155	1.999	0.055	1.337	0.531	1.824	-0.018	1.988		
Women	-1.055	4.479	-0.798	3.697	-0.251	2.146	0.561	2.762	-0.188	2.874		
Participates	0.773	0.419	0.727	0.446	0.737	0.440	0.769	0.421	0.995	0.069	0.989	0.106
Men	0.571	0.495	0.476	0.500	0.499	0.500	0.559	0.497	0.989	0.103	0.979	0.144
Women	0.975	0.157	0.976	0.154	0.975	0.155	0.977	0.149	0.999	0.036	0.995	0.074
Transition into[1]	0.076	0.265	0.102	0.303	0.106	0.308	0.148	0.355	0.004	0.065		
Men	0.131	0.338	0.189	0.391	0.197	0.398	0.368	0.482	0.012	0.111		
Women	0.021	0.144	0.018	0.134	0.017	0.131	0.021	0.145	0.001	0.031		
Transition out of[1]	0.124	0.330	0.107	0.309	0.095	0.293	0.004	0.062	0.007	0.086		
Men	0.229	0.420	0.187	0.390	0.167	0.373	0.006	0.075	0.014	0.116		
Women	0.020	0.141	0.028	0.166	0.025	0.156	0.003	0.052	0.005	0.070		
Hours|Participating	3.723	3.705	3.086	3.224	2.382	1.690	2.200	1.665	2.681	2.263	2.597	2.256
Men	2.049	2.709	1.720	2.591	1.225	1.260	1.247	1.443	1.394	1.415	1.424	1.500
Women	4.666	3.855	3.680	3.292	2.927	1.590	2.710	1.549	3.377	2.330	3.220	2.341
ΔHours|Participating	-0.866	4.206	-0.717	3.438	-0.145	2.008	0.464	2.578	-0.136	2.675		
Men	-0.348	3.333	-0.375	2.690	0.026	1.877	0.204	1.986	0.030	2.045		
Women	-1.027	4.432	-0.806	3.603	-0.198	2.045	0.552	2.743	-0.193	2.857		
Household hours	6.783	5.787	5.024	4.760	3.915	2.349	3.722	2.732	4.733	4.242	4.537	4.131
ΔHousehold hours	-1.804	6.793	-1.235	5.372	-0.219	3.462	0.811	4.689	-0.288	4.772		
%Household hours	0.431	0.383	0.436	0.405	0.438	0.395	0.445	0.384	0.575	0.340	0.575	0.347
Δ%Household	0.004	0.296	0.007	0.306	0.004	0.286	0.054	0.318	0.009	0.305		

hours												
%Market hours	0.736	0.301	0.730	0.335	0.738	0.325	0.697	0.357	0.535	0.399	0.537	0.406
Men	0.867	0.244	0.877	0.266	0.883	0.257	0.839	0.305	0.682	0.388	0.676	0.398
Women	0.605	0.296	0.590	0.334	0.601	0.323	0.565	0.351	0.451	0.381	0.456	0.388
Δ%Market hours	-0.006	0.288	-0.027	0.313	-0.059	0.319	-0.140	0.402	0.003	0.403		
Men	0.008	0.243	-0.023	0.268	-0.059	0.281	-0.160	0.385	0.004	0.389		
Women	-0.019	0.325	-0.031	0.347	-0.058	0.349	-0.129	0.411	0.003	0.408		
Poor health	0.039	0.193	0.043	0.202	0.043	0.202	0.051	0.219	0.066	0.248	0.075	0.264
Negative health shock[1]	0.033	0.178	0.038	0.191	0.046	0.209	0.055	0.228	0.052	0.221		
Positive health shock[1]	0.028	0.165	0.025	0.158	0.027	0.162	0.031	0.173	0.041	0.198		
Age	42.01	11.04	43.74	11.11	45.24	10.94	46.22	10.48	48.83	10.18	50.67	10.05
Education												
< Primary	0.622	0.485	0.617	0.486	0.600	0.490	0.547	0.498	0.536	0.499	0.536	0.499
Primary	0.242	0.429	0.245	0.430	0.242	0.428	0.274	0.446	0.281	0.449	0.285	0.452
Lower middle	0.088	0.283	0.090	0.286	0.107	0.309	0.111	0.314	0.112	0.316	0.109	0.311
Upper middle/technical	0.027	0.163	0.027	0.162	0.034	0.181	0.041	0.199	0.043	0.202	0.042	0.201
College+	0.020	0.141	0.021	0.142	0.018	0.131	0.027	0.161	0.029	0.167	0.028	0.165
Male	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Household size												
No. adults	2.848	1.223	2.866	1.233	2.939	1.251	2.933	1.176	3.012	1.160	3.558	1.417
No. boys	0.723	0.708	0.663	0.688	0.568	0.667	0.473	0.610	0.358	0.550	0.316	0.528
No. girls	0.677	0.782	0.607	0.745	0.513	0.693	0.429	0.628	0.320	0.537	0.286	0.515
Occupation												
Farmer	0.603	0.489	0.601	0.490	0.634	0.482	0.599	0.490	0.611	0.488	0.618	0.486
Laborer	0.109	0.312	0.110	0.313	0.093	0.291	0.090	0.286	0.084	0.278	0.083	0.276
Professional	0.103	0.304	0.103	0.304	0.099	0.299	0.116	0.321	0.116	0.320	0.112	0.316
Skilled worker	0.090	0.286	0.089	0.285	0.077	0.267	0.085	0.279	0.082	0.274	0.079	0.270
Service worker	0.078	0.269	0.098	0.297	0.102	0.303	0.114	0.317	0.138	0.345	0.143	0.350
Wealth per capita[1]	317	565	606	1334	1897	5394	2365	7744	2338	6648	2824	13373
Urban	0.304	0.460	0.304	0.460	0.292	0.455	0.297	0.457	0.298	0.458	0.289	0.454

[1]Transitions calculated as x(t+1) - x(t).

[2]Deflated to 2006 yuan.

Sample is restricted to all married adults, age 18+, appearing in at least two adjacent survey waves (NT = 28472)

Source: China Health and Nutrition Survey, 1991 - 2006.

Table 31. Effect of spousal health on total production hours: OLS and individual FE estimates

	Pooled OLS	Individual FE	FD	FD + baseline covariates	Works at baseline (-) shock	Works at baseline (+) shock	Doesn't work (-) shock
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	y	y	Δy	Δy	$\Delta y \mid y_t>0,\ p_t=0$	$\Delta y \mid y_t>0,\ h_p=1$	$\Delta y \mid y_t=0,\ p_t=0$
Health status							
Poor health	-1.107	-0.619					
	(0.188)***	(0.188)***					
Spouse's poor health	0.471	0.077					
	(0.185)**	(0.204)					
ΔPoor health			-0.469	-0.464	-0.580	0.368	0.393
			(0.192)**	(0.193)**	(0.230)**	(0.548)	(0.585)
ΔSpouse's poor health			0.111	0.102	-0.111	0.740	-1.168
			(0.209)	(0.208)	(0.264)	(0.521)	(1.205)
Individual characteristics							
Male	-1.418			0.411	0.229	1.533	-0.505
	(0.104)***			(0.088)***	(0.094)**	(0.717)**	(1.141)
Age	0.101			-0.092	-0.032	-0.172	-0.301
	(0.041)**			(0.037)**	(0.043)	(0.322)	(0.441)
Age^2	-0.002			0.001	0.000	0.001	0.002
	(0.000)***			(0.000)**	(0.000)	(0.003)	(0.004)
Primary school	0.122			0.010	0.026	0.210	0.795
	(0.121)			(0.095)	(0.103)	(0.892)	(0.904)
Lower middle school	0.029			0.229	0.299	0.025	0.313
	(0.149)			(0.133)*	(0.134)**	(1.197)	(1.417)
Upper middle school	0.510			0.105	0.220	-0.936	0.008
	(0.193)***			(0.165)	(0.178)	(1.324)	(1.941)
College+	0.419			-0.120	-0.005	0.896	-0.963
	(0.275)			(0.288)	(0.311)	(1.618)	(1.351)
Farmer	1.276			-0.017	0.025	0.076	1.205
	(0.195)***			(0.145)	(0.148)	(1.193)	(1.067)
Laborer	-0.222			-0.123	-0.139	0.642	-0.170
	(0.181)			(0.151)	(0.160)	(1.263)	(1.002)
Professional	0.731			-0.020	0.021	0.012	-0.794
	(0.153)***			(0.157)	(0.157)	(1.173)	(0.901)
Skilled worker	0.251			-0.070	-0.049	0.414	-0.827
	(0.189)			(0.168)	(0.185)	(1.248)	(0.960)
Spouse's characteristics							
Age	0.129			0.076	0.049	0.024	0.166
	(0.037)***			(0.036)**	(0.042)	(0.322)	(0.347)
Age^2	-0.002			-0.001	-0.000	-0.000	-0.001
	(0.000)***			(0.000)**	(0.000)	(0.003)	(0.003)
Primary school	0.105			-0.135	-0.190	0.013	2.046
	(0.128)			(0.096)	(0.104)*	(0.689)	(1.002)**
Lower middle school	0.034			0.010	-0.055	0.083	2.305
	(0.176)			(0.131)	(0.141)	(1.299)	(1.659)
Upper middle school	0.253			-0.161	-0.264	1.766	1.235
	(0.235)			(0.170)	(0.179)	(1.171)	(2.112)
College+	0.547			0.069	-0.082	1.783	-1.872
	(0.269)**			(0.225)	(0.228)	(2.482)	(1.840)
Farmer	0.926			-0.090	-0.175	1.187	1.372
	(0.180)***			(0.148)	(0.157)	(1.173)	(0.923)
Laborer	0.183			-0.242	-0.318	1.183	0.195
	(0.192)			(0.136)*	(0.147)**	(1.002)	(0.742)
Professional	0.111			-0.291	-0.343	0.388	0.171
	(0.190)			(0.130)**	(0.139)**	(1.396)	(1.392)
Skilled worker	0.119			-0.175	-0.238	1.880	0.088
	(0.202)			(0.153)	(0.163)	(1.215)	(1.111)
Household characteristics							
No. adults	-0.043	0.164					
	(0.050)	(0.065)**					
ΔNo. adults			0.020	-0.007	-0.044	0.430	-0.039
			(0.074)	(0.076)	(0.076)	(0.310)	(0.309)

No. girls	0.002	0.050					
	(0.072)	(0.130)					
ΔNo. girls			-0.045	-0.049	-0.086	-0.135	1.250
			(0.158)	(0.160)	(0.164)	(0.532)	(0.665)*
No. boys	-0.075	-0.156					
	(0.081)	(0.130)					
ΔNo. boys			0.040	0.030	0.000	1.055	-0.288
			(0.142)	(0.141)	(0.147)	(0.387)***	(0.707)
Wealth per capita	-0.000	-0.000					
	(0.000)	(0.000)					
ΔWealth per capita			-0.000	-0.000	-0.000	0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urban	-0.672			0.086	0.043	0.166	-0.497
	(0.235)***			(0.115)	(0.118)	(0.620)	(0.635)
Constant	8.611	10.998	-1.581	-0.975	-1.388	-0.187	9.212
	(0.984)***	(0.289)***	(0.166)***	(0.887)	(0.936)	(5.160)	(6.578)
Observations	21366	21366	15215	15215	14300	608	286
R-squared	0.21	0.55	0.01	0.02	0.02	0.09	0.28

Robust standard errors in parentheses, clustered at the community level.
* significant at 10%; ** significant at 5%; *** significant at 1%
All regression include controls for survey year and province.
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 32. Propensity score estimation for the spousal health analysis

	OR
Individual characteristics	
Poor health	1.244
	(0.286)
Male	1.333
	(0.113)***
Age	1.027
	(0.059)
Age^2	1.000
	(0.001)
Primary school	1.718
	(0.596)
Lower middle school	1.666
	(0.559)
Upper middle school	1.425
	(0.474)
College+	1.281
	(0.511)
Farmer	1.127
	(0.197)
Laborer	1.153
	(0.225)
Professional	0.912
	(0.188)
Skilled worker	1.287
	(0.234)
Spousal characteristics	
Primary school	1.971
	(0.942)
Lower middle school	1.598
	(0.764)
Upper middle school	1.486
	(0.723)
College+	1.334
	(0.634)
Farmer	1.458
	(0.253)**
Laborer	1.406
	(0.288)*
Professional	1.447
	(0.301)*
Skilled worker	1.409
	(0.250)*
Household characteristics	
No. adults	0.970
	(0.035)
No. girls	1.071
	(0.073)
No. boys	1.039
	(0.066)
Wealth per capita	1.000
	(0.000)
Urban	1.069
	(0.109)
Urban*poor health	1.392
	(0.452)
Observations	21047

Robust standard errors in parentheses, clustered at the community level.
* significant at 10%; ** significant at 5%; *** significant at 1%
All regression include a vector of dummy variables for the spouse's age, survey year, province, and survey year*province.
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 33. Trimmed sample characteristics for the spousal health analysis

Variables	Full sample					Propensity score trimmed sample				
	No shock N = 20631		Shock N = 997		Diff/SD	No shock N = 4280		Shock N = 717		Diff/SD
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Individual characteristics										
Male	0.50	0.50	0.55	0.50	0.10	0.53	0.50	0.56	0.50	0.06
Age	44.47	10.85	50.77	11.02	**0.57**	47.85	7.88	49.38	8.65	0.18
< Primary school	0.58	0.49	0.72	0.45	**0.30**	0.73	0.45	0.73	0.44	0.01
Primary school	0.26	0.44	0.20	0.40	-0.15	0.21	0.41	0.20	0.40	-0.02
Lower middle	0.10	0.31	0.06	0.23	-0.21	0.05	0.21	0.05	0.22	0.01
Upper middle	0.03	0.18	0.02	0.14	-0.11	0.01	0.11	0.01	0.11	0.01
College+	0.02	0.15	0.01	0.09	-0.15	0.01	0.08	0.01	0.10	0.03
Farmer	0.62	0.49	0.68	0.47	0.12	0.74	0.44	0.70	0.46	-0.09
Laborer	0.09	0.29	0.10	0.29	0.00	0.08	0.26	0.09	0.28	0.04
Professional	0.10	0.30	0.07	0.25	-0.14	0.06	0.24	0.06	0.24	0.01
Skilled worker	0.08	0.27	0.08	0.27	0.00	0.06	0.24	0.08	0.26	0.06
Service worker	0.10	0.30	0.07	0.26	-0.12	0.08	0.26	0.07	0.25	-0.04
State sector	0.19	0.39	0.15	0.35	-0.12	0.12	0.33	0.14	0.34	0.05
Collective sector	0.12	0.32	0.09	0.28	-0.12	0.09	0.29	0.08	0.28	-0.03
Private sector	0.69	0.46	0.77	0.42	0.18	0.79	0.41	0.78	0.42	-0.02
Spousal characteristics										
Age	44.43	10.82	50.79	11.12	**0.57**	47.66	7.25	49.10	8.08	0.18
< Primary school	0.58	0.49	0.75	0.43	**0.38**	0.74	0.44	0.74	0.44	0.02
Primary school	0.26	0.44	0.17	0.38	-0.23	0.19	0.39	0.17	0.38	-0.05
Lower middle	0.10	0.30	0.05	0.23	-0.22	0.05	0.22	0.06	0.23	0.02
Upper middle	0.03	0.18	0.02	0.14	-0.10	0.01	0.12	0.02	0.14	0.04
College+	0.02	0.14	0.01	0.09	-0.15	0.01	0.07	0.01	0.08	0.02
Farmer	0.62	0.48	0.70	0.46	0.16	0.74	0.44	0.73	0.44	-0.03
Laborer	0.09	0.29	0.09	0.29	0.01	0.08	0.27	0.08	0.27	0.01
Professional	0.10	0.30	0.07	0.26	-0.11	0.06	0.24	0.06	0.25	0.02
Skilled worker	0.08	0.27	0.07	0.25	-0.05	0.05	0.23	0.06	0.24	0.03
Service worker	0.10	0.30	0.06	0.24	-0.17	0.07	0.26	0.06	0.24	-0.06
State sector	0.19	0.39	0.14	0.34	-0.16	0.12	0.32	0.12	0.33	0.02
Collective sector	0.12	0.33	0.08	0.27	-0.15	0.10	0.29	0.08	0.27	-0.07
Private sector	0.69	0.46	0.78	0.41	0.23	0.79	0.41	0.79	0.41	0.01
Household characteristics										
No. adults	2.90	1.20	3.15	1.33	0.19	3.30	1.24	3.31	1.28	0.00
No. boys	0.53	0.70	0.44	0.69	-0.12	0.48	0.72	0.44	0.69	-0.06
No. girls	0.58	0.67	0.47	0.66	-0.17	0.51	0.66	0.47	0.67	-0.05
Wealth per capita	1411.03	4850.87	1212.82	5665.49	-0.03	864.57	2911.54	959.64	4732.30	0.02
Urban	0.29	0.45	0.30	0.46	0.02	0.24	0.43	0.27	0.44	0.06
1991	0.24	0.43	0.18	0.38	-0.18	0.20	0.40	0.18	0.38	-0.06
1993	0.19	0.39	0.16	0.37	-0.08	0.18	0.38	0.17	0.37	-0.03
1997	0.20	0.40	0.20	0.40	0.00	0.19	0.39	0.20	0.40	0.01
2000	0.18	0.38	0.23	0.42	0.13	0.20	0.40	0.23	0.42	0.06
2004	0.19	0.39	0.23	0.42	0.10	0.23	0.42	0.23	0.42	0.01
Liaoning	0.07	0.25	0.07	0.26	0.02	0.08	0.26	0.08	0.27	0.01
Heilongjiang	0.08	0.26	0.05	0.21	-0.13	0.06	0.24	0.06	0.23	-0.01
Jiangsu	0.12	0.33	0.10	0.30	-0.07	0.10	0.31	0.10	0.30	-0.02
Shandong	0.12	0.32	0.08	0.27	-0.13	0.09	0.29	0.09	0.29	-0.01
Henan	0.12	0.32	0.13	0.34	0.04	0.13	0.33	0.12	0.32	-0.04
Hubei	0.13	0.34	0.17	0.38	0.11	0.15	0.36	0.18	0.38	0.06
Hunan	0.13	0.34	0.10	0.31	-0.10	0.11	0.31	0.10	0.30	-0.01
Guangxi	0.11	0.32	0.14	0.35	0.08	0.13	0.33	0.14	0.34	0.03
Guizhou	0.12	0.33	0.15	0.36	0.07	0.15	0.36	0.15	0.36	-0.02

Data source: China Health and Nutrition Survey, 1991-2006

Table 34. Effect of spousal health on total production hours: FE and PS method estimates

		Any production activity				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Full sample N		14300	14538	13577	15362	14167
(1)	Individual FE FD with baseline covariates	-0.111	0.017	-0.244	-1.273	0.018
		(0.264)	(0.005)***	(0.266)	(0.756)*	(0.012)
Trimmed & balanced sample N		3689	3689	3505	3689	3636
(2)	Individual FE FD with baseline covariates	0.390	0.008	0.264	-0.586	0.028
(3)	1:1 Matching on the p-score	0.693	-0.002	0.497	-0.259	0.042
(4)	1:3 Nearest neighbor matching	0.579	0.009	0.261	-0.555	0.050
(5)	Kernel density estimator[1]	0.378	0.006	0.214	-0.702	0.039
(6)	WLS Regression with covariates[2]	0.217	0.011	0.138	-0.396	0.011

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression methods.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 35. Effect of spousal health on total production hours: Marginal effect decomposition

All production hours		
Sample mean	Estimated effect[1]	Product
$-E[-y_{it} \mid y_{i,t+1} = 0]$	$\dfrac{\partial \Pr(y_{i,t+1} > 0)}{\partial \Delta P_{it}}$	
6.298	0.017	0.107
$\Pr(y_{i,t+1} > 0)$	$\dfrac{\partial E[\Delta y_{it} \mid y_{i,t+1} > 0]}{\partial \Delta P_{it}}$	
0.979	-0.244	-0.239
$E[\Delta y_{it} \mid y_{i,t+1} > 0]$	$\dfrac{\partial \Pr(y_{i,t+1} > 0)}{\partial \Delta P_{it}}$	
-0.866	0.017	-0.015
Total effect	$\dfrac{\partial E[\Delta y_{it}]}{\partial \Delta P_{it}}$	-0.147

[1] Estimates used in the calculation are taken from first-differenced fixed effects regressions for the full sample of individuals (see Table 34, row 1).
Data Source: China Health and Nutrition Survey, 1991-2006

Table 36. Effect of spousal health on total production outcomes by gender

		Any production activity				
		(1)	(2)	(3)	(4)	(5)
	Estimation method	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Men						
	Full sample N	6693	6693	6129	6693	6625
(1)	Individual FE FD with baseline covariates	0.134	**0.040**	-0.094	**0.305**	0.015
		(0.359)	(0.007)***	(0.364)	(0.939)	(0.015)
	Trimmed & balanced sample N	1688	1688	1548	1688	1659
(2)	Individual FE FD with baseline covariates	0.559	0.022	0.280	0.869	0.029
(3)	1:1 Matching on the p-score	0.643	0.007	0.501	1.235	0.028
(4)	1:3 Nearest neighbor matching	0.529	0.013	0.379	0.928	0.033
(5)	Kernel density estimator[1]	0.499	0.018	0.222	0.945	0.030
(6)	WLS Regression with covariates[2]	0.391	0.026	0.153	1.124	0.007
Panel B: Women						
	Full sample N	7607	7607	7448	7607	7542
(1)	Individual FE FD with baseline covariates	-0.330	**-0.006**	-0.349	**-2.485**	0.026
		(0.360)	(0.008)	(0.358)	(1.007)**	(0.017)
	Trimmed & balanced sample N	2001	2001	1957	2001	1977
(2)	Individual FE FD with baseline covariates	0.252	-0.006	0.241	-1.956	0.028
(3)	1:1 Matching on the p-score	0.140	-0.014	0.076	-3.138	0.051
(4)	1:3 Nearest neighbor matching	0.459	-0.011	0.360	-2.302	0.040
(5)	Kernel density estimator[1]	0.237	-0.007	0.187	-2.590	0.045
(6)	WLS Regression with covariates[2]	0.066	-0.003	0.003	-2.010	0.017

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level using a fully interacted model.

Estimates in **BOLD** are significantly different between men and women at the 95% confidence level.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model in regression methods.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 37. Effect of spousal health on total production hours by age

		Any production activity				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Under 50						
Full sample N		10161	10161	9781	10161	10080
(1)	Individual FE FD with baseline covariates	-0.537	**0.003**	-0.662	-0.954	0.019
		(0.337)	(0.005)	(0.338)*	(0.790)	(0.015)
Trimmed & balanced sample N		2005	2005	1936	2005	1982
(2)	Individual FE FD with baseline covariates	0.261	0.010	0.105	0.030	0.010
(3)	1:1 Matching on the p-score	0.277	0.007	0.259	-0.048	0.026
(4)	1:3 Nearest neighbor matching	0.410	0.009	0.159	0.272	0.023
(5)	Kernel density estimator[1]	0.297	0.009	0.090	0.124	0.020
(6)	WLS Regression with covariates[2]	0.408	0.010	0.200	0.664	-0.010
Panel B: 50 and over						
Full sample N		4139	4139	3796	4139	4087
(1)	Individual FE FD with baseline covariates	0.375	**0.031**	0.232	-1.174	0.018
		(0.392)	(0.009)***	(0.404)	(1.226)	(0.018)
Trimmed & balanced sample N		1114	1114	1054	1114	1098
(2)	Individual FE FD with baseline covariates	1.065	0.008	1.034	-0.719	0.060
(3)	1:1 Matching on the p-score	1.406	0.021	1.334	-0.759	0.074
(4)	1:3 Nearest neighbor matching	1.289	0.010	1.239	-0.543	0.076
(5)	Kernel density estimator[1]	0.922	0.014	0.907	-0.997	0.074
(6)	WLS Regression with covariates[2]	0.530	0.011	0.767	-1.272	0.053

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between age groups at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.
Participation is estimated using a linear probability model in regression methods.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 38. Effect of spousal health on total production hours by wealth

	Any production activity				
	(1)	(2)	(3)	(4)	(5)
Estimation method	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Lower wealth					
Full sample N	4768	4768	4538	4768	4714
(1) Individual FE FD with baseline covariates	-0.478	**-0.000**	-0.587	-2.440	0.013
	(0.425)	(0.008)	(0.429)	(1.354)*	(0.015)
Trimmed & balanced sample N	1410	1410	1359	1410	1389
(2) Individual FE FD with baseline covariates	0.393	0.006	0.395	-1.044	0.032
(3) 1:1 Matching on the p-score	0.865	0.017	0.656	-0.418	0.054
(4) 1:3 Nearest neighbor matching	0.557	0.017	0.589	-0.372	0.050
(5) Kernel density estimator[1]	0.205	0.010	0.210	-1.245	0.042
(6) WLS Regression with covariates[2]	-0.117	0.007	-0.024	-1.688	0.026
Panel B: Higher wealth					
Full sample N	9532	9532	9039	9532	9453
(1) Individual FE FD with baseline covariates	0.186	**0.031**	0.020	0.127	0.021
	(0.336)	(0.006)***	(0.336)	(0.811)	(0.017)
Trimmed & balanced sample N	1710	1710	1632	1710	1692
(2) Individual FE FD with baseline covariates	0.778	0.011	0.588	0.692	0.025
(3) 1:1 Matching on the p-score	0.282	0.016	-0.005	-0.130	0.041
(4) 1:3 Nearest neighbor matching	0.471	0.025	0.052	-0.474	0.044
(5) Kernel density estimator[1]	0.628	0.016	0.397	0.132	0.042
(6) WLS Regression with covariates[2]	0.955	0.012	0.866	1.329	0.007

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between wealth groups at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.
Participation is estimated using a linear probability model in regression methods.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 39. Effect of spousal health on market labor hours: OLS and individual FE estimates

				FD + time-invariant covariates				
					Works at baseline		Doesn't work	
	Pooled OLS	Individual FE	FD		(-) shock	(+) shock	(-) shock	(+) shock
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	y	y	Δy	Δy	$\Delta y \mid y_t>0, p_t=0$	$\Delta y \mid y_t>0, p_t=1$	$\Delta y \mid y_t=0, p_t=0$	$\Delta y \mid y_t=0, p_t=1$
Health status								
Poor health	-1.089	-0.843						
	(0.156)***	(0.151)***						
Spouse's poor health	0.412	0.021						
	(0.158)***	(0.163)						
ΔPoor health			-0.549	-0.527	-0.697	0.067	-0.066	0.162
			(0.156)***	(0.157)***	(0.207)***	(0.591)	(0.223)	(0.673)
ΔSpouse's poor health			0.045	0.064	0.066	0.500	-0.221	0.189
			(0.187)	(0.186)	(0.282)	(0.546)	(0.322)	(0.610)
Individual characteristics								
Male	1.296			0.194	0.647	1.881	1.202	-0.216
	(0.100)***			(0.071)***	(0.087)***	(0.606)***	(0.277)***	(0.947)
Age	0.203			-0.080	0.010	-0.573	0.063	-0.395
	(0.034)***			(0.034)**	(0.047)	(0.337)*	(0.122)	(0.440)
Age^2	-0.003			0.001	-0.001	0.005	-0.001	0.002
	(0.000)***			(0.000)*	(0.001)	(0.003)	(0.001)	(0.003)
Primary school	0.047			0.041	0.081	-0.659	-0.019	-0.086
	(0.107)			(0.082)	(0.098)	(0.843)	(0.238)	(0.945)
Lower middle school	0.036			0.003	0.147	-0.133	-0.118	0.299
	(0.133)			(0.111)	(0.137)	(1.191)	(0.317)	(1.489)
Upper middle school	0.289			-0.004	0.465	-0.866	0.123	-0.263
	(0.193)			(0.154)	(0.197)**	(1.580)	(0.375)	(0.909)
College+	0.188			0.048	0.484	1.760	-0.449	1.302
	(0.246)			(0.188)	(0.211)**	(1.986)	(0.492)	(2.451)
Farmer	1.199			-0.044	0.187	1.575	0.678	1.128
	(0.194)***			(0.122)	(0.155)	(1.379)	(0.276)**	(1.020)
Laborer	-0.327			-0.054	-0.317	0.842	-0.240	-0.539
	(0.173)*			(0.136)	(0.201)	(1.500)	(0.235)	(0.634)
Professional	0.634			-0.011	0.585	0.790	-0.474	-0.406
	(0.145)***			(0.126)	(0.161)***	(1.365)	(0.298)	(0.868)
Skilled worker	0.112			-0.213	-0.186	0.970	-0.190	0.156
	(0.186)			(0.131)	(0.166)	(1.519)	(0.296)	(0.758)
Spouse's characteristics								
Age	0.176			-0.018	0.065	0.363	-0.282	-0.336
	(0.031)***			(0.032)	(0.045)	(0.336)	(0.123)**	(0.390)
Age^2	-0.002			0.000	-0.001	-0.004	0.002	0.002
	(0.000)***			(0.000)	(0.000)*	(0.003)	(0.001)**	(0.003)
Primary school	-0.075			-0.084	-0.058	1.077	-0.026	-2.533
	(0.119)			(0.080)	(0.097)	(0.663)	(0.264)	(0.837)***
Lower middle school	0.035			0.052	-0.036	1.773	0.923	0.372
	(0.150)			(0.123)	(0.155)	(0.981)*	(0.358)**	(1.805)
Upper middle school	0.193			-0.049	0.244	3.028	0.469	-1.708
	(0.192)			(0.140)	(0.197)	(1.173)**	(0.397)	(1.972)
College+	0.596			-0.063	0.487	3.363	0.201	-2.568
	(0.238)**			(0.164)	(0.233)**	(1.992)*	(0.419)	(3.469)
Farmer	1.174			0.005	0.248	0.587	0.614	-0.511
	(0.163)***			(0.119)	(0.161)	(1.127)	(0.321)*	(1.080)
Laborer	0.157			-0.059	-0.073	-0.093	-0.288	-0.336
	(0.163)			(0.128)	(0.173)	(1.030)	(0.254)	(0.815)
Professional	0.188			-0.146	-0.214	-0.593	-0.373	-0.206
	(0.167)			(0.114)	(0.157)	(1.291)	(0.278)	(1.202)
Skilled worker	0.148			0.044	0.008	-1.266	-0.364	-0.580
	(0.183)			(0.118)	(0.167)	(1.392)	(0.266)	(1.074)
Household characteristics								
No. adults	-0.124	0.126						
	(0.046)***	(0.054)**						
ΔNo. adults			-0.053	-0.085	-0.081	0.176	-0.006	-0.006
			(0.059)	(0.060)	(0.071)	(0.301)	(0.081)	(0.210)
No. girls	-0.124	-0.151						

	(0.067)*	(0.108)						
ΔNo. girls			-0.238	-0.270	-0.277	-0.561	0.248	0.169
			(0.139)*	(0.141)*	(0.160)*	(0.618)	(0.259)	(0.492)
No. boys	-0.156	-0.285						
	(0.080)*	(0.115)**						
ΔNo. boys			-0.192	-0.243	-0.214	-0.241	-0.165	0.017
			(0.125)	(0.124)*	(0.132)	(0.502)	(0.256)	(0.514)
Wealth per capita	-0.000	-0.000						
	(0.000)*	(0.000)*						
ΔWealth per capita			-0.000	-0.000	-0.000	0.000	0.000	0.000
			(0.000)**	(0.000)**	(0.000)***	(0.000)	(0.000)	(0.000)**
Urban	-0.910			0.039	-0.404	-0.984	-0.671	-0.115
	(0.237)***			(0.103)	(0.145)***	(0.625)	(0.283)**	(0.622)
Constant	1.951	9.147	-1.159	1.490	-2.733	1.361	12.371	28.947
	(0.937)**	(0.268)***	(0.158)***	(0.770)*	(0.982)***	(6.021)	(1.870)***	(9.345)***
Observations	28472	28472	19946	19946	15860	660	3202	224
R-squared	0.21	0.51	0.01	0.01	0.03	0.10	0.18	0.27

Robust standard errors in parentheses, clustered at the community level.
* significant at 10%; ** significant at 5%; *** significant at 1%
All regression include controls for survey year and province.
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 40. Effect of spousal health on market labor hours: FE and PS method estimates

		Market labor				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Employed						
Full sample N		15860	15991	12910	16015	14397
(1)	Individual FE FD with baseline covariates	0.066	**0.020**	-0.052	-0.724	0.033
		(0.282)	(0.013)	(0.290)	(0.614)	(0.013)**
Trimmed & balanced sample N		3801	3801	2550	3801	3450
(2)	Individual FE FD with baseline covariates	0.385	0.044	0.069	-0.291	0.047
(3)	1:1 Matching on the p-score	0.330	0.040	-0.083	-0.427	0.040
(4)	1:3 Nearest neighbor matching	0.263	0.048	-0.098	-0.172	0.039
(5)	Kernel density estimator[1]	0.316	0.044	-0.050	-0.426	0.039
(6)	WLS Regression with covariates[2]	0.126	0.041	-0.166	-0.665	0.045
Panel B: Unemployed						
Full sample N		3202	3223		3229	1641
(1)	Individual FE FD with baseline covariates	-0.221	**-0.047**		-1.891	-0.004
		(0.322)	(0.030)*		(1.039)*	(0.027)
Trimmed & balanced sample N		790	790		790	401
(2)	Individual FE FD with baseline covariates	-0.018	-0.026		-1.067	0.026
(3)	1:1 Matching on the p-score	0.215	-0.050		-0.614	0.073
(4)	1:3 Nearest neighbor matching	-0.091	-0.083		-1.144	0.024
(5)	Kernel density estimator[1]	-0.112	-0.067		-1.520	0.011
(6)	WLS Regression with covariates[2]	-0.451	-0.036		-0.901	0.015

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between the employed and the unemployed at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression models.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 41. Spousal health marginal effect decomposition by sector for employed individuals

Market labor (1)			Home production (2)		
Sample mean	Estimated effect[1]	Product	Sample mean	Estimated effect[1]	Product
$-E[-y_{it} \mid y_{i,t+1} = 0]$	$\frac{\partial \Pr(y_{i,t+1} > 0)}{\partial \Delta P_{it}}$		$-E[-y_{it} \mid y_{i,t+1} = 0]$	$\frac{\partial \Pr(y_{i,t+1} > 0)}{\partial \Delta P_{it}}$	
7.974	0.019	0.152	1.750	0.021	0.037
$\Pr(y_{i,t+1} > 0)$	$\frac{\partial E[\Delta y_{it} \mid y_{i,t+1} > 0]}{\partial \Delta P_{it}}$		$\Pr(y_{i,t+1} > 0)$	$\frac{\partial E[\Delta y_{it} \mid y_{i,t+1} > 0]}{\partial \Delta P_{it}}$	
0.864	-0.052	-0.045	0.890	0.115	0.102
$E[\Delta y_{it} \mid y_{i,t+1} > 0]$	$\frac{\partial \Pr(y_{i,t+1} > 0)}{\partial \Delta P}$		$E[\Delta y_{it} \mid y_{i,t+1} > 0]$	$\frac{\partial \Pr(y_{i,t+1} > 0)}{\partial \Delta P_{it}}$	
-0.297	0.019	-0.006	-0.381	0.021	-0.008
Total effect	$\frac{\partial E[\Delta y_{it}]}{\partial \Delta P_{it}}$	0.101	Total effect	$\frac{\partial E[\Delta y_{it}]}{\partial \Delta P_{it}}$	0.131

[1] Estimates used in the calculation are taken from first-difference regressions for the full sample of individuals (see columns 2 and 3 of Table 40, Panel A, row 1 and Table 46, row 1).

Data Source: China Health and Nutrition Survey, 1991-2006

Table 42. Effect of spousal health on market labor hours by gender

		Market labor				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Men						
Full sample N		8320	8320	7015	8320	7515
(1)	Individual FE (FD) with baseline covariates	0.170	0.000	0.240	**0.661**	**0.006**
		(0.375)	(0.017)	(0.377)	(0.738)	(0.016)
Trimmed & balanced sample N		2093	2093	1298	2093	1873
(2)	Individual FE FD with baseline covariates	0.534	0.030	0.058	1.201	0.027
(3)	1:1 Matching on the p-score	0.160	0.002	-0.081	0.713	0.016
(4)	1:3 Nearest neighbor matching	0.248	0.023	-0.204	1.023	0.008
(5)	Kernel density estimator[1]	0.469	0.025	0.000	1.119	0.029
(6)	WLS Regression with covariates[2]	0.247	0.028	-0.169	1.015	0.025
Panel B: Women						
Full sample N		7540	7540	5895	7540	6882
(1)	Individual FE FD with baseline covariates	-0.065	0.047	-0.454	**-2.530**	**0.064**
		(0.434)	(0.020)**	(0.400)	(0.942)***	(0.018)***
Trimmed & balanced sample N		1708	1708	1252	1708	1577
(2)	Individual FE FD with baseline covariates	0.270	0.070	0.102	-2.088	0.072
(3)	1:1 Matching on the p-score	0.043	0.051	0.112	-3.354	0.089
(4)	1:3 Nearest neighbor matching	0.410	0.089	0.060	-2.315	0.078
(5)	Kernel density estimator[1]	0.089	0.073	-0.118	-2.640	0.076
(6)	WLS Regression with covariates[2]	-0.046	0.063	-0.343	-2.940	0.069

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.
Estimates in **BOLD** are significantly different between men and women at the 95% confidence level using a fully interacted model.
Participation is estimated using a linear probability model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression models.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 43. Effect of spousal health on market labor hours by age

	Market labor				
	(1)	(2)	(3)	(4)	(5)
Estimation method	Δy	$Pr(y_{t+1}>0)$	$\Delta y \vert y_{t+1}>0$	$\Delta\sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Under 50					
Full sample N	11844	11844	10012	11844	10877
(1) Individual FE FD with baseline covariates	-0.103	0.011	-0.246	-0.700	0.034
	(0.319)	(0.015)	(0.316)	(0.661)	(0.015)**
Trimmed & balanced sample N	2368	2368	1701	2368	2180
(2) Individual FE FD with baseline covariates	0.127	0.036	-0.164	-0.599	0.043
(3) 1:1 Matching on the p-score	-0.023	0.003	-0.544	-1.463	0.038
(4) 1:3 Nearest neighbor matching	-0.028	0.022	-0.339	-0.554	0.020
(5) Kernel density estimator[1]	0.155	0.026	-0.191	-0.478	0.043
(6) WLS Regression with covariates[2]	0.057	0.035	-0.286	-0.554	0.035
Panel B: 50 and over					
Full sample N	4016	4016	2898	4016	3520
(1) Individual FE FD with baseline covariates	0.195	0.022	0.268	-0.951	0.031
	(0.444)	(0.024)	(0.471)	(0.965)	(0.021)
Trimmed & balanced sample N	1433	1433	849	1433	1270
(2) Individual FE FD with baseline covariates	0.659	0.049	0.592	-0.173	0.052
(3) 1:1 Matching on the p-score	0.463	0.092	0.170	-1.031	0.063
(4) 1:3 Nearest neighbor matching	0.902	0.111	0.232	0.542	0.068
(5) Kernel density estimator[1]	0.592	0.073	0.204	-0.138	0.062
(6) WLS Regression with covariates[2]	0.264	0.040	0.195	-1.053	0.059

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between age groups at the 95% confidence level using a fully interacted model.
Participation is estimated using a linear probability model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.
Participation is estimated using a linear probability model for regression models.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 44. Effect of spousal health on market labor hours by wealth

		Market labor				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Lower wealth						
Full sample N		5682	5682	4764	5682	5195
(1)	Individual FE FD with baseline covariates	0.336	0.037	-0.112	-1.267	0.048
		(0.392)	(0.016)**	(0.412)	(0.874)	(0.017)***
Trimmed & balanced sample N		1723	1723	1207	1723	1582
(2)	Individual FE FD with baseline covariates	0.634	0.055	-0.212	-0.618	0.057
(3)	1:1 Matching on the p-score	0.932	0.056	-0.317	-0.238	0.073
(4)	1:3 Nearest neighbor matching	1.082	0.083	-0.071	0.544	0.072
(5)	Kernel density estimator[1]	0.525	0.051	-0.147	-0.929	0.061
(6)	WLS Regression with covariates[2]	0.126	0.046	-0.695	-1.403	0.053
Panel B: Higher wealth						
Full sample N		10178	10178	8146	10178	9202
(1)	Individual FE FD with baseline covariates	-0.257	-0.003	0.030	-0.242	0.015
		(0.409)	(0.020)	(0.378)	(0.756)	(0.019)
Trimmed & balanced sample N		2079	2079	1344	2079	1869
(2)	Individual FE FD with baseline covariates	0.079	0.030	0.453	0.046	0.033
(3)	1:1 Matching on the p-score	-0.527	0.028	-0.692	-0.454	0.013
(4)	1:3 Nearest neighbor matching	-0.321	0.050	-0.389	-0.309	0.020
(5)	Kernel density estimator[1]	-0.008	0.033	-0.047	0.397	0.035
(6)	WLS Regression with covariates[2]	0.081	0.034	0.374	-0.050	0.037

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.
Estimates in **BOLD** are significantly different between wealth groups at the 95% confidence level using a fully interacted model.
Participation is estimated using a linear probability model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.
Participation is estimated using a linear probability model for regression models.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 45. Effect of spousal health on home production hours: OLS and individual FE estimates

				FD + baseline covariates				
					Works at baseline		Doesn't work	
	Pooled OLS	Individual FE	FD		(-) shock	(+) shock	(-) shock	(+) shock
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	y	y	Δy	Δy	$\Delta y \vert y_t>0, p_t=0$	$\Delta y \vert y_t>0, p_t=1$	$\Delta y \vert y_t=0, p_t=0$	$\Delta y \vert y_t=0, p_t=1$
Health status								
Poor health	-0.027	0.061						
	(0.078)	(0.104)						
Spouse's poor health	0.097	0.174						
	(0.062)	(0.075)**						
ΔPoor health			0.050	0.042	-0.011	0.623	0.038	-0.193
			(0.101)	(0.101)	(0.124)	(0.302)**	(0.138)	(0.145)
ΔSpouse's poor health			0.155	0.128	0.171	0.208	-0.009	-0.071
			(0.078)**	(0.079)	(0.113)	(0.247)	(0.084)	(0.214)
Individual characteristics								
Male	-2.609			0.436	0.057	0.120	-1.971	-1.602
	(0.073)***			(0.049)***	(0.056)	(0.295)	(0.200)***	(0.625)**
Age	-0.178			0.086	0.090	0.213	-0.032	-0.067
	(0.027)***			(0.021)***	(0.028)***	(0.147)	(0.043)	(0.114)
Age^2	0.002			-0.001	-0.001	-0.002	0.000	0.001
	(0.000)***			(0.000)***	(0.000)***	(0.001)	(0.000)	(0.001)
Primary school	0.048			0.021	-0.033	-0.108	0.137	-0.219
	(0.051)			(0.053)	(0.068)	(0.379)	(0.054)**	(0.303)
Lower middle school	-0.098			0.020	-0.004	0.965	0.045	-0.498
	(0.075)			(0.074)	(0.098)	(0.511)*	(0.074)	(0.416)
Upper middle school	0.200			0.062	0.100	-0.382	0.046	0.454
	(0.114)*			(0.127)	(0.153)	(0.678)	(0.151)	(0.600)
College+	0.119			-0.121	-0.091	0.082	0.089	1.647
	(0.156)			(0.169)	(0.232)	(0.892)	(0.135)	(0.654)**
Farmer	0.107			-0.036	-0.022	-0.266	-0.071	0.729
	(0.075)			(0.069)	(0.085)	(0.475)	(0.123)	(0.373)*
Laborer	0.065			0.011	-0.003	-0.019	0.008	0.438
	(0.078)			(0.085)	(0.111)	(0.458)	(0.154)	(0.401)
Professional	0.120			-0.093	-0.096	-0.371	-0.008	0.480
	(0.082)			(0.082)	(0.101)	(0.462)	(0.152)	(0.475)
Skilled worker	0.117			0.107	0.065	0.320	0.011	0.109
	(0.107)			(0.088)	(0.114)	(0.559)	(0.150)	(0.397)
Spouse's characteristics								
Age	-0.060			0.072	0.113	0.023	-0.020	-0.022
	(0.025)**			(0.022)***	(0.030)***	(0.158)	(0.057)	(0.089)
Age^2	0.000			-0.001	-0.001	-0.000	0.000	0.000
	(0.000)			(0.000)***	(0.000)***	(0.001)	(0.001)	(0.001)
Primary school	0.084			0.020	0.024	-0.187	0.038	-0.179
	(0.049)*			(0.052)	(0.060)	(0.495)	(0.081)	(0.269)
Lower middle school	0.032			-0.049	-0.032	-0.287	-0.128	-0.402
	(0.084)			(0.074)	(0.088)	(0.370)	(0.088)	(0.363)
Upper middle school	0.014			0.024	0.091	0.628	-0.581	1.237
	(0.134)			(0.108)	(0.119)	(0.842)	(0.202)***	(0.764)
College+	-0.239			0.189	0.264	0.690	-0.518	1.860
	(0.159)			(0.170)	(0.193)	(1.006)	(0.364)	(1.067)*
Farmer	-0.282			-0.050	-0.106	-0.192	-0.053	-0.636
	(0.073)***			(0.070)	(0.088)	(0.413)	(0.107)	(0.400)
Laborer	-0.062			-0.192	-0.256	-0.589	0.131	-0.868
	(0.086)			(0.079)**	(0.099)**	(0.404)	(0.152)	(0.462)*
Professional	-0.086			-0.051	-0.142	-0.142	0.265	-0.273
	(0.093)			(0.082)	(0.096)	(0.515)	(0.203)	(0.583)
Skilled worker	0.000			-0.195	-0.245	0.010	0.160	0.586
	(0.085)			(0.097)**	(0.109)**	(0.870)	(0.214)	(0.679)
Household characteristics								
No. adults	0.126	0.074						
	(0.017)***	(0.029)**						
ΔNo. adults			0.041	0.066	0.063	0.182	0.031	-0.041
			(0.029)	(0.029)**	(0.035)*	(0.095)*	(0.042)	(0.110)

No. girls	0.228	0.096						
	(0.030)***	(0.060)						
ΔNo. girls			0.074	0.169	0.199	0.174	0.130	-0.361
			(0.060)	(0.059)***	(0.075)***	(0.273)	(0.071)*	(0.322)
No. boys	0.079	-0.126						
	(0.030)***	(0.057)**						
ΔNo. boys			0.071	0.181	0.216	0.225	0.080	-0.122
			(0.051)	(0.051)***	(0.064)***	(0.237)	(0.065)	(0.157)
Wealth per capita	0.000	0.000						
	(0.000)	(0.000)*						
ΔWealth per capita			0.000	0.000	0.000	0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)***	(0.000)	(0.000)
Urban	0.220			0.056	0.096	0.146	0.176	0.284
	(0.048)***			(0.051)	(0.063)	(0.228)	(0.070)**	(0.263)
Constant	9.187	2.680	-0.727	-4.891	-5.929	-6.828	3.199	3.572
	(0.451)***	(0.162)***	(0.087)***	(0.477)***	(0.588)***	(3.150)**	(0.645)***	(2.314)
Observations	23196	23196	16682	16682	12583	551	3416	132
R-squared	0.28	0.55	0.02	0.04	0.04	0.09	0.15	0.57

Robust standard errors in parentheses, clustered at the community level.
* significant at 10%; ** significant at 5%; *** significant at 1%
All regression includes controls for survey year and province.
Data Source: China Health and Nutrition Survey, 1991-2006.

Table 46. Effect of spousal health on home production hours: FE and PS method estimates

		Home production				
		(1)	(2)	(3)	(4)	(5)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$\Delta y \vert y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Full sample N		12583	12681	10472	13282	12247
(1)	Individual FE FD with baseline covariates	0.171	0.021	0.115	-0.071	0.035
		(0.113)	(0.013)	(0.132)	(0.222)	(0.014)**
Trimmed & balanced sample N		3112	3112	2636	3112	3009
(2)	Individual FE FD with baseline covariates	0.129	0.008	0.120	0.028	0.020
(3)	1:1 Matching on the p-score	0.222	-0.007	0.155	0.220	0.020
(4)	1:3 Nearest neighbor matching	0.135	0.003	0.152	0.175	0.027
(5)	Kernel density estimator[1]	0.196	-0.001	0.203	0.192	0.015
(6)	WLS Regression with covariates[2]	0.188	0.012	0.202	0.174	0.020

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression methods.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 47. Effect of spousal health on home production hours by employment status

	Home production				
	(1)	(2)	(3)	(4)	(5)
	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Employed					
Full sample N	10498	10498	8670	10498	10228
(1) Individual FE FD with baseline covariates	0.110	0.017	0.055	-0.098	0.034
	(0.131)	(0.016)	(0.155)	(0.254)	(0.017)**
Trimmed & balanced sample N	2527	2527	2115	2527	2444
(2) Individual FE FD with baseline covariates	0.123	0.009	0.119	-0.006	0.023
(3) 1:1 Matching on the p-score	0.252	-0.020	0.212	0.274	0.016
(4) 1:3 Nearest neighbor matching	0.230	0.000	0.294	0.197	0.031
(5) Kernel density estimator[1]	0.238	-0.001	0.270	0.311	0.014
(6) WLS Regression with covariates[2]	0.178	0.008	0.192	0.098	0.020
Panel B: Unemployed					
Full sample N	2059	2059	1782	2059	1995
(1) Individual FE FD with baseline covariates	0.411	0.038	0.362	0.309	0.041
	(0.214)*	(0.026)	(0.214)*	(0.539)	(0.036)
Trimmed & balanced sample N	583	583	519	583	563
(2) Individual FE FD with baseline covariates	0.278	0.013	0.266	0.114	0.016
(3) 1:1 Matching on the p-score	0.166	0.031	0.008	-0.204	0.027
(4) 1:3 Nearest neighbor matching	-0.087	0.052	-0.353	-0.341	0.066
(5) Kernel density estimator[1]	0.013	0.016	-0.172	-0.191	0.035
(6) WLS Regression with covariates[2]	0.289	0.031	0.335	0.375	0.021

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between the employed and the unemployed at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression models.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 48. Effect of spousal health on home production hours by gender

		Home production				
		(1)	(2)	(3)	(4)	(5)
		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Men						
Full sample N		3837	3837	2325	3837	3731
(1)	Individual FE FD with baseline covariates	**0.483**	0.025	0.332	0.325	0.066
		(0.154)***	(0.030)	(0.214)	(0.358)	(0.028)**
Trimmed & balanced sample N		883	883	556	883	838
(2)	Individual FE FD with baseline covariates	0.514	0.010	0.410	0.374	0.059
(3)	1:1 Matching on the p-score	0.731	-0.015	0.562	0.828	0.074
(4)	1:3 Nearest neighbor matching	0.817	0.007	0.565	0.720	0.079
(5)	Kernel density estimator[1]	0.603	0.012	0.567	0.731	0.055
(6)	WLS Regression with covariates[2]	0.402	0.032	0.249	0.594	0.031
Panel B: Women						
Full sample N		6661	6661	6345	6661	6497
(1)	Individual FE FD with baseline covariates	**-0.128**	-0.006	-0.046	-0.419	0.007
		(0.200)	(0.011)	(0.203)	(0.337)	(0.022)
Trimmed & balanced sample N		1644	1644	1559	1644	1606
(2)	Individual FE FD with baseline covariates	-0.108	-0.002	-0.003	-0.235	-0.003
(3)	1:1 Matching on the p-score	-0.180	-0.018	-0.035	-0.510	-0.025
(4)	1:3 Nearest neighbor matching	0.136	-0.014	0.291	0.094	-0.008
(5)	Kernel density estimator[1]	0.058	-0.004	0.207	0.060	-0.011
(6)	WLS Regression with covariates[2]	0.052	-0.013	0.114	-0.154	0.009

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between men and women at the 95% confidence level using a fully interacted model.

Participation is estimated using a linear probability model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression models.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 49. Effect of spousal health on home production hours by age

		Home production				
		(1)	(2)	(3)	(4)	(5)
		Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: Under 50						
Full sample N		8111	8111	6682	8111	7909
(1)	Individual FE FD with baseline covariates	-0.014	-0.002	-0.055	-0.411	0.026
		(0.170)	(0.022)	(0.199)	(0.285)	(0.020)
Trimmed & balanced sample N		1664	1664	1396	1664	1607
(2)	Individual FE FD with baseline covariates	0.005	-0.014	0.039	-0.301	0.012
(3)	1:1 Matching on the p-score	0.352	0.028	0.001	0.487	0.045
(4)	1:3 Nearest neighbor matching	0.235	0.016	0.119	0.270	0.022
(5)	Kernel density estimator[1]	0.103	0.032	0.068	0.190	0.010
(6)	WLS Regression with covariates[2]	0.168	0.044	0.167	0.076	0.014
Panel B: 50 and over						
Full sample N		2387	2387	1988	2387	2319
(1)	Individual FE FD with baseline covariates	0.266	0.037	0.194	0.239	0.044
		(0.188)	(0.019)*	(0.219)	(0.419)	(0.031)
Trimmed & balanced sample N		863	863	719	863	837
(2)	Individual FE FD with baseline covariates	0.320	0.041	0.256	0.331	0.052
(3)	1:1 Matching on the p-score	0.404	0.026	0.613	0.024	0.046
(4)	1:3 Nearest neighbor matching	0.373	-0.012	0.584	0.115	0.039
(5)	Kernel density estimator[1]	0.261	0.007	0.544	-0.052	0.035
(6)	WLS Regression with covariates[2]	0.193	0.036	0.332	0.185	0.047

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between age groups at the 95% confidence level using a fully interactive model.
Participation is estimated using a linear probability model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.
Participation is estimated using a linear probability model for regression models.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $Weight_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 50. Effect of spousal health on home production hours by wealth

		Home production				
		(1)	(2)	(3)	(4)	(5)
		Δy	$Pr(y_{t+1}>0)$	$Δy \mid y_{t+1}>0$	$Δ\sum y_i$	$Δ(y_i/\sum y_i)$
Panel A: Lower wealth						
Full sample N		3608	3608	2987	3608	3507
(1)	Individual FE FD with baseline covariates	-0.050	0.025	-0.079	-0.058	0.004
		(0.163)	(0.024)	(0.185)	(0.288)	(0.026)
Trimmed & balanced sample N		1106	1106	930	1106	1075
(2)	Individual FE FD with baseline covariates	0.050	0.026	0.107	-0.118	0.022
(3)	1:1 Matching on the p-score	-0.076	-0.034	0.061	-0.217	0.010
(4)	1:3 Nearest neighbor matching	0.138	-0.007	0.078	0.006	0.012
(5)	Kernel density estimator[1]	0.140	-0.001	0.160	0.081	0.005
(6)	WLS Regression with covariates[2]	0.101	0.035	0.173	-0.252	0.038
Panel B: Higher wealth						
Full sample N		6890	6890	5683	6890	6721
(1)	Individual FE FD with baseline covariates	0.276	0.009	0.217	-0.084	0.063
		(0.184)	(0.021)	(0.222)	(0.381)	(0.024)***
Trimmed & balanced sample N		1421	1421	1185	1421	1369
(2)	Individual FE FD with baseline covariates	0.270	-0.003	0.221	0.171	0.028
(3)	1:1 Matching on the p-score	0.128	0.011	0.026	0.168	0.051
(4)	1:3 Nearest neighbor matching	0.187	0.004	0.132	-0.057	0.057
(5)	Kernel density estimator[1]	0.280	-0.005	0.314	0.436	0.018
(6)	WLS Regression with covariates[2]	0.241	-0.013	0.340	0.562	0.016

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between wealth groups at the 95% confidence level using a fully interacted model.

Participation is estimated using a linear probability model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression models.

All regressions are conditional on participating in the activity and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 51. Effect of spousal health on the percent of total production hours spent in market labor

		% total production hours spent working in the market				
		all	men	women	< 50	≥ 50
Estimation method		(1)	(2)	(3)	(4)	(5)
Full sample N		12850	6129	7448	9781	3796
(1)	Individual FE FD with baseline covariates	0.004	-0.022	0.002	-0.016	-0.001
		(0.013)	(0.020)	(0.020)	(0.018)	(0.023)
Trimmed & balanced sample N		2825	1364	1461	1847	978
(2)	Individual FE FD with baseline covariates	0.028	-0.002	0.058	0.019	0.040
(3)	1:1 Matching on the p-score	0.030	0.011	0.010	0.064	-0.006
(4)	1:3 Nearest neighbor matching	0.039	0.005	0.012	0.072	0.017
(5)	Kernel density estimator[1]	0.034	0.004	0.014	0.054	0.024
(6)	WLS Regression with covariates[2]	0.029	0.005	0.056	0.020	0.039

		lower wealth	higher wealth	state/collective sector employee	private sector employee
Estimation method		(6)	(7)	(8)	(9)
Full sample N		4538	9039	3522	7852
(1)	Individual FE FD with baseline covariates	-0.017	-0.019	-0.040	-0.002
		(0.020)	(0.020)	(0.040)	(0.016)
Trimmed & balanced sample N		1301	1525	458	1944
(2)	Individual FE FD with baseline covariates	0.027	0.022	-0.055	-0.003
(3)	1:1 Matching on the p-score	0.055	0.026	-0.010	0.041
(4)	1:3 Nearest neighbor matching	0.058	0.044	0.033	0.047
(5)	Kernel density estimator[1]	0.034	0.035	0.012	0.035
(6)	WLS Regression with covariates[2]	0.024	0.028	-0.021	0.030

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between sub-groups at the 95% confidence level using a fully interacted model. Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression methods.

All regressions are conditional on being employed and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 52. CHNS individual sample summary statistics for the analysis by firm type

	1991 (N=6861)		1993 (N=7258)		1997 (N=6145)		2000 (N=5518)		2004 (N=4518)		2006 (N=4165)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Market labor												
Hours	8.540	4.463	7.629	4.497	8.224	4.041	7.805	4.254	9.676	4.687	9.603	4.683
State	6.741	3.389	6.519	3.363	7.629	2.250	7.547	2.458	8.023	2.179	8.040	1.902
Collective	7.586	4.392	7.120	4.172	8.348	3.042	7.867	3.384	9.177	3.743	8.534	3.072
Private	9.466	4.573	8.190	4.851	8.357	4.501	7.865	4.700	10.145	5.111	10.012	5.094
ΔHours[1]	-1.212	5.023	-0.680	5.368	-1.446	5.476	-0.509	6.646	-1.746	6.425		
State	-0.400	2.761	-0.779	3.703	-1.164	3.458	-1.411	4.317	-1.086	3.786		
Collective	-1.102	4.163	-0.920	4.859	-1.680	4.770	-1.768	5.364	-1.973	5.634		
Private	-1.543	5.792	-0.592	5.856	-1.479	5.967	-0.138	7.199	-1.901	6.994		
Participates	0.909	0.288	0.898	0.303	0.965	0.184	0.967	0.179	0.993	0.085	1.000	0.000
% State	0.206	0.404	0.207	0.405	0.183	0.386	0.189	0.392	0.197	0.398	0.173	0.378
% Collective	0.149	0.356	0.159	0.365	0.115	0.319	0.092	0.289	0.055	0.228	0.046	0.209
% Private	0.645	0.478	0.634	0.482	0.702	0.457	0.719	0.450	0.748	0.434	0.781	0.413
Transition into (from unemployment)[1]	0.018	0.134	0.027	0.162	0.018	0.135	0.014	0.117	0.005	0.071		
State	0.019	0.135	0.026	0.161	0.007	0.084	0.001	0.035	0.004	0.062		
Collective	0.020	0.138	0.019	0.138	0.005	0.069	0.010	0.101	0.000	0.000		
Private	0.018	0.133	0.029	0.167	0.023	0.151	0.018	0.132	0.006	0.075		
Transition out of (from employed)[1]	0.070	0.256	0.099	0.299	0.120	0.325	0.230	0.421	0.173	0.378		
State	0.046	0.209	0.127	0.333	0.118	0.323	0.223	0.416	0.126	0.332		
Collective	0.091	0.288	0.118	0.322	0.174	0.379	0.262	0.440	0.173	0.379		
Private	0.074	0.261	0.087	0.282	0.112	0.315	0.229	0.420	0.185	0.388		
Transition into private (from state/collective)	0.087	0.281	0.244	0.430	0.200	0.400	0.239	0.427	0.148	0.355		
Transition into state/collective (from private)	0.065	0.246	0.036	0.186	0.032	0.175	0.022	0.146	0.030	0.170		
Hours|Participating	9.410	3.709	8.839	3.569	8.750	3.574	8.513	3.703	10.063	4.353	9.898	4.437
State	8.184	1.458	8.032	1.335	7.989	1.559	8.035	1.583	8.161	1.924	8.119	1.735
Collective	9.245	2.858	8.762	2.649	8.695	2.572	8.587	2.511	9.442	3.450	8.859	2.628
Private	9.838	4.252	9.133	4.198	8.959	4.040	8.633	4.197	10.622	4.720	10.362	4.819
ΔHours|Participating in labor force	-0.566	4.435	-0.210	4.691	-0.480	4.584	1.279	5.451	-0.241	5.101		
State	-0.169	1.738	-0.034	1.870	-0.088	1.941	0.126	2.292	-0.060	2.208		
Collective	-0.467	3.191	-0.029	3.800	-0.159	3.586	0.208	3.754	0.105	3.923		
Private	-0.725	5.239	-0.290	5.285	-0.630	5.158	1.701	6.103	-0.321	5.752		
Household hours	23.945	13.175	21.389	13.018	21.422	12.124	19.256	11.977	20.847	12.274	19.887	11.298
ΔHousehold hours	-3.278	12.665	-2.629	14.036	-4.076	13.324	-2.763	14.968	-4.032	14.164		
%Household hours	0.405	0.225	0.410	0.242	0.440	0.217	0.470	0.236	0.549	0.266	0.563	0.261
Δ%Household hours	-0.006	0.210	-0.015	0.240	-0.008	0.247	0.012	0.328	-0.037	0.322		
Home production												
Hours	2.471	3.460	1.821	2.863	1.432	1.664	1.457	1.675	2.303	2.244	2.159	2.105
State	2.164	2.918	1.621	2.711	1.324	1.554	1.345	1.592	2.163	2.122	1.871	1.882
Collective	2.346	3.171	1.811	3.012	1.178	1.657	1.240	1.584	1.906	1.716	1.656	1.679
Private	2.620	3.705	1.898	2.871	1.499	1.687	1.514	1.704	2.367	2.303	2.254	2.165
ΔHours[1]	-0.617	3.569	-0.434	2.865	-0.063	1.753	0.601	2.403	-0.106	2.705		
State	-0.486	3.389	-0.119	3.038	0.037	2.020	0.734	2.280	-0.191	2.447		
Collective	-0.511	3.594	-0.529	3.014	-0.004	1.630	0.789	2.453	0.073	2.032		
Private	-0.695	3.626	-0.493	2.774	-0.097	1.699	0.547	2.425	-0.096	2.807		

Table 52. Continued.

Variable	1991 (N=6861) Mean	SD	1993 (N=7258) Mean	SD	1997 (N=6145) Mean	SD	2000 (N=5518) Mean	SD	2004 (N=4518) Mean	SD	2006 (N=4165) Mean	SD
Participates	0.736	0.441	0.686	0.464	0.712	0.453	0.747	0.435	0.995	0.073	0.993	0.082
% State	0.235	0.424	0.229	0.420	0.190	0.392	0.186	0.389	0.196	0.397	0.176	0.381
% Collective	0.169	0.375	0.168	0.374	0.104	0.305	0.092	0.289	0.052	0.221	0.045	0.206
% Private	0.596	0.491	0.603	0.489	0.706	0.456	0.722	0.448	0.752	0.432	0.779	0.415
Transition into[1]	0.089	0.285	0.121	0.327	0.113	0.316	0.159	0.366	0.005	0.072		
State	0.091	0.288	0.155	0.362	0.111	0.314	0.208	0.407	0.004	0.064		
Collective	0.095	0.294	0.130	0.337	0.142	0.349	0.170	0.376	0.000	0.000		
Private	0.087	0.282	0.110	0.313	0.108	0.311	0.145	0.353	0.006	0.076		
Transition out of[1]	0.136	0.342	0.113	0.317	0.108	0.310	0.003	0.051	0.006	0.080		
State	0.156	0.363	0.132	0.339	0.147	0.354	0.003	0.056	0.014	0.119		
Collective	0.141	0.349	0.131	0.338	0.109	0.312	0.000	0.000	0.008	0.088		
Private	0.126	0.332	0.104	0.305	0.098	0.297	0.003	0.052	0.004	0.065		
Hours|Participating	3.411	3.65	2.839	3.144	2.121	1.625	2.058	1.651	2.442	2.2363	2.317	2.0951
State	2.900	3.046	2.514	3.025	1.869	1.546	1.915	1.586	2.303	2.115	2.018	1.877
Collective	3.182	3.313	2.919	3.375	1.925	1.747	1.784	1.624	2.073	1.690	1.885	1.666
Private	3.675	3.921	2.937	3.115	2.216	1.617	2.129	1.665	2.503	2.295	2.408	2.153
ΔHours|Participating	-0.768	4.143	-0.714	3.381	-0.094	1.986	0.498	2.522	-0.087	2.7489		
State	-0.465	3.883	-0.189	3.378	0.094	2.151	0.535	2.392	-0.140	2.491		
Collective	-0.607	4.206	-0.931	3.875	-0.164	1.949	0.596	2.569	0.278	2.096		
Private	-0.924	4.210	-0.792	3.253	-0.131	1.946	0.479	2.546	-0.096	2.844		
Household hours	7.027	6.310	5.370	5.290	4.085	2.575	3.834	3.070	5.093	4.956	4.666	4.297
ΔHousehold hours	-1.655	7.436	-1.357	5.798	-0.223	3.888	0.905	5.110	-0.441	5.306		
%Household hours	0.372	0.373	0.366	0.390	0.378	0.384	0.412	0.384	0.530	0.348	0.540	0.357
Δ%Household hours	0.003	0.291	0.009	0.303	0.010	0.280	0.058	0.324	0.015	0.307		
%Market hours	0.775	0.280	0.784	0.297	0.836	0.213	0.818	0.229	0.791	0.193	0.805	0.174
State	0.720	0.331	0.761	0.332	0.859	0.178	0.852	0.179	0.803	0.151	0.827	0.123
Collective	0.721	0.338	0.756	0.342	0.872	0.193	0.840	0.236	0.821	0.164	0.827	0.173
Private	0.811	0.231	0.801	0.266	0.825	0.224	0.806	0.239	0.785	0.204	0.798	0.183
Δ%Market hours	-0.019	0.269	-0.035	0.308	-0.078	0.311	-0.188	0.390	-0.123	0.365		
State	0.018	0.241	-0.074	0.345	-0.075	0.296	-0.220	0.351	-0.070	0.297		
Collective	-0.026	0.283	-0.056	0.321	-0.119	0.334	-0.243	0.409	-0.147	0.341		
Private	-0.030	0.274	-0.020	0.293	-0.070	0.312	-0.170	0.396	-0.130	0.381		
Poor health	0.032	0.177	0.035	0.184	0.031	0.174	0.039	0.193	0.043	0.202	0.047	0.211
Negative health shock[1]	0.030	0.171	0.034	0.182	0.037	0.188	0.050	0.217	0.039	0.193		
Positive health shock[1]	0.023	0.151	0.023	0.149	0.024	0.152	0.026	0.159	0.034	0.180		
Height	161.13	8.24	161.25	8.27	161.84	8.20	162.32	8.25	163.02	8.23	163.10	8.22
Age	39.73	13.43	40.49	13.67	40.71	11.98	42.21	11.58	43.98	11.20	45.69	10.97
Education												
< Primary	0.582	0.493	0.563	0.496	0.524	0.499	0.495	0.500	0.446	0.497	0.465	0.499
Primary	0.274	0.446	0.290	0.454	0.301	0.459	0.304	0.460	0.324	0.468	0.322	0.467
Lower middle	0.096	0.294	0.099	0.299	0.120	0.325	0.125	0.330	0.132	0.338	0.121	0.326
Upper middle/technical	0.027	0.162	0.027	0.163	0.035	0.185	0.047	0.211	0.056	0.231	0.054	0.226
College+	0.021	0.144	0.021	0.144	0.020	0.140	0.030	0.171	0.042	0.201	0.038	0.192
Married	0.833	0.373	0.817	0.387	0.849	0.358	0.869	0.338	0.893	0.310	0.915	0.279
Male	0.521	0.500	0.520	0.500	0.527	0.499	0.515	0.500	0.540	0.498	0.537	0.499
Household size												
No. adults	3.093	1.380	3.138	1.392	3.141	1.351	3.043	1.236	3.098	1.201	3.576	1.444
No. boys	0.668	0.704	0.613	0.679	0.548	0.666	0.475	0.612	0.402	0.569	0.367	0.562
No. girls	0.622	0.758	0.544	0.715	0.497	0.670	0.436	0.629	0.358	0.561	0.334	0.548

Table 52. Continued.

	1991 (N=6861)		1993 (N=7258)		1997 (N=6145)		2000 (N=5518)		2004 (N=4518)		2006 (N=4165)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Occupation												
Farmer	0.582	0.493	0.575	0.494	0.633	0.482	0.615	0.487	0.580	0.494	0.605	0.489
Laborer	0.129	0.335	0.133	0.339	0.099	0.299	0.088	0.283	0.087	0.282	0.085	0.279
Professional	0.093	0.290	0.093	0.290	0.094	0.291	0.111	0.315	0.126	0.332	0.114	0.318
Skilled worker	0.093	0.291	0.094	0.292	0.082	0.274	0.082	0.274	0.087	0.281	0.078	0.267
Service worker	0.088	0.283	0.114	0.318	0.115	0.319	0.119	0.324	0.156	0.363	0.164	0.370
Wealth per capita[1]	300	553	594	1415	1920	7379	2125	7300	2492	8314	2962	13624
Urban	0.311	0.463	0.300	0.458	0.280	0.449	0.282	0.450	0.273	0.446	0.259	0.438

[1]Transitions calculated as x(t+1) - x(t).

[2]Deflated to 2006 yuan.

Sample is restricted to all adults, age 18+, appearing in at least two adjacent survey waves (NT = 34465)

Source: China Health and Nutrition Survey, 1991 - 2006.

Table 53. Effect of own health on total production hours by firm type

		Any production activity				
		(1)	(2)	(3)	(4)	(5)
	Estimation method	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: State/collective sector						
	Full sample N	6163	6162	5931	6162	6105
(1)	Individual FE FD with baseline covariates	-0.139	-0.028	0.020	**1.258**	**-0.069**
		(0.381)	(0.019)	(0.403)	(0.695)*	(0.023)***
	Trimmed & balanced sample N	1206	1206	1167	1206	1193
(2)	Individual FE FD with baseline covariates	-0.262	-0.042	0.021	0.978	-0.084
(3)	1:1 Matching on the p-score	1.244	-0.041	0.060	0.204	-0.058
(4)	1:3 Nearest neighbor matching	0.576	-0.035	0.478	1.125	-0.083
(5)	Kernel density estimator[1]	-0.035	-0.034	0.078	0.799	-0.076
(6)	WLS Regression with covariates[2]	-0.323	-0.067	0.075	0.318	0.011
Panel B: Private sector						
	Full sample N	13441	13441	12755	13441	13228
(1)	Individual FE FD with baseline covariates	-0.608	-0.026	-0.493	**-1.611**	**0.006**
		(0.296)**	(0.008)***	(0.297)*	(0.764)**	(0.012)
	Trimmed & balanced sample N	4229	4229	4041	4229	4166
(2)	Individual FE FD with baseline covariates	-0.413	-0.027	-0.363	-1.573	0.015
(3)	1:1 Matching on the p-score	-0.211	-0.024	0.045	-1.387	0.030
(4)	1:3 Nearest neighbor matching	-0.393	-0.025	-0.183	-1.602	0.020
(5)	Kernel density estimator[1]	-0.453	-0.028	-0.325	-1.230	0.009
(6)	WLS Regression with covariates[2]	-0.525	-0.030	-0.527	-2.361	-0.042

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between sectors at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.
Participation is estimated using a linear probability model.

All regressions are conditional on being employed, participating in some production activity, and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 54. Effect of own health on market labor hours by firm type

		Market labor					
		(1)	(2)	(3)[3]	(4)	(5)	(6)
Estimation method		Δy	$Pr(y_{t+1}>0)$	$Pr(y^{s}_{t+1}=1 \mid y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: State/collective sector							
Full sample N		7109	7109	5987	5790	5987	5853
(1)	Individual FE FD with baseline covariates	-0.398	-0.067	0.014	-0.107	0.857	-0.031
		(0.324)	(0.031)**	(0.030)	(0.216)	(0.722)	(0.020)
Trimmed & balanced sample N		1416	1416	976	918	1142	1106
(2)	Individual FE FD with baseline covariates	-0.334	-0.057	0.000	0.112	0.800	-0.036
(3)	1:1 Matching on the p-score	0.679	-0.050	0.021	0.505	1.451	-0.026
(4)	1:3 Nearest neighbor matching	-0.080	-0.078	0.076	0.344	1.418	-0.039
(5)	Kernel density estimator[1]	-0.272	-0.063	0.055	0.003	0.835	-0.049
(6)	WLS Regression with covariates[2]	-0.462	-0.085	0.009	0.593	0.483	0.017
Panel B: Private sector							
Full sample N		15870	15870	13155	12290	13155	12544
(1)	Individual FE FD with baseline covariates	-0.856	-0.078	0.011	-0.531	-0.771	-0.005
		(0.258)***	(0.017)***	(0.006)*	(0.271)*	(0.801)	(0.012)
Trimmed & balanced sample N		4982	4982	3678	3273	4157	3922
(2)	Individual FE FD with baseline covariates	-0.684	-0.080	0.013	-0.532	-0.570	0.007
(3)	1:1 Matching on the p-score	-0.632	-0.065	0.002	-0.162	-1.181	-0.008
(4)	1:3 Nearest neighbor matching	-0.581	-0.062	0.006	-0.328	-1.146	-0.007
(5)	Kernel density estimator[1]	-0.651	-0.074	0.011	-0.358	-0.878	-0.018
(6)	WLS Regression with covariates[2]	-0.795	-0.070	0.014	-0.455	-1.189	-0.038

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between sectors at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.
Participation is estimated using a linear probability model.

All regressions are conditional on employment and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

[3] Outcome is the probability of remaining in the sector given that the individual continues to work.

Table 55. Effect of own health on home production hours by firm type

		Home production				
		(1)	(2)	(3)	(4)	(5)
	Estimation method	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: State/collective sector employee						
	Full sample N	4834	4833	3788	4833	4678
(1)	Individual FE FD with baseline covariates	0.048	-0.049	0.373	0.101	**-0.071**
		(0.229)	(0.031)	(0.320)	(0.434)	(0.031)**
	Trimmed & balanced sample N	972	972	798	972	944
(2)	Individual FE FD with baseline covariates	0.004	-0.065	0.355	-0.057	-0.074
(3)	1:1 Matching on the p-score	0.083	-0.065	0.450	-0.315	-0.025
(4)	1:3 Nearest neighbor matching	0.160	-0.043	0.502	0.147	-0.038
(5)	Kernel density estimator[1]	0.019	-0.095	0.441	0.105	-0.056
(6)	WLS Regression with covariates[2]	0.199	-0.061	0.494	0.258	0.002
Panel B: Private sector employee						
	Full sample N	11134	11134	9267	11134	10753
(1)	Individual FE FD with baseline covariates	-0.064	-0.036	-0.017	0.044	**-0.026**
		(0.154)	(0.013)***	(0.166)	(0.234)	(0.017)
	Trimmed & balanced sample N	3595	3595	3096	3595	3474
(2)	Individual FE FD with baseline covariates	-0.000	-0.034	0.071	0.216	-0.022
(3)	1:1 Matching on the p-score	0.243	0.032	0.027	0.147	0.009
(4)	1:3 Nearest neighbor matching	0.240	0.034	0.319	-0.019	0.028
(5)	Kernel density estimator[1]	0.064	0.014	0.018	-0.017	0.003
(6)	WLS Regression with covariates[2]	0.072	-0.049	0.204	0.268	0.003

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between sectors at the 95% confidence level using a fully interacted model.

Propensity score is estimated using a logit specification with the following predictors: age dummy indicators, height, height squared, education, male, married, no. adults, no. adults squared, no. adults cubed, no. girls, no. girls squared, no. girls cubed, no. boys, no. boys squared, no. boys cubed, farmer, laborer, professional, skilled worker, wealth per capita, wealth per capita squared, wealth per capita cubed, wave and province dummies and wave*province interactions.

Participation is estimated using a linear probability model.

All regressions are conditional on employment, participating in home production, and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 56. CHNS spousal health sample summary statistics for the analysis by firm type

	1991 (N=4480)		1993 (N=4588)		1997 (N=3864)		2000 (N=3166)		2004 (N=3328)		2006 (N=2200)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Market labor												
Hours	8.872	4.457	7.952	4.657	8.391	4.116	8.024	4.464	10.089	4.883	9.952	4.780
State	6.676	3.479	6.344	3.501	7.794	2.251	7.552	2.444	8.063	2.056	8.003	1.742
Collective	7.963	4.566	7.356	4.487	8.628	3.106	7.820	4.087	10.200	4.171	8.622	2.969
Private	9.816	4.419	8.638	4.881	8.486	4.506	8.157	4.849	10.547	5.249	10.350	5.101
ΔHours[1]	-1.237	5.135	-0.718	5.442	-1.374	5.484	-0.541	6.746	-1.700	6.603		
State	-0.353	2.657	-0.779	3.612	-1.218	3.221	-1.260	3.993	-0.944	3.516		
Collective	-1.251	4.438	-1.051	5.171	-1.702	4.907	-2.091	5.479	-2.602	6.394		
Private	-1.526	5.833	-0.630	5.847	-1.364	5.915	-0.235	7.306	-1.821	7.111		
Participates	0.920	0.271	0.899	0.302	0.964	0.188	0.969	0.173	0.994	0.080	1.000	0.000
% State	0.186	0.389	0.188	0.391	0.159	0.365	0.178	0.382	0.179	0.384	0.145	0.352
% Collective	0.137	0.344	0.142	0.349	0.100	0.300	0.072	0.259	0.043	0.203	0.034	0.180
% Private	0.676	0.468	0.67	0.470	0.742	0.438	0.750	0.433	0.777	0.416	0.821	0.383
Transition into (from unemployment)[1]	0.018	0.133	0.025	0.157	0.020	0.140	0.014	0.119	0.004	0.065		
State	0.020	0.141	0.024	0.154	0.005	0.073	0.000	0.000	0.000	0.000		
Collective	0.028	0.164	0.017	0.128	0.000	0.000	0.027	0.161	0.000	0.000		
Private	0.015	0.122	0.027	0.163	0.026	0.158	0.017	0.128	0.005	0.073		
Transition out of (from employed)[1]	0.071	0.256	0.092	0.289	0.104	0.305	0.221	0.415	0.155	0.362		
State	0.047	0.211	0.125	0.331	0.113	0.317	0.189	0.392	0.105	0.307		
Collective	0.095	0.293	0.121	0.326	0.163	0.370	0.282	0.451	0.148	0.357		
Private	0.073	0.260	0.078	0.269	0.094	0.292	0.223	0.416	0.166	0.372		
Transition into private (from state/collective)	0.088	0.284	0.249	0.433	0.179	0.384	0.219	0.414	0.137	0.344		
Transition into state/ collective (from private)	0.063	0.243	0.039	0.195	0.031	0.173	0.031	0.174	0.023	0.149		
Hours|Participating	9.650	3.756	9.197	3.692	8.907	3.658	8.772	3.901	10.434	4.589	10.150	4.614
State	8.207	1.516	8.042	1.370	8.073	1.729	8.023	1.602	8.121	1.944	8.054	1.627
Collective	9.641	3.008	9.073	3.039	8.912	2.725	8.986	2.946	10.200	4.171	8.986	2.423
Private	10.048	4.201	9.563	4.186	9.088	4.034	8.936	4.335	10.996	4.877	10.573	4.922
ΔHours|Participating in labor force	-0.563	4.536	-0.340	4.794	-0.512	4.625	1.209	5.558	-0.352	5.350		
State	-0.152	1.657	0.043	1.847	-0.219	1.853	0.151	2.100	-0.043	2.016		
Collective	-0.613	3.401	-0.085	4.147	-0.355	4.061	-0.565	3.982	-0.159	4.046		
Private	-0.675	5.253	-0.461	5.266	-0.596	5.087	1.614	6.177	-0.439	5.952		
Household hours	23.081	11.708	20.616	11.900	21.094	11.220	19.644	11.369	23.064	11.310	22.273	10.452
ΔHousehold hours	-2.975	12.161	-1.782	13.359	-3.491	13.039	-2.714	14.382	-4.658	14.004		
%Household hours	0.411	0.181	0.411	0.194	0.429	0.164	0.435	0.161	0.460	0.164	0.465	0.144
Δ%Household hours	-0.006	0.195	-0.011	0.231	-0.006	0.230	0.028	0.310	0.006	0.285		
Home production												
Hours	2.827	3.580	2.116	3.015	1.633	1.707	1.550	1.621	2.441	2.230	2.214	1.982
State	2.554	2.933	1.969	2.929	1.607	1.559	1.613	1.623	2.385	2.067	1.968	1.875
Collective	2.653	3.252	2.148	3.176	1.449	1.762	1.515	1.691	2.024	1.656	1.969	2.117
Private	2.960	3.836	2.156	3.002	1.662	1.728	1.538	1.614	2.478	2.293	2.270	1.993
ΔHours[1]	-0.741	3.660	-0.485	2.994	-0.090	1.764	0.571	2.419	-0.219	2.575		
State	-0.563	3.507	-0.298	3.385	0.039	1.975	0.536	2.491	-0.358	2.206		
Collective	-0.667	3.732	-0.535	3.097	-0.082	1.818	0.906	2.811	-0.153	1.833		
Private	-0.817	3.691	-0.517	2.872	-0.117	1.709	0.551	2.365	-0.190	2.689		
Participates	0.776	0.417	0.731	0.444	0.741	0.438	0.776	0.417	0.997	0.058	0.997	0.059
% State	0.219	0.414	0.22	0.415	0.172	0.377	0.185	0.388	0.182	0.386	0.151	0.358
% Collective	0.155	0.362	0.156	0.363	0.093	0.291	0.081	0.274	0.044	0.205	0.035	0.184
% Private	0.626	0.484	0.624	0.485	0.735	0.441	0.734	0.442	0.774	0.418	0.814	0.389

Table 56. Continued.

Variable	1991 (N=4480) Mean	SD	1993 (N=4588) Mean	SD	1997 (N=3864) Mean	SD	2000 (N=3166) Mean	SD	2004 (N=3328) Mean	SD	2006 (N=2200) Mean	SD
Transition into[1]	0.074	0.262	0.104	0.305	0.103	0.304	0.139	0.346	0.003	0.053		
State	0.083	0.277	0.128	0.334	0.089	0.285	0.159	0.366	0.000	0.000		
Collective	0.072	0.258	0.117	0.321	0.110	0.314	0.102	0.304	0.000	0.000		
Private	0.072	0.258	0.095	0.294	0.105	0.306	0.137	0.344	0.004	0.060		
Transition out of[1]	0.124	0.330	0.107	0.309	0.094	0.292	0.003	0.057	0.004	0.059		
State	0.129	0.336	0.121	0.326	0.119	0.324	0.005	0.073	0.004	0.062		
Collective	0.135	0.341	0.141	0.348	0.105	0.307	0.000	0.000	0.000	0.000		
Private	0.120	0.326	0.096	0.294	0.087	0.282	0.003	0.056	0.004	0.060		
Hours|Participating	3.699	3.681	3.064	3.203	2.309	1.599	2.108	1.549	2.57	2.2147	2.344	1.9638
State	3.226	2.949	2.772	3.140	2.060	1.477	2.091	1.554	2.492	2.048	2.072	1.867
Collective	3.459	3.317	3.107	3.408	2.156	1.759	1.919	1.687	2.191	1.613	2.148	2.122
Private	3.923	3.966	3.154	3.168	2.385	1.600	2.133	1.531	2.609	2.279	2.403	1.971
ΔHours|Participating	-0.878	4.149	-0.71	3.437	-0.129	1.994	0.489	2.52	-0.223	2.6072		
State	-0.586	3.956	-0.406	3.658	0.125	2.175	0.340	2.526	-0.309	2.197		
Collective	-0.721	4.351	-0.773	3.839	-0.251	2.106	0.885	3.006	0.125	1.764		
Private	-1.016	4.158	-0.765	3.297	-0.171	1.933	0.488	2.469	-0.221	2.728		
Household hours	6.797	5.838	5.079	4.816	3.835	2.126	3.546	2.178	4.580	4.257	4.209	3.515
ΔHousehold hours	-1.796	6.788	-1.270	5.417	-0.202	3.392	0.877	4.390	-0.433	4.665		
%Household hours	0.430	0.381	0.434	0.402	0.437	0.394	0.446	0.382	0.574	0.333	0.569	0.343
Δ%Household hours	0.003	0.293	0.007	0.305	0.004	0.286	0.056	0.319	0.007	0.307		
%Market hours	0.762	0.268	0.764	0.297	0.818	0.219	0.810	0.230	0.785	0.188	0.803	0.167
State	0.682	0.324	0.717	0.341	0.830	0.178	0.827	0.186	0.789	0.134	0.819	0.122
Collective	0.708	0.327	0.723	0.346	0.854	0.188	0.800	0.266	0.830	0.122	0.799	0.199
Private	0.801	0.219	0.789	0.265	0.811	0.230	0.807	0.235	0.782	0.202	0.800	0.173
Δ%Market hours	-0.018	0.271	-0.031	0.299	-0.068	0.300	-0.183	0.389	-0.111	0.356		
State	0.021	0.252	-0.066	0.336	-0.067	0.273	-0.179	0.336	-0.068	0.303		
Collective	-0.022	0.294	-0.060	0.325	-0.110	0.326	-0.274	0.431	-0.132	0.337		
Private	-0.029	0.271	-0.017	0.283	-0.063	0.301	-0.176	0.396	-0.120	0.368		
Poor health	0.036	0.187	0.040	0.197	0.037	0.189	0.043	0.203	0.048	0.213	0.054	0.226
Negative health shock[1]	0.032	0.175	0.037	0.189	0.044	0.205	0.051	0.220	0.043	0.203		
Positive health shock[1]	0.026	0.159	0.025	0.157	0.026	0.160	0.027	0.163	0.037	0.189		
Height	161.01	8.18	161.10	8.15	161.39	8.14	161.93	8.08	162.04	8.24	162.39	8.19
Age	41.71	10.91	43.23	10.80	43.46	9.85	44.46	9.61	46.53	9.23	47.65	9.20
Education												
< Primary	0.615	0.487	0.609	0.488	0.578	0.494	0.534	0.499	0.494	0.500	0.513	0.500
Primary	0.245	0.430	0.250	0.433	0.255	0.436	0.277	0.448	0.293	0.455	0.299	0.458
Lower middle	0.088	0.283	0.089	0.285	0.112	0.315	0.114	0.318	0.125	0.331	0.111	0.315
Upper middle	0.030	0.170	0.029	0.169	0.035	0.185	0.045	0.207	0.048	0.213	0.042	0.200
College+	0.023	0.149	0.023	0.150	0.019	0.137	0.029	0.169	0.040	0.196	0.035	0.184
Male	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Household size												
No. adults	2.842	1.222	2.858	1.226	2.913	1.215	2.890	1.132	3.003	1.116	3.470	1.420
No. boys	0.744	0.715	0.684	0.688	0.617	0.681	0.509	0.624	0.395	0.576	0.330	0.542
No. girls	0.691	0.790	0.617	0.752	0.545	0.707	0.462	0.647	0.351	0.549	0.322	0.546
Occupation												
Farmer	0.615	0.487	0.612	0.487	0.688	0.463	0.662	0.473	0.659	0.474	0.676	0.468
Laborer	0.103	0.304	0.106	0.308	0.075	0.264	0.070	0.255	0.058	0.234	0.061	0.239
Professional	0.104	0.306	0.104	0.305	0.093	0.291	0.107	0.310	0.125	0.331	0.110	0.312
Skilled worker	0.083	0.276	0.084	0.278	0.064	0.245	0.069	0.254	0.068	0.252	0.059	0.235
Service worker	0.078	0.268	0.096	0.295	0.098	0.297	0.102	0.303	0.128	0.334	0.131	0.338

Table 56. Continued.

Variable	1991 (N=4480) Mean	1991 (N=4480) SD	1993 (N=4588) Mean	1993 (N=4588) SD	1997 (N=3864) Mean	1997 (N=3864) SD	2000 (N=3166) Mean	2000 (N=3166) SD	2004 (N=3328) Mean	2004 (N=3328) SD	2006 (N=2200) Mean	2006 (N=2200) SD
Wealth per capita[1]	317	546	609	1363	1757	5168	2007	7431	2064	4910	2844	16354
Urban	0.309	0.462	0.296	0.457	0.254	0.435	0.257	0.437	0.232	0.422	0.221	0.415

[1]Transitions calculated as x(t+1) - x(t).

[2]Deflated to 2006 yuan.

Sample is restricted to all adults, age 18+, appearing in at least two adjacent survey waves (NT = 20626)

Source: China Health and Nutrition Survey, 1991 - 2006.

Table 57. Effect of spousal health on total production hours by firm type

	Estimation method	Any production activity (1) Δy	(2) $Pr(y_{t+1}>0)$	(3) $\Delta y \mid y_{t+1}>0$	(4) $\Delta \sum y_i$	(5) $\Delta(y_i/\sum y_i)$
Panel A: State/collective sector employee						
	Full sample N	3647	3647	3522	3647	3629
(1)	Individual FE FD with baseline covariates	0.126	0.024	-0.061	0.462	0.001
		(0.587)	(0.010)**	(0.586)	(1.058)	(0.026)
	Trimmed & balanced sample N	605	605	575	605	601
(2)	Individual FE FD with baseline covariates	0.268	0.005	0.078	-0.119	0.028
(3)	1:1 Matching on the p-score	0.397	0.023	0.029	0.936	0.066
(4)	1:3 Nearest neighbor matching	0.940	0.019	0.849	2.134	0.065
(5)	Kernel density estimator[1]	0.520	0.021	0.412	1.445	0.033
(6)	WLS Regression with covariates[2]	0.221	0.006	0.153	0.556	0.004
Panel B: Private sector employee						
	Full sample N	8205	8205	7852	8205	8137
(1)	Individual FE FD with baseline covariates	-0.254	0.013	-0.380	-1.091	0.019
		(0.372)	(0.004)***	(0.370)	(1.048)	(0.013)
	Trimmed & balanced sample N	2376	2376	2285	2376	2344
(2)	Individual FE FD with baseline covariates	0.505	0.011	0.394	-0.237	0.025
(3)	1:1 Matching on the p-score	0.627	0.014	0.340	-0.404	0.041
(4)	1:3 Nearest neighbor matching	0.698	0.016	0.341	-0.091	0.043
(5)	Kernel density estimator[1]	0.349	0.011	0.207	-1.010	0.045
(6)	WLS Regression with covariates[2]	0.165	0.012	0.140	-0.564	0.017

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between firm type at the 95% confidence level using a fully interacted model.
Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.
Participation is estimated using a linear probability model in regression methods.

All regressions are conditional on being employed and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $\text{Weight}_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 58. Effect of spousal health on market labor hours by firm type

		Market labor					
		(1)	(2)	(3)[3]	(4)	(5)	(6)
	Estimation method	Δy	$Pr(y_{t+1}>0)$	$Pr(y^{s}_{t+1}=1 \vert y_{t+1}>0)$	$\Delta y \vert y_{t+1}>0$	$\Delta \sum y_i$	$\Delta (y_i / \sum y_i)$
Panel A: State/collective sector employee							
	Full sample N	4513	4513	3794	3676	3794	3715
(1)	Individual FE FD with baseline covariates	-0.038	-0.011	0.015	0.502	0.204	0.005
		(0.535)	(0.037)	(0.042)	(0.414)	(0.892)	(0.025)
	Trimmed & balanced sample N	720	720	555	455	555	541
(2)	Individual FE FD with baseline covariates	0.448	0.034	-0.045	0.252	-0.060	0.026
(3)	1:1 Matching on the p-score	-0.235	-0.010	-0.054	0.627	0.152	-0.062
(4)	1:3 Nearest neighbor matching	0.663	0.027	-0.023	0.911	1.292	-0.017
(5)	Kernel density estimator[1]	0.509	0.014	-0.001	0.719	0.754	-0.001
(6)	WLS Regression with covariates[2]	0.285	0.028	-0.035	-0.120	0.392	0.010
Panel B: Private sector employee							
	Full sample N	10577	10577	8825	8249	8825	8401
(1)	Individual FE FD with baseline covariates	-0.097	0.028	0.005	-0.381	-1.875	0.035
		(0.344)	(0.014)**	(0.007)	(0.358)	(0.842)**	(0.013)***
	Trimmed & balanced sample N	2875	2875	2425	1928	2425	2316
(2)	Individual FE FD with baseline covariates	0.276	0.045	0.010	-0.209	-1.301	0.037
(3)	1:1 Matching on the p-score	0.368	0.039	0.005	-0.087	-0.944	0.056
(4)	1:3 Nearest neighbor matching	0.454	0.055	0.006	-0.091	0.210	0.050
(5)	Kernel density estimator[1]	0.190	0.052	0.014	-0.254	-0.748	0.060
(6)	WLS Regression with covariates[2]	-0.207	0.041	0.010	-0.453	-1.247	0.047

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between firm types at the 95% confidence level using a fully interacted model. Participation is estimated using a linear probability model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression models.

All regressions are conditional on being employed and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $Weight_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

[3] Outcome is the probability of remaining in the sector given that the individual continues to work.

Table 59. Effect of spousal health on home production hours by firm type

	Home production				
	(1)	(2)	(3)	(4)	(5)
	Δy	$Pr(y_{t+1}>0)$	$\Delta y \mid y_{t+1}>0$	$\Delta \sum y_i$	$\Delta(y_i/\sum y_i)$
Panel A: State sector employee					
Full sample N	3043	3043	2445	3043	2985
(1) Individual FE FD with baseline covariates	0.188	0.033	-0.017	-0.188	0.069
	(0.265)	(0.035)	(0.324)	(0.489)	(0.038)*
Trimmed & balanced sample N	468	468	375	468	454
(2) Individual FE FD with baseline covariates	0.206	0.009	-0.017	-0.097	0.045
(3) 1:1 Matching on the p-score	0.340	0.016	0.436	-0.336	0.108
(4) 1:3 Nearest neighbor matching	0.069	-0.005	0.088	-0.070	0.055
(5) Kernel density estimator[1]	0.195	0.020	0.139	0.216	0.023
(6) WLS Regression with covariates[2]	0.162	0.073	-0.118	0.381	0.025
Panel B: Private sector employee					
Full sample N	6984	6984	5842	6984	6803
(1) Individual FE FD with baseline covariates	0.143	0.011	0.157	0.027	0.028
	(0.150)	(0.018)	(0.173)	(0.283)	(0.019)
Trimmed & balanced sample N	1931	1931	1632	1931	1867
(2) Individual FE FD with baseline covariates	0.125	0.004	0.169	0.029	0.018
(3) 1:1 Matching on the p-score	0.020	-0.030	0.146	0.102	0.006
(4) 1:3 Nearest neighbor matching	0.238	-0.010	0.259	0.113	0.018
(5) Kernel density estimator[1]	0.276	-0.016	0.368	0.304	0.009
(6) WLS Regression with covariates[2]	0.214	0.022	0.295	0.084	0.026

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses, clustered at the community level.

Estimates in **BOLD** are significantly different between men and women at the 95% confidence level using a fully interacted model.

Participation is estimated using a linear probability model.

Propensity score is estimated using a logit specification with the following predictors: (1) individual characteristics of poor health, male, age, age squared, education, and occupation; (2) spousal characteristics of age, education, and occupation; (3) household characteristics of no. adults, no. girls, no. boys, wealth per capita, urbanicity, and urbanicity*poor health; and (4) controls for survey wave, province, and survey year*province interactions.

Participation is estimated using a linear probability model for regression models.

All regressions are conditional on being employed, participating in home production, and having good health at baseline.

Data source: China Health and Nutrition Survey, 1991-2006

[1] Biweight kernel used with a 0.06 bandwidth.

[2] $Weight_{it} = \sqrt{\frac{\Delta P_{it}}{\hat{p}(X_{it})} + \frac{1-\Delta P_{it}}{1-\hat{p}(X_{it})}}$

Table 60. Summary of analytical results from first-differenced fixed effects estimates

Panel A. Individual health effects on time use

	Individual response		Household response	
	Market labor	Home production	Market labor	Home production
Employed	(-)*	(-)*	(-)	(+)
- Men	(-)*^	(-)	(-)*	(0)
- Women	(+)^	(-)*	(+)	(0)
- Under 50	(-)*^	(-)*	(-)	(-)
- 50 and over	(-)*^	(-)*	(-)*	(+)
- Lower wealth	(-)*^	(-)*	(-)	(0)
- Higher wealth	(-)*^	(-)*	(-)	(+)
- State/collective sector	(-)*	(-)	(+)	(+)
- Private sector	(-)*	(-)	(-)	(0)
Unemployed	(-)*	(-)	(-)	(-)

* Estimate is statistically significant for hours and/or participation outcomes
^ Estimate is statistically significantly different between subgroups.

Panel B. Spousal health effects on time use

	Individual response		Household response	
	Market labor	Home production	Market labor	Home production
Employed	(+)^	(+)	(-)	(-)
- Men	(+)	(+)*	(+)^	(+)
- Women	(+)*	(0)	(-)*^	(-)
- Under 50	(-)	(0)	(-)	(-)
- 50 and over	(+)	(+)	(-)	(+)
- Lower wealth	(+)*	(-)	(-)	(-)
- Higher wealth	(-)	(+)	(-)	(0)
- State/collective sector	(-)	(+)	(+)	(-)
- Private sector	(+)*	(+)	(-)	(0)
Unemployed	(-)^	(+)	(-)	(+)

* Estimate is statistically significant for hours and/or participation outcomes
^ Estimate is statistically significantly different between subgroups.

Table 61. Summary of estimated magnitudes of health effects for employed individuals from first-difference fixed effects estimates

	Total work hours	Market work hours	Home production hours
Men			
Own health	-1.2	-1.5	-0.2
Wife's health	+0.1	+0.2	+0.5
Women			
Own health	0.0	0.0	0.0
Husband's health	-0.3	-0.1	-0.1
Under 50			
Own health	-0.2	-0.2	-0.2
Spouse's health	-0.5	-0.1	0.0
50 and over			
Own health	-0.6	-1.4	0.0
Spouse's health	+0.4	+0.2	+0.3
Lower wealth			
Own health	-0.9	-1.1	-0.2
Spouse's health	-0.5	+0.3	-0.1
Higher wealth			
Own health	-0.4	-1.0	+0.1
Spouse's health	+0.2	-0.3	+0.3
State/collective sector			
Own health	-0.1	-0.4	0.0
Spouse's health	+0.1	-0.1	0.2
Private sector			
Own health	-0.6	-0.9	-0.1
Spouse's health	-0.3	-0.1	+0.1