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Three Essays on Development Economics

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Abstract

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This dissertation combines research on three topics in development economics. The first paper estimates the long-term labor performance outcomes for a worker subjected to a negative labor market shock upon entry. The second paper, based on joint work with Alain de Janvry and Elisabeth Sadoulet, examines the political economy of public goods provision through community driven development projects in the context of decentralization . The third paper analyzes household behavior under multiple shocks in rural China.

The first paper looks at the impact of labor market shocks upon graduation on the education/work decision and on subsequent employment status in Indonesia where the Asian financial crisis hit in 1997/8. The work/education decision affects the selection of samples when estimating the later impact. Therefore we use a dual selection model to correct the sample selection bias due to the decision process. We find evidence of persistent impacts on later labor market outcomes for junior high and senior high school graduates measured as the probability of working in the informal sector or the agricultural sector.

The second paper identifies the impact of increasing decentralization on community targeting using the unique situation of Zambia's Social Investment Fund (SIF) where the degree of decentralization changed in time and space across districts over the 15 years of program implementation. We find that greater decentralization of SIF's functions to districts that had been deemed to have the necessary level of managerial capacity to deserve decentralization led to more progressive targeting across wards, mildly so at the national level and strongly so within districts. We also observe how local electoral politics gained importance with greater decentralization, with more votes received by the candidate from the majority party in the district council attracting more projects to a ward, and more projects in a ward rewarded by more votes for the councilor from the incumbent party.

The third paper examines who is more likely to be exposed to shocks, which ex-post coping strategies are employed, and how shocks affect the welfare of Chinese rural households using detailed information on a variety of shocks and household characteristics. We find that an increase in medical expenditures due to health shocks has a negative impact on non-medical expenditures: durable consumption is negatively associated with health shocks in two relatively wealthier provinces; food consumption

shows a similar trend among households in the richest province of the sample. Secondly, households who experienced only health shocks have higher medical expenditures than those who experienced both agricultural and health shocks. This suggests that medical insurance schemes in rural China are absent or not functioning well, and that agricultural shocks are also not well-insured.

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Chapter 1

Long-Term Impact of the Asian Financial Crisis on Labor Market Outcome for Market Entrants in Indonesia

1.1. Introduction

Does the labor market conditions when an individual's starts his/her job affect his employment status in later years? During an economic crisis, it is difficult for anyone to find a new job, let alone for new graduates without previous working experience.[1] Those who remain unemployed do not obtain working experience. Even if they obtain jobs, their jobs may be in sectors with low wage premiums or in sectors with lower match quality and they will find it difficult to switch to better-paying or better-matched sectors or firms. This can be partly explained by the existence of sector or firm-specific work experience that hinders them to switch jobs as their tenure goes on.

If there is industry or firm-specific experience, the wage gap between the cohorts who enter the labor market before and during the crisis may persist for some duration of time. Previous research on state dependence (Oyer, 2006; Bertrand and Mullainathan, 2001) has examined the long-term impact of shocks in the initial labor market conditions on wage profiles (Kahn, 2010; Machikita, 2005; Oreopoulos, Wachter, and Heisz, 2006). The current literature has focused on highly-skilled labor in developed countries. In this paper we provide empirical evidence for different groups in different settings: in particular, we examine employment status for labor market entrants in Indonesia at the time before and after the Asian Financial Crisis using panel survey (IFLS). Combining 12 years of working history from the panel households with year and province specific labor market condition constructed eleven years of nationally-representative labor surveys, we have enough temporal and spatial variations in labor market conditions to identify the effects of temporary versus persistent shocks.

Labor market condition at the year of graduation is closely related to what level of education the young people choose. If the graduation year of junior high school is unfortunately in the middle of crisis, one may want to attend high school, hoping that market condition upon graduation of senior high school will be better in addition to gaining higher return on education. The crisis may cause other direction, where someone who intended to continue education to the next level may need to find a job because the crisis hit his/her family severely and may not be able to support school cost. We formulate this schooling and working decision at each step of education completion (i.e. graduation timing) where the new graduates choose to continue or enter the labor

[1] There are several papers which show that young people constitute the majority of the unemployed in a labor market with a high unemployment rate. For example, Magruder (2010) reports that in South Africa, which has a high unemployment rate, the unemployed are concentrated among blacks, rural population and the young.

market, observing the market condition for the cohort.

The estimation results show that a negative shock in the labor market at the time of entry affects current employment status: they are more likely to be in informal sector and in agricultural sector. For example, male high school graduates who enter the labor market with one percent higher fraction of unpaid workers at province level are 0.55 percent more likely to work in informal sector, but this negative effect is slightly diminishing as time passes and is expected to offset in about 14 years.

These finding contribute to the research on the long-term impact of economic performance on individual career formation which has been conducted in a developed countries but not in developing countries with experience of severe crisis. While an extensive literature examines the short-run labor market consequences from a financial crisis, relatively few address the long-term impacts on the labor market. If the effects do persist across time, this suggests a role for the government through such programs as job training.

The remainder of this paper is organized as follows. In section 2, we review the existing literature which examines the long-term impacts of initial labor market conditions on current wages. In section 3, we explain the data set and provide a background on Indonesia during the 1997 Asian Financial Crisis. We explain theoretical frameworks relevant for this analysis in section 4. In section 5, we discuss identification strategy and main results, and conclusion follows thereafter.

1.2. Literature Review: Impact of a Recession/Crisis on the Labor Market Entrants

Several papers have previously focused on long-term labor market outcomes for individuals who enter the labor market during a recession or a crisis. Oreopoulos, Wachter, and Heisz (2006) examined earnings and job mobility of Canadian college graduates during the recession in the early 1980s and 90s. They found that entrants during the recession suffered significant initial wage losses as compared to other cohorts who graduated during a non-recession period. They showed that the impact only fades away after 8 to 10 years. Kahn (2010) examined the effects of the recessions of the early 80s on the wage profile for US college graduates and found initial wage loss of 3-6 percent depending on the specifications and that this disadvantage is persistent even after 18 years. One reason for these persistent effects may be that only college graduates in the United States or Canada who are classified as skilled workers are studied. Accumulating sector or firm specific experience is considered to be more important for skilled workers than unskilled workers. If the return to experience for unskilled labor is low, and if unskilled workers are more likely to switch to better-matched jobs when the economy has recovered, the persistent shock may fade away quickly. Since developing countries tend to have relatively larger shares of unskilled labor, it is particularly important to examine the effects on unskilled workers. In this paper, we look at cohorts with junior and high school graduates as well as university graduates.

The sudden shock on labor markets and unexpected time to recovery distinguishes our analysis from those which look at the effect of recessions because we can treat the Asian Financial Crisis as a natural-experiment. Machikita (2005) examined the impact of the Asian Financial Crisis on employment outcomes in Thailand using dates from the Thai Labor Force Survey, and found that the unemployment rate was initially higher and wages were lower for labor market entrants during the crisis years relative to

cohorts in non-crisis periods, but these effects diminish in the short span of three years. Our identification strategy differs in a number of ways. First, instead of year of entry or cohort dummy, we use province level labor market condition to identify the magnitude of shock. The temporal and spatial variation of labor market condition as shock is also employed in other mentioned literature (Khan 2010 and Oreopoulos, Wachter, and Heisz). Additionally, there is possible endogeneity for the timing of labor market entry. In the setting of post-secondary education, delay of graduation by staying the university for one more semester or one year during the recession is not a rare event. They also may find it benefitable to go straight to graduate school or professional school. In case of graduates of secondary education, the issue is choice of whether they continue education or stop and start working. Our paper provides empirical results which accounts for these potential econometric problems.

1.3. Theoretical Framework

There are several theoretical frameworks that explain relationship between the current employment outcome and loss from initial labor market condition. First, in the standard neo-classical model of wage determination, we should observe the cut in wages only upon the crisis, leaving the serial correlation of labor market conditions as a persistent impact (Oreopoulos, Wachter, and Heisz, 2006). Blanchard and Katz (1992) explain the neo-classical model of wage determination with unemployment which shows the adjustment process of the labor market from an exogenous shock over time (Blanchard & Katz, 1992). Kahn (2010) argues that one version of the search model can predict almost no persistence of the shock (Kahn, 2010). A person is more likely to draw a less matched job during the crisis, but he/she can switch to a better match when the economy recovers. If we assume diminishing marginal returns to experience, the initial loss will be minimal after a certain period of work.

On the other hand, there are theories which postulate that the losses incurred by entrants into the labor market in a downturn are persistent. Kahn (2010) describes a case where an agent invests firm (Jovanovic, 1979), career (Neal 1999), or task-specific experience with the lower matching qualities (Jovanovic, 1979; Neal 1999). When an individual accumulates specific experience with the lower match quality, his/her reservation matching quality increases, and the probability of staying in the sector or firm become higher, in which case the disadvantage will persist at least for a certain period. Based on similar search models by Wright (1986) and Bull and Jovanovic (1988), Machikita (2005) constructed a model which yields testable hypotheses that persistence will diminish over time (Bull & Jovanovic, 1988, Machikita, 2005; Wright, 1986).

Our empirical findings are more in line with the existence of firm/sector specific experiences: we observe persistent negative effect of bad initial labor market condition for male junior and senior high school graduates at least for 14 years after their first entry in Indonesia between 1996 and 2008.

1.4. Indonesian Labor Market and Financial Crisis

The collapse of the Thai Baht in Thailand in 1997 quickly spread the financial crisis to surrounding countries including Indonesia and affected nearly all aspects of Indonesian economy. There is already a wealth of empirical literature studying the

impact of the Asian Financial Crisis on Indonesia. Frankenberg, Thomas, and Beegle (1999) estimate that real GDP in 1998 fell 12 per cent below the 1997 level and household expenditure fell 11 per cent, with the change in composition of goods consumed – fewer semi durables. Thomas et al. (2004) report that the education expenditure's share of household budget declined by over 10 percent in urban areas and by nearly 30 percent in rural areas between 1997 and 1998. Discussion on the effects of the crisis on all aspects of economy is beyond the scope of this paper, so we will pay attention to the literature on labor market consequences. Using panel household survey (IFLS), Sakernas, Smith et al. (2002) found that the overall employment level did not worsen significantly due to the flexibility of the labor market, observing a decrease of only 1 percentage point. But closer examination reveals that there was a significant shift away from the non-agricultural sector to the agricultural sector. The agricultural sector was the only sector which recorded an increase in employment. They also report a decline in the number of wage earners and an increase in the number of self-employed or family workers, especially among the younger generations. Similarly, there is an increase in the people who work as family worker or for unpaid job during the crisis (Figure 1). To take account for the loss of better employment opportunity during the crisis which may not be apparent in the unemployment rate, we use fraction of workers who engage in unpaid work instead of using unemployment rate.

The most severe effect of the crisis appeared in the real wages which collapsed by about 40 per cent between August 1997 and August 1998 especially in the urban sector. Smith et al. found that the wage loss was more prevalent among the young indicating that they were the group most vulnerable to the crisis. Figure 2 shows the trend of real wages for male by age groups. There is a drop in the real wages during 1998; however, it recovers to the rate of before the crisis by 2000 or 2001 for young workers. But these figures do not provide information on how the employment status evolves in later years. We examine these changes on the labor market condition upon entry in detail using recall data of work history between 1996 and 2007.

1.5. Data

Indonesian Family Life Survey (IFLS) was conducted four times during duration of 14 years (1993, 1997, 2000, and 2007/2008). It covered detailed socio-economic information such as education, health, and employment for 13,535 households from 13 out of 27 provinces in Indonesia. In each round, individuals older than fifteen years are asked to recall their history of employment status of all years between survey year and the previous round, recovering up to 1988, which enable us to construct trajectory of employment status since he/she graduated from junior high school and senior high school. The working history from the second wave ranges from 1988 till 1997, and there is relatively more missing information. Therefore, we rely on only the third and fourth waves of the survey. In addition, due to the survey design, we are not able to construct work history for those who started work after finishing elementary schools in the latest wave. In Indonesia, everyone must complete nine years of compulsory education which consists of six years at elementary level and three in secondary level and high fraction of the population continues on to junior high school. Susenas, Suryadarma et al. (2006) studied reasons for not continuing on to junior high school and reported that 6.7 percent of discontinued children cited work as the reason; but only 20 per cent of those who answered this way were actually working. Simple calculation indicates a little more than 1 per cent of children choose to work after primary school. On the other hand,

there is not enough observation for those who acquires higher than bachelor or 2-year college degree in the time of study Therefore, we focus on junior high school and senior high school graduates although we consider selection bias from obtaining the post-secondary education.

Employment outcomes we are interested in are whether one worked formal/informal sector, and if they worked for agricultural sector, that are in line with other empirical literature on the Asian Financial Crisis. Unfortunately, recall information of monthly wage is not available for the last wave, and even for the available waves, recall data of wage for the past several years makes hard to bring clean estimation results. We supplement wage dynamics drawn from the repeated cross sectional labor force survey with additional untested assumptions. We also construct proxy of labor market condition from the labor force survey because of abundance of observation for constructing aggregate data at province level whereas IFLS does not contain enough observation to do so. Sakernas, a repeated cross-sectional labor force survey, is conducted every year since 1986 by the Central Agency of Statistics of Indonesia (BPS).[2] Sakernas is a nationally-representative survey from all provinces containing approximately 35,000 households or 250,000 individuals each year.[3] The survey provides data in terms of household demographics, age, and gender of all household members. All household members above the age of 10 are asked labor-related information including educational achievement, activities during the previous week, work status, sector, working hours the previous week, wages in the previous week and the previous month. Since 1992, the survey has been conducted in August every year. This ensures that there is no seasonality effect on employment or wages. Figure 1 shows trend of labor market condition among young workers from 1986 to 2004. In the late 1980's the fraction of unpaid workers had as high as sixty percent among those at 16 to 18 years old but this rate steadily decreased up to 1995. The rate again rose after 1997 and the rising rate does not seem to stop up to 2004. Combining recall data of employment status from IFLS and the local labor market condition constructed from Sakernas, we first examine how the market entrants or new graduates decides their choice of human capital investment and first career. Then we explore how their first careers, if different across the status of labor market, evolves. In other words, we examine if new workers' career during bad economy diverges or converges to those in the good time. We analyze this trajectory by the level of human capital they have invested.

1.6. Empirical Strategy and Main Results

1.6.1. Career Choice upon Graduation

Individuals who are graduating junior high school choose to continue their education at high school level or to stop investing in education and start to work. Local labor market condition at this time is one of the important factors to make this education/work decision. If the labor market is bad, it is reasonable to continue education hoping that market environment becomes favorable when they graduate the next level of institution. We postulate that graduates form an expectation of his/her future employment outcome if they continue to the next level of education by looking at

[2] In 1995, BPS conducted SUPAS (intercensal demographic survey) instead of Sakernas. SUPAS covers almost all the questions asked in Sakernas, and contains about three times as large sample as Sakernas.

[3] IFLS (Indonesian panel survey) is conducted in 13 provinces.

the labor market those who are graduating that level are currently facing. If these three or four years older cohorts are not facing favorable market, graduates are discouraged to continue education. We exclude the possibility of graduates knowing the business cycle so that they adjust information of elder's market condition based on the cycle. This assumption is reasonable at the time of study because the financial crisis disrupted in the middle of study period when few people could predict the economic performance even two or three years ahead. We also include dummy of whether a student failed a grade during the school years and normalized scores of graduation tests (EBTANAS/UAN/UN) in decision equations.

Senior graduates face another selection stage in addition to the decision upon graduating junior high schools. Those who chose to enter senior high school after junior high school then face a new decision on whether they continue education to college or university. The decision at this stage is also influenced by the labor market conditions at that moment. We take this dual sequence of selection process into the estimation of the effect of later market shock on first career choices. There has been a fair amount of literature addressing double selection process and correcting the selection biases (Catsiapis and Robinson, 1982; Krishnan, 1990; Mohanty, 2000; Mohanty, 2001; Solensen, 1989; Vijverberg, 1995). Unlike in the conventional Heckman's two-step procedure which corrects selection bias using a single selection model, these authors formulate multiple selection models to estimate the outcome equation. The main idea for correcting the selection bias is similar to conventional two step approach: first we estimate selection probabilities from the selection models, compute mills ratios, and introduce mills ratios to the outcome equation, which we have outlined below. Vijvererg (1995) shows that in the presence of dual selection process for the wage equation, there is a selection bias without correction of sample selection using double-lambda method. He also shows that the correction through single lambda method from the single equation which accounts two selection processes does not correct the sample selection bias. We employ double lambda method for correcting sample selection bias in this analysis. Consider the following discrete choice model:

$$Y_{ipt}^{*1} = \alpha_1 X_{ipt}^{1} + \alpha_2 L_{pt}^{0} + \alpha_3 L_{pt}^{h0} + \nu_{1t} + \mu_{1p} + \varepsilon_{1ipt} \qquad \textbf{(1)}$$

Y_{icrt}^{*1} denotes schooling/working choice of individual 'i' in the province 'p' of at the year of graduation 't'. X_{ipt}^{1} is individual characteristics for person 'i'. L_{p}^{0} denotes labor market condition in the province 'p' at a time when an individual 'i' completed the education. Senior high school graduates face another decision equation;

$$Y_{ipt}^{*2} = \beta_1 X_{ipt}^{2} + \beta_1 L_{pt}^{0} + \beta_1 L_{pt}^{h0} + \nu_{2t} + \mu_{2p} + \varepsilon_{2ipt} \qquad \textbf{(2)}$$

where L_{pt}^{0} is labor market condition among high school graduates and L_{pt}^{h0} is labor market condition among university/college graduates. These decision equations lead to the career decision at the first year of market entry that is formulated as follows:

$$Y_{ipt} = \gamma_1 X_{ipt}^{3} + \gamma_2 L_{p}^{0} + \nu_{3t} + \mu_{3p} + u_{ipt} \qquad \textbf{(3)}$$

where Y_{ipt} is career decision after individual 'i' enters labor market. We consider whether the new workers work in the formal sector or informal sector. Additionally, we examine if graduates started their career in the agricultural sector to consider if the agricultural sector absorbed workforce pushed out from other sector as discussed in the previous literature. Unlike standard wage regressions where it is necessary to control individual ability for unbiased estimation of return to school, the necessity assumption

for unbiased estimates of γ_2 is that individual unobservable characteristics are orthogonal to local labor market shocks. Assume that the error distributions of equation (1), (2), and (3) as standard multivariate normal distribution. Let us denote,

$\mathrm{Var}(u_{ipt})=\sigma_v^2$

$\mathrm{Cov}(u_{ipt},\varepsilon_{1ipt})=\sigma_{v1}$

$\mathrm{Cov}(u_{ipt},\varepsilon_{2ipt})=\sigma_{v2}$

$\mathrm{Cov}(\varepsilon_{1ipt},\varepsilon_{2ipt})=\rho$.

$\mathrm{Var}(\varepsilon_{1ipt})=\mathrm{Var}(\varepsilon_{2ipt})=1$.

By following Heckman (1979), Mohanty (2001) shows that

$\mathrm{E}(u_{ipt} \mid Y_{ipt}^1=1 \cap (Y_{ipt}^2 \mid Y_{ipt}^1)=1) = \sigma_{v1}^2\lambda_{ipt}^1+\sigma_{v2}^2\lambda_{ipt}^2$,

where $\lambda_{1ipt} = \phi(\alpha\ X_{ipt}^1)*\Phi(A_{ipt})/F(\alpha\ X_{ipt}^1,\beta\ X_{ipt}^2,\rho)$,

$A_{ipt}=\dfrac{(\beta X_{ipt}^2-\rho*\alpha X_{ipt}^1)}{\sqrt{1-\rho^2}}$, $\lambda_{2ipt} = \phi(\beta X_{ipt}^2)*\Phi(B_{ipt})/F(\alpha X_{ipt}^1,\beta X_{ipt}^2,\rho)$,

$B_{ipt}=\dfrac{(\alpha X_{ipt}^1-\rho*\beta X_{ipt}^2)}{\sqrt{1-\rho^2}}$, and F is a bivariate standard normal distribution. After computing λ_{1ipt} and λ_{2ipt}, we estimate the following outcome equation,

$$Y_{ipt}=\gamma_1 X_{ipt}+\gamma_2 L_p^0+\sigma_{v1}\lambda_{1ipt}+\sigma_{v2}\lambda_{2ipt}+\nu_t+\mu_p+u_{ipt} \qquad (4)$$

by OLS. To compute λ_{1ipt} and λ_{2ipt}, we estimate coefficients of the two selection equations and ρ by maximum likelihood. Note that if there is no correlation between the two selection equations (ρ =0), and the outcome of the second equation is not conditional on the first outcome, we can estimate each selection equation and compute the inverse of the mills ratio separately. By a similar argument as the SUR, we exploit the correlation between the two selection equations for more efficient estimation. The issue in estimating two equations is partial observability: the outcome of the second equation depends on the first outcome. Meng and Schmidt (1985) provide the likelihood function for estimation with this partial observability, which is:

$$\begin{aligned} l = &\sum Y_{ipt}^1 * Y_{ipt}^2 \ln F(\alpha X_{ipt}^1,\beta X_{ipt}^2,\rho) \\ &+(1-Y_{ipt}^1)*\ln\Phi(-\alpha X_{ipt}^1) \\ &+Y_{ipt}^1*(1-Y_{ipt}^2)*\ln[\Phi(\alpha X_{ipt}^1)-F(\alpha X_{ipt}^1,\beta X_{ipt}^2,\rho)]. \end{aligned} \qquad (5)$$

The parameters α, β, and ρ in the equation (5) are estimated through maximum likelihood estimation.

Table 1 provides estimates of marginal probabilities of work/education decision for male junior high school and senior high school graduates. 1st and 3rd column shows estimates by the linear probability models and 2nd and 4th column show estimates by the probit model and two stage probit models. First note is that junior high school graduates are one percent more likely to continue education instead of starting to work when the fraction of unpaid worker among junior high school graduates is one percent higher at province level (column 1). At the same time, they are one percent more likely to finish education and start to work if the fraction of unpaid worker among senior high school graduates is one percent higher at province level. Observing the severe labor market condition of close cohorts is functioning as deterrent of labor market entry, but further expecting the severe market condition upon graduating senior high school promotes to work now instead of continuing education to senior high school. The marginal probability of the labor market conditions is net effect of this deterrent force and promoting force such as income loss of the household associated with recession. On the other hand, labor market conditions have relatively smaller impacts on education / work decision among senior high school graduates (columns 3 and 4). It is possible that hurdle of entrance into college or university such as entrance exam is harder than that of senior high school entrance and university or college education may not be a valid option for everyone as a way to avoid bad labor market condition.

Test scores are positively associated with the probability of continuing education across all specifications. Graduates with test score of one standard deviation higher than mean test score are 7 to 9 percent more likely to continue to higher educational level. The indicator of failing a grade provide similar context. Senior high school graduates who failed a grade during school years are 16 percent more likely to stop education (column 4). The number of sibling in school has consistently negative effect on finishing education after controlling labor market condition. It can be interpreted as heterogeneity across households such as network effect among siblings and income level. Lastly inverse of mill's ratio from the first selection equation is significant in the second selection equation, implying there are correlations among observables in these equation and necessity of correcting the selection bias.

Table 2 shows career choice among graduating cohort, conditioned that working decision is made through equations (1) and (2). Coefficient estimates by OLS and model with sample selection correction are consistently similar in magnitude when we look at marginal probability of career choice by labor market condition, so we mainly discuss on estimates with sample selection correction. Junior high school graduates are one percent more likely to work in informal sector when the fraction of unpaid worker among junior high school graduates is one percent higher at province level (column 3). In the same condition, these young workers are 1.2 percent more likely to work in agricultural sector, which is consistent with the literature documenting agricultural sector absorbs workforce in recession, especially in the financial crisis. Senior high school graduates who choose to work also have similar marginal probability of working in informal sector (0.74 percent in column 7) and agricultural sector (0.69 percent in column 8). In summary, labor market condition upon graduation affects education/work decision and career decision among junior high school graduates whereas it affects only career decision among high school graduates. These findings are consistent with literature on labor markets right after the financial crisis (Smith et al. 2002). We turn to long terms impacts of these shocks in the following section.

1.6.2. Long Term Effect of Initial Labor Market Condition

In the previous section we show that local labor market condition upon graduation influenced education and immediate career choices for graduating cohorts. Those who graduated in bad year such as the year of the financial crisis are more likely to enter informal sector and agricultural sector for both junior and senior high school graduates. The next question is how long does this impact continue. To estimate the initial loss and persistence, we formulate the following outcome specification:

$$y_{ipt} = \beta^0 X_{ipt} + \beta_1 L_p^0 + \beta_2 L_p^0 * \exp_{ipt} + \phi_{pt} + \upsilon_{ipt} \qquad \textbf{(6)}$$

where $\exp_{ipt}$ denotes duration after the graduation year. β_1 captures impact of labor market condition upon entry on the current wage rate. β_2 measures how the impact of initial labor market condition alters by the duration after graduation. ϕ_{pt} is province-year specific unobservable characteristics to take account of current labor market condition. The variable of interest is whether the young workers are formal or informal sector, and in agricultural sector several years later as in the previous estimation. Due to the limitation of data, we consider experience of 6 years, so it may be considered as medium term impact. As we considered in the previous section, we present OLS results and those with sample correction.

Table 3 shows the OLS estimates and estimates with sample selection correction that are discussed previously. Since two estimates are not so different, we focus on the estimates with sample selection correction. For junior high school graduates, we find persistent effect of local labor market condition upon graduation that does not disappear with time after graduation: coefficients and standard errors for interaction of labor market condition and duration after graduation are much smaller than those of labor market condition. The bad initial local labor market condition tends to increase probability of graduates working in informal sector or agricultural sector, but once they are in the sector, they seem to stay in the same sector. On the other hand, senior high school student have less persistent effect on market condition for probability of staying in informal sector. One percent higher fraction of unpaid worker at province level is associated with 0.55 percent higher percentage of working in informal sector, but one year of experience reduce this probability by 0.038 point percentage, which imply the influence of initial labor market may disappear in about 14 years, assuming the same rate of reduction even after 6 years.

1.6.3. Migration and Potential Endogeneity

It is possible that when labor market condition at the time of graduation is severe, some graduates migrate to the location with better market condition. The Table 4 shows that 12 percent of young workers cross the provincial border during first two years after graduation. In the US labor market for young workers, Kennan and Walker (2011) shows interstate migration decision of young white male is largely explained by difference in labor market condition: mean income difference. Although provincial migration situation in Indonesia can be different from that of the US, it is reasonable to assume labor market difference affects migration decision. If they find a job in formal sector or non-agricultural job simply because the new location has favorable market condition, it underestimates the effect of the market condition at origin.

Table 6 shows the estimates of the effect of labor market condition on the migration decision during the first two years after graduation for junior and senior high school graduates. We do not observe significant influence of labor market condition on migration decision with this simple linear probability model, but it may be simply due to the imprecise estimation or high standard error with small number of observations and less variation in decision variables.

To explore endogeneity due to migration further, we compare long term employment outcomes among those who stayed in the same province and those who crossed for the period of study. Table 6 shows similar estimation results as Table 3 for migrants and non-migrants. The results indicate small difference among migrants and non-migrants who graduated senior high schools where as we observe bigger effect of labor market shock upon being in agricultural sector for non-migrant who got job after junior high school. It is reasonable that migrating junior high school graduates are more likely to hold a job in non-agricultural sector than non-migrating counterparts. Somewhat more puzzling result is that this mitigation of employment outcome by migration is apparent only in junior high school graduates that calls for further research.

1.6.4. Long Term Impact on Wages using Repeated Cross Sectional Data

Unfortunately, we are not able to construct history of clean wage data from recall data; therefore, we cannot estimate impact of initial labor market condition on wage outcome which is one of the important employment outcomes. However, we supplement previous findings with estimates of impacts on wage outcome using repeated cross sectional labor force survey (Sakernas) that we used to construct local market condition. But as repeated cross sectional data requires us to rest on untestable assumptions for the estimation, we need to be cautious in interpreting the results. Sakernas does not collect recall history of wage or employment status, thus, we only observe one year of data per individual. We do not know the province or specific year they finished their education. Therefore, we aggregate labor market to island level so that postulating few of new graduates cross islands to look for better labor market. For the issue of unobserved graduation year, we construct expected graduation year from age and year of education an individual earned.

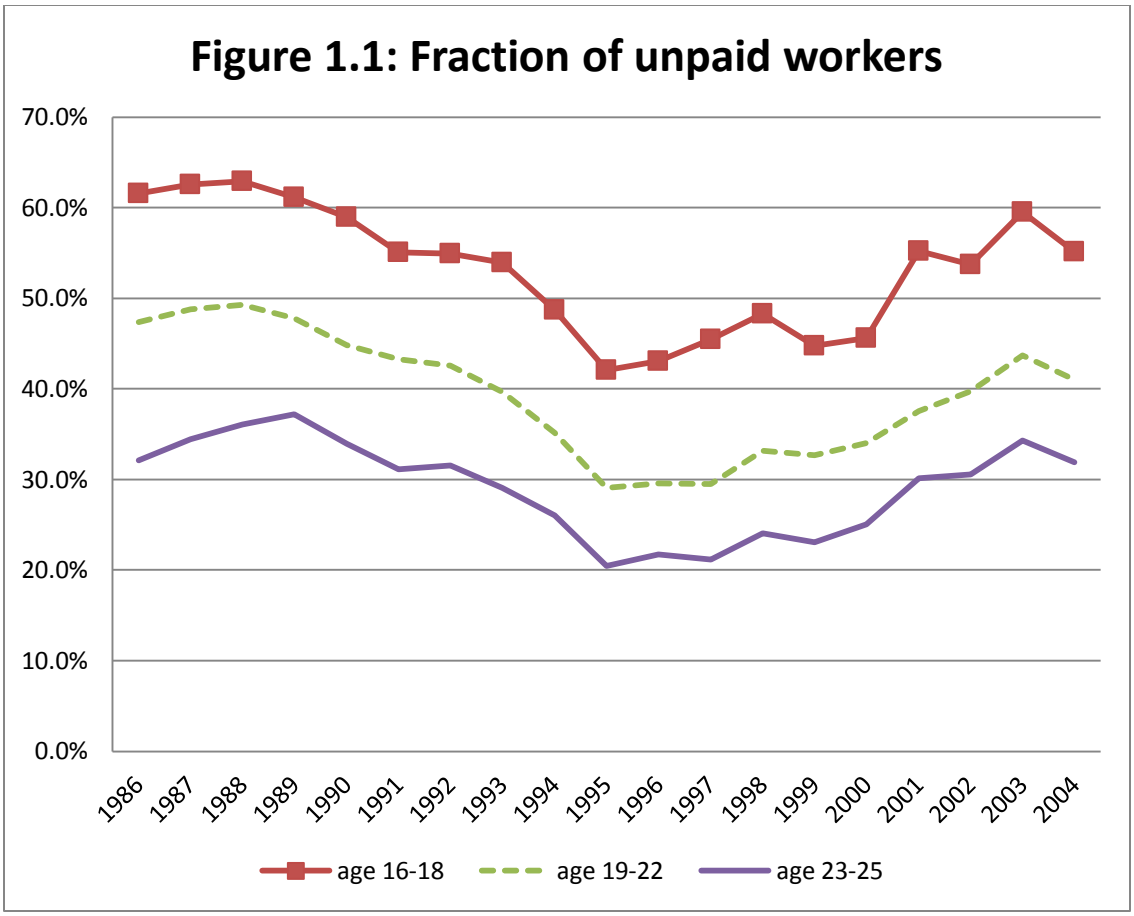
With that said, Table 7 shows the long term impact of initial labor market condition on current wage for junior high school and senior high school graduates[4]. Both OLS estimation and estimation with sample correction shows similar results in terms of order of magnitude: the negative shock on wage by the initial market condition is observed for senior high school. For senior high school graduate, those who enter labor market with ten percentage point higher in the fraction of unpaid worker observes 2 percent lower wages at the time of survey; this does not seem to disappear at least 6 years of observable period. The interaction of market conditions and experience seem not to decimate the initial shocks, observing no statistical significance at all level. Previous literature has also found persistent shocks which lasts longer than 5 years when they look at the effects on the wages of college graduates. Our results complement their findings by showing the persistent effects on the wages of unskilled labor in developing countries, even though we need to be cautious when comparing results from very different settings.

[4] We use national CPI from the World Bank World Development Indicators to construct real wages.

1.7. Conclusion

This paper analyzed persistence of negative effect from initial labor market shock upon the first entry in Indonesia during the Asian Financial Crisis using recall history of employment status from the panel survey, supplemented by repeated cross-sectional labor force surveys. Endogeneity due to the sequential decision incurring from data generating process is accounted for by a dual sample selection model. Estimation results from the two-step procedure show that the initial negative shock on labor market affects employment outcome for male junior and senior high school graduates significantly, and persists at least for 14 years. This evidence complements previous literature on the state dependence of wage outcomes for skilled workers in developed countries with evidence of persistent effects from recession.

The findings of this paper also have some policy implications: the government should take extra care for those who were unfortunate enough to join labor market during a downturn in the economy through additional training programs or arrangements that enhance job mobility across sectors, especially between agricultural and non-agricultural sector.



Source: computed by author from Sakernas

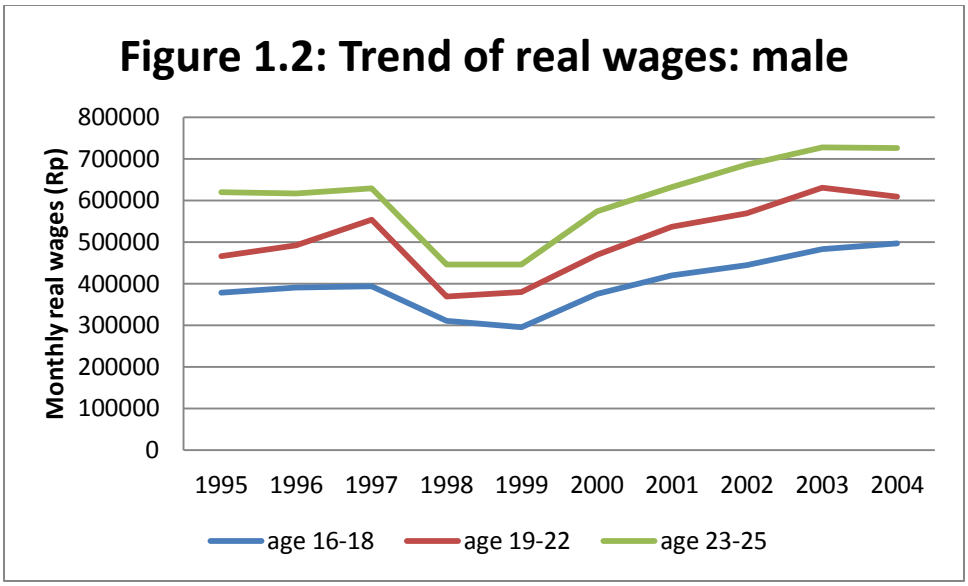


Figure 1.2: Trend of real wages: male
Monthly real wages (Rp)
800000
700000
600000
500000
400000
300000
200000
100000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
age 16-18
age 19-22
age 23-25

Table 1.1: Probability of not continuing education upon graduation of :

	(1)	(2)	(3)	(4)
Dependent variable	stop at junior high		stop at senior high	
	OLS	probit	OLS	probit
Labor market condition among graduates of same education level	-1.038***	-1.091***	0.120	0.210**
	(0.206)	(0.224)	(0.322)	(0.0791)
Labor market condition among graduates of higher education level	1.535***	1.594***	-0.0890	-0.228*
	(0.270)	(0.286)	(0.424)	(0.104)
Dummy: failed a grade	0.107	0.128	0.117	0.162***
	(0.108)	(0.121)	(0.0828)	(0.0249)
Test score (normalized)	-0.0851***	-0.0936***	-0.0749***	-0.0798***
	(0.0129)	(0.0157)	(0.0113)	(0.00277)
Number of siblings in school	-0.0460***	-0.0514***	0.0226	-0.0256***
	(0.00777)	(0.00973)	(0.0133)	(0.00269)
age	-0.154	-0.154	-0.241	0.0248*
	(0.204)	(0.213)	(0.252)	(0.0108)
age squared	0.00278	0.00269	0.00484	-0.000470*
	(0.00440)	(0.00455)	(0.00491)	(0.000194)
Inverse mill's ratio				0.839***
				(0.113)
Fixed effects	province, year	province, year	province, year	province, year
Number of Observations	2437	2437	2101	2101

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<0.05, ** p<0.01, *** p<0.001

Table 1.2: Estimates for the effect of local labor market condition on the career choice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Junior high school				Senior high school			
	OLS		with correction		OLS		with correction	
	unpaid	agsec	unpaid	agsec	unpaid	agsec	unpaid	agsec
labor market condition	0.679**	0.998***	1.059**	1.208***	0.748***	0.714***	0.742***	0.685***
fraction of unpiad worker	(0.213)	(0.208)	(0.324)	(0.304)	(0.170)	(0.158)	(0.215)	(0.191)
age	-0.800	-0.751	-0.597	-0.556	-1.154*	0.510	-1.634*	-0.0245
	(0.601)	(0.569)	(0.794)	(0.710)	(0.542)	(0.491)	(0.642)	(0.607)
age squared	0.0162	0.0155	0.0114	0.0109	0.0238*	-0.00902	0.0322*	0.000372
	(0.0133)	(0.0126)	(0.0175)	(0.0157)	(0.0108)	(0.00969)	(0.0128)	(0.0120)
Inverse mill's ratio selection at graduating junior high			-0.00176	-0.140			-0.926	2.312*
			(0.189)	(0.180)			(1.022)	(0.985)
Inverse mill's ratio selection at graduating senior high							-1.948	1.451
							(1.086)	(1.059)
Fixed effects	province, year	province, year	province, year	province, year	province, year	province, year	province, year	province, year
Number of Observations	233	238	233	238	602	609	602	609
adj. R-sq	0.056	0.113	0.046	0.164	0.081	0.034	0.098	0.028

Standard errors in parentheses
* p<0.05,** p<0.01, *** p<0.001

Table 1.3: Estimates for the effect of local labor market condition on the current employment status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Junior high school				Senior high school			
	OLS		with correction		OLS		with correction	
	unpaid	agsec	unpaid	agsec	unpaid	agsec	unpaid	agsec
labor market condition	0.548***	0.739***	0.545***	0.738***	0.563***	0.562***	0.547***	0.569***
fraction of unpiad worker	(0.112)	(0.111)	(0.112)	(0.111)	(0.0730)	(0.0712)	(0.0729)	(0.0712)
interacted with experience	-0.0382	0.0149	-0.0343	0.0155	-0.0465**	-0.0181	-0.0384*	-0.0216
	(0.0256)	(0.0255)	(0.0258)	(0.0256)	(0.0169)	(0.0165)	(0.0170)	(0.0166)
age	-0.0218	0.0749	-0.0507	0.0703	0.0638*	0.0867***	0.0649*	0.0866***
	(0.0500)	(0.0497)	(0.0530)	(0.0527)	(0.0268)	(0.0261)	(0.0268)	(0.0261)
age squared	0.000131	-0.00196*	-0.0000814	-0.00199*	-0.00113*	-0.00148**	0.00165**	-0.00126**
	(0.000946)	(0.000939)	(0.000954)	(0.000947)	(0.000472)	(0.000459)	(0.000481)	(0.000468)
Inverse mill's ratio selection at graduating junior high			0.102	-0.0575			0.401**	-0.379**
			(0.0812)	(0.0809)			(0.147)	(0.141)
Inverse mill's ratio selection at graduating senior high							-0.108	0.225
							(0.153)	(0.145)
Fixed effects	province-year	province-year	province-year	province-year	province-year	province-year	province-year	province-year
Number of Observations	2542	2561	2542	2561	6064	6111	6064	6111

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<0.05, **p<0.01, *** p<0.001

Table 1.4 : Descriptive statistics of migration status among young workers

	Junior high		Senior high or higher	
	mean	sd	mean	sd
number of migration across province during the first 2 years after graduation for any reason	0.15	0.42	0.21	0.51
number of migration across province during the first 6 years after graduation for any reason	0.33	0.74	0.38	0.76
number of migration across provinceduring the first 2 years after graduation for work reason	0.11	0.36	0.13	0.39
number of migration across province during the first 6 years after graduation for work reason	0.22	0.57	0.21	0.55
number of migration across provinceduring the first 2 years after graduation for any reason	0.06	0.26	0.09	0.33
number of migration across province during the first 6 years after graduation for any reason	0.14	0.47	0.16	0.49
number of migration across provinceduring the first 2 years after graduation for work reason	0.04	0.2	0.05	0.25
number of migration across province during the first 6 years after graduation for work reason	0.09	0.35	0.09	0.35
Number of observations	2640		6918	

Table 1.5 : Estimates of the effects on migration decision by labor market condition, by level of education

	(1)	(2)	(3)	(4)
	Junior high school		Senior high school	
Dependent variable:	Dummy: migrated during 2 years after graduation for any reason	Dummy: migrated during 2 years after graduation for work reason	Dummy: migrated during 2 years after graduation for any reason	Dummy: migrated during 2 years after graduation for work reason
labor market condition	0.0284	-0.00352	-0.121	-0.0922
fraction of unpiad worker	(0.169)	(0.150)	(0.171)	(0.158)
age	-0.00796	-0.0246	-0.0534	-0.0874
	(0.0836)	(0.0743)	(0.110)	(0.102)
age squared	0.000460	0.000762	0.000610	0.000928
	(0.00154)	(0.00137)	(0.00186)	(0.00171)
Fixed effects	province-year	province-year	province-year	province-year
Number of Observations	1194	1194	2143	2143
adj. R-sq	0.032	0.029	0.066	0.052

Standard errors in parentheses
* p<0.05,** p<0.01, *** p<0.001

Table 1.6 : Estimates for the effect of local labor market condition on the current employment status, by migration statu

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Those who migrated in 6 years for all reasons				Those who stayed in the same province in 6 years			
	Junior high school with correction		Senior high school with correction		Junior high school with correction		Senior high school with correction	
	unpaid	agsec	unpaid	agsec	unpaid	agsec	unpaid	agsec
labor market condition	0.792**	0.215	0.478*	0.558*	0.850***	1.215***	0.510***	0.476***
fraction of unpiad worker	(0.285)	(0.303)	(0.206)	(0.234)	(0.169)	(0.166)	(0.109)	(0.101)
interacted with experience	-0.106	0.0935	-0.0827	-0.0271	-0.0874*	-0.0623	-0.0197	-0.00491
	(0.0643)	(0.0683)	(0.0479)	(0.0546)	(0.0385)	(0.0376)	(0.0255)	(0.0236)
age	-0.0635	-0.160	0.0689	0.000128	0.0933	0.240**	0.0864*	0.0574
	(0.157)	(0.167)	(0.0952)	(0.110)	(0.0757)	(0.0738)	(0.0420)	(0.0388)
age squared	0.000966	0.00104	-0.00144	0.000846	-0.00171	-0.00436**	-0.00168*	-0.00108
	(0.00294)	(0.00312)	(0.00154)	(0.00177)	(0.00138)	(0.00135)	(0.000710)	(0.000655)
Inverse mill's ratio selection at graduating junior high	0.0694	0.133	0.584*	-0.858**	0.00884	-0.0839	0.283	-0.340*
	(0.144)	(0.151)	(0.242)	(0.280)	(0.0871)	(0.0853)	(0.160)	(0.148)
Inverse mill's ratio selection at graduating senior high			-0.215	0.0886			-0.0231	0.229
			(0.330)	(0.382)			(0.167)	(0.154)
Fixed effects	province-year	province-year	province-year	province-year	province-year	province-year	province-year	province-year
Number of Observations	375	377	759	764	1758	1774	4300	4328

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<0.05, **p<0.01, *** p<0.001

Table 1.7: Effect of initial labor market condition on current wage:

	Dependent variable			
	Log monthly wage			
	OLS		With sample correction	
	Junior high school graduates	Senior high school graduates	Junior high school graduates	Senior high school graduates
	(1)	(2)	(3)	(4)
Fraction of unpaid workers upon graduation at island level	0.110	-0.177**	0.129	-0.202*
	(0.112)	(0.0589)	(0.115)	(0.0894)
Interacted with experience	-0.00214	0.00861	-0.00803	0.00538
	(0.0258)	(0.0117)	(0.0261)	(0.0140)
Inverse mill's ratio for choice upon junior high graduation			-0.150	0.347
			(0.108)	(0.303)
Inverse mill's ratiofor choice upon senior high graduation				0.0770
				(0.329)
Observations	12672	29227	12672	27166
	12.79901	13.10488	12.79901	12.97875
Adjusted R square	0.416	0.471	0.416	0.434

Notes: All specifications include province-rural/urban-year index variables, age and square of age

Chapter 2

Pro-poor Targeting and Electoral Rewards in Decentralizing to Communities the Provision of Local Public Goods in Rural Zambia

2.1. Introduction

Citizen participation in the provision of local public goods has been widely pursued in developing countries in the past decades. This has been the hallmark of the Social Investment Fund (SIF) approach to deliver small-scale social and economic investment projects to communities, initially introduced to mitigate the negative impacts of adjustment policies on the poor (Rawlings, Sherburne-Benz, and van Domelen, 2001). Under this approach, community-based organizations (CBO) were invited to submit project proposals to an ad-hoc central agency that had the responsibility of selecting from among proposals received, providing budget support, and monitoring the implementation of projects. This approach to the delivery of local public goods was based on the presumption that delegating to CBOs the responsibility of identifying projects for investment in local public goods could improve their poverty reduction effectiveness compared to a top-down approach because of asymmetric information available at the local level. Which communities were selected for support, and which projects were funded within these communities, depended, however, on the particular capacity of each community's CBOs to formulate demands and get them approved by the central agency.

Because community capacity is quite uneven, and citizen interests are highly unevenly represented by CBOs, questions arose as to whether this approach would effectively serve the poorer communities. For this reason, the centralized SIF methodology gradually evolved toward a more decentralized approach giving greater roles to a structured representation of local interests. Local representation could be through the district administration, often with the assistance of an appointed development council in charge of representing the interests of the communities in the district, consisting of wards in the case of Zambia as the lowest formal administrative units. Under partial decentralization, the district was charged with receiving project proposals from CBOs, appraising these projects, transmitting to the central agency project appraisals, and monitoring implementation of projects that had received budgetary support from the central agency. Under complete decentralization, the districts received budgetary transfers from the SIF under the form of Community Investment Funds that they could allocate across wards in response to CBO project

proposals (Figure 1).

The decentralized SIF approach, often referred to as Community-Driven Development (CDD), met with considerable support among international development agencies as a pro-poor instrument to allocate funds to the provision of local public goods and to support local productive projects. It was estimated that, in 2003, up to one fourth ($7 billion) of the World Bank's annual disbursements were occurring through this modality (Mansuri and Rao, 2004). As district administrative capacity was gradually strengthened by purposeful interventions of the central agency, district roles were correspondingly increased. From playing an intermediary role between CBOs and the central SIF agency under partial decentralization, districts were gradually entrusted with greater responsibilities in resource disbursement. The ultimate step was the complete decentralization of SIF resources, eventually transferring to districts a lump-sum investment fund to be competitively allocated to the projects submitted by CBOs in the wards composing the district.

In spite of large scale implementation of the modality, there are still few evaluations of the role of decentralization in the SIF approach to the delivery of local public goods, leaving strong reservations about the actual effectiveness of the approach and the conditions for success (World Bank, 2006). The main issue that requires evaluation is the trade-off that may exist between taking advantage of local information and local social capital to better target resources on the poorest communities; and the risks of capture of benefits by richer communities and by local elites and politicians (Platteau and Gaspard, 2003).[5]

Previous research gave mixed evidence on the pro-poor value of decentralization. The first stream of literature comes from comparison between before and after the decentralization. Faguet (2003) found that municipal decentralization in Bolivia allowed to better adjust public expenditures to the specificity of community needs in human capital formation and social services, particularly in the poorest municipalities. This result is important as it shows that gains can indeed be achieved for the poor through decentralization, as opposed to inevitably leading to capture by local elites as had generally been expected. There is a closely related literature that examine targeting performance for pro-poor programs at different levels of administrative units (e.g. districts and villages, inter and intra villages). For example, Paxon and Schady (2002) found that Peruvian SIF was better at reaching the poorest communities but not the poorest households within communities. In this case, capture was an intra-community phenomenon as project benefits did not reach the neediest. Galasso and Ravallion (2005) for Bangladesh, Alderman (2002) for Albania, Arcand and Bassole (2006) for Senegal, and Bardhan and Mookherjee (2006) for West Bengal all found the opposite, namely that inequality in the appropriation of benefits of decentralized programs was more an inter-community than an intra-community problem. In addition to responsiveness, detailed evidence on the factors influencing the targeting and the characteristics of the beneficiaries have been documented for different programs. In Senegal, it is regional politics that is important in influencing the allocation of projects across communities in a CDD approach to local public goods, leading to eventual "community capture" (Arcand and Bassole, 2006). In Thailand, it is the differential social capital endowment of a community, in particular the strength of its organizations and networks, and not necessarily its wealth, that determines its success in attracting CDD projects (Chase, 2006). Combining inter- and intra-community distribution of Zambia's SIF benefits across households, Chase and Sherburne-Benz (2001) observed that the program

[5] For a review of the relationships between decentralization and accountability, see Bardhan and Mookherjee (2005).

reached poor households in rural areas, but not in urban areas where benefited households were better off than urban households overall. Van Domelen (2002) analyzed six social funds in Armenia, Bolivia, Honduras, Nicaragua, Peru, and Zambia and concluded favorably that investments were generally targeted at the poorer districts and benefited more the poorer households, and that they largely responded to stated community needs. But Rao and Ibáñez (2003) found that, in the Jamaican social fund, gains were extensively captured by the elites within the community.

Hence, evidence about the needs-capture tradeoff is mixed at both the community and the individual level, and outcomes depend on local specificities and program implementation. To identify the effectiveness of decentralization relative to other aspects of program implementation, we need to observe an evolution from centralized SIF to decentralized SIF across similar other program characteristics and local environments. The necessary situation for that analysis would be to have two categories of districts: one within which local communities or individuals receive the service from centrally operated SIF, and one that delivers the same program to local communities. Selection of districts is a relevant issue not only for the econometric reason but also in the context of decentralization. If heterogeneity in the competency of local administrative officials is large, it is a wise strategy to only delegate to authorities that are deemed capable enough to deliver the service effectively. In this sense, we need to consider the 'treatment effect of the treated' in a sense of measuring how decentralization changes the effectiveness in targeting when the function is only given to capable local authorities.

Zambia offers a unique laboratory to analyze the progressivity / regressivity in targeting of the SIF approach under different levels of decentralization. It has had a sustained 16 years experience with participatory SIF projects administered through different levels of decentralization: two centrally managed SIFs -- SRP I (1990-1994) and SRP II (1995-1999) --, and an increasingly decentralized SIF -- ZAMSIF (2000-2005) --, with increasing decentralization of control over resources to districts deemed capable of performing this function, ultimately converging into full decentralization. Under ZAMSIF, the degree of devolution of control over resources was increased with district administrative capacity, from capacity category A with no decentralization, to capacity category B with partial decentralization, and to capacity category C with a high and ultimately complete level of decentralization. Therefore, our identification strategy of the role of decentralization in SIF projects rests on comparing the changes in the within-district allocation of projects across time and district types, analogous to a difference in difference approach. We then analyze the relation between politics and projects to assess how increasing decentralization enhances the relevance of local politics in the allocation of local public goods, both in going from votes received by local politicians to project allocation, and from projects received by wards to votes earned by local incumbent politicians.

2.2. Zambia's Social Investment Fund Programs

The SIFs in Zambia had the objective of funding small, simple, and locally initiated projects to mitigate the hardships that poor communities were facing under structural adjustment following the debt crisis.[6] Under SRPI and SRPII, the Micro Project Unit (MPU) of the Ministry of Finance was the central agency in charge of project selection

[6] A detailed explanation of how SIFs functioned is provided by Chase and Sherburne-Benz (2001).

and resource allocation. Staff of the provincial offices of MPU provided information on potential funding opportunities to the communities and local authorities. To enhance the likelihood that projects submitted for funding dealt with the perceived needs of those in the poor communities, a participatory approach was adopted trough CBOs. Under this scheme, potential beneficiary organizations were asked to express and prioritize their needs, and were encouraged to formulate and submit project proposals for potential funding. In addition to this, SRP II started to train the districts to enable them to achieve levels of administrative capacity that would permit to decentralize to the district level the functions initially fulfilled centrally by the Social Fund agency.

SIFs in Zambia were transformed into increasingly decentralized programs with initiation of ZAMSIF in 2000. Compared to the former SRPs, the ZAMSIF program allowed more district participation to SIF activities depending on the level of district administrative capacity. Capacity was carefully established by a set of indicators updated on an annual basis in the District Assessments conducted by the Provincial Assessment Committees, and summarized in a 5-level administrative capacity index. A district could enjoy an increasing degree of autonomy regarding SIF activities, up to receiving block grants for fully decentralized implementation.[7]

For districts with administrative capacity level 1, ZAMSIF supported all community project activities in the same fashion as under SRP I and II, with no decentralization. Districts with administrative capacity level 2 were given the responsibility to field appraise, desk appraise, and monitor projects. Districts with administrative capacity level 3 had the role of costing and budgeting projects, and of supporting implementation with monitoring and technical advice. Districts with administrative capacity level 4 could approve projects up to US$50,000, and communities were accountable for these expenditures to the districts. Finally, districts with administrative capacity level 5 received an annual Community Investment Fund allocation from the central agency, and were responsible to disburse and monitor all community projects. For the analysis conducted in this paper, districts with administrative capacity levels 1 and 2 are in categories A and B, respectively, while districts with administrative capacity levels 3 to 5 were regrouped in a category C due to the small number of districts at these levels. We thus refer to these three categories of districts as centralized, partially decentralized, and highly decentralized (Table 1). As discussed later, district councils mainly consisted of elected representatives including the district's Member of Parliament (MP) and the locally elected ward councilors, giving local politicians a high level of control over project allocation. Local politics thus assumed increasing importance with the degree of decentralization.

2.3. Data

We have an exhaustive list of the 1,282 projects approved under SRP I, SRP II, and ZAMSIF, providing information on the type and budget of each project. Table 2 shows that the vast majority of projects under SRP I and SRP II focused on education, health, and water supply/sanitation. Projects became more diversified under ZAMSIF, including funds in support of income generation. Resources are very equally allocated across projects, with on average a budget of $60,000 per project. As a consequence, the

[7] The potential impact of district capacity on project choice by wards, in particular achieving a better fit between project type and community needs, can thus come through both greater administrative capacity and more autonomy in project management.

distribution of allocated budgets by sector and program is quite similar to the distribution of the number of approved projects.

While the number of wards has changed over time, mostly through division of former wards, for the purpose of the analysis, we maintain a fixed definition of wards. We use the administrative divisions in 1288 wards reported in the 2000 census. For all but 51 of the projects we also know their location, given by the wards that received them. Table 3 shows that in all three program periods, there were still many wards which had never received a project, representing 81%, 80%, and 68% of all wards under SRP I, SRP II, and ZAMSIF, respectively. Among those that participated, most did so only once or twice, with very few receiving three or more projects.

We combine the project data with information from the 1990 and 2000 population censuses. The 1990 census however does not report wards. Matching Census Statistical Areas (CSA) in the two censuses, we are able to aggregate the 1990 census information for 1234 of the 1288 wards. Censuses provide detailed information on the characteristics of individuals such as education and housing conditions. From the two censuses, we measure two district- or ward-level welfare indicators: the school enrollment rate for children 7 to 12 years old, and a household welfare index, constructed as the first principal component of indicators of housing conditions normalized by its mean and standard deviation over the whole population.[8] Scoring factors for the first principal components with means and standard deviations are provided in the Appendix Table 1. Table 4 shows that school enrollment for ages 7 to 12 was 50.2% in 1990 and 56.4% in 2000. Although the wealth index is by construction of mean 0 in the population, the un-weighted mean across wards need not be equal to 0 because of the unequal size of wards.

By law, local governance, and in particular the supervision of the provision of services such as infrastructure, is insured by a district government council. This district government council is composed of (1) the members of parliament from constituencies in the district, (2) two representatives of the traditional Chiefs, appointed by the Chiefs in the district, and (3) all the elected councilors in the district representing their respective wards. A district consists of one to seven constituencies – 2.7 on average –, each of which elects one member of parliament. A district also consists of eleven to thirty wards – 19 on average –, each of which elects one councilor. In order to establish each district majority party, we collected voting results for the local elections of 1998, 2001, and 2006 and the parliamentary elections of 1996, 2001 and 2006. For each candidate to the position of district councilor or parliament, the election data provide the name, party membership, and number of votes received in the ward or constituency.[9] The timing and summary results on these elections are reported in Table 5.

Parliamentary results are complete except for 2 out of 150 constituencies in 2006, and constituencies have not changed over the course of the period we study.[10] However, there are only 1,144 and 1,206 wards with local election results in 1998 and 2001 respectively, which leave 1,128 and 1,198 wards with complete election and census data.[11] Due to the division of wards since the census, we managed to construct 1,103

[8] The potential impact of district capacity on project choice by wards, in particular achieving a better fit between project type and community needs, can thus come through both greater administrative capacity and more autonomy in project management.

[9] We do not have information on the two representatives of the Chiefs for each district, which implies that the majority party constructed from the two elections (members of parliament and district councilors) is not completely accurate.

[10] The number of MPs in the 2006 results does not account for two constituencies where the election was postponed due to sudden death of the candidates.

[11] Two districts lack information for all wards, whereas about half the districts miss 1 or 2 wards. To avoid losing half of the data, we included all districts except for these two districts that do not have any election

wards from 2006 election result with census data. Combining the parliamentary and councilor election results, we construct a variable for majority-party in a council in a district. 75 % of the wards elected councilors from the party which is the majority-party in the district council.

The political sphere has been dominated by the Movement for Multiparty Democracy (MMD), which won all four presidential elections since democracy was established in 1991, although with a declining share of the votes as the number of candidate parties increased. Similarly, in parliamentary and local elections, the MMD members declined dramatically in 2000 to about 50% of the seats. However, as the percentage of councilors that are from the district majority party shows there a certain degree of clustering in party affiliation, but not all wards of a district votes for the same party. This is the variation that we will exploit in section 5 on the political economy of project allocations.

2.4. Decentralization and Targeting

2.4.1. Empirical Specification and Identification Strategy

The question of interest in this paper is whether project allocation across either districts or wards becomes more progressive or regressive as decentralization progresses. The allocation across districts is the outcome of the central agency decision both under the centralized regimes (in this case indirectly through project allocation to ward-based CBOs) or decentralized regimes (in this case directly through budgetary transfers to the districts). With decentralization, the overall allocation of resources across wards is an outcome of the allocation across districts by the central agency and within districts by the local agency. So while this overall allocation is the correct measure for welfare and equity obtained by a decentralized regime, it combines centralized and decentralized decisions. It is therefore in the allocation across wards within districts that the role of decentralization is best observed, comparing allocations within districts under centralized and decentralized regimes.

We correspondingly estimate several specifications for the allocation of projects. We first consider project allocation across districts, with the following specification:

$$P_{di} = \beta_i W_{di} + X_{di}\gamma_i + \mu_i + \varepsilon_{di}, \quad (1)$$

where P_{di} is the (log) project budget per capita in district d under program i (SRPI, SRPII, or ZAMSIF), W_{di} is the district welfare indicator (school enrollment rate or household wealth), X_{di} are other district characteristics, notably population and rural share of population, μ_i a program fixed effect, and ε_{di} is unobserved heterogeneity. Welfare and other characteristics are measured before each program is implemented. The differences among β_i indicate the relative degree of progressivity across districts under the three programs. This specification does not, however, indicate the role of decentralization as differences in β_i can be due to shifts in program features, such as the allocation rule across districts, and learning effects.

We then consider the allocation across wards, contrasting wards that pertain to

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results.

type B or C districts, that will respectively become partially or highly decentralized under ZAMSIF, to wards that pertain to type A districts that remained under central decision-making. We estimate two specifications:

$$P_{wdi} = \theta_i^A L_d^A W_{wdi} + \theta_i^B L_d^B W_{wdi} + \theta_i^C L_d^C W_{wdi} + X_{wdi}\pi_i + \nu_{di} + \xi_{wdi} \quad (2)$$

$$P_{wdi} = \phi_i^A L_d^A W_{wdi} + \phi_i^B L_d^B W_{wdi} + \phi_i^C L_d^C W_{wdi} + X_{wdi}\lambda_i + \mu_i + \zeta_{wdi} \quad (3)$$

where P, W, and X are now measured at the ward level w. L_d^A, L_d^B, and L_d^C are districts' administrative capacity categories under ZAMSIF, and ν_{di} a program-specific district fixed effect. Equation (2) looks at the within-district allocation of funds in response to the welfare level of a ward relative to the other wards in the same district, whereas equation (3) estimates the overall allocation of funds in response to the welfare level of a ward relative to the national mean.

Identification of the effect of decentralization to districts B and C is based on a comparison of parameters θ_i^K, K = A, B, C, of equation (2). In a difference in difference framework, the effect of decentralization is measured by comparing the evolution of θ_i^B and θ_i^C across programs $i = SRPI, SRPII, ZAMSIF$ with the counterfactual evolution of θ_i^A observed in districts A.

2.4.2. Empirical Results

The overall allocation of projects across districts under the different programs (SRPI, SRPII, and ZAMSIF) corresponding to equation (1) above is analyzed in Table 6. Project allocation does not respond to district welfare level under SRPI and ZAMSIF. When using the household wealth index, SRPII shows regressive allocation across districts. With the district wealth index varying approximately from -1 to +1, the estimated parameter suggests that a point one increase in wealth index is associated with 13% higher project budget per capita. These changes in project allocation across districts must be attributed to changes in district features such as CBOs' capacity to formulate projects and the selection process at the level of the central agency.

Table 7 analyzes the progressivity in budget allocation across wards under each program. Panel A reports the within-district allocation while Panel B reports on the overall allocation across wards. The targeting of wards within districts clearly became more progressive over time. In terms of school enrollment, regressive targeting under SRPI and SRPII (columns 1 and 2) became neutral under ZAMSIF (column 3). In terms of household wealth, neutral targeting under SRPI and SRPII (columns 4 and 5) became progressive under ZAMSIF (column 6). Similar results are found when looking at the overall allocation of project budget across wards (columns 7 to 12), although progressivity under ZAMSIF is substantially lower than it is within district and not statistically significant. This is to be expected as it results from the combination of the within-district allocation with the across district allocation that we saw did not improve or even became more regressive.

Regression results for equations (2) and (3), with contrast across levels of district decentralization, are shown in Table 8. Panel A reports the within-district allocation of

projects using equation (2). Results show that the within-district project allocation in response to ward welfare did not differ across different (future) district administrative capacity levels under SRPI and SRPII: projects were more likely to be placed in wards with relatively higher school attendance rates exhibiting regressivity in districts at all levels of future administrative capacity (columns 1 and 2); in terms of household wealth, allocation was neutral in all types of districts (columns 4 and 5). However, project allocation became more progressive in districts with higher level of administrative capacity (B and C) under ZAMSIF, while it remained unchanged in districts with low capacity level (columns 3 and 6). Allocation became neutral using the school enrollment criterion, and progressive using the household wealth criterion. This change occurred with partial decentralization in district category B and was further reinforced with higher decentralization in district category C. The fact that there was no effect of future administrative capacity levels on project allocation under SRP I and II gives us a good counterfactual indicating that it is district decentralization that affected the shift towards progressivity. These results give strong support to the proposition that greater administrative decentralization to districts with proven administrative capacity led to targeting of relatively poorer wards within district.

Using these results, we compute the difference in difference estimation of the effect of decentralization in districts C on the relationship between ward welfare and allocation of SIF funds:

	Ward welfare effect on project allocation	
	School enrollment	Wealth index
$\left(\theta^{B}_{Zamsif} - \theta^{B}_{SRPI}\right) - \left(\theta^{A}_{Zamsif} - \theta^{A}_{SRPI}\right)$	-1.77	-0.98
p-value for equality to 0	(0.18)	(0.02)
$\left(\theta^{C}_{Zamsif} - \theta^{C}_{SRPI}\right) - \left(\theta^{A}_{Zamsif} - \theta^{A}_{SRPI}\right)$	-0.80	-1.11
p-value for equality to 0	(0.53)	(0.01)

It shows that decentralization was accompanied by a significant shift of resources allocated to poorest wards in terms of their wealth asset. Point estimates for the shift with respect to school enrollment are large but not statistically significant. In contrast, none of these differences is large or statistically significant when comparing SRP II to SRP I.

Panel B reports the overall allocation across all wards using equation (3). Results show that the progressivity effect across all wards of decentralization in project allocation is weaker overall than it is within district. This was expected as the increased progressivity observed in within-district allocation only occurred in some districts and was not accompanied by any similar progressivity in the across-district allocation (as seen in Table 6).

2.5. The Politics of Decentralizing SIF Allocations

2.5.1. Theoretical Framework for a Correlation Between Voting Results and Budget Allocation

It is well known that the allocation of public goods is part and parcel of the political process. Whether decentralization reinforces the two-way link between projects and votes is an important question as it may suggest a trade-off between a more efficient targeting of local public goods (based on local information and local social capital) and a greater use of public budgets to reward or mobilize votes. A number of studies have analyzed the performance of local public expenditure programs when local political rewards become part of the process.

One class of theories – the core-supporter model – suggests that a politician allocates investments to the communities where he has received the strongest electoral support as rewards for their loyalty (Cox and McCubbins, 1986; Dixit and Londregan 1996; Verdier and Snyder, 2002). Finan (2003) finds that Brazilian federal deputies allocated more public works in 1996 and 1999 to the municipalities where they had received more electoral support in 1994, supporting the core-supporter model. Another other class of theories focuses on the way incumbent politicians use projects to influence votes. Among these theories, the swing-voter model predicts that incumbent politicians target communities with more swing voters whose electoral choices could be influenced by the public goods provision (Dixit and Londregan, 1996). Dahlberg and Johansson (1999) found evidence that Swedish incumbent governments distributed temporary grants for ecologically sustainable development programs to regions where there were more swing voters. There is also evidence that government spending increases the incumbent's vote share in US congressional elections (Levitt and Snyder, 1997) and for political incumbents in Spain (Sole-Olle and Sorribas-Navarro, 2008). For Mexico, Rodriguez-Chamussy (2009) finds that Progresa/Oportunidades expenditures at the municipal level not only increased the share of votes for the incumbent presidential party in municipal elections (a legitimate reward since the program is fully under the authority of the Federal government), but also for the local incumbent party even if in opposition to the presidential party, indicating capacity of local mayors to successfully engage in "credit claiming" for benefits delivered by others. Manacorda, Miguel, and Vigorito (2009) find that beneficiaries of a cash transfer program in Uruguay were more likely than non-beneficiaries to favor the current government that is responsible for the program relative to the previous one.

In this paper, we do not try to identify which model prevails or the direction of causality. We analyze instead whether increasing decentralization in the allocation of expenditures on local public goods gives greater importance of local politics along the two directions of influence. To do this, we match local election results in 1998, 2001, and 2006 with project placement results under the three programs and examine whether there is an association between electoral outcomes and subsequent project allocation and between project placement and subsequent electoral rewards.

2.5.2. Identification and results

We first look at the direction of influence that would run from vote to project allocation. According to the core-supporter model, politicians (the district council here) allocate projects to the wards where relatively more of their supporters are located. The proxy information in this case is the percent of votes received by the candidate from the majority party in the district council, and we look at project allocation in relation to the previous local election result. Specifically, we estimate the following equation:

$$P_{wd} = \theta^A L_d^A SH_{wd} + \theta^B L_d^B SH_{wd} + \theta^C L_d^C SH_{wd} + X_{wd}\pi + \nu_d + \xi_{wd}, \quad (4)$$

where the dependent variable P_{wd} is the project budget per capita (in log) in ward w of district d for three years after the previous local election, and the independent variable is the share of ward votes SH_{wd} received by the candidate from the party with most seats in the district council. Due to non-availability of 1992 election results and the interruption in budget between SRP II and Zamsif, we can only analyze project allocation after the December 2001 election, i.e., under Zamsif but not under SRPI or SRPII (as shown by project and election timing reported in Table 5).

Expectations are thus that the θ parameters be positive for districts with higher level of responsibility (district administrative capacity category C and possibly B) while null when the allocation is centralized (in district category A). Results in Table 9 show point estimates for parameters θ to increase from 0 in districts A to 0.011 in districts C (column 1, statistically significant at 10 percent level). When splitting the districts by literacy rate, we see that projects follow local votes when there is greater decentralization (districts C) and a high adult literacy rate (column 2). Votes received by the candidate from the majority party in the district council located in districts with high decentralization and high adult literacy rates are rewarded by larger per capita project budgets for the ward. A 10 percentage points increase in vote share would lead to a 32% increase in program budget to that ward. The result is robust to adding ward control variables (column 3). This increase in expected budget allocation largely comes from the increasing probability of receiving a project. Column (4) shows that a 10 percentage points higher vote share is associated with a 9% increased probability to receive a project. Compared to an average of 29% among this category of wards, this is a 31% increase in the probability for a ward to receive a project.

For the electoral reward model, we correlate local election results for the candidate from the incumbent party with the project budget per capita for three years before that election in estimating:

$$W_{wd} = \lambda^A L_d^A Ppc_{wd} + \lambda^B L_d^B Ppc_{wd} + \lambda^C L_d^C Ppc_{wd} + X_{wd}\pi + \nu_d + \xi_{wd} \quad (5)$$

where W_{wd} indicates whether the incumbent district majority party won in ward d, and Ppc_{wd} represent the per capita project budget. This is done for the 1998 and 2006 local elections, allowing a contrast between the SRPII and Zamsif periods in addition to the contrast across district categories. For the 1998 election, we do not know the incumbent party (since this is the outcome of the 1992 election that is not available). However, Burnell (2000) reports that MMD captured around 80 per cent of all votes in 1992, and most districts had an MMD majority. We therefore use the MMD party as a proxy for the district majority in 1998. Results in Table 10 show that, in districts with high administrative capacity and adult literacy rates, per capita project budgets received by wards are rewarded by electoral victory for the candidate from the incumbent party in the 2006 election (column 3). This did not happened under SRPII (1998 elections) when these same districts were not decentralized (column 1), nor under ZAMSIF (2006 elections) in the districts with low decentralization (administrative capacity category A or B in column 3). These results are robust to adding ward characteristics (columns 2 and 4). The effect is such that a doubling of project budget per capita in a ward increases the probability that the incumbent majority candidate wins by 4-5 percentage points (columns 3 and 4). Column (5) shows that having received a project, whatever its budget level, increases the probability of the incumbent district majority candidate to be elected by 14%. This is a large effect given that 24% of the wards in these districts received a project and 39% elected a councilor from the incumbent district majority.

Decentralization thus made local politics more relevant in relating projects to votes and votes to projects. In both cases, our identification strategy rests on the contrast between the districts with high administrative capacity and high literacy rates and the other districts. We showed that voting for the district majority lead to rewards in projects in those districts, which operated under the decentralized system of ZAMSIF. This is solely a cross sectional comparison as we can not establish the relationship in earlier years because of data availability. But in the projects to vote relationship, we establish the positive relationship under ZAMSIF while it did not hold under SRP II, nor in the other districts.

2.5.3. Is There a Trade-off Between Targeting to the Poor and Political Forces?

A frequent concern with decentralization is the possible trade-off between the targeting objective for the funds and the political use of resources. Could it be that political forces pull resources to the wealthier? In the particular case of the Social Fund in Zambia, this does not look to be a major issue. This is because it happens so that wards that most vote for the majority party of the district tends also to be the poorest wards. This can be seen in Table 10, columns 2 and 4. Controlling for project allocation, there is no differential voting behavior by level of education, and ward with higher wealth index tend to vote less for the district majority than those with lower wealth in 2006. Symmetrically, we see in Table 9, column 3, that even controlling for voting behavior, allocation of projects favors relatively poor wards. This conditional negative correlation between wealth and voting preference thus insure that these two objectives of catering to voters and to less endowed wards do not work at cross-purpose.

2.6. Conclusion: Decentralization of Public Goods for Poverty and Politics

Zambia offers a unique laboratory to analyze the social and political impacts of decentralization in the participatory provision of local public goods to districts deemed to be good managers of public affairs. Over a 16 year period, the provision of local public goods was increasingly decentralized to district councils with proven administrative capacity. We use this experience to ask whether decentralization to administratively capable local governments leads to better poverty targeting across communities and changes the role of local politics. We find that decentralization of SIFs' functions to administratively capable local districts led to more progressive targeting across wards, mildly so at the national level and clearly so within districts. We also find that games of local political influence changed with increasing decentralization: local votes were increasingly rewarded by the allocation of local projects, and local projects were increasingly rewarded by electoral support for incumbent politicians. This suggests that decentralization made concerns with community poverty more salient in targeting across wards. Decentralization also made local politics more important in influencing public goods allocation and in rewarding elected officials for delivering local public goods.

Figure 2.1. Operational rules under Social Investment Fund programs by level of decentralization

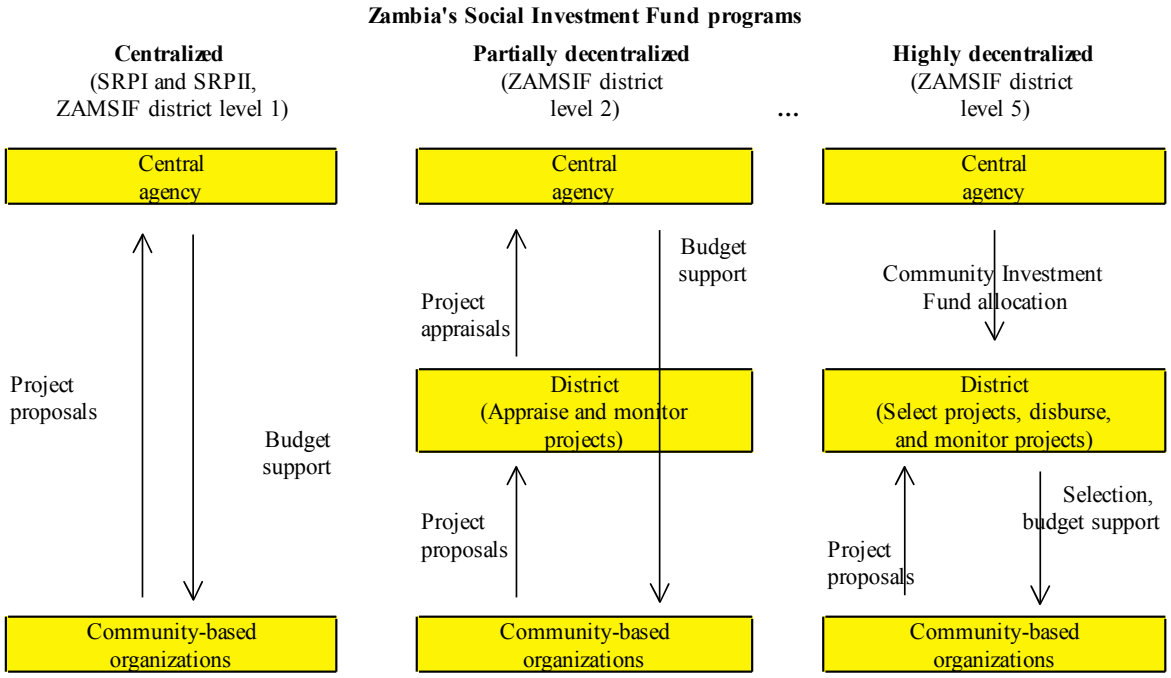

Table 2.1. Levels of decentralization by program and district administrative capacity

District administrative capacity category in 2005	Number of districts in 2005	Social Investment Fund programs		
		SRP I SRP I 1990-94	SRP II 1995-99	ZAMSIF 2000-05
A (administrative capacity level 1)	22	Centralized	Centralized	Centralized
B (administrative capacity level 2)	24	Centralized	Centralized	Partially decentralized
C (administrative capacity levels 3 to 5)	26	Centralized	Centralized	Highly decentralized

Capacity category C includes 19 districts of administrative capacity level 3, 3 districts of level 4, and 4 districts of level 5.

Table 2.2. Number of projects implemented under SRP I, SRP II, and ZAMSIF

Projects	Social Investment Fund programs						All	
	SRP I (1990-94)		SRP II (1995-98)		ZAMSIF (2000-05)			
	Number	Share (%)	Number	Share (%)	Number	Share (%)	Number	Share (%)
Education	266	70	266	82	255	44	787	61
Health	69	18	38	12	134	23	241	19
Water supply/Sanitation	31	8	16	5	62	11	109	9
Community welfare	-	-	-	-	22	4	22	2
Environment/Income	-	-	-	-	10	2	10	1
Food security/Market	-	-	-	-	16	3	16	1
HIV/AIDS	-	-	-	-	24	4	24	2
Infrastructure	12	3	4	1	11	2	27	2
Roads	-	-	-	-	39	7	39	3
Training activities	-	-	-	-	3	1	3	0
Other	2	1	2	1	-	-	4	0
Total	380	100	326	100	576	100	1282	100

Table 2.3. Distribution of wards by number of projects

Number of projects	SRP I		SRP II		ZAMSIF	
	Number	Share (%)	Number	Share (%)	Number	Share (%)
0	1042	80.9	1029	79.9	875	67.9
1	170	13.2	215	16.7	305	23.7
2	52	4.0	34	2.6	86	6.7
3	15	1.2	7	0.5	15	1.2
4 or more	9	0.7	3	0.2	7	0.5
Number of wards	1288	100	1288	100	1288	100
Wards with projects	246		259		413	
Total projects*	361		317		553	

* 51 of the 1282 projects do not have a ward assignation.
Wards referred to the 2000 administrative limits

Table 2.4. Ward level characteristics from the 1990 and 2000 population censuses

Census year	1990	2000
Number of wards	1234	1288
School enrollment rate for 7-12 years old (%)	50.2	56.4
	(19.8)	(18.0)
Household wealth index (standardized)	-0.23	-0.20
	(0.77)	(0.76)
Rural population (%)	76.5	78.7
	(40.7)	(39.4)
Population in ward (people)	6,369	7,745
	(6,237)	(7,579)

Standard deviations in parentheses
Only 1234 of the 2000 census wards could be identified in the 1990 census.
The household wealth index is the principal component of several indicators on housing conditions, normalized to mean 0 and standard deviation 1.

Table 2.5. Timeline for Zambia's Social Investment Fund programs and elections

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
SIF program			SRPI					SRPII					ZAMSIF					
Number of SIF projects	2	1	199	104	36	64	95	120	80	0	27	55	116	259	91	33	-	1282
Parliamentary elections (MP)		October					November					December					December	
MMD victories/total		125/150					131/150*					69/150					72/148**	
Local elections (councilors)		November							December			December					December	
Main political parties		not available							MMD, UNIP			MMD, FDD UNIP, UPND						
Wards with election results									1144			1206					1421	
Number of candidates			Results						2795			6201					4091	
Councilor is MMD (%)									70.0			47.4					52.7	
Councilor is from the district majority party (%)									81.5			75.7					75.1	

* The second largest party (UNIP) boycotted the 1996 election. ** Elections in 2 constituencies were postponed due to the death of candidates.
Political parties: Forum for Democracy and Development (FDD), United National Independence Party (UNIP), United Party for National Development (UPND), Patriotic Front (PF), and United Democratic Alliance (UDA).

Table 2.6. Progressivity in targeting: Project allocation across districts

Dependent variable:	SRPI	SRPII	Zamsif	SRPI	SRPII	Zamsif
District level project budget per capita (log)	School enrollment rate for 7-12 years old			Household wealth index		
	(1)	(2)	(3)	(4)	(5)	(6)
District welfare	-3.473	5.325*	0.153	-0.336	1.302**	-0.121
(School enrollment or household wealth)	(3.189)	(3.169)	(0.585)	(0.631)	(0.589)	(0.261)
Rural population (%)	0.412	1.515	0.248	-0.308	2.104*	-0.0290
	(1.476)	(1.466)	(0.274)	(1.195)	(1.116)	(0.488)
Population in district (log)	0.799**	0.637**	0.905***	-0.389***	-0.581***	-0.0917
	(0.319)	(0.317)	(0.0869)	(0.133)	(0.124)	(0.0805)
Constant	5.410	2.123	3.437***	6.640***	7.608***	3.750***
	(4.927)	(4.895)	(1.215)	(1.732)	(1.617)	(1.018)
Observations	57	57	72	57	57	72
R-squared	0.149	0.132	0.648	0.206	0.326	0.063
Fixed effects	No	No	No	No	No	No

Standard errors in parentheses. ***, **, *: significant at the 1%, 5%, and 10% level.

Table 2.7. Progressivity in targeting: Project allocation across wards

Dependent variable:	SRPI	SRPII	Zamsif	SRPI	SRPII	Zamsif
Ward-level project budget per capita (log)	School enrollment rate for 7-12 years old			Household wealth index		
Panel A. Within districts allocation	(1)	(2)	(3)	(4)	(5)	(6)
Ward welfare	1.217***	1.211***	0.509	0.157	0.0251	-0.356**
(School enrollment or household wealth)	(0.342)	(0.379)	(0.474)	(0.126)	(0.140)	(0.166)
Percent rural population	-0.0961	-0.365	0.270	-0.217	-0.632**	-0.273
	(0.217)	(0.241)	(0.250)	(0.245)	(0.272)	(0.300)
Population in ward (log)	-0.0524	-0.0859	0.220**	-0.0355	-0.0648	0.234***
	(0.0559)	(0.0620)	(0.0887)	(0.0559)	(0.0621)	(0.0882)
Observations	1234	1234	1288	1234	1234	1288
R-squared	0.124	0.094	0.052	0.115	0.086	0.055
Fixed effects	District	District	District	District	District	District
Panel B - Allocation across all wards	(7)	(8)	(9)	(10)	(11)	(12)
Ward welfare (School enrollment or househo	0.548*	1.310***	0.359	0.0238	0.0982	-0.211
	(0.279)	(0.303)	(0.357)	(0.108)	(0.118)	(0.133)
Percent rural population	0.158	0.178	0.282*	0.0169	-0.0909	-0.177
	(0.138)	(0.150)	(0.167)	(0.206)	(0.225)	(0.258)
Population in ward (log)	0.0393	-0.0517	0.297***	0.0432	-0.0433	0.304***
	(0.0462)	(0.0501)	(0.0638)	(0.0463)	(0.0505)	(0.0637)
Constant	-0.0911	0.379	-1.817***	0.264	1.194**	-1.355**
	(0.462)	(0.500)	(0.648)	(0.431)	(0.469)	(0.603)
Observations	1234	1234	1288	1234	1234	1288
R-squared	0.004	0.019	0.018	0.001	0.005	0.019
Fixed effects	No	No	No	No	No	No

Standard errors in parentheses. ***, **, *: significant at the 1%, 5%, and 10% level.

Table 2.8. Progressivity in targeting: Project allocation across wards by category of district administrative capacity

Dependent variable:	SRPI	SRPII	Zamsif	SRPI	SRPII	Zamsif
Ward-level project budget per capita (log)	School enrollment rate for 7-12 years old			Household wealth index		
Panel A. Within districts allocation	(1)	(2)	(3)	(4)	(5)	(6)
Ward welfare (school enrollment or household wea	1.250**	1.522**	1.429*	0.136	0.0949	0.453
	(0.618)	(0.686)	(0.812)	(0.225)	(0.249)	(0.290)
- interacted with administrative capacity cetegory	0.242	-0.348	-1.526	0.00748	-0.0333	-0.989***
	(0.804)	(0.893)	(1.082)	(0.264)	(0.293)	(0.324)
- interacted with administrative capacity cetegory	-0.310	-0.490	-1.105	0.0539	-0.169	-1.058***
	(0.774)	(0.859)	(1.034)	(0.267)	(0.296)	(0.336)
Rural population (%)	-0.112	-0.366	0.254	-0.213	-0.645**	-0.264
	(0.218)	(0.242)	(0.250)	(0.249)	(0.276)	(0.300)
Population in ward (log)	-0.0535	-0.0863	0.215**	-0.0366	-0.0617	0.228***
	(0.0559)	(0.0621)	(0.0891)	(0.0562)	(0.0623)	(0.0882)
Observations	1234	1234	1288	1234	1234	1288
R-squared	0.124	0.095	0.054	0.115	0.087	0.064
Fixed effects	District	District	District	District	District	District
Tests						
Base + Category B: Coefficient	1.49	1.17	-0.10	0.14	0.06	-0.54
[p-value]	[0.01]	[0.05]	[0.90]	[0.40]	[0.74]	[0.01]
Base + Category C: Coefficient	0.94	1.03	0.32	0.19	-0.07	-0.61
[p-value]	[0.01]	[0.04]	[0.90]	[0.39]	[0.99]	[0.01]
Panel B - Allocation across all wards	(7)	(8)	(9)	(10)	(11)	(12)
Ward welfare (school enrollment or household wea	0.502*	1.091***	0.348	0.00628	0.138	0.0162
	(0.305)	(0.330)	(0.389)	(0.144)	(0.157)	(0.188)
- interacted with administrative capacity cetegory	-0.160	0.324	-0.0770	0.0611	0.00601	-0.232
	(0.194)	(0.210)	(0.215)	(0.132)	(0.144)	(0.168)
- interacted with administrative capacity cetegory	0.150	0.306	0.0974	-0.0182	-0.106	-0.305*
	(0.187)	(0.203)	(0.213)	(0.131)	(0.142)	(0.170)
Rural population (%)	0.123	0.199	0.270	0.0208	-0.0828	-0.147
	(0.140)	(0.152)	(0.167)	(0.206)	(0.225)	(0.259)
Population in ward (log)	0.0419	-0.0596	0.299***	0.0456	-0.0421	0.295***
	(0.0464)	(0.0503)	(0.0644)	(0.0465)	(0.0507)	(0.0640)
Constant	-0.0654	0.424	-1.827***	0.236	1.176**	-1.289**
	(0.462)	(0.501)	(0.653)	(0.433)	(0.472)	(0.605)
Observations	1234	1234	1288	1234	1234	1288
R-squared	0.007	0.021	0.018	0.001	0.005	0.021
Fixed effects	No	No	No	No	No	No
Tests						
Base + Category B: Coefficient	0.34	1.42	0.27	0.07	0.14	-0.22
[p-value]	[0.27]	[0.00]	[0.47]	[0.59]	[0.29]	[0.14]
Base + Category C: Coefficient	0.65	1.40	0.45	-0.01	0.03	-0.29
[p-value]	[0.02]	[0.00]	[0.23]	[0.92]	[0.81]	[0.07]

Standard errors in parentheses. ***, **, *: significant at the 1%, 5%, and 10% level.

Table 2.9. Decentralization and local politics: From votes to projects

Election year	2001			
Project budget period	2002-2004			
Dependent variable	Ward-level project budget per capita (log)			Received a project
	(1)	(2)	(3)	(4)
Percent of votes received by the candidate from the district council majority party				
In district administrative capacity category A	0.000598			
	(0.00690)			
In district administrative capacity category B	0.00287			
	(0.00585)			
In district administrative capacity category C	0.0113*			
	(0.00597)			
In district category A with low adult literacy rate		-0.00342	-0.00299	-0.00131
		(0.00842)	(0.00842)	(0.00222)
In district category B with low adult literacy rate		0.00688	0.00728	0.00132
		(0.00777)	(0.00777)	(0.00205)
In district category C with low adult literacy rate		0.00583	0.00592	0.000237
		(0.00670)	(0.00670)	(0.00177)
In district category A with high adult literacy rate		0.00884	0.0100	0.00168
		(0.0121)	(0.0121)	(0.00319)
In district category B with high adult literacy rate		-0.00227	-0.00243	-0.000354
		(0.00888)	(0.00887)	(0.00234)
In district category C with high adult literacy rate		0.0323**	0.0317**	0.00897***
		(0.0131)	(0.0132)	(0.00346)
School enrollment rate for 7-12 years old (0 to 1)			0.565	
			(0.541)	
Household wealth index			-0.410**	
			(0.187)	
Rural population (%)	0.405*	0.365	0.00302	0.0678
	(0.222)	(0.222)	(0.294)	(0.0586)
Population in ward (log)	0.195**	0.179**	0.178**	0.108***
	(0.0888)	(0.0894)	(0.0896)	(0.0235)
Observations	1198	1198	1198	1198
R-squared	0.053	0.057	0.061	0.096
Fixed effects	District	District	District	District

Standard errors in parentheses. ***, **, *: significant at the 1%, 5%, and 10% level.

Table 2.10. Decentralization and local politics: From projects to votes

Election year	1998		2006		
Project budgets period	1996-1998		2003-2005		
Dependent variable	MMD candidate (proxy for		Candidate from incumbent party won		
	(1)	(2)	(3)	(4)	(5)†
Ward received a project in columns (5), project budget per capita (log) in other columns					
In district category A with low adult literacy rate	-0.0483*	-0.0488*	0.0249	0.0239	0.0712
	(0.0262)	(0.0263)	(0.0231)	(0.0230)	(0.0938)
In district category B with low adult literacy rate	-0.0131	-0.0137	-0.00881	-0.00865	-0.0549
	(0.0328)	(0.0328)	(0.0164)	(0.0163)	(0.0627)
In district category C with low adult literacy rate	0.00241	0.000515	-0.0108	-0.0108	-0.0151
	(0.0168)	(0.0169)	(0.0148)	(0.0147)	(0.0572)
In district category A with high adult literacy rate	0.0240	0.0218	0.0136	0.0191	0.0857
	(0.0275)	(0.0276)	(0.0199)	(0.0199)	(0.0775)
In district category B with high adult literacy rate	0.00169	-8.95e-06	0.0199	0.00833	0.0703
	(0.0208)	(0.0208)	(0.0193)	(0.0194)	(0.0676)
In district category C with high adult literacy rate	0.00823	0.00663	0.0475**	0.0386*	0.143*
	(0.0263)	(0.0263)	(0.0233)	(0.0234)	(0.0817)
School enrollment rate for 7-12		0.0659		-0.0951	
		(0.131)		(0.130)	
Household wealth index		0.0383		-0.118***	
		(0.0446)		(0.0442)	
Rural population (%)	0.0487	0.110	0.312***	0.154**	0.311***
	(0.0533)	(0.0710)	(0.0527)	(0.0689)	(0.0527)
Population in ward (log)	0.00805	0.00678	0.0430**	0.0480**	0.0408*
	(0.0213)	(0.0213)	(0.0212)	(0.0212)	(0.0213)
Observations	1128	1128	1103	1103	1103
R-squared	0.293	0.295	0.453	0.460	0.453
Fixed effects	District	District	District	District	District

Standard errors in parentheses. ***, **, *: significant at the 1%, 5%, and 10% level.
† Dependent variable is "ward received a project".

Chapter 3

Contrasting Welfare Impacts of Health and Agricultural Shocks in Rural China

3.1. Introduction

Rural households in China, as those in other developing countries are exposed to a variety of shocks, and their economic behaviors under exposure to these shocks have been one of the important themes in development economics.[12] One big strand of this literature is a test of full risk sharing which examines temporal or geographical correlates of consumption and income (e.g. Townsend (1994)). To test full risk sharing, one needs to have measures of consumption and income. Detailed information on shocks is not necessary in the test. The other strand of literature focuses on a certain type of shock and examines changes in income, consumption, or savings due to shocks. Particular interest has been put on agricultural shocks using weather or rainfall data (e.g. Paxson (1992), Dercon (2004) Kazianga and Udry (2006), and Alderman (2006)) and on health shocks (e.g. Shultz and Tansel (2002), Gertler and Gruber (2002), De Weerdt and Dercon (2006)). However, except for Dercon, Hoddinott and Woldehanna (2005), relatively small weight has been put on understanding the relative impacts of various types of shocks on household welfare. Particularly, agricultural shocks and health shocks are different in frequency, magnitude of impacts and on the types of consumption the shocks affect. Dercon, Hoddinott and Woldehanna (2005) provides quantitative evidence of impacts of various types of self reported shocks including agricultural and health shocks on consumption in rural Ethiopian villages where they found drought and illness shocks have negative impacts on per capita consumption. The aim of this paper is to complement the findings by Dercon, Hoddinott and Woldehanna (2005) using data from rural China with additional insights. In addition to looking at impacts of agricultural and health shocks on different kinds of consumption, this paper also examines whether the effect of shocks is additive when households are hit by both agricultural and health shocks compared to experiencing a single shock. We find that there is an association between health-related shocks and non-medical consumption: food consumption is negatively

[12] Morduch (1995) provides extensive survey on income and consumption smoothing under a variety of shocks

associated with health shocks in the rich province of Zhejiang. Durable consumption is also negatively related with health shocks in three of four provinces. No strong evidence of impacts of agricultural shocks on various consumption measures was found, but there is a difference in medical expenditure between those who had only health shocks and those who experienced both agricultural and health shocks, indicating those hit by the combination of health and agricultural shocks are not insured enough to spend in the necessary medical expenditure. Being hit by the two types of shocks is not rare in rural China: 6 to 7 percent of households in Guangxi or Gansu provinces report they are hit by both agricultural and health-related shocks within one year. 3 to 4 percent of households report they are hit by both shocks each of which significantly decreased households' income. These fractions are similar in proportion to those who report only health-related shocks. These findings suggest the need to increase coverage of insurance schemes against both agricultural and especially health shocks in rural China.

The rest of this paper is organized as follows. Section 2 explains the China Social Protection Survey which is used in this paper and the medical insurance schemes in rural China. Descriptive statistics of household characteristics and information on shocks are also provided in that section. Section 3 describes the empirical strategy and estimation results on welfare impacts of agricultural and health-related shocks. Concluding remarks are provided in the final section.

3.2. Data and Background

3.2.1. The China Rural Social Protection Survey

The China Rural Social Protection Survey was conducted in 2004 as part a World Bank project. The survey collected rural households' welfare measures such as various types of consumption and various household characteristics in four provinces of China: Zhejiang, Fujian, Guangxi and Gansu. The sample consists of 6400 families in 120 villages (60 townships 12 and counties). The selected provinces are economically as well as geographically different. Zhejiang province lies in East coast of China, and is one of the most economically advanced provinces in China. Fujian province is next to Zhejiang, and is also a relatively wealthy province. Guangxi is a relatively poor autonomous region (27th out of 31 administrative divisions in terms of GDP per capita in 2006) which lies next to Vietnam. Gansu province is the poorest of the four surveyed provinces (30th out of 31) located near Mongolia. The descriptive statistics shown in Table 1 indicates the relative economic

development of four provinces. Households in Zhejiang province have about 70 percent higher total expenditure per capita than those in the rest of the provinces. There are also wide differences in food expenditure per capita across provinces. However, medical expenditure per capita is not as different across provinces as total expenditure: it ranges between 610 RMB in Zhejiang and 412 RMB in Guangxi. In addition to various consumption measures, a wealth level index is constructed from the various housing characteristics such as water and toilet access and conditions of wall and roofs, which are less likely to change due to shocks. The constructed wealth index is consistent with the above qualitative explanations and means of consumption of the four provinces.

The survey questionnaires contain rich information on the various types of shocks which occurred in 2004: including perceptions on the severity of the impacts on income, and households' detailed shock coping strategies employed through the shocks. To be more precise, households are asked if they experienced a list of shocks in the year of 2004.[13] If the household answered yes to any of the shocks, then they were asked about the severity of the impacts on income and how they coped with each shock.[14] Of these reported shocks, we classify illness and death of household members as health-related shocks and crop failure and loss of livestock as agricultural shocks. Table 2 summarizes the frequency of various types of shocks by severity of impacts, telling that not only the socio economics characteristics but also frequencies of shocks vary across provinces significantly. Very few agricultural shocks are observed in Zhejiang or Fujian provinces whereas 67 percent and 26 percent of households in Guangxi and Gansu provinces respectively experienced agricultural shocks. About a third of households in Guangxi and one fifth of households in Gansu report crop failure significantly decreased their income. Even though the difference in occurrence of health-related shocks is not as stark as that of agricultural shocks, households in Fujian and Gansu provinces report higher incidence of health-related shocks than those in Zhejiang and Fujian provinces. 6 percent and 9 percent of households in Guangxi and Gansu provinces report the illness of working members decreased income significantly. Panel B of Table 2 reports the frequency of multiple shocks among households. Interestingly, when we look at shocks which significantly reduced their incomes, about a half of households in Guangxi and 40 percent of households in Gansu who report health-related shocks say that they were hit by agricultural shocks as well. The ratio is higher when less severe shocks are included. As there is almost no agricultural shock and very low likelihood of death in household members

[13] A list of shocks are as follows: household member got married, gave birth to a child or adopted a child, household working member died, household dependents died, crop failure, livestock died, household member got unemployed, household property was lost, such as burglary, household working member had a major illness, and household dependents had a major illness.

[14] Households are asked to indicate whether the shock had no influence in their income, slightly decreased income, or significantly decreased income.

in Zhejiang and Fujian, these two provinces do not exhibit multiple shocks. Based on these facts, our analysis of impacts of multiple shocks is restricted to households in Guangxi and Gansu provinces.

We explore if these shocks are clustered within certain villages or whether shocks are spread across villages in Table 3 which presents the fraction of villages where at least one household reported each shock across provinces. Given the high frequency of crop failure in Guangxi, there is at least one household who experienced a shock in all villages, but there is some evidence of geographic concentration of shocks in Gansu: 18 percent of households report crop failure but there are 30 percent of villages where no household experiences this shock. Health-related shocks seem to be more uniformly distributed across villages than agricultural shocks. These facts provide some support for our later empirical analysis which employs village-level fixed effects.

When we look at different types of shocks, it is important to look at the heterogeneity of households reporting these shocks, and how the occurrence of these shocks is correlated among each other. Table 4 presents simple correlations among shocks and wealth index. First, wealth level is negatively correlated with various types of shocks. Second, in Guangxi, where 67 percent of all households reported at least the occurrence of crop failure and a little less than half of those said the shock severely decreased income, agricultural shocks at any level are not correlated with wealth level, but severe shocks are negatively and significantly correlated with wealth level. This could be because wealthier households are more able to mitigate the impact of agricultural shocks through strategies such as crop diversification (e.g. Binswanger and Rosenzweig (1993) and Kurosaki and Fafchamps (2002)) or they may be able to increase labor supply to smooth income (e.g. Kochar (1999)).

Turning to correlation among shocks, we observe a positive correlation between reporting agricultural shocks and illness of household working members in Guangxi and Gansu.[15] To examine the correlation, we estimate a linear probability model of reporting shocks on household characteristics. For reporting illness or death of household members, we also add agricultural shocks to the RHS variables in Guangxi and Gansu provinces. Specifically, we estimate the following simultaneous equations:

$$D_{iv}^{a} = \alpha^{a} + \beta^{a} X_{iv} + \eta_{v}^{a} + u_{iv} \quad (1)$$

$$D_{iv}^{h} = \alpha^{h} + \nu^{h} D_{iv}^{a} + \beta^{h} X_{iv} + \varsigma_{v}^{h} + \varepsilon_{iv} \quad (2)$$

[15] It could be because crop loss results in lower health investments and hence more likelihood of reporting health, or could be because illness could affect productivity of household members as argued by Strauss (1986). In this study, we treat agricultural shocks as exogenous shocks.

where D_{iv}^{a} and D_{iv}^{h} are dummy variables for reporting agricultural shock and health-related shocks for household i in village v respectively. X_{iv} is a vector of household characteristics which affect the likelihood of reporting shocks: household head's age, gender, ethnicity, educational attainment, migration history, and marital status, household size, share of household members working on own agricultural business, own non-agricultural business, and working for others, distance to the nearest hospital, and wealth index. η_v^j and ς_v^h are village-level unobservable characteristics, and u_{iv} and ε_{iv} are household unobservable error terms. There is a problem of reverse causation in interpreting the coefficients of wealth level. Households report shocks which occurred in 2004 whereas the wealth index is constructed from housing characteristics as of interview date. Households might move to a different house or sell furniture to mitigate shocks, and changes the wealth index. However, as we describe later in this section, selling furniture or household property is uncommon, and migration is not frequent in the sampled households, indicating the wealth level does not change after the shock. [16] It is likely that these two equations are determined jointly, and we estimate these two equations by seemingly unrelated regressions proposed by Zellner (1962). For Zhejiang and Fujian provinces, equation (1) is not estimated and a dummy of reporting agricultural shocks is excluded from equation (2). The results are shown in Table 5. After controlling for household characteristics and village fixed effects, agricultural shocks are positively correlated with the likelihood of reporting illness of household working member in Guangxi and Gansu provinces. We observe high overlap between agricultural shocks and health shocks in Guangxi and Gansu, and this result indicates that we also need to analyze the impact of combined shocks against single shocks. Contribution of wealth level to reporting agricultural shock is different across different levels of severity in Guangxi province. As wealth level increases by one standard deviation, the likelihood of reporting severe agricultural shocks is reduced by 6.7 percents and reporting any level of agricultural shock is not sensitive to wealth level.[17]

3.2.2. Medical Insurance in Rural China

After the market oriented reforms China has been embarked since the early 1980s, the old and village-based rural medical insurance scheme called cooperative medical system

[16] Even though we do not have a measure of migration in the last year, households are asked if they have moved since 1995. Even for this long duration, 0.2 to 0.3 percent of household migrated in Zhejiang and Fujian, and about 1 percent of household moved in Guangxi and Gansu.
[17] Testing the null hypothesis that coefficients of wealth index for reporting agricultural shocks between these levels of severity yields, F-statistic of 5.37 (P-value = 0.0205).

(CMS) has collapsed, and coverage of medical insurance has been decreasing.[18] Many have found empirically that high medical expenditures are causing impoverishment in rural area. There have been a number of new county-based rural insurance schemes called New Cooperative Medical Scheme (NCMS) which the government aims at covering all rural counties by 2008. As of 2004, the enrollment was not complete yet, and there were provincial differences in enrollment rates: Zhejiang (94.2 percent) and Gansu (89.9 percents) exhibit high enrollment rates whereas in Fujian (0.3 percent) and Guangxi (0.8 percent) NCMS has not been covering the sampled villages.[19] Even for those who joined NCMS, limited coverage and high copayments restrict households' access to medical care.[20] Under these environments with incomplete medical insurance, households either have to resort to informal insurance mechanisms, or have to suffer from squeezing non-medical consumption under health shocks.

3.2.3. Description of Shock Coping Strategies

There is a large theoretical and empirical literature on ex-post shock coping behaviors as described in the introduction. The China Rural Social Protection Survey provides an opportunity to explore what kinds of ex-post shock coping strategies are adopted for each type of shock. For each shock households reported, they are asked 5 questions regarding income smoothing strategies: household member increased workload, worked for other households, found another local job, went out for work, and children were put to work. As for consumption smoothing, households are asked if they used up savings, ate stored grain, sold livestock, sold production tools, sold furniture, and sold other household property. Households are also asked if any household member went to live with relatives or friends, anyone offered help in cultivating land or other production for free, if anyone took care of children or patients for free, if the household borrowed money, food or other items from anyone.[21] These questions are considering consumption smoothing strategies via social networks. The summary statistics of these answers are provided in Table 6. There is

[18] Liu et al (2003) reports that by 1998, insurance coverage for rural households was only 9.5 % of total expenditure, hence out of pocket payments constituted the majority of medical expenditure. Wang et al. (2005) notes 87 percent of farmers had to pay medical expenses in full amounts based on the 1998 China National Health Survey.
[19] The more detailed and updated information on NCMS is explained in Wagstaff et al (2007).
[20] There is the medical financial assistance program (MFA) which provides monetary supports to poor households. But as of 2004, only 37 households from the sample succeeded in their application and 22 of these received positive amounts. About half of recipients report that their family members got sick in the past 6 months but did not seek medical treatment because of financial problems.
[21] They were asked who offered help from the list of relatives, friends, villagers, or others.

evidence of reporting income smoothing by increasing workload: half of those who report the death or illness of household members, increase their workload, while about a third of households increase their workload under crop failure. Consumption smoothing is more frequently reported than income smoothing strategies. Looking at the data in greater detail, we observe that borrowing money from banks, relatives or friends is the most common strategy. We also observe household do not sell-off production tools (except for livestock) or household properties under shocks. That is, the housing characteristics do not vary much before and after the shocks. This is important to note because we constructed a wealth index from the households' housing characteristics and property to account for households' persistent income level. A large fraction of households report that they reduced food consumption under various types of shocks, indicating the shocks were not fully insured. However, as we show later, we find evidence of association between food consumption and shocks in only Zhejiang province. Table 7 reports detailed sources of financial help in cases of shocks. Borrowing money from relatives without interest is the most widespread source of financial help. Friends are also an important source of financial help although borrowing from banks is slightly more frequent. This implies that there is a high degree of informal risk sharing without interest, and that the formal banking sector is not the only source of credit for those hit by shocks.

3.3. Impacts of Different Shocks on Various Types of Consumption.

The previous section shows that there is some heterogeneity in exposure to health and agricultural shocks among rural households in China. It also shows that households employ various, sometimes multiple ex-post shock coping strategies. In this section, we examine how households' welfare is associated with the exposure to shocks after these shock coping strategies are adopted. We first analyze how the report of various types of shocks is associated with different types of consumption, controlling for household characteristics including wealth level. Then we estimate the association between consumption and multiple shocks (against not reporting a shock or reporting a single shock).

3.3.1. Single Shocks

Consider following estimation equation:

$$\ln C_{iv} = \alpha + \sum_j \nu^j D_{iv}^j + \beta X_{iv} + \eta_v + \varepsilon_{iv} \qquad (3)$$

where $\ln C_{iv}$ is natural log of consumption per capita plus 1RMB. The types of consumption we examine are total consumption, food consumption, consumption of durable goods, and medical expenditure. Medical expenditure is defined as out of pocket payments, or total medical expenditure minus medical financial assistance and reimbursements from health insurance. Included household characteristics are household head's gender, age, ethnicity, educational attainment and marital status, household size, and wealth index. In this analysis, our estimation strategy relies on a crucial assumption due to the limitation of cross sectional data: households' characteristics including wealth levels capture counterfactual consumption levels. Ideally, we would want to know how much consumption has changed due to the shocks relative to counterfactual level. This implies counterfactual consumption is included in the household unobservable tem. If we assume that exposure to shocks is independent of counterfactual consumption (a strong assumption), then the coefficients ν^j are unbiased. However, as we have shown in the previous section, exposure to shocks is associated with household's characteristics such as wealth level. Our weaker assumption is that the component of counterfactual consumption that is correlated with exposure to shocks is represented by household characteristics and that the rest of counterfactual consumption is independent of exposure to shocks.

Table 8 presents estimation results. First, agricultural shocks do not seem to be associated with any consumption measure (from looking at Guangxi and Gansu). This finding is not new: there have been a number of empirical papers that fail to reject the permanent income hypothesis or full risk sharing when looking at agricultural shocks. Medical expenditure is strongly correlated with illness of household members for all provinces, indicating health insurance schemes and financial assistance are not enough to cover the cost of health shocks. This positive relation contributes to the association between total consumption and health shocks. Even with the possibility of income losses when a working member is sick, households hit by a health shock increase overall expenditure, indicating that they must employ some types of coping strategy. Another interesting question is whether households squeeze other types of consumption to be able to increase medical expenditure. Food consumption per capita is negatively correlated with illness of household working members only in Zhejiang province. The magnitude of the decrease is sizeable: the shock is associated with a 38 percent reduction in food consumption. A possible explanation for this result is that households in the other three provinces are relatively near subsistence levels so that they cannot reduce food consumption substantially whereas those in Zhejiang province have enough room to reduce food consumption. Turning to other types of consumption, we note that households seem to reduce a sizeable portion of durable purchases

because of health shocks. Those who reported illness of household working members in Zhejiang and Fujian provinces consume durables by 70 to 80 percent less. Those in Guangxi and Gansu provinces seem to consume a lower amount of durables even though the magnitudes are overall lower and not statistically significant.

As a robustness check, we explore differences in means of per capita consumption between those who reported shocks and those who did not. This exercise is like estimating an average treatment effect for the treated where reporting a shock is considered as the "treatment". As we have shown, various household characteristics as well as other types of shocks are determinants of reporting shocks. Thus, we employ the matching methods based on propensity scores proposed by Rosenbaum and Rubin (1983) and now widely used in the program evaluation literature. We first construct propensity scores from the estimation equations (1) and (2) using a logit model, then we construct counterfactual consumption from the smoothed weights of the propensity scores. We compare these results to OLS results where we regress the level of consumption per capita instead of natural logs. The results are presented in Table 9, which shows that the OLS coefficients describe the association between shocks and consumption levels, but the main messages are similar to those from previous OLS results. Also, the coefficients of shocks in the OLS regressions and estimates of ATT are similar in magnitude as well as in statistical significance, providing more confidence in the previous regression results.

3.3.2. Multiple Shocks

Estimating associations between various shocks and types of consumption reveals that households hit by health shocks change their expenditure in non-medical items such as food or durables whereas agricultural shocks do not seem to be associated with any measure of consumption. However, we have not looked at how the exposure to multiple shocks is associated to consumption. Are associations between various types of consumption and shocks similar for multiple shocks and for a single shock? What happens to medical expenditure if households are also hit by agricultural shocks? To address these issues, we estimate estimation equation similar to equation (3) except that we now categorize the dummy variables of reporting shocks as follows: no shocks (0), agricultural shocks only (1), death of household members only (2)[22], illness of household members only (3), agricultural shocks and death of household members (4), agricultural shocks and illness of household members (5), death and illness of household members (6), all shocks (7). Since we do not observe agricultural shocks in Zhejiang and Fujian provinces, we restrict the sample to

[22] We combine the death of a working member and dependents to have more variation in covariates. Similar treatment is done for illness of household members.

Guangxi and Gansu provinces. As shown in Table 2, the frequency of reporting multiple shocks is sizeable for shocks (1), (3), and (5), so we focus on consumption of these households, which is shown in Table 10. Reporting no shock is set as base. Again, reporting only agricultural shocks is not associated with changes in consumption. However, the positive association with medical expenditure is higher for households reporting only illness of household members compared to those who report an agricultural shock and illness (although the F-test of equality of coefficients between only health shock and both health and agricultural shocks cannot be rejected in both provinces, p-value = 0.14 in Guangxi and 0.13 in Gansu). This is a weak indication that agricultural shocks are not insured enough to allow households to cover their health expenditures. This finding should be taken seriously given the fact that a similar fraction of households report both shocks and only illness of household members in Guangxi (3.3 percent and 3.2 percent). In Gansu, 6.4 percent of households report both shocks and 4.1 percent of households report illness of household members. Consumption of durables is negatively associated with shocks in a few cases: reporting only illness or death of household members in Gansu, and reporting agricultural shocks and death of household members and reporting all shocks in Guangxi.

3.4. Concluding Remarks

Chinese rural households are exposed to various types of shocks, just like other rural households in developing countries. In two of the four provinces where the China Rural Social Protection Survey was conducted, sizeable fraction of households reported they experienced crop failure or loss of livestock. Health shocks are less frequent but relatively evenly distributed across provinces. This survey and other empirical literature find health insurance scheme does not fully insure medical expenditures, indicating households have to employ some sort of smoothing strategies. The possible losses of labor income together with the increase in medical expenditure may have impacts on non-medical consumption. This paper examines who are more likely to be exposed to shocks, what ex-post coping strategies are adopted, and how much of the welfare impact of these shocks remains after these coping strategies are taken. Especially, the rich information on experiencing shocks from this survey allows us to examine if there are differences between households who experience single shock and those who reported multiple shocks.

An increase in medical expenditure from health shocks forces households to reduce their non-medical expenditure: consumption of durables is negatively associated with health shocks in the two relatively richer provinces; food consumption has a similar tendency for the households in the richest province. The positive association between medical expenditure

and health shocks is higher for those who do not report agricultural shocks than for those who reported them, indicating that agricultural shocks are not insured well enough to cover the cost of medical expenditure. Experiencing both health and agricultural shocks is not a rare incident in rural China. These findings document the need for well-functioning health insurance schemes, especially areas where households are vulnerable to multiple shocks.

Table 3.1: Descriptive Statistics of Sampled Households

	Zhejiang		Fujian		Guangxi		Gansu		Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Hh size	3.69	1.31	4.11	1.59	4.52	1.67	4.60	1.40	4.26	1.55
Hh head's age	53	12	52	14	48	12	46	12	49	13
Hh head is male	95%	22%	94%	23%	91%	28%	97%	17%	94%	23%
Migration since 1995	1%	18%	1%	19%	2%	19%	3%	29%	2%	22%
Electricity access	100%	6%	99%	9%	99%	8%	100%	4%	100%	7%
Wealth index	0.94	0.65	0.31	0.83	-0.09	0.69	-0.91	0.67	0.00	0.97
Total expenditure	17,262	32,881	11,342	11,919	9,488	9,784	9,564	10,523	11,657	18,361
Total expenditure per capita	4,922	10,635	3,111	5,018	2,163	1,920	2,193	2,334	3,001	5,873
Hh food consumption per capita	2,123	1,621	1,432	1,285	1,031	790	888	671	1,327	1,215
Hh nonfood daily consumption per capita	1,248	3,468	629	1,664	460	1,127	424	1,047	663	2,011
Medical expenditure per capita	610	2,148	525	4,170	412	995	538	1,777	517	2,497
Education per capita	234	489	114	303	87	263	165	358	147	362
Purchasing durable goods per capita	417	9,600	144	582	70	222	60	233	161	4,519
Utilities per capita	233	223	235	535	82	164	84	186	152	317

Table 3.2: Fraction of Households Experiencing the Shocks

Panel A: Frequency of Shocks

	All shocks					Less severe or no impact					Severe shocks				
Shocks	Zhejiang	Fujian	Guangxi	Gansu	Total	Zhejiang	Fujian	Guangxi	Gansu	Total	Zhejiang	Fujian	Guangxi	Gansu	Total
Hh working member died	1.1%	0.5%	0.8%	1.0%	0.8%	1.1%	0.4%	0.8%	1.0%	0.8%	0.6%	0.3%	0.7%	0.5%	0.5%
Hh dependants died	0.3%	0.6%	1.5%	1.2%	0.9%	0.2%	0.5%	1.3%	1.1%	0.8%	0.0%	0.3%	1.0%	0.7%	0.5%
Crop failure	0.9%	1.4%	67.2%	26.2%	25.9%	0.9%	1.1%	63.3%	25.0%	24.4%	0.0%	0.4%	28.2%	18.2%	12.7%
Livestock died	0.2%	0.2%	23.5%	3.0%	7.3%	0.2%	0.2%	17.9%	2.6%	5.6%	0.0%	0.1%	5.6%	1.1%	1.8%
Hh working member had a major ill	4.1%	3.1%	7.7%	12.0%	7.0%	3.2%	2.5%	7.3%	11.1%	6.3%	1.2%	1.3%	5.8%	8.6%	4.5%
Hh dependants had a major ill	0.7%	0.5%	2.8%	4.3%	2.2%	0.6%	0.3%	2.6%	4.1%	2.0%	0.2%	0.1%	1.3%	2.9%	1.2%
Observation	1277	1335	1537	1528	5677	1277	1335	1537	1528	5677	1277	1335	1537	1528	5677

Panel B: Frequency of Multiple Shocks

	All shocks					Less severe or no impact					Severe shocks				
	Zhejiang	Fujian	Guangxi	Gansu	Total	Zhejiang	Fujian	Guangxi	Gansu	Total	Zhejiang	Fujian	Guangxi	Gansu	Total
(0) no shock	92.8%	93.8%	26.2%	62.9%	66.8%	94.0%	95.1%	31.2%	64.9%	69.3%	98.1%	97.6%	65.1%	74.5%	82.6%
(1) crop failure or livestock died	0.9%	1.6%	62.0%	20.1%	22.9%	0.9%	1.3%	57.8%	19.2%	21.4%	0.0%	0.5%	26.6%	13.9%	11.1%
(2) death of hh member	1.3%	1.0%	0.7%	1.2%	1.1%	1.2%	0.8%	0.6%	1.1%	0.9%	0.6%	0.6%	0.9%	0.7%	0.7%
(3) illness of hh member	4.8%	3.6%	2.4%	8.9%	5.0%	3.7%	2.8%	2.4%	8.5%	4.5%	1.4%	1.4%	3.3%	6.4%	3.3%
(4) combination of (1) and (2)	0.2%	0.0%	1.1%	0.7%	0.5%	0.2%	0.0%	1.1%	0.7%	0.5%	0.0%	0.0%	0.5%	0.3%	0.2%
(5) combination of (1) and (3)	0.0%	0.0%	7.2%	5.9%	3.5%	0.0%	0.0%	6.6%	5.4%	3.3%	0.0%	0.0%	3.2%	4.1%	2.0%
(6) combination of (2) and (3)	0.0%	0.0%	0.1%	0.2%	0.1%	0.0%	0.0%	0.1%	0.2%	0.1%	0.0%	0.0%	0.1%	0.2%	0.1%
(7) combination of (1), (2), and (3)	0.0%	0.0%	0.3%	0.1%	0.1%	0.0%	0.0%	0.2%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%

Table 3.3: Fraction of Villages with at least one Hh experiencing the shocks

Panel A: Frequency of Shocks

	All shocks					Less severe or no impact					Severe shocks				
Variable	Zhejiang	Fujian	Guangxi	Gansu	Total	Zhejiang	Fujian	Guangxi	Gansu	Total	Zhejiang	Fujian	Guangxi	Gansu	Total
Hh working member died	37%	27%	33%	53%	38%	37%	23%	30%	53%	36%	17%	20%	27%	37%	25%
Hh dependants died	13%	27%	50%	40%	33%	10%	23%	43%	37%	28%	0%	10%	37%	23%	18%
Crop failure	27%	33%	100%	93%	63%	27%	30%	100%	90%	62%	0%	17%	100%	70%	47%
Livestock died	7%	10%	100%	53%	43%	7%	10%	100%	50%	42%	0%	7%	83%	33%	31%
Hh working member had a major ill	87%	77%	97%	100%	90%	77%	70%	97%	100%	86%	50%	50%	93%	100%	73%
Hh dependants had a major ill	27%	17%	77%	90%	53%	23%	13%	77%	87%	50%	7%	3%	53%	83%	37%

Panel B: Frequency of Multiple Shocks

	All shocks					Less severe or no impact					Severe shocks				
	Zhejiang	Fujian	Guangxi	Gansu	Total	Zhejiang	Fujian	Guangxi	Gansu	Total	Zhejiang	Fujian	Guangxi	Gansu	Total
(0) no shock	100%	100%	100%	93%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
(1) crop failure or livestock died	30%	40%	100%	90%	65%	30%	37%	100%	87%	63%	0%	20%	100%	67%	47%
(2) death of hh member	43%	47%	30%	50%	43%	40%	40%	23%	47%	38%	17%	30%	37%	37%	30%
(3) illness of hh member	87%	80%	77%	93%	84%	80%	77%	77%	93%	82%	57%	53%	83%	93%	72%
(4) combination of (1) and (2)	7%	0%	47%	20%	18%	7%	0%	43%	20%	18%	0%	0%	20%	10%	8%
(5) combination of (1) and (3)	0%	0%	93%	63%	39%	0%	0%	93%	50%	36%	0%	0%	87%	47%	33%
(6) combination of (2) and (3)	0%	3%	7%	7%	4%	0%	3%	7%	7%	4%	0%	0%	7%	7%	3%
(7) combination of (1), (2), and (3)	0%	0%	13%	7%	5%	0%	0%	10%	7%	4%	0%	0%	7%	3%	3%

Table 3.4: Correlation among Income, Wealth Level and Shocks

	All shocks					Less severe or no impact					Severe shocks				
	Wealth index	Agrcultural shock	Death of hh working member	Illness of hh working member	Death of hh dependents	Wealth index	Agrcultural shock	Death of hh working member	Illness of hh working member	Death of hh dependents	Wealth index	Agrcultural shock	Death of hh working member	Illness of hh working member	Death of hh dependents
Zhejiang															
Agrcultural shock	-0.03					-0.03					.				
	0.35					0.35					0.00				
Death of hh working	-0.03	-0.01				-0.03	-0.01				-0.07	.			
member	0.25	0.70				0.25	0.70				0.01	0.00			
Illness of hh working	-0.12	-0.02	-0.02			-0.13	-0.02	-0.02			-0.12	.	-0.01		
member	0.00	0.44	0.43			0.00	0.49	0.48			0.00	0.00	0.75		
Death of hh	-0.02	0.27	-0.01	-0.01		-0.02	0.32	-0.01	-0.01		.	.	.	.	
dependents	0.43	0.00	0.83	0.67		0.43	0.00	0.86	0.74		0.00	0.00	0.00	0.00	
Illness of hh	0.00	-0.01	-0.01	-0.02	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.01	.	0.00	0.00	.
dependents	0.90	0.76	0.75	0.52	0.87	0.86	0.79	0.78	0.62	0.90	0.81	0.00	0.92	0.87	0.00
Fujian															
Agrcultural shock	-0.05					-0.04					-0.03				
	0.08					0.11					0.25				
Death of hh working	0.00	-0.01				-0.01	-0.01				0.00	-0.01			
member	0.89	0.72				0.82	0.77				1.00	0.85			
Illness of hh working	-0.10	-0.03	-0.02			-0.08	-0.02	-0.01			-0.09	-0.01	-0.01		
member	0.00	0.34	0.56			0.00	0.43	0.62			0.00	0.68	0.72		
Death of hh	0.00	-0.01	-0.01	0.03		0.02	-0.01	-0.01	0.04		0.00	0.00	0.00	-0.01	
dependents	0.87	0.72	0.83	0.23		0.59	0.77	0.85	0.11		0.95	0.89	0.91	0.80	
Illness of hh	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00
dependents	0.81	0.76	0.85	0.61	0.85	0.84	0.82	0.89	0.71	0.89	0.64	0.94	0.95	0.89	0.96
Guangxi															
Agrcultural shock	0.01					-0.02					-0.10				
	0.83					0.34					0.00				
Death of hh working	-0.03	-0.01				-0.03	0.01				-0.03	0.05			
member	0.31	0.73				0.20	0.68				0.19	0.07			
Illness of hh working	-0.04	0.05	0.02			-0.04	0.07	0.03			-0.04	0.13	0.04		
member	0.12	0.07	0.36			0.15	0.01	0.26			0.10	0.00	0.08		
Death of hh	0.02	-0.02	0.05	0.01		0.02	-0.01	-0.01	0.02		0.02	-0.02	-0.01	0.03	
dependents	0.41	0.33	0.07	0.82		0.55	0.82	0.70	0.54		0.48	0.48	0.75	0.18	
Illness of hh	0.00	0.02	-0.02	0.06	0.05	0.01	0.02	-0.01	0.07	0.02	-0.02	0.02	-0.01	0.07	-0.01
dependents	0.99	0.46	0.53	0.03	0.06	0.80	0.47	0.56	0.01	0.41	0.47	0.42	0.70	0.01	0.66
Gansu															
Agrcultural shock	-0.41					-0.40					-0.41				
	0.00					0.00					0.00				
Death of hh working	-0.07	-0.02				-0.07	-0.02				-0.03	-0.03			
member	0.01	0.34				0.01	0.41				0.20	0.30			
Illness of hh working	-0.12	0.11	-0.03			-0.13	0.11	-0.03			-0.12	0.15	-0.03		
member	0.00	0.00	0.23			0.00	0.00	0.27			0.00	0.00	0.24		
Death of hh	-0.06	0.05	0.04	-0.01		-0.06	0.06	0.04	0.00		-0.05	0.04	0.08	0.03	
dependents	0.01	0.05	0.15	0.73		0.03	0.01	0.11	0.95		0.05	0.13	0.00	0.32	
Illness of hh	-0.02	-0.02	-0.03	0.13	0.00	-0.02	-0.01	-0.03	0.11	0.01	-0.03	0.05	-0.02	0.13	0.03
dependents	0.50	0.41	0.28	0.00	0.94	0.46	0.66	0.30	0.00	0.79	0.18	0.06	0.51	0.00	0.28

Table 3.5: Determinants of reporting shocks

	Zhejiang			Fujian			Guangxi			Gansu		
Agricultural Shocks												
Magnitude of shocks	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe
Wealth index							-0.017	-0.034	-0.066	-0.076	-0.081	-0.072
							(0.86)	(1.62)	(3.37)**	(3.74)**	(4.09)**	(4.32)**
Observations							1453	1453	1453	1375	1375	1375
R-squared							0.15	0.15	0.15	0.51	0.49	0.48
Death of hh working member												
Magnitude of shocks	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe
Wealth index	-0.004	-0.004	-0.010	0.002	0.002	0.002	-0.009	-0.009	-0.008	-0.012	-0.012	-0.007
	(0.71)	(0.71)	(2.05)*	(0.57)	(0.82)	(0.60)	(2.13)*	(2.18)*	(2.04)*	(1.83)+	(1.84)+	(1.39)
Agricultural Shocks							-0.004	-0.003	0.009	-0.007	-0.006	-0.004
							(0.57)	(0.40)	(1.54)	(0.71)	(0.70)	(1.82)+
Observations	1194	1194	1194	1228	1228	1228	1453	1453	1453	1375	1375	1375
R-squared	0.11	0.11	0.17	0.07	0.07	0.08	0.05	0.05	0.05	0.07	0.07	0.05
Illness of hh working member												
Magnitude of shocks	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe
Wealth index	-0.039	-0.038	-0.024	-0.026	-0.023	-0.013	-0.026	-0.026	-0.019	-0.009	-0.015	-0.023
	(3.13)**	(3.31)**	(2.90)**	(2.49)*	(2.58)*	(2.03)*	(2.22)*	(2.26)*	(1.77)+	(0.48)	(0.84)	(1.56)
Agricultural Shocks							0.020	0.035	0.066	0.056	0.050	0.065
							(1.30)	(2.46)*	(3.82)**	(1.83)+	(1.70)+	(2.04)*
Observations	1194	1194	1194	1228	1228	1228	1453	1453	1453	1375	1375	1375
R-squared	0.07	0.06	0.05	0.07	0.07	0.06	0.06	0.06	0.08	0.09	0.09	0.10
Death of hh dependent												
Magnitude of shocks	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe
Wealth index	-0.002	-0.002		-0.000	0.001	-0.001	0.003	0.002	0.001	-0.006	-0.007	-0.006
	(0.73)	(0.73)		(0.10)	(0.24)	(0.29)	(0.58)	(0.40)	(0.27)	(1.75)+	(1.87)+	(1.96)+
Agricultural Shocks							-0.006	-0.000	-0.003	0.001	0.012	0.009
							(0.72)	(0.02)	(0.50)	(0.10)	(1.19)	(0.94)
Observations	1194	1194		1228	1228	1228	1453	1453	1453	1375	1375	1375
R-squared	0.03	0.03		0.04	0.04	0.04	0.11	0.06	0.03	0.07	0.08	0.06
Illness of hh dependent												
Magnitude of shocks	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe	All	Less Severe	Severe
Wealth index	-0.004	-0.002	-0.002	0.001	-0.001	0.002	-0.006	-0.005	-0.007	-0.017	-0.015	-0.010
	(0.83)	(0.42)	(1.36)	(0.38)	(0.33)	(1.00)	(0.95)	(0.78)	(1.92)+	(1.52)	(1.34)	(1.00)
Agricultural Shocks							0.002	0.002	-0.003	-0.007	0.002	0.038
							(0.14)	(0.17)	(0.38)	(0.51)	(0.16)	(2.13)*
Observations	1194	1194	1194	1228	1228	1228	1453	1453	1453	1413	1413	1413
R-squared	0.04	0.03	0.03	0.06	0.03	0.04	0.05	0.03	0.03	0.02	0.03	0.03

Table 3.6: Descriptive statistics on consumption and income smoothing strategies

		household working member died	household dependants died	crop failure	livestocks died	household working member had a major ill	hh dependants had a major ill
Income smoothing by working more	hh member increased workload	54%	41%	32%	16%	47%	51%
	hh member worked for other hh	18%	11%	6%	2%	14%	14%
	hh member find another job	7%	6%	7%	6%	7%	11%
	hh member went out for work	14%	30%	22%	15%	30%	33%
	children were made to work	12%	0%	3%	1%	5%	4%
	At lease one means of income smoothing	62%	55%	50%	31%	62%	67%
Consumption smoothing within hh	Use saving	50%	24%	7%	4%	41%	46%
	Eat stored grain	25%	25%	19%	8%	27%	28%
	Sell off livestock	15%	9%	8%	3%	14%	14%
	Sell off production tools	5%	2%	2%	1%	6%	2%
	Sell of furnitures	1%	0%	1%	0%	1%	3%
	Sell off other hh property	4%	0%	2%	1%	4%	4%
Consumption smoothing using network	hh member live in other hh	2%	7%	3%	2%	9%	7%
	other hh help production for free	20%	13%	7%	4%	17%	13%
	other hh help taking care of children	9%	5%	4%	2%	12%	10%
	borrow food or other things from other hh	19%	18%	21%	10%	23%	19%
	borrow money from other hh or bank	69%	62%	44%	24%	70%	67%
At lease one means of consumption smoothing		89%	78%	59%	33%	88%	88%
Subjective experience of cosumption smoothing	Children's schooling discontinued	2%	3%	1%	1%	4%	0%
	Eat cheap food	63%	51%	45%	43%	59%	58%
	Reduce hh food consumption to lowest level	38%	31%	25%	14%	37%	41%
	At least one of (2) and (3)	72%	51%	50%	44%	66%	65%
Panel C: Composition of lenders							
	Relatives without interest	93%	89%	66%	68%	79%	86%
	Relatives with interest	0%	0%	1%	2%	5%	0%
	Friends witout interest	27%	38%	29%	34%	37%	30%
	Friends with interest	3%	0%	1%	1%	4%	1%
	Credit coope	0%	0%	1%	1%	0%	0%
	Bank	34%	35%	50%	41%	48%	45%
	Other wituout interest	0%	0%	2%	4%	2%	2%
	Other with interest	0%	0%	2%	4%	2%	0%

Table 3.7: Source of lenders in case of shocks

	household working member died	household dependants died	crop failure	livestocks died	household working member had a major ill	hh dependants had a major ill
Relatives without interest	93%	89%	66%	68%	79%	86%
Relatives with interest	0%	0%	1%	2%	5%	0%
Friends witout interest	27%	38%	29%	34%	37%	30%
Friends with interest	3%	0%	1%	1%	4%	1%
Credit coope	0%	0%	1%	1%	0%	0%
Bank	34%	35%	50%	41%	48%	45%
Other wituout interest	0%	0%	2%	4%	2%	2%
Other with interest	0%	0%	2%	4%	2%	0%

Table 3.8: Association between consumption per capita and shocks

	Zhejiang				Fujian			
	Total consumption	Food consumption	Purchasing durable	Medical expenditure	Total consumption	Food consumption	Purchasing durable	Medical expenditure
crop failure or livestock loss	0.000	0.000	0.000	0.000	-0.082	0.012	-0.461	-1.219
	(.)	(.)	(.)	(.)	(0.22)	(0.02)	(1.58)	(0.89)
death of hh working member	0.797	-0.172	-0.138	0.776	0.345	-0.011	-1.856	0.776
	(2.85)**	(0.51)	(0.16)	(0.65)	(1.84)+	(0.07)	(3.77)**	(0.69)
ill of hh working member	0.542	-0.374	-0.826	5.191	0.641	-0.027	-0.696	4.662
	(3.15)**	(2.65)**	(2.01)*	(11.83)**	(3.72)**	(0.22)	(2.07)*	(6.71)**
death of hh dependent memb	0.000	0.000	0.000	0.000	1.134	0.363	0.961	1.046
	(.)	(.)	(.)	(.)	(6.06)**	(1.12)	(0.85)	(0.60)
ill of hh dependent member	0.054	0.023	-1.678	4.241	-0.231	-0.618	-1.069	5.440
	(0.27)	(0.15)	(2.51)*	(8.46)**	(1.94)+	(5.22)**	(2.79)**	(9.91)**
Constant	8.853	7.990	1.168	3.086	7.538	7.043	0.482	1.819
	(39.53)**	(36.90)**	(1.55)	(3.00)**	(34.62)**	(28.29)**	(0.74)	(2.31)*
Observations	1226	1226	1226	1226	1413	1413	1413	1413
R-squared	0.23	0.18	0.11	0.13	0.25	0.21	0.09	0.23

	Guangxi				Gansu			
	Total consumption	Food consumption	Purchasing durable	Medical expenditure	Total consumption	Food consumption	Purchasing durable	Medical expenditure
crop failure or livestock loss	0.027	0.035	-0.117	0.158	0.044	0.058	0.118	-0.073
	(0.71)	(0.86)	(0.89)	(1.21)	(0.69)	(0.99)	(0.70)	(0.28)
death of hh working member	0.885	0.276	0.001	-0.180	0.185	-0.508	-0.421	0.462
	(3.55)**	(1.87)+	(0.00)	(0.22)	(0.93)	(1.70)+	(2.18)*	(0.63)
ill of hh working member	0.531	0.059	-0.141	2.128	0.397	-0.022	-0.205	2.422
	(7.32)**	(0.89)	(0.57)	(11.14)**	(5.49)**	(0.41)	(1.32)	(11.64)**
death of hh dependent memb	0.428	0.092	-0.731	0.039	0.616	0.134	0.892	1.876
	(3.27)**	(0.87)	(1.60)	(0.08)	(2.73)**	(0.71)	(0.84)	(3.09)**
ill of hh dependent member	0.440	0.016	-0.115	2.318	0.259	0.106	-0.078	2.214
	(3.54)**	(0.09)	(0.29)	(5.84)**	(2.26)*	(1.03)	(0.28)	(8.43)**
Constant	7.402	6.451	0.256	2.601	7.386	6.952	0.612	1.732
	(35.22)**	(24.06)**	(0.43)	(4.00)**	(32.28)**	(26.60)**	(0.93)	(2.17)*
Observations	1485	1485	1485	1485	1396	1396	1396	1396
R-squared	0.21	0.18	0.08	0.19	0.26	0.22	0.10	0.23

Dependent variables are in log (X + 1)

Included independent variables are: household head's gender, age, ethnicity, educational attainment (dummy for each level) and marital status, household size, and wealth index constructed from the characteristics of houses.

Table 3.9: Comparison between OLS and difference in means from propensity score matching

	Guangxi					
	Total consumption		Food consumption		Medical expenditure	
	OLS	ATT	OLS	ATT	OLS	ATT
agricultural shock	59.109	112.35907	-0.473	-44.31298	-13.291	69.535366
	(0.55)	(0.93)	(0.01)	(0.97)	(0.26)	(1.22)
illness of hhold working member	1,473.447	1562.4989	36.681	80.672759	1,193.595	1159.9475
	(4.10)	(4.19)	(0.47)	(0.67)	(6.07)	(6.67)
illness of hhold dependent member	1,013.867	1225.0026	21.403	12.553756	1,100.828	1296.1068
	(2.12)	(2.2)	(0.17)	(0.09)	(2.35)	(2.7)
	Gansu					
	Total consumption		Food consumption		Medical expenditure	
	OLS	ATT	OLS	ATT	OLS	ATT
agricultural shock	-300.146	-666.7593	-16.809	-14.24654	-367.878	-666.4682
	(1.16)	(1.94)	(0.20)	(0.16)	(1.60)	(2.24)
illness of hhold working member	1,623.162	2017.5231	-45.111	-67.1783	1,706.421	2111.5721
	(3.24)	(3.96)	(0.91)	(1.28)	(3.46)	(4.26)
illness of hhold dependent member	565.519	1531.5521	112.146	6.557889	673.303	1597.2541
	(1.55)	(2.81)	(1.06)	(0.07)	(1.84)	(3.00)

Table 3.10: Association between consumption per capita and shocks (multiple shocks)

	Guangxi				Gansu			
	Total conumption	Food consumption	Purchasing durable	Medical expenditure	Total conumption	Food consumption	Purchasing durable	Medical expenditure
(1) crop failure or livestock die	0.044	0.044	-0.099	0.220	0.030	0.039	0.094	-0.041
	(1.09)	(1.02)	(0.72)	(1.58)	(0.45)	(0.62)	(0.55)	(0.15)
(2) death of hh member	0.717	0.267	-0.632	-0.415	0.413	-0.322	-0.419	0.611
	(3.58)**	(2.55)*	(1.49)	(0.72)	(1.88)+	(1.16)	(2.24)*	(0.95)
(3) illness of hh member	0.583	0.032	-0.092	2.713	0.451	-0.043	-0.408	2.942
	(7.31)**	(0.33)	(0.28)	(13.25)**	(5.11)**	(0.73)	(2.45)*	(13.27)**
(4) shocks (1) and (2).	0.403	-0.004	-0.971	0.441	0.698	0.126	2.321	2.131
	(2.00)*	(0.02)	(5.02)**	(0.43)	(3.06)**	(0.39)	(1.28)	(2.04)*
(5) shocks (1) and (3)	0.588	0.106	-0.450	2.269	0.373	0.095	0.159	2.322
	(5.20)**	(1.18)	(1.57)	(9.00)**	(3.80)**	(0.99)	(0.56)	(7.00)**
(6) shocks (2) and (3)	0.596	-0.007	2.304	1.257	0.318	0.025	-0.694	3.647
	(2.49)*	(0.04)	(0.98)	(1.35)	(1.43)	(0.15)	(1.45)	(7.90)**
(7) shocks (1), (2) and (3)	1.255	-0.017	-0.945	3.666	0.000	0.000	0.000	0.000
	(4.32)**	(0.09)	(3.28)**	(4.31)**	(.)	(.)	(.)	(.)
Constant	7.379	6.447	0.397	2.557	7.378	6.927	0.594	1.398
	(34.30)**	(23.70)**	(0.65)	(3.93)**	(32.62)**	(26.68)**	(0.90)	(1.77)+
Observations	1467	1467	1467	1467	1396	1396	1396	1396
R-squared	0.21	0.18	0.08	0.19	0.26	0.22	0.10	0.24

Robust t statistics in parentheses

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

Dependent variables are in log (X + 1)

Included independent variables are: household head's gender, age, ethnicity, educational attainment (dummy for each level) and marital status, household size, and wealth index constructed from the characteristics of

Appendix Table 3.1. Principal components and summary statistics for housing characteristics

Census year	1990			2000		
Variable	Scoring factor for first principal component	Mean	Std. dev	Scoring factor for first principal component	Mean	Std. dev
Latrine access (Pit or better)	0.297	0.706	0.456	0.271	0.719	0.449
Water supply (Well or better)	0.282	0.729	0.444	0.219	0.768	0.422
Floor type of house (Not dirt floor)	0.465	0.403	0.491	0.456	0.376	0.484
Material of roof (Better than grass)	0.469	0.403	0.491	0.459	0.370	0.483
Source of energy for lighting	0.438	0.150	0.357	0.469	0.167	0.373
Source of energy for cooking	0.398	0.095	0.293	0.450	0.138	0.345
Number of living rooms	0.126	0.955	0.588	0.133	0.878	0.514
Number of bed rooms	0.173	1.684	1.085	0.141	1.677	0.966

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