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Poverty, Inequality, Violent Conflict, and Welfare Loss: Micro-Level Evidence from Nepal

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BY

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DISSERTATION

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One of the most time consuming aspects of this research is obtaining appropriate data sets for the analysis. Gathering Maoist People's War related human casualty data across the villages of Nepal took several months as the main sources of those data are several volumes of Human Rights Year Books (annual reports) of Informal Sector Services Center (INSEC) where events are recorded as narrative stories, not in the ready-to-use tables. Nepal Study Center (NSC) at the University of New Mexico played a coordinating role while gathering most of the data sets used in this research. I gratefully acknowledge the research facility and support of the NSC. I would specially like to thank Mohan Khajum Chongbang from Nepal Central Bureau of Statistics (CBS) for helping me to get one or the other missing components of the household survey data without which this research project would not have been completed in this form.

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ABSTRACT

Poverty alleviation has become one of the main global agendas of the twenty first century, but the identification and targeting of the poor is facing fundamental problems due to the lack of required information. We utilize the micro-level estimation technique to estimate household expenditure for the census households using Nepalese household surveys, and estimate different measures of poverty and inequality at the national level as well as at the regional, districts and village levels, and for the different caste/ethnic groups.

Our findings indicate that the reduction in poverty during 1995/96 – 2003/04 is not uniform across the villages of Nepal, and the level of poverty actually went up in a significant part of the country. The intensity of inequality went up significantly during the study period, where enterprise income and remittances contributed the most.

Using public choice theory of conflict, we test the effect of inequality and poverty on the intensity of Nepal's conflicts due to the Maoist's People's War. We take into account the heterogeneity among the districts of Nepal and hierarchical nature of the data

by introducing multi-level models. The increased poverty accompanied by the accelerating inequality throughout the country has compounded the divide between the haves and the have-nots and provided a suitable atmosphere for the conflict. The results show that higher inequality and poverty escalate the deadly violence while the presence of social network and the government welfare programs reduces it. An economic variable, such as employment, however, has no effect on the level of conflict indicating that Nepal's conflict is rooted in the age-old grievances and inequality.

Finally, we test the implication of the full consumption insurance hypotheses in the presence of violent conflict that household consumption should not be affected by the idiosyncratic shocks. We find that food consumption suffers the most from the violence related shocks. The level of food consumption vulnerability is more pronounced for the households with low levels of education and income, but the socially disadvantaged caste/ethnicity is not appeared as a significant factor of food-consumption vulnerability.

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INTRODUCTION TO POVERTY AND INEQUALITY MAPPING AND VIOLENT CONFLICT IN NEPAL

1.1 . Introduction

Nepal experienced violent political unrest during 1996-2006. Within a decade, over 13,000 people have been killed and over 200,000 people have been displaced due to the Maoist People's War (MPW) that started in 1996. In November 21, 2006 the Comprehensive Peace Accord 2006 was signed by the rebel insurgents and Nepal government that officially ended the MPW. The over a decade long deadly violence has raised many questions: why did such high-intensity violent conflict occur in the country that is very often referred to as the county of peace loving people who embrace heterogeneity and diversity? What are the consequences of it? Is the prospect of reoccurrence of such violent conflict over for good? Or, are there still chances of reoccurrence of such violent conflicts in the future from one or the other sections of the society? Clearly, until and unless the backgrounds and the pre-existing conditions that led the conflict are changed permanently such violent conflict might reoccur in the future. This research estimates the distributional measures of household expenditure at the village level, and utilizes a public choice theory of conflict (e.g., Esteban and Ray 1999, Milante 2004) to analyze the causes of the decade long armed conflicts in Nepal, and to some extent explore the consequences of it with respect to households' welfare.

The social cost of such violent civil unrest is tremendous, including loss of lives, abductions, disappearances, and family disintegration. On the economic front, the short-run consequences of such violent conflict are increased spending on defense activities

and decreased spending in social sectors that puts a strain on the financial viability of the welfare state in addition to the destruction of infrastructure, the backbone of economic progress. Evidence from elsewhere (Abadie and Gardeazabal 2003) shows that the long-run cost of violent conflict would be a significant drop in GDP growth over time that may be reflected in lower standards of living. Nepal's GDP growth supports this finding as it was expected to grow just by 2% in 2006/07 contrary to South Asia's expected growth rate of over 7.3%. Before the start of MPW, Nepal's GPD growth rate was over 5% (Asian Development Bank 2006). Results from a recent national household survey (CBS 2005) shows that inequality has gone up significantly compared to 1995/96, the starting point of the MPW (CBS 2005). Such an increased inequality coupled with sluggish economic growth may lead to further polarization and social clustering thereby reinforcing the violent conflict.[1]

1.2 . Poverty and Inequality Mapping

Data deficiency is the major problem while doing social science research related to developing countries (DCs). In order to address the data issue, several DCs, on the one hand, have been conducting household surveys spending millions of dollars with the help of multilateral institutions, such as the World Bank. On the other hand, census data that almost all countries collect on their own, has not been utilized to the extent it could be used. The data collected from such nationally representative household surveys are used extensively to analyze the aggregate household welfare and to estimate other aggregate

[1] For detailed discussion of Maoist insurgency in Nepal, see Bohara, Mitchell and Nepal (2006), and Murshed and Gates (2005).

development indicators and those results are widely used while designing various socio-economic policies.

While the outcomes of the surveys are very useful in designing socio-economic policies at the aggregate (national or regional) levels, by design those surveys are not representative at the lower administrative units of the country. In the decentralized communities, census data that are used basically to analyze the population dynamics in the county can provide details about all households in the given geographical (political) units, but generally lack information about household welfares (income or expenditure) that can be found in details in the household surveys. This kind of information problem can be resolved by linking survey data with census using a statistical methodology called the micro-level estimation technique (Elbers *et al* 2003). Once the welfare indicators of census households are estimated, we can use those indicators to estimate levels of poverty, inequality, polarization, and other measures of welfares at the village level, the lowest administrative unit of Nepal.

1.3 . A Brief History of Nepal's Maoist Movement

The Communist Party of Nepal (Maoist) was founded in 1996 after breaking away form Samyoukta Jana Morcha (United People's Front) and Communist Party of Nepal (Unity Center) in 1994. After breaking up, they ran the parallel parties, boycotted 1994 mid-term election, and finally, in 1996, both break-away factions merged into one party, the Communist Party of Nepal (Maoist or CPN (M)). Some of its members such as present spokesperson, KB Mahara, were also the elected members of the parliament in 1991 from the United People's Front party.

The MPW began on February 13, 1996 with a simultaneous attack on three remotely stationed police outposts, a bank branch, a soft-drink bottling plant (owned by an American Company), a liquor factory and a private house. This event went unnoticed in the beginning as was the case in similar revolutionary movements in other countries.[2] Their strategy was of a guerilla nature – establishing bases in the rural and remote areas with the objective of surrounding urban centers in order to seize state power. They did so by eliminating the police outposts and killing local feudal elements and the so called informers (school teachers and other local people who opposed the Maoist ideology and did not provide food, shelter and did not pay money when they are asked for). In their base areas, the Maoist redistributed the captured land from the absentee landlords and feudal interests to the locals to farm and use as cooperatives. What started as an insignificant and isolated incident in 1996 has transformed into a devastating conflict claiming more than 13,000 lives and displacing over 200,000 people in the next ten years.

In November 21, 2006 the MPW was formally ended with signing of a historic peace deal with Nepal government. Maoist fighters and their arms have been put in different cantonments under the supervision of the United Nations, aiming to conduct the election to constituent assembly under fearless environment of the Maoist arms. The

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[2] For example, in Peru, the Maoist People's War, also called the Shining Path Movement, was begun on May 17, 1980 when a group of Maoist workers burned the ballot boxes and voters list during the first ever presidential election after 17 years of *juntas* rule, in the Andean town of Chuschi (Grorriti 1999). That event went unnoticed in the beginning. During two-decade long violent conflict, the MPW in Peru claimed more than 69,000 lives.

Maoists have joined the Interim Government on April 1, 2007. In the mean time, in the southern plains of Nepal, two break-away fractions of the Maoist organization, both are called Janatantratic Terai Mukti Morcha (JTMM), have been actively using the same old tactics of abductions, killings, intimidations, and all sorts of violent activities that they have inherited from the Maoists. They put forth various demands including an independent state for the people of Terai origin (a flat belt of fertile plain that runs east to west along the Indian border). In the hills area, several ethnic groups are also raising their voices demanding federal structure with the provision of rights to self-determination. What was started as an ideology based political movement a decade ago might well be headed towards a separatist movement. Whether the peace deal translates into a lasting peace remains to be seen in the light of increasing frustration among the masses about the slow socio-economic transformation of the country and how the government and responsible political parties will handle the issues raised by the JTMM, and several other indigenous and ethnic groups who are now looking for their identity and fair share in Nepali politics.

1.4 . Violent Conflict in Nepal

Nepal's decade old violent conflict has claimed over 13,000 lives and the prospects for such conflicts in the future have not been addressed yet. Bohara, Mitchell and Nepal (2006) made an initial contribution towards analyzing the causes of the violent conflict using district level (sub-national) information. District level analysis, however, requires aggregation of village level data to the district level that basically covers up the diverse information that we could use for the analysis. The micro-level analysis that uses

the village level information can provide better understandings of Nepal conflict. Additionally, there are competing theories about the causes of the violent rebellion. Is it the inequality in the wealth/income or is it the polarization of the people/communities based on the income/wealth distance coupled with the group (ethnic or caste) identification that leads to the violent conflict (Esteban and Ray 1994, 1999; Montalvo and Reynal-Querol 2005)? Once we estimate the household level income/expenditures at the micro-level, we can then estimate the measures of inequality as well as the polarization indices at the lowest administrative units of the country (villages) and investigate the links between the violent conflict and the distributional issues like inequality, poverty and polarization.

1.5 . Introduction to Data and other Information Sources

In the case of Nepal, there are two sets of nationally representative household survey data: Nepal Living Standard Survey 1995/96 (NLSS-I) and Nepal Living Standard Survey 2003/04 (NLSS-II). These comparable surveys are Nepal's version of the World Bank's Living Standard Measurement Survey (LSMS). So far, these surveys have been used extensively to formulate periodic plans and other government policies. As stated earlier, extensive use of household survey data, which are representative at most up to the regional level, to formulate village level plans and policies may not provide reliable information. After the restoration of the dissolved parliament in April 2006, Nepal has been striving to restructure the political landscape into federal system. This kind of restructuring requires massive amounts of reliable information of all administrative units. One way to derive the essential information is to utilize the micro-level estimation

technique that links nationally representative small but information rich household survey with large data set like census data.

In this research, an attempt is made to estimate the income as well as expenditure of all households covered in the census. The usefulness of such a detailed account of income and expenditure of all households in the country is extensive. Here we use such information to estimate village level poverty, polarization, inequality and average income/expenditure all over the country. This research effort is the first of its kind using Nepal data. The estimated micro-level distributional information is mapped using GIS technology that makes the results visually more accessible to wider audiences and thus expands the applicability of the research outcomes across the villages of Nepal.

1.6 . Hypotheses

This research builds upon the public choice theory of conflicts (Chapter 3) and consumption insurance hypothesis (Chapter 4). We test two different sets of hypotheses that are given below:

- The intensity of violent conflict is positively associated with degree of inequality and polarization.
- Social capital helps to reduce the violent conflict.
- Government transfers helps to lower the incidence of violence conflict.
- Higher level of poverty exacerbates violent conflict.
- The effect of aggregate shock(s) on household's consumption is proportional (one-to-one) if households pool their resources and insure each other for unforeseen shocks within an insurance community.

- There is no effect of idiosyncratic shocks to growth rate of the per capita household consumption if households pool their resources and insure each other within a given insurance community.

The first four hypotheses are generated from the public choice theory of conflict in the presence of inequality and polarization. The remaining hypotheses are generated from the theory of full consumption insurance where households within a given insurance community collectively maximize their time separable state dependent utility functions given the resource constraint.

1.7. Major Contribution

The major contributions of this research are as follows:

i) *Poverty and Inequality Mapping*: Household survey data are now available for several countries around the world. One common characteristic of these surveys is that they follow the same format of the Living Standard Measurement Survey methodology advanced by the World Bank. These data sets provide household and community level information regarding household's demographic, employment, income, expenditures, and other information as well as community characteristics where those households reside. Now, household surveys are commonly used for generating socio-economic indicators and designing socio-economic policies in most of the developing countries around the world. The major issue with this practice is that household surveys are small in sample size and not representative below regional level. However, communities or villages within a region may vary in terms of socio-economic opportunities, infrastructures and connectivity to the markets, culture and level of education, and hence income and

expenditure of households in those communities may vary significantly. Aggregate information obtained from household survey may not be relevant to the lower geographical units of a country given that these lower levels of geographical units are heterogeneous.

One way of addressing such informational problem is to reconcile census data that includes all the households around the country but does not include detailed measures of household welfare, and survey data that is rich in welfare related information but small in size. This research reconciles information contained in two household surveys and one population census for Nepal and estimates poverty and inequality at the national level, as well as at the regional, districts, and village levels. Also, we compute these welfare indicators for different caste/ethnic groups. This research is first of its kind using Nepal data.

ii) Estimation of Polarization Indices: Second contribution of this paper is the estimation of the polarization indices across the villages of Nepal using the idea advanced by Esteban and Ray (1994, 1999).

iii) Analysis of the link between the violent conflict and inequality, poverty, polarization, social capital and government transfers: Third contribution of this research is the analysis of a relationship between the violent conflict and distributional measures of household income/expenditures such as inequality, poverty and polarization as well as the government welfare programs and social capital.

iv) Analysis of the welfare impact of the violent conflict: Another contribution of this research is the evaluation of the theory of consumption insurance using Nepal data. Several researchers have tested the consumption insurance hypothesis using data from

different countries, e.g., US, India, Indonesia, and Russia. In those studies, shocks such as, illness, job loss, bad weather, etc., are considered. In our case, we not only use negative shocks, such as, intensity of violent conflict in the village of Nepal and natural disasters but also use positive shocks, such as, flow of remittances to the households. We directly modeled these different shocks and analyze their impact on the household's welfare.

1.8. Organization of the dissertation

The next three chapters comprise the major body of the research. After a brief introduction in Chapter 1, we present an analysis of poverty and inequality at the national as well as at the regional, district and village levels across Nepal. This chapter presents the technical as well as empirical methods of micro-level estimation that we use to estimate the poverty and inequality indices across the country at the different political/geographical units. Additionally, we also estimate the poverty and inequality indices for different caste/ethnic groups in the country. Chapter 2 also presents the decomposition of inequality by expenditure categories and income sources as such decompositions provide the necessary information for policy intervention if the degree of inequality goes beyond a desirable limit.

In Chapter 3, we use the public choice theory of conflict to analyze of the correlates of the violent conflict in Nepal. We make use of the poverty and inequality indices from Chapter 2 and also estimate polarization indices while analyzing the causes of the violent conflict. Chapter 4 investigates the consequences of the violent conflict on household welfare, especially on household's consumption. In this chapter, we first

present the theory of full consumption insurance, which generally implies that household consumption should be insulated from the idiosyncratic shocks and it should only respond to the aggregate shocks to the households. Some of the variables estimated in Chapter 2 are used in Chapter 4. We specifically use the estimated household's consumption from micro-level estimates to calculate the village level aggregate consumption as the village level consumption that can be obtained from the household surveys alone suffers from the small sample property where the individual household expenditure may have significant influence on the aggregate expenditure of the village or the community. We summarize the overall research and findings in Chapter 5. This chapter also summarizes the policy implications of our findings and outlines future direction.

CHAPTER 2

MICRO-LEVEL ESTIMATION AND DECOMPOSITION OF POVERTY AND INEQUALITY IN NEPAL

2.1. Introduction

Poverty alleviation has become one of the global development agendas of the twenty-first century.[3] It basically requires identification of the poor and targeting programs. For policy and planning purpose, the estimation of the poverty rate at the national level is the most prevalent practice in developing countries. However, the aggregate estimate of poverty at the national or regional level generally covers up important details and does not provide a good account of the distribution of the poor across local geographical units that could affect targeting the poor and implementing poverty alleviation programs. Micro-level poverty estimates help to find out who the poor are and where they are living.

Another concern with the poverty reduction is the lack of resources in developing countries that hinders implementing the development programs to alleviate poverty. Estimates of poverty, inequality and household income/expenditure within the same geographical unit may provide a useful guide about the distributional issues, needs and priorities of the local communities, and information regarding whether the mobilization of the local resources is feasible to finance the programs locally. Mobilization of resources at the local level also helps to promote and strengthen the decentralization that

[3] Eradicating extreme poverty and hunger by 2015 is the first Millennium Development Goal of the United Nations that was set in 2000 (UN 2006).

reduces the dependency of local governments on the central one, and dependency of the central government on foreign loans and grants. Local people may feel more responsible if they are to utilize their own resources rather than receiving funds from outside. Such a sense of association of people may help to raise awareness and lower corruption as well, which is considered as a major issue in most of the developing countries as corruption engenders poverty (TI 2006).

Given the scopes of micro-level estimation of poverty and inequality, this chapter has two objectives: to estimate the poverty and inequality at the village level, and to decompose the inequality based on the sources and the determinants of households income/expenditure to provide policy prescriptions. Basically, we estimate village level poverty and inequality for the years 1995/96 and 2003/04, and compare the results between those two years. We use Nepal Living Standard Surveys 1995/96 and 2003/04 (NLSS-I and NLSS-II) as a primary data sources. By design, those surveys, however, are not representative at the village level. In the case of census data, the issue of sample size and selection biases would disappear but census data generally lack welfare measures of the households. Therefore, we use the two-step micro-level estimation technique (Elbers, Lanjouw and Lanjouw 2003) that provides a framework to link the census data with the survey and estimate welfare measures at the village level.

Though small in size, there is a wider variation in geography, culture, ethnicity and economic opportunities across Nepal. It is divided into 75 districts and each district is further divided into several Village Development Committees (VDCs). The official poverty and inequality estimates using the household surveys for Nepal (CBS 2005) do not go beyond the traditional rural-urban, mountain-hills-*terai*, and east-central-west-

midwest-farwest settings that cannot be used to analyze the distributional issues at the village level across the country. This research contributes towards filling such gap.

Consistent with the official report (CBS 2005), our results show that aggregate poverty in Nepal declined from 41.7% to 31.5% between 1995/96 and 2003/04. This is a good outcome given that Nepal is facing a decade-long Maoist insurgency and economic slow-down. When we analyze the situation with disaggregated data, the results are not uniform. Our results show that during the eight-year period, 16 out of 75 districts, and about 22% of VDCs (out of 3880 for which we have census information) across the country experienced increased poverty.[4] In the case of inequality, aggregate Gini coefficient went up from 0.382 to 0.427 during the same period (the Atkinson index went up from 0.366 to 0.412). But micro-level estimates show that it went down in 9 districts and in 34% of VDCs, indicating that inferences drawn from aggregate estimates will not be that accurate for designing the public policies in the decentralized communities.

For the past several years, the caste/ethnic issue has been at the forefront of the development agenda in Nepal. Most of the analyses are based on the inter-caste/ethnicity. But the analysis of poverty status of different caste/ethnic groups and the income or expenditure inequality within a given caste/ethnic group is not available for designing appropriate policies. The estimation of poverty and inequality at the micro-level and within different caste/ethnic groups is the main contribution of this chapter. Such inequality and poverty mapping at the district and village levels provides background

[4] Total VDCs across the country are over 4000. Due to the on going high intensity conflict in Nepal since 1996, some of the VDCs are not included in the census, and some VDCs do not have enough observation to be included in the estimation.

information for designing economic policies suitable for decentralized communities. Also, the estimates of poverty and inequality within different caste/ethnic group may be used as a guide while formulating social and economic policies.

2.2. Statistical Method

The basic methodology of micro-level estimation (Elbers *et al* 2003) is a technique that links survey with census information and it resembles the small-area statistics of Ghosh and Rao (1994). In the recent years, the technique has been used in Ecuador, Brazil, South Africa, Panama, Madagascar and Nicaragua (Alderman *et al* 2002, Elbers *et al* 2003) for mapping poverty. This section summarizes the basic idea of the micro-level estimates.[5]

Assume that per-capita household expenditure, y_{ch}, depends on a vector of observable characteristics, X_{ch}, of the household that are present in both survey and census data sets. Then the linear approximation of the conditional distribution of y_{ch} is given by:

$$\ln y_h = E(\ln y_h \mid X_h) + u_h = X'_{ch}\beta + u_{ch} \qquad [2.1]$$

Where, c refers to the sample cluster (level of aggregation of survey and census data) and u as a vector of disturbances, $u \sim \Im(0, \sum)$. By nature, the survey data is just a sample of a total population, therefore, the residual of [2.1] must contain the location variance to allow for a within cluster correlation (spatial autocorrelation) in disturbances as $u_{ch} = \eta_c + \varepsilon_{ch}$, where η is the cluster component and ε is household components. They are independent of each other and uncorrelated with X_{ch}. Generalized least squares (GLS)

[5] For details, see Elbers *et al* (2003).

or Weighted Least Squares (WLS) estimation of [2.1] using household survey data provides the estimates of the complex error structures, $\hat{u}_{ch}$, that can be decomposed as $\hat{u}_{ch} = \hat{\eta}_c + e_{ch}$. The residual term e_{ch} can be used to estimate the following heteroscedatic model:

$$\ln(e_{ch}^2 /(A - e_{ch}) = Z'_{ch}\,\alpha + r_{ch} \qquad [2.2]$$

where Z_{ch} refers to the vector of household characteristics assumed to be driving the heteroscedasticity, and A is the upper bound of e_{ch}^2. We will refer [2.1] as 'Beta' model and [2.2] as 'Alpha' model (as in Zhao 2004) for estimation purposes.

2.2.1. Steps in Micro-level Estimation[6]

The process of linking household survey with census data to estimate micro-level welfare indicators requires two steps. The first step includes the following (Zhao 2004):

Step I

i) estimate the beta model [2.1] using survey data that provides model parameters estimates, including the beta vector, an associated variance-covariance matrix, and parameters describing the distribution of the disturbances.

ii) calculate the location effect $\hat{\eta}_c$,

iii) calculate the variance estimator $\text{var}(\hat{\sigma}_n^2)$,

iv) estimate the alpha model [2.2],

v) estimate GLS model to generate a variance-covariance matrix,

[6] Zhao (2004) and Elbers *et al* (2003) provide details of the estimation process.

vi) generate a vector of normally distributed random variable, and

vii) read the census data that follows the simulation.

Step II

In the second step, we estimate the following model and generate household level welfare measures using bootstrap simulation

$$\ln \tilde{y}_{ch} = X'_{ch}\tilde{\beta} + \tilde{\eta}_c + \tilde{\varepsilon}_{ch} \qquad [2.3]$$

where $\tilde{\beta} \sim N(\hat{\beta}, \hat{\Sigma}_\beta)$, $\tilde{\eta}_c$ and $\tilde{\varepsilon}_{ch}$ are random variables (could be normally distributed or t-distributed).[7] This specification allows spatial autocorrelation for the households in the given community and for the heteroscedasticity in household component of the disturbances. After simulating for $\ln \tilde{y}_{ch}$, we compute several poverty and inequality measures that are discussed below.

2.2.2. FGT Class of Poverty Indices

In poverty analysis, how any measure of poverty relates sub-group poverty to total poverty is an important issue, also called additive property. It is because in poverty analysis, all else being equal, one would expect to know a subgroup's contribution to total poverty and that a decrease in poverty level of one subgroup should lead to reduce over all poverty (Foster, Greer and Thorbecke 1984). Sen (1976) proposes two axioms that any poverty measure must fulfill: i) Monotonicity Axiom that a reduction in income of a person below the poverty line must increase the poverty measure, and ii) Transfer

[7] The variance structure of these errors is given in Elbers *et al.* (2003).

Axiom that a pure transfer of income from a person below the poverty line to anyone who is richer must increase the poverty measure, *ceteris paribus*. Foster, Greer and Thorbecke (1984) demonstrate that the following poverty measure (also called FGT poverty measure) allows a quantitative as well as qualitative assessment of the effect of change in subgroup poverty on total poverty.

$$FGT(\alpha) = \frac{1}{N} \sum_{h \in H_v} m_h (1 - \frac{y_h}{z})^{\alpha} \text{ for } y_h < z \qquad [2.4]$$

where $z > 0$ is a predetermined poverty line defined in per capita expenditure terms, $\alpha \geq 0$ is the poverty sensitivity parameter, H_v is the number of households, m_h is the household size in the case of census (household weight in the case of large survey), and $N = \sum m_h$ is the number of individuals in village *v*. We compute FGT measure of poverty that (i) is additively decomposable with population-share weights, (ii) satisfies the basic properties proposed by Sen (1976), and (iii) is justified by a relative deprivation concept of poverty. The *FGT(0)* index is called the head count index that represents the proportion of a population that is in poverty, and the index *FGT(1)* is called the poverty gap that indicates an average shortfall of income from the poverty line, also known as the depth of poverty.

2.2.3. Inequality Measures

Several distributional measures that satisfy the *principle of transfer* are in use for empirical analysis of inequality. The transfer principle, originally proposed by Dalton (1920) states that social welfare will be increased (inequality will be decreased) by any arbitrary transfer of *t* from a richer to a poorer person, provided that the transfer does not change the relative positions of the rich and the poor. Dalton indicates that more

equitable distribution of income is desirable than more unequal distribution (p. 349). Social welfare functions are usually preferred to more equal distributions to less equal ones (Deaton 2000, p. 135). In that sense, measuring inequality itself is an important part of welfare analysis. Some of the standard measures of inequality that are consistent with the principle of transfer and social welfare function are Atkinson Inequality Index, Generalized Entropy Index, and Gini Coefficient (Deaton 2000,). We calculate these three classes of inequality measures as described below.

2.2.3.1. Atkinson Inequality Index

The Atkinson Inequality Index represents the cumulative deviation of the actual expenditure (income) distribution from the equally distributed equivalent expenditure (income) (Fields 1979), and is given by the following expression:

$$A(\alpha) = \begin{cases} 1 - \dfrac{(\int_0^1 y(p)^{(1-\alpha)}\,dp)^{\frac{1}{1-\alpha}}}{\mu}, \alpha \neq 1 \\ 1 - \dfrac{\exp(\int_0^1 \ln(y(p))dp)}{\mu}, \alpha = 1 \end{cases} \qquad [2.5]$$

where α is the Atkinson parameter of relative inequality aversion, and μ is the mean expenditure. There would be no perceived inequality if $\alpha = 0$ as the marginal social utility is constant at this value of α ; a situation where an increase in income of poor people by a certain amount has the same social welfare impact as an equal increase in income of the non-poor people. To avoid such neutrality, we use $\alpha > 0$ that indicates an increase in poor people's income is more desirable than that of the non-poor. This index is often criticized on the ground that the inequality aversion parameter depends on the value judgment of the researchers (Fields 1979).

2.2.3.2. Generalized Entropy Index

Generalized Entropy (GE) Index is an alternative to Atkinson Inequality Index. This index has a property that an index derived from it can be interpreted as a measure of the distance between the distribution of the expenditure (income) and the distribution in which every economic unit spends (receives) the mean expenditure (income) μ (Cowell and Victoria-Feser 1996). The GE Index is given by the following expression:

$$GE(\theta) = \begin{cases} \frac{1}{\theta(\theta-1)}\left(\int_0^1 \left(\frac{y(p)}{\mu}\right)^{\theta} dp - 1\right), \text{ if } \theta \neq 0, 1 \\ \end{cases} \qquad [2.6]$$

where $\theta \in (-\infty, +\infty)$ represents the weights given to distance between the incomes at different parts of the distribution. For empirical purpose, θ = [0, 1, 2], where $\theta = 0$ indicates more weights to the lower tail of the distribution, and $GE(0) = \int_0^1 \ln(\frac{\mu}{y(p)})dp$, which is the mean logarithmic deviation (average deviation between the log of the mean income and the log of incomes. The GE index for $\theta = 1$ applies equal weights across the distribution, and $GE(1) = \int_0^1 \frac{y(p)}{\mu} \ln(\frac{\mu}{y(p)})dp$, which is also called the Theil index of inequality. If every one has the same (mean) income, then *GE(1)* = 0, and if one person has all the income, then *GE(1)* = ln(*N*). $\int_0^p y(q)dq$ sums to the expenditure (income) of the bottom *p* proportion of the population. When $\theta = 2$, the GE measure gives relatively more weights to the upper tail gaps, and it is equivalent to the half of the squared coefficient of variation.

2.2.3.3. Gini Coefficient

Gini coefficient is the most widely used measure of relative inequality given its relation with the Lorenz curve. The social welfare function associated with the Gini coefficient assigns weight to the individual income based on the relative position of the individuals in the distribution. In this case, the income of the poor gets more weights than the non-poor ones.[8] Let y_h denote the per capita consumption expenditure of household *h* in the given village. Then the Gini index for the village is given by (Deaton 2000, p. 139):

$$GINI = \frac{1}{\mu N(N-1)} \sum_{i>j} \sum_{j} | y_i - y_j | \qquad [2.7]$$

where μ is the average expenditure, *N* is sample size, $| y_i - y_j |$ is the absolute deviation of expenditure between a pair of households. An alternative, but related formulation of the Gini index is given by (Deaton 2000, p.139):

$$GINI = \frac{N+1}{N-1} - \frac{2}{N(N-1)\mu} \sum_{i=1}^{N} \rho_i y_i \qquad [2.7a]$$

where ρ_i is the rank of individual *i* in the y-distribution, counting from top so that the richest has the rank 1. For computational purposes, we use [2.7a].

[8] Such a weighting scheme involves value judgments as in the case of Atkinson index. Therefore, despite the known sampling distribution of the Gini coefficient, it is not dispute free measure of inequality measure (Thistle 1990).

2.2.4. Inequality Decomposition

The inequality itself may or may not have much importance while designing the public policies. Common belief is that a moderate degree of inequality may be desirable for economic growth, and trying to even-out inequality may provide disincentive effects to work and invest thereby leading towards slower growth. Feldstein (1998) argues that if we accept the Pareto principle as a basis of economic analysis that a change is good if it makes someone better off without making anyone else worse off, then inequality should not be considered as a problem. Another line of argument (Alesina and Angeletos 2005, Bowles and Gintis 2002) is that whether inequality is a problem depends on the social belief about what determines income. In a society where people believe that individual effort determines income or wealth, inequality does not appear to be a problem. But in Nepalese society where people believe that corruption, connection, birth, or luck determines income or wealth (Bista 1991), inequality appears to be a social problem. Empirical evidence shows that inequality contributes significantly towards conflicts and violence (Fajnzylber, Lederman and Loayza 2002, Kelly 2000, Wang et al 1993). As we can see in Chapter 3, the village level expenditure inequality has significant effect on the violent conflict in Nepal. Using a general equilibrium model as well as an empirical test, Persson and Tabellini (1994) show that inequality is harmful for growth.

The following sub-section presents methodology for decomposing inequality by the factor components as well as the income sources. Such decomposition provides the contribution of different factors or sources in the total inequality that can be used to design a public policy so that inequality can be reduced if it goes beyond an acceptable range.

2.2.4.1. Decomposition by Factor Components

Knowledge about the determinants of the inequality can be used to design appropriate policies if inequality goes beyond a desirable limit. The desirable limit may not be a fixed number and it may depend on the perception of the citizens towards what determines income, wealth and employment as discussed in previous sub-section. Inequality decomposition by factor components is proposed by Fields (2002) using regression based analysis that was proposed earlier by Shorrocks (1984). The determinants of household expenditure are termed as factor components in this case. Shorrocks also provides the axiomatic decomposition of inequality by income sources. The following paragraphs summarize the method for the decomposition of expenditure inequality proposed by Fields (2002).

Assume that $\ln y = X'\beta + u$ is the expenditure function where, y is the household expenditure, X is the vector of determinants of the household expenditure, and u is the normally distributed error term with zero mean and constant variance. The expenditure share of j^{th} factor is given by

$$s_j = \text{cov}(\beta_j X_j, \ln y) / \sigma^2(\ln y) = \frac{\beta_j \times \sigma(X_j) \times \rho(X_j, \ln y)}{\sigma(\ln y)} \qquad [2.8]$$

where σ is the standard deviation and ρ is the correlation coefficient. This decomposition is independent of the inequality measures as we get the same percentage effect for the j^{th} factor for a broad class of inequality measures applied to the log of the household expenditure (Fields 2002).

There is a serious concern that Nepal inequality index has gone up from 0.34 to 0.42 between 1995/96 and 2003/04 (CBS 2005). Our goal, therefore, is not only to estimate the factor weights but also estimate the factor contribution for the change in the

inequality during the 1995/96 and 2003/04 so that these results can be used for designing economic policies that address the distributional issues. The contribution of the j^{th} factor to the change in inequality between period t and period $(t+1)$ for an arbitrary inequality measure $I(.)$ is given by (Fields 2002):

$$\pi_j(I(.)) = [s_{j,t+1} \times I(.)_{t+1} - s_{j,t} \times I(.)_t] / [I(.)_{t+1} - I(.)_t] \quad [2.9]$$

where $\sum_j \pi_j(I(.)) = 1$, that the sum of the factor contribution to the change in inequality is 100%. Here the contribution of the j^{th} factor depends on the measures of inequality used for analysis.

2.2.4.2. Decomposition by Income Sources

An alternative way to look into the sources of inequality that can be used to analyze the distributional impact of economic policies is to calculate the marginal contribution of various income sources to the given inequality measure. Following Pyatt, Chen and Fei (1980), Lerman and Yitzhaki (1985), and Stark, Taylor and Yitzhaki (1986) we write the Gini coefficient (G) as a function of the covariance between household income, y, and its cumulative distribution, $F(y)$, as

$$G = \frac{2Cov[y_i, F(y_i)]}{\bar{y}} = \frac{2\sum_{k=1}^{K} Cov[y_k, F(y_i)]}{\bar{y}} = \sum_{k=1}^{K} R_k G_k S_k \quad [2.10]$$

where $y_i = \sum_{k=1}^{K} y_{ik}$ is the incomes that household i gets from K different sources, $\bar{y}$ is the mean income, R_k is the correlation coefficient between y_k and y_i, also called the Gini correlation, G_k is the Gini index corresponding to income component k, and S_k is the share of component k in total income. One important advantage of the given decomposition by income source is its use in examining the marginal effect of an income

source on overall inequality, that is given by $\partial G / \partial e = S_k (R_k G_k - G)$, where e is the small percentage change in income from source k. The marginal effect of income source k relative to overall G is given by the source's inequality contribution as a percentage of the overall Gini minus the source's share of total income, i.e.,

$$\frac{\partial G / \partial e}{G} = \frac{S_k G_k R_k}{G} - S_k \qquad [2.11]$$

When the inequality goes beyond a certain acceptable limit,[9] the government can design an appropriate fiscal (tax-transfers) policy to address the issue by utilizing such results.

2.3. The Data

The data for this analysis are drawn from various sources. The major sources are the Nepal Living Standard Survey 1995/96 (NLSS-I), Nepal Living Standard Survey 2002/03 (NLSS-II), and the Nepal Population Census (2001). The NLSS-I and NLSS-II are the Nepal version of the World Bank's Living Standard Measurement Survey (LSMS) that consists of nationally representative household survey responses to questions covering different aspects of household welfare. The survey is the outcome of a joint

[9] There is no fixed or given size that indicates an acceptable limit of inequality in a given country. It is a matter of empirical investigation and may well depend on the general notion about what determines income and how opportunities are distributed for general public in a given society. If human capital or acquired skills do not determine economic opportunities or income but the birth, connection or luck does so, then the threat level of inequality may be lower than the case where human capital plays key role in determining opportunities and income.

project of the Central Bureau of Statistics (Nepal) and the World Bank. In the NLSS-I, the full data set consists of a national sample of 3373 households (rural and urban). The households were selected from 274 sampling units around the country, called *wards,* based on a Probability Proportional to Size (PPS) sampling plan. In NLSS-II, the sample size is 3912 households from 334 sampling units around the country. In both surveys, a two-stage stratified sampling procedure was used. The household survey responses include the detail account of income and expenditures at the household level, along with extensive socio-economic and demographic characteristics of household.

The third source of the data is the Nepal Population Census 2001 conducted by Nepal Central Bureau of Statistics (CBS). For the first time CBS administrated two types of forms, complete enumeration and sample enumeration, simultaneously, to collect census information. The sample enumeration was intended to collect comprehensive information that is generally not included in the complete enumeration due to resource constraints.[10] For the sample enumeration, systematic sampling was used that included one-in-eight housing units in each enumeration area meaning that the sample size for sample enumeration is about 12.5% of the complete enumeration that comprises 520,624 households throughout Nepal.

[10] The sample enumeration basically collected the information related to housing, utilities, land ownership, education, employment, occupation, economic activities, etc, along with the usual demographic information.

Nepal is divided into 75 administrative districts and each district is further divided into several village development committees (VDC).[11] Altogether, there are over 4000 VDCs (or simply 'villages'). This research focuses on estimating the poverty and the inequality at the lower administrative divisions (villages) in Nepal. Sample surveys like NLSS-I and NLSS-II that contain detailed information about household income or expenditures can be used to calculate distributional measures, but such survey information is not representative at the village level due to the small sample. On the other hand, sample enumeration in the census that covers significant number of households around the country does not collect detailed accounts of household income and expenditures. Without the detailed accounts of household income and expenditures, the computation of inequality and poverty at the village level is not possible. To overcome such a data deficiency, we utilize both household surveys and sample enumeration of census using the recently developed micro-level estimation technique (Elbers, Lanjouw and Lanjouw 2003), which was developed from the small area statistics (Ghosh and Rao 1994).

2.4. Empirical Estimates of Poverty Indicators

2.4.1. Comparing Basic Statistics in Surveys and Census Data

The starting point of micro-level estimation is preparing a set of the common variables that are defined and measured in the same way in both household surveys and the population census. The survey data is collected in 1996 and the census data is

[11] For our purpose, we treat all types of municipalities like VDCs, and call them villages for simplicity.

collected in 2001, giving five-year or so gap between those two data sets. Table 2.1 presents the summary statistics of the variables used in the analysis from the household surveys and the census data. The table shows that descriptive statistics across the data sets are fairly comparable after allowing for the natural change in some of the variables like literacy rates, and economic activities. For example, the literacy rate of the household head was 38.1% in 1996, and that went up to 48.7% in 2001 and 52% in 2004.

Table 2.1: Variable Definitions and Basic Statistics

Variable	Definition	NLSS 1995/96		NLSS 2003/04		Census 2001	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
AGEHEAD	Age of HH Head	44.698	14.403	45.488	14.226	43.350	14.364
BAHUNCHHETRI	1 if upper caste (Bahun or Chhetri), else 0	0.341	0.474	0.299	0.458	0.337	0.473
LITERACY	1 if HH head can write, else 0	0.381	0.478	0.520	0.500	0.487	0.500
CENTRAL	1 if region is central, else 0	0.391	0.488	0.383	0.486	0.331	0.470
DAKASA	1 if lower caste (Damai, Kami, or Sarki), else 0	0.077	0.267	0.078	0.268	0.069	0.253
EASTERN	1 if region is eastern, else 0	0.213	0.409	0.230	0.421	0.217	0.412
EDUCATION	HH head's years of schooling	3.732	4.175	3.257	4.393	3.468	5.101
FARMER	1 if HH head is farmer, else 0	0.509	0.485	0.432	0.323	0.476	0.499
FULEWOOD	1 if household uses fuelwood for energy, else 0	0.629	0.483	0.647	0.478	0.645	0.478
FWESTERN	1 if region is far-western, else 0	0.104	0.306	0.071	0.256	0.096	0.295
HHAGE	Average age of all household members	25.703	10.599	27.092	11.781	26.505	11.959
HHEDU	Household average year's of schooling	3.802	4.139	4.606	4.002	4.618	3.885
HHFARMER	% of household members employed in agriculture	0.516	0.310	0.323	0.196	0.241	0.272
HHMONTHWORK	Household's average months of employment	7.997	2.969	8.359	1.922	5.275	3.229
HHSIZE	Average household size	5.590	2.768	5.504	2.639	4.962	2.453
HHLETERACY	% of all household member who can write	0.396	0.337	0.518	0.344	0.463	0.333
HINDU	1 if household religion is Hindu, else 0	0.828	0.377	0.816	0.388	0.821	0.383
ELECTRICITY	1 if household uses electricity, else 0	0.259	0.438	0.446	0.497	0.423	0.494
MALE	1 if household head is male, else 0	0.865	0.342	0.807	0.395	0.841	0.365
MARRIED	1 if household head is married, else 0	0.850	0.357	0.855	0.352	0.904	0.294

MOUNTAIN	1 if Mountain region, else 0	0.121	0.326	0.098	0.298	0.095	0.293
NEWARI	1 if mother tongue is Newari, else 0	0.042	0.200	0.067	0.250	0.055	0.227
OWNHOUSE	1 if household owns a house, else 0	0.876	0.329	0.887	0.316	0.780	0.414
OWNLAND	1 if the household owns land, else 0	0.760	0.427	0.726	0.446	0.654	0.476
PERMANENTHOUSE	1 if the household owns a house with brick/concrete, else 0	0.172	0.378	0.239	0.426	0.411	0.492
RURAL	1 if rural area, else 0	0.788	0.409	0.623	0.485	0.588	0.492
SEMIPERMANENT	1 if household owns a house with semi-permanent structure, else 0	0.719	0.450	0.414	0.165	0.274	0.446
TAMAGURALI	1 if Tamang, Magar, Gurung, Rai, or Limbu, else 0	0.161	0.368	0.204	0.403	0.187	0.390
TERAI	1 if Terai region, else 0	0.363	0.481	0.417	0.493	0.467	0.499
TERAICASTE	1 if Low caste from Terai, else 0	0.085	0.279	0.079	0.269	0.080	0.271
TOILETFLUSH	1 if the household owns flush toilet, else 0	0.161	0.368	0.291	0.454	0.238	0.426
TV	1 if the household owns a TV, else 0	0.137	0.344	0.118	0.322	0.224	0.417
WATERPIPED	1 if the household uses piped water, else 0	0.424	0.494	0.498	0.500	0.531	0.499
WATERWELL	1 if the household uses well-water, else 0	0.377	0.485	0.368	0.482	0.367	0.482
WESTERN	1 if western region, else 0	0.185	0.388	0.199	0.400	0.215	0.411

Sources:

1. Nepal Living Standard Survey 1995/96, Central Bureau of Statistics, Nepal.
2. Nepal Living Standard Survey 2003/04, Central Bureau of Statistics, Nepal.
3. Population Census 2001, Central Bureau of Statistics, Nepal.

Table 2.2 displays the official estimates (CBS 2005) of the aggregate welfare indicators using the Nepal Living Standard Surveys (NLSS-I & NLSS-II). It also provides the same welfare indicators obtained from the micro-level estimation technique.[12] As we can see in table 2, the official estimates of the nominal per capita expenditures, head count ratios, poverty gaps, and Gini indices estimated from NLSS-I and NLSS-II, and the micro-level estimates that we get by combining survey data with the census are very close to each other. Such comparable aggregate estimates provide reasonable justification for using micro-level estimation technique to get the village level estimates of those welfare indicators.

Table 2.2: Comparison of Basic Welfare Indicators from NLSS-I & II, and Micro-level Estimation

Welfare Indicators	1995/96		2003/04	
	NLSS-I	Micro-Level Estimates	NLSS-II	Micro-Level Estimates
Per Capita HH Expenditure (Rs)	6802	6828	15848	15836
		(181)		(437)
Head Count (%)[1]	41.76	41.70	30.85	31.5
		(0.018)		(0.014)
Poverty Gap (%)[2]	11.75	13.30	7.55	8.80
		(0.009)		(0.006)
Gini Coefficient	0.367	0.385	0.41	0.427
		(0.01)		(0.011)

Notes:

The figures in parentheses are the standard errors of the imputed values.
[1] Percentage of households below the poverty line.
[2] Poverty Gap measures the amount of income relative to the poverty line that has to be transferred to the poor families to bring their incomes up to the poverty threshold. It is sometimes called the depth of the poverty (how severe is the poverty problem).

[12] The first-stage GLS estimates (equation [2.1]) and the estimates for the heteroscedastic model (equation [2.2]) that are required in order to get the bootstrap simulation for the micro-level estimates are presented in Appendix 2A (Table 2A.1 and Table 2A.2).

2.4.2. Poverty among Caste/Ethnic Groups

One of the main social issues in Nepal is the probable social discrimination based on caste/ethnicity. In Table 2.3, we present the household per capita expenditures, and poverty estimates at the regional, rural-urban level as well as among different caste/ethnic groups in Nepal. At the aggregate level, the head-count ratio has gone down across the board. The reduction is significant in all regions except in the case of the eastern region. The poverty gap also follows the same trend. Those drops are significant in most of the cases. In the case of caste/ethnic groups, one notable point is that among the Tamang, Magar, Gurung, Rai and Limbu (*TAMAGURALI*, also called *janajaties*) who comprise about 19% of the total population and living primarily in the hilly areas, the drop in poverty and the poverty gap is insignificant. The poverty rate as well as the poverty gap among all the caste/ethnic groups (62% of total population) is above the national average except in Bahun-Chhetri (34% of total population with 20.6% poverty rate in 2003/04) and Newar (7.5% of total population with 11.7% poverty rate in 2003/04),. Among the higher caste/ethnic groups, the poverty rate is lower than the national average of 31.5%. The poverty rate among the lower castes/ethnic groups such as Damai, Kami, Sarki, Muslims (43.1%) is not only higher than the current national average (31.5%) but also higher than the national average in 1996/96 (41.7%), indicating that there is a high economic disparity between the upper and lower castes/ethnic groups in Nepal.

Table 2.3: Regional, Rural-Urban, Caste/Ethnic Per-Capita HH Expenditures, Head Count Ratios, and Poverty Gaps in Nepal

		Per Cap HH Expenditure			Head Count Ratio			Poverty Gap		
	Region/Ethnicity	1995/96	2003/04	% Change	1995/96	2003/04	% Change	1995/96	2003/04	% Change
Regions	EASTERN	6749	13861	105**	0.365	0.361	-1.10	0.102	0.103	0.98
		(3)	(3)	(2.40)	(4)	(2)	(0.12)	(4)	(2)	(0.08)
	CENTRAL	8232	19247	134***	0.339	0.283	-16.52***	0.102	0.080	-21.57*
		(1)	(1)	(13.20)	(5)	(4)	(2.12)	(4)	(4)	(1.89)
	WESTERN	7029	16502	135***	0.371	0.249	-32.88***	0.112	0.065	-41.96***
		(2)	(2)	(13.01)	(3)	(5)	(3.52)	(3)	(5)	(3.18)
	MIDWEST	4402	11898	170***	0.647	0.396	-38.79***	0.236	0.112	-52.54***
		(5)	(5)	(15.17)	(1)	(1)	(6.02)	(1)	(1)	(5.32)
	FARWEST	4502	12670	181***	0.630	0.355	-43.65***	0.233	0.100	-57.08***
		(4)	(4)	(10.31)	(2)	(3)	(5.48)	(2)	(3)	(4.87)
Ecological Belts	MOUNTAIN	6315	13552	115***	0.398	0.281	-29.40***	0.120	0.073	-39.17***
		(2)	(3)	(11.25)	(2)	(2)	(3.05)	(2)	(3)	(3.08)
	HILLS	8003	17950	124***	0.332	0.277	-16.57**	0.099	0.076	-23.23**
		(1)	(1)	(17.40)	(3)	(3)	(2.11)	(3)	(2)	(2.23)
	TERAI	5827	14150	143***	0.496	0.353	-28.83***	0.166	0.102	-38.55***
		(3)	(2)	(18.14)	(1)	(1)	(4.92)	(1)	(1)	(4.44)
Rural-Urban	RURAL	5868	12894	120***	0.461	0.349	-24.30***	0.148	0.098	-33.78***
		(2)	(2)	(20.59)	(1)	(1)	(4.34)	(1)	(1)	(4.29)
	URBAN	12795	33911	165***	0.138	0.103	-25.36*	0.041	0.029	-29.27*
		(1)	(1)	(13.55)	(2)	(2)	(1.91)	(2)	(2)	(1.79)
Caste/Ethnicity	BAHUNCHHETRI	8014	19111	138***	0.324	0.206	-36.42***	0.097	0.052	-46.39***
		(2)	(2)	(17.36)	(6)	(6)	(5.13)	(6)	(6)	(5.03)
	TAMAGURALI	6757	13127	94***	0.374	0.368	-1.60	0.109	0.104	-4.59
		(3)	(4)	(13.77)	(5)	(4)	(0.21)	(5)	(4)	(0.41)
	DAKASA	4976	11391	129***	0.569	0.431	-24.25***	0.200	0.127	-36.50***
		(7)	(7)	(14.57)	(1)	(1)	(3.73)	(1)	(2)	(3.70)

		5109	11918	133***	0.553	0.404	-26.94***	0.192	0.117	-39.06***
	TERAICASTE	(6)	(6)	(14.39)	(2)	(3)	(3.76)	(2)	(3)	(3.86)
		11850	31727	168***	0.156	0.117	-25.00**	0.042	0.030	-28.57*
	NEWAR	(1)	(1)	(9.75)	(7)	(7)	(2.08)	(7)	(7)	(1.79)
		5294	12304	132***	0.550	0.430	-21.82***	0.188	0.131	-30.32***
	MUSLIM	(5)	(5)	(9.66)	(3)	(2)	(3.30)	(3)	(1)	(3.02)
		5765	13821	140***	0.500	0.360	-28.00**	0.163	0.103	-36.81***
	OTHER	(4)	(3)	(8.08)	(4)	(5)	(4.76)	(4)	(5)	(4.06)
		6828	15836	132***	0.417	0.315	-24.46***	0.133	0.088	-33.83***
Total	NEPAL			(19.04)			(4.47)			(4.16)

2.4.3. Regional Poverty

Table 2.4 shows the head-count ratio and the poverty gap in 15 different regions across Nepal. The regional disaggregation of the poverty shows that the poverty has not gone down everywhere as reported in the official documents (CBS 2005), and the reduction is not significant in several regions, indicating that aggregate poverty estimates do not provide enough information for lower level geographical targeting. In the Eastern Mountain (*MEAST*), Eastern Hill (*HEAST*), and the Central Hill (*HCENTRAL*) regions, both the head-count ratio and the poverty-gap have gone up, and that increase is significant in the Eastern Hill region. Though the rates are lower, the changes are insignificant in the case of the Central Mountain (*MCENTRAL*), Western Mountain (*MWEST*), and the Eastern Terai (*TEAST*) regions. What we find is that the poverty rate and the poverty gap either went up or did not change significantly in the Eastern region (Mountain, Hills and Terai), most of the Central region (Mountain and Hills) and the Western mountain region. Those six regions (out of 15) comprise over 41% of total population in the country suggesting that the official estimate of the aggregate poverty measures does not provide detail account of the distribution across the regions.

Table 2.4: Per Capita Household Expenditure, Headcount Ratio, and Poverty Gap in 15 Regions, 1995/96 and 2003/04

	Per Cap HH Expenditure			Head Count Ratio			Poverty Gap		
DIST	1995/96	2003/04	% Change	1995/96	2003/04	% Change	1995/96	2003/04	%Change
	6748	12008	77.9***	0.31	0.335	8.1	0.089	0.079	12.66
MEAST	(329)	(507)	(8.70)	(0.035)	(0.030)	(0.54)	(0.010)	(0.012)	(0.64)
	7731	15219	96.9***	0.262	0.234	-10.7	0.06	0.067	-10.45
MCENTRAL	(416)	(673)	(9.46)	(0.031)	(0.025)	(0.70)	(0.008)	(0.011)	(0.51)
	7229	15579	115.5***	0.3	0.229	-23.7	0.062	0.083	-25.30
MWEST	(521)	(860)	(8.30)	(0.043)	(0.030)	(1.35)	(0.011)	(0.016)	(1.08)
	4298	11349	164.1***	0.65	0.385	-40.8***	0.105	0.224	-53.13***
MMWEST	(244)	(624)	(10.52)	(0.041)	(0.041)	(4.57)	(0.015)	(0.024)	(4.20)
	4839	13610	181.3***	0.564	0.249	-55.9***	0.062	0.191	-67.54**
MFWEST	(344)	(752)	(10.61)	(0.050)	(0.033)	(5.26)	(0.010)	(0.028)	(4.34)
	6801	11368	67.2***	0.321	0.405	26.2**	0.115	0.083	38.55**
HEAST	(304)	(402)	(9.06)	(0.033)	(0.025)	(2.03)	(0.010)	(0.012)	(2.05)
	10797	25649	137.6***	0.196	0.199	1.5	0.054	0.052	3.85
HCENTRAL	(543)	(1320)	(10.41)	(0.020)	(0.012)	(0.13)	(0.004)	(0.007)	(0.25)
	7625	16961	122.4***	0.315	0.229	-27.3**	0.059	0.089	-33.71**
HWEST	(370)	(683)	(12.02)	(0.031)	(0.019)	(2.37)	(0.006)	(0.012)	(2.24)
	4509	11124	146.7***	0.621	0.407	-34.5***	0.114	0.214	-46.73***
HMWEST	(240)	(447)	(13.04)	(0.037)	(0.032)	(4.37)	(0.012)	(0.022)	(3.99)
	4983	12331	147.5***	0.547	0.325	-40.6***	0.088	0.184	-52.17***
HFWEST	(352)	(745)	(8.92)	(0.050)	(0.038)	(3.53)	(0.013)	(0.026)	(3.30)
	6759	14726	117.9***	0.395	0.341	-13.7	0.098	0.115	-14.78
TEAST	(281)	(624)	(11.64)	(0.027)	(0.021)	(1.58)	(0.009)	(0.012)	(1.13)
	5932	13913	134.5***	0.479	0.367	-23.4***	0.107	0.151	-29.14**
TCENTRAL	(234)	(540)	(13.56)	(0.032)	(0.021)	(2.93)	(0.009)	(0.016)	(2.40)
	6089	15652	157.1***	0.463	0.282	-39.1***	0.075	0.151	-50.33***
TWEST	(357)	(787)	(11.07)	(0.034)	(0.026)	(4.23)	(0.009)	(0.017)	(3.95)
	4287	12980	202.8***	0.677	0.389	-42.5***	0.112	0.261	-57.09***
TMWEST	(243)	(2470)	(3.50)	(0.0320	(0.033)	(6.27)	(0.013)	(0.024)	(5.46)
	3988	12581	215.5***	0.721	0.421	-41.6***	0.125	0.289	-56.75***
TFWEST	(246)	(1089)	(7.70)	(0.032)	(0.044)	(5.51)	(0.019)	(0.026)	(5.09)

Note: ***, ** and * indicate significant at 1%, 5% and 10% respectively. Standard errors are in the parentheses. The t-values are in parentheses in the % change columns.

2.4.4. District-level Poverty

Beyond the regional level we also estimate several welfare measures at the district level. Table 2.5 shows the poverty profile of Nepal's 75 districts. The district level disaggregation of poverty provides a detailed account of the poverty dynamics between 1995/96 and 2003/04. The head count ratio went up in 16 out of 75 districts, whereas the poverty reduction in 13 districts was statistically insignificant. In total, the poverty rate either went up or did not change significantly in 29 districts (out of 75). In the case of poverty gap, it went up in 19 districts and that increment was significant in 15 districts. In most of the cases, both the head-count ratio and the poverty-gap went up in the districts located in the eastern and central parts of Nepal. Map 2.1 provides the district level poverty rates in 1995/96, Map 2.2 provides the same for 2003/04, and Map 2.3 provides the change in district level poverty between 1995/96 and 2003/04.

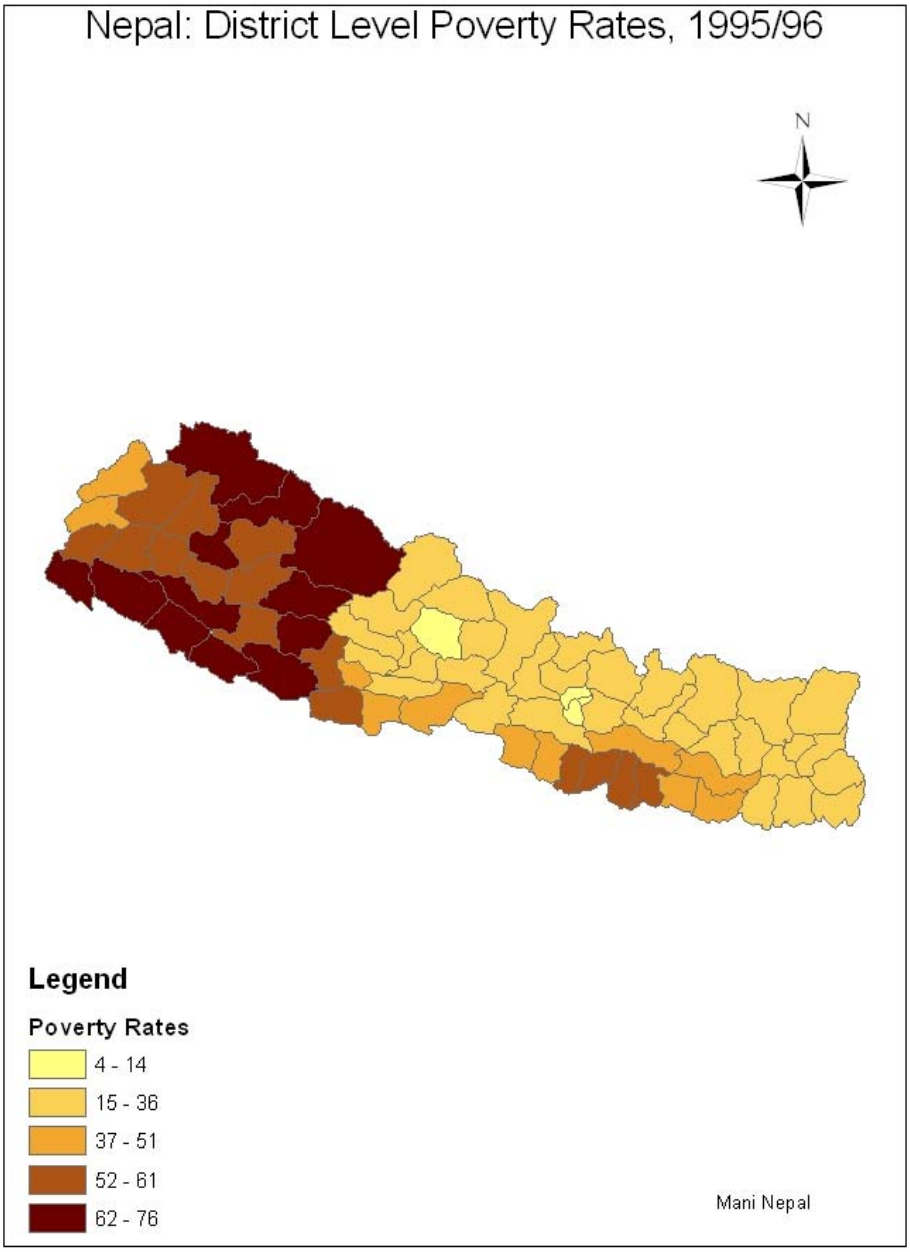
Table 2.5: District level Per Capita Household Expenditure, Head Count Ratio and Poverty Gap, 1995/96 and 2003/04

	Expenditure		Head Count Ratio					Poverty Gap				
DISTRICTS	1995/96	2003/04	1995/96	Rank	2003/04	Rank	Difference	1995/96	Rank	2003/04	Rank	Difference
KATHMANDU	15419	39827	0.043	1	0.037	1	-0.006	0.009	1	0.009	1	0
BHAKTAPUR	13447	36404	0.062	2	0.051	2	-0.011	0.014	2	0.013	2	-0.071***
LALITPUR	14268	37336	0.076	3	0.07	3	-0.006	0.018	3	0.019	3	0.056***
KASKI	12055	30714	0.139	4	0.102	4	-0.037*	0.037	4	0.026	4	-0.297***
MANANG	7807	15941	0.229	5	0.196	6	-0.033	0.056	5	0.049	6	-0.125***
KAVRE	8708	18626	0.239	6	0.257	18	0.018	0.062	6	0.069	20	0.113***
ILAM	7950	13606	0.252	7	0.327	37	0.075*	0.063	7	0.09	37	0.429***
DOLAKHA	7933	15999	0.255	8	0.218	10	-0.037	0.064	8	0.055	8	-0.141***
CHITAWAN	8823	19489	0.255	9	0.216	9	-0.039	0.069	12	0.056	10	-0.188***
NUWAKOT	7929	14360	0.26	10	0.292	28	0.032	0.067	10	0.079	28	0.179***
SINDHUPALCHOK	7665	15053	0.261	11	0.229	11	-0.032	0.067	9	0.057	11	-0.149***
SOLUKHUMBU	7081	12132	0.277	12	0.322	34	0.045	0.067	11	0.084	30	0.254***
TERHATHUM	7179	11601	0.282	13	0.379	51	0.097**	0.071	13	0.105	49	0.479***
SYANGJA	7628	16421	0.285	14	0.208	7	-0.077**	0.077	16	0.052	7	-0.325***
MYAGDI	7362	14527	0.296	15	0.235	12	-0.061	0.081	18	0.061	12	-0.247***
OKHALDHUNGA	6930	10894	0.298	16	0.399	56	0.101**	0.075	14	0.111	54	0.480***
TAPLEJUNG	6834	11962	0.303	17	0.344	42	0.041	0.076	15	0.093	40	0.017
RASUWA	7177	13467	0.306	18	0.311	31	0.005	0.081	19	0.086	34	0.062***
DHADING	6989	12420	0.307	19	0.32	33	0.013	0.08	17	0.085	32	0.063***
JHAPA	7507	16108	0.311	20	0.278	23	-0.033	0.083	21	0.076	27	-0.084***
PARBAT	7118	14980	0.315	21	0.214	8	-0.101**	0.087	24	0.055	9	-0.368***
LAMJUNG	7202	15390	0.316	22	0.241	13	-0.075*	0.088	25	0.063	13	-0.284***
BHOJPUR	6520	10635	0.322	23	0.418	63	0.096**	0.081	20	0.118	62	0.457***
DHANKUTA	6992	12483	0.324	24	0.372	44	0.048	0.084	23	0.103	45	0.226***
KHOTANG	6515	10191	0.326	25	0.454	73	0.128***	0.083	22	0.131	72	0.578***
MAKWANPUR	7652	15753	0.333	26	0.337	40	0.004	0.093	28	0.094	41	0.011
PANCHTHAR	6327	10277	0.341	27	0.434	69	0.093**	0.089	27	0.123	66	0.382***
BAGLUNG	6882	14517	0.341	28	0.251	16	-0.090**	0.097	30	0.066	15	-0.320***
MUSTANG	6895	15609	0.342	29	0.249	14	-0.093*	0.1	32	0.068	19	-0.320***
SANKHUWASABHA	6400	11907	0.343	30	0.337	41	-0.006	0.089	26	0.09	38	0.011

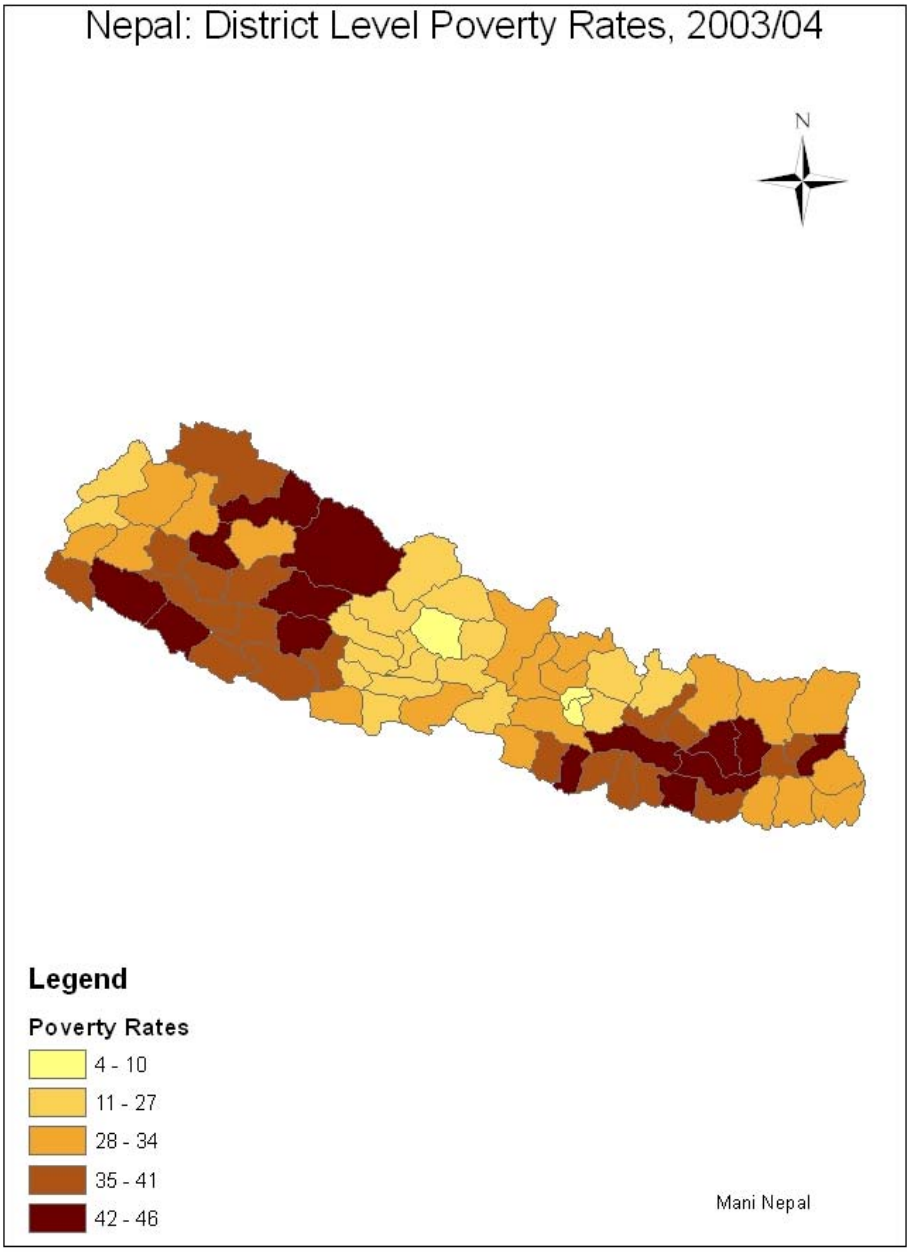
MORANG	7421	16598	0.348	31	0.301	30	-0.047	0.098	31	0.086	35	-0.122***
RAMECHHAP	6412	11268	0.354	32	0.378	48	0.024	0.094	29	0.104	47	0.106***
TANAHU	6991	15497	0.354	33	0.259	20	-0.095**	0.102	35	0.069	21	-0.324***
GULMI	6561	13982	0.36	34	0.25	15	-0.110***	0.102	34	0.064	14	-0.373***
PALPA	7040	15702	0.36	35	0.257	19	-0.103***	0.105	36	0.066	16	-0.371***
GORKHA	6486	13713	0.361	36	0.279	25	-0.082*	0.1	33	0.073	25	-0.270***
SUNSARI	7348	16273	0.364	37	0.322	35	-0.042	0.107	37	0.094	42	-0.121***
UDAYAPUR	6129	11038	0.399	38	0.438	70	0.039	0.112	38	0.128	69	0.143***
ARGHAKHANCHI	6163	13617	0.404	39	0.259	21	-0.145***	0.12	39	0.067	17	-0.442***
PARSA	7055	17155	0.409	40	0.298	29	-0.111***	0.124	40	0.083	29	-0.331***
RUPANDEHI	6791	17968	0.42	41	0.251	17	-0.169***	0.136	41	0.067	18	-0.507***
NAWALPARASI	5945	14989	0.454	42	0.278	24	-0.176***	0.143	44	0.074	26	-0.483***
SAPTARI	5753	12590	0.468	43	0.395	55	-0.073*	0.139	43	0.116	59	-0.165***
SINDHULI	5477	10387	0.468	44	0.448	71	-0.02	0.138	42	0.13	71	-0.058***
DARCHULA	5466	15611	0.477	45	0.176	5	-0.301***	0.151	45	0.041	5	-0.728***
BARA	5594	12789	0.481	46	0.386	53	-0.095**	0.152	46	0.113	56	-0.257***
BAITADI	5361	13386	0.492	47	0.27	22	-0.222***	0.159	48	0.069	22	-0.566***
SIRAHA	5305	11095	0.506	48	0.428	67	-0.078*	0.153	47	0.127	67	-0.170***
DHANUSA	5621	13844	0.516	49	0.383	52	-0.133***	0.165	50	0.112	55	-0.321***
SARLAHI	5320	12402	0.518	50	0.403	58	-0.115***	0.164	49	0.12	63	-0.268***
DADELDHURA	5096	12628	0.536	51	0.312	32	-0.224***	0.182	53	0.085	33	-0.533***
KAPILBASTU	5199	13180	0.538	52	0.327	38	-0.211***	0.183	54	0.089	36	-0.514***
MAHOTTARI	5151	11936	0.54	53	0.406	60	-0.134***	0.175	51	0.121	64	-0.309***
RAUTAHAT	5042	11948	0.552	54	0.425	66	-0.127***	0.181	52	0.128	70	-0.293***
DOTI	4917	12370	0.558	55	0.336	39	-0.222***	0.192	55	0.092	39	-0.521***
SALYAN	4922	12401	0.582	56	0.362	43	-0.220***	0.195	56	0.099	43	-0.492***
JAJARKOT	4528	10807	0.596	57	0.378	49	-0.218***	0.198	58	0.102	44	-0.485***
JUMLA	4743	13081	0.596	58	0.325	36	-0.271***	0.197	57	0.084	31	-0.574***
BAJHANG	4537	12647	0.604	59	0.285	27	-0.319***	0.209	61	0.072	24	-0.656***
ACHHAM	4527	11050	0.606	60	0.378	50	-0.228***	0.207	59	0.104	48	-0.498***
PYUTHAN	4636	11365	0.607	61	0.399	57	-0.208***	0.211	63	0.113	57	-0.464***
DAILEKH	4510	10658	0.609	62	0.407	61	-0.202***	0.207	60	0.114	58	-0.449***
BAJURA	4532	12689	0.611	63	0.284	26	-0.327***	0.211	62	0.071	23	-0.664***

BANKE	4755	14243	0.627	64	0.372	45	-0.255***	0.24	69	0.11	53	-0.542***
SURKHET	4617	12799	0.637	65	0.386	54	-0.251***	0.23	67	0.108	50	-0.530***
RUKUM	4287	10364	0.639	66	0.416	62	-0.223***	0.219	65	0.117	61	-0.466***
ROLPA	4294	9835	0.641	67	0.458	74	-0.183***	0.222	66	0.131	73	-0.410***
DOLPA	4250	10452	0.644	68	0.428	68	-0.216***	0.217	64	0.121	65	-0.442***
KANCHANPUR	4418	14168	0.663	69	0.377	47	-0.286***	0.256	71	0.109	52	-0.574***
HUMLA	4084	10472	0.674	70	0.403	59	-0.271***	0.232	68	0.109	51	-0.530***
DANG	4208	12115	0.684	71	0.375	46	-0.309***	0.259	72	0.103	46	-0.602***
MUGU	3989	10329	0.696	72	0.424	65	-0.272***	0.248	70	0.116	60	-0.532***
BARDIYA	3971	11917	0.712	73	0.423	64	-0.289***	0.281	74	0.127	68	-0.548***
KALIKOT	3877	10189	0.718	74	0.459	75	-0.259***	0.266	73	0.139	75	-0.477***
KAILALI	3724	11440	0.756	75	0.448	72	-0.308***	0.308	75	0.134	74	-0.565***

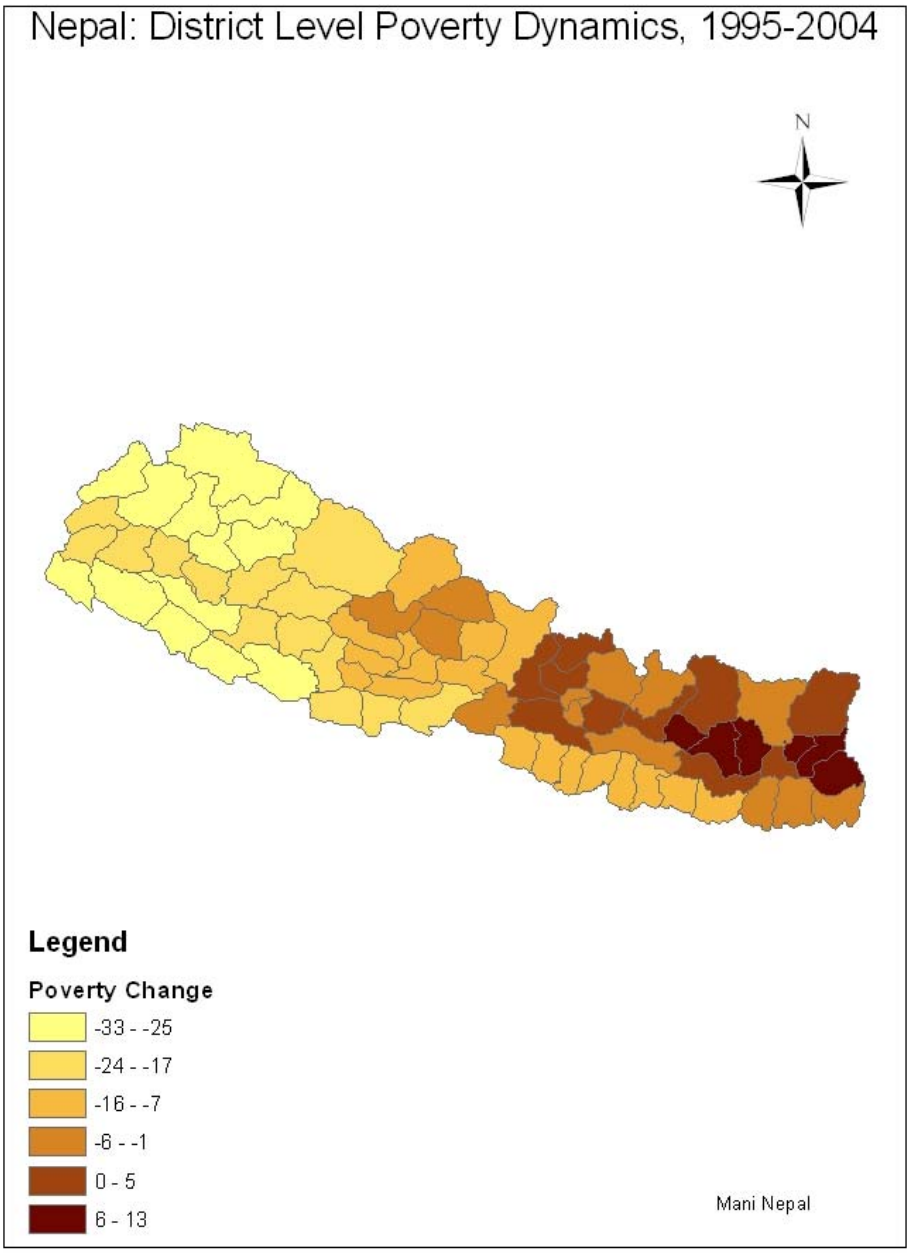
Map 2.1: District Level of Poverty Rates, 1995/96



Map 2.2: District Level Poverty Rates, 2003/04



Map 2.3: Change in District Level Poverty Rates, 1995/96- 2003/04



2.4.5. Village-level Poverty

We also compute the village-level head-count ratio and the poverty-gap for all the villages across Nepal. Fig. 2.1 displays the change in the village level head-count ratio, and fig. 2.2 displays the change in poverty-gap between 1995/96 and 2003/04.[13] The head count ratio increased in 22% (out of 3880) of the villages, and the poverty gap has increased in 23.6% of the villages. The village level trend is similar to district level trend in that villages in the eastern and central part of the country experienced worsening poverty situation. This trend can be seen in Map 2.4, Map 2.5 and Map 2.6 presented below.

Poverty analysis using the national average statistics indicate the welfare improvement among the poor people between 1995/95 and 2003/04, but the disaggregate analysis using micro-level estimation shows that the achievement towards reducing poverty rate is a mixed-bag during that period. The puzzling aspect of the outcome is that the Eastern and Central parts of the country, which otherwise are considered as relatively the better-off regions than the mid-west and far-west regions, experienced worsening poverty.[14]

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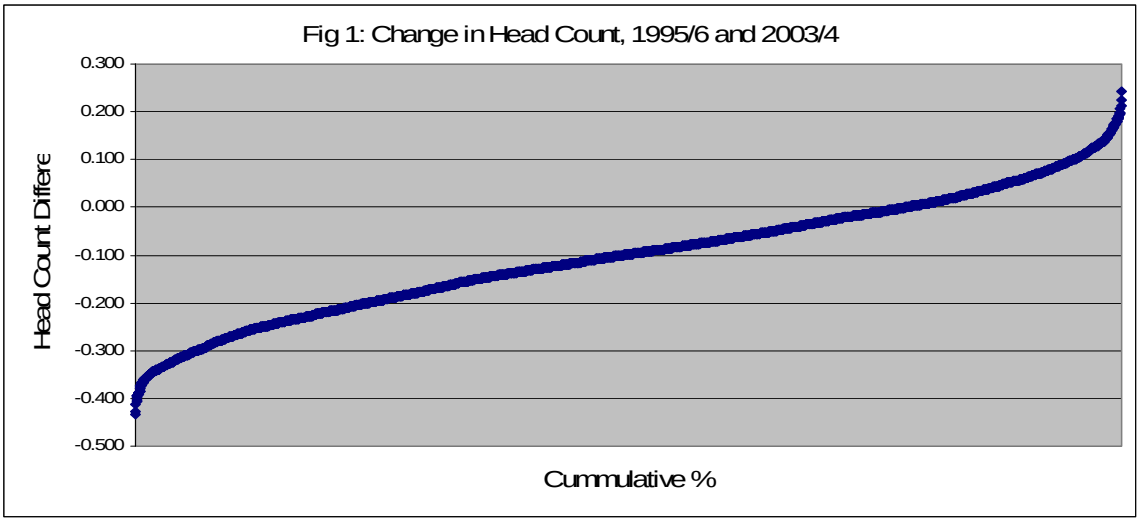
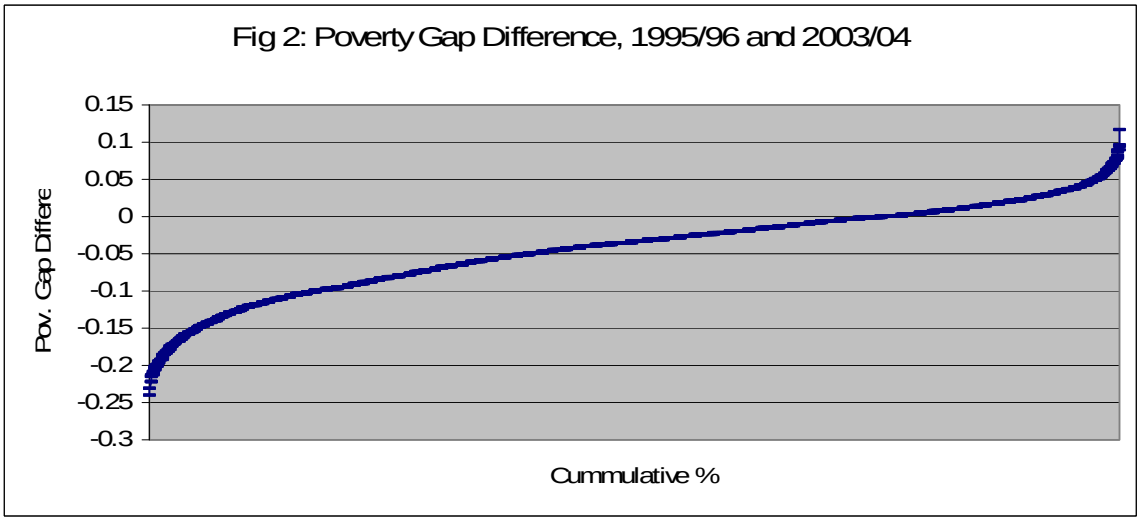
[13] The village level poverty indicators are presented in Appendix A.

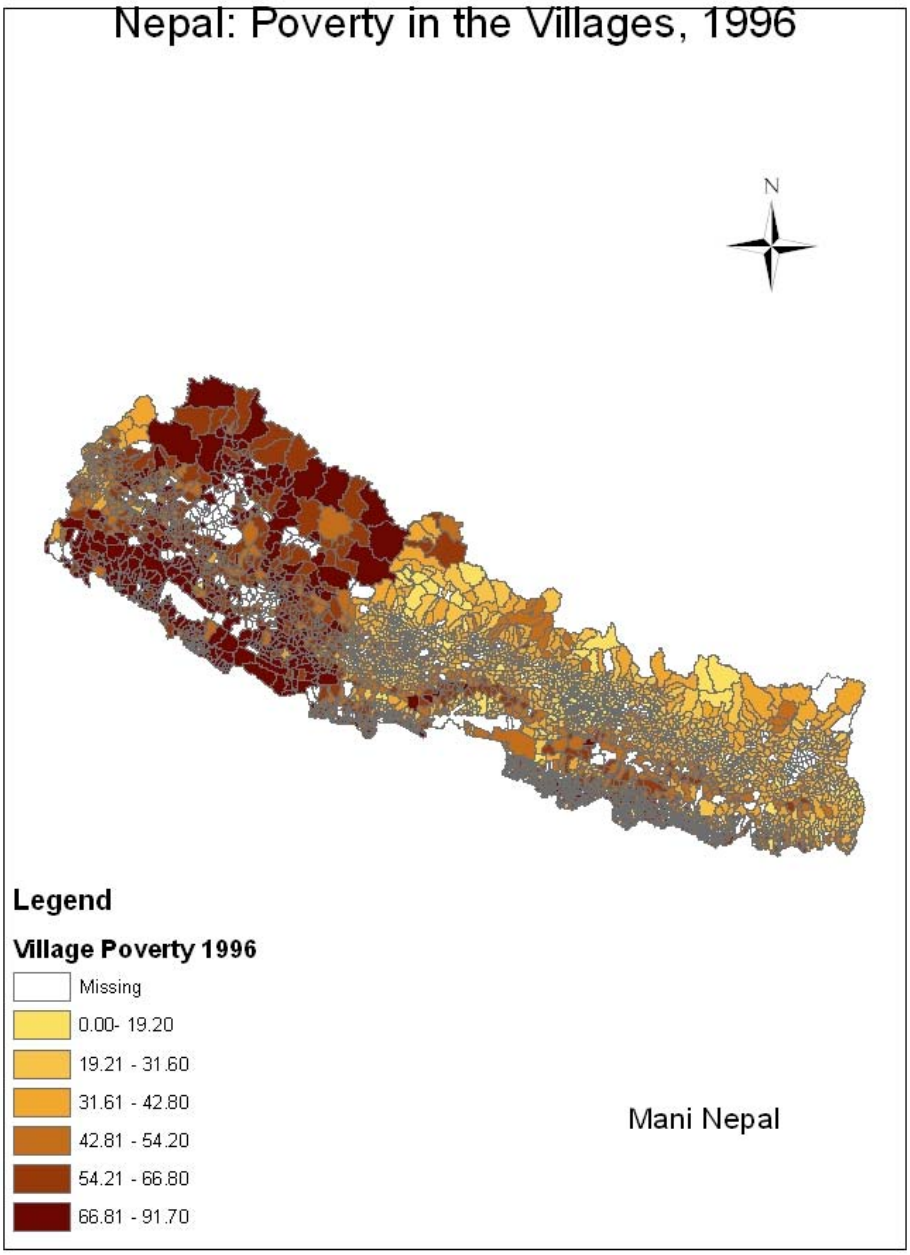
[14] Our claim is that the Maoist People's War (MPW) drove adult household members out of their home. Some are forced to join the rebel army (voluntarily or otherwise), and others voted with their own feet by moving either to urban centers or to foreign countries in search of a secure life. It may be the case that in a labor surplus subsistence agrarian society like Nepal, the reduction of the labor force may not reduce output, but the per capita output/expenditure may go up instead (an application of the principle of



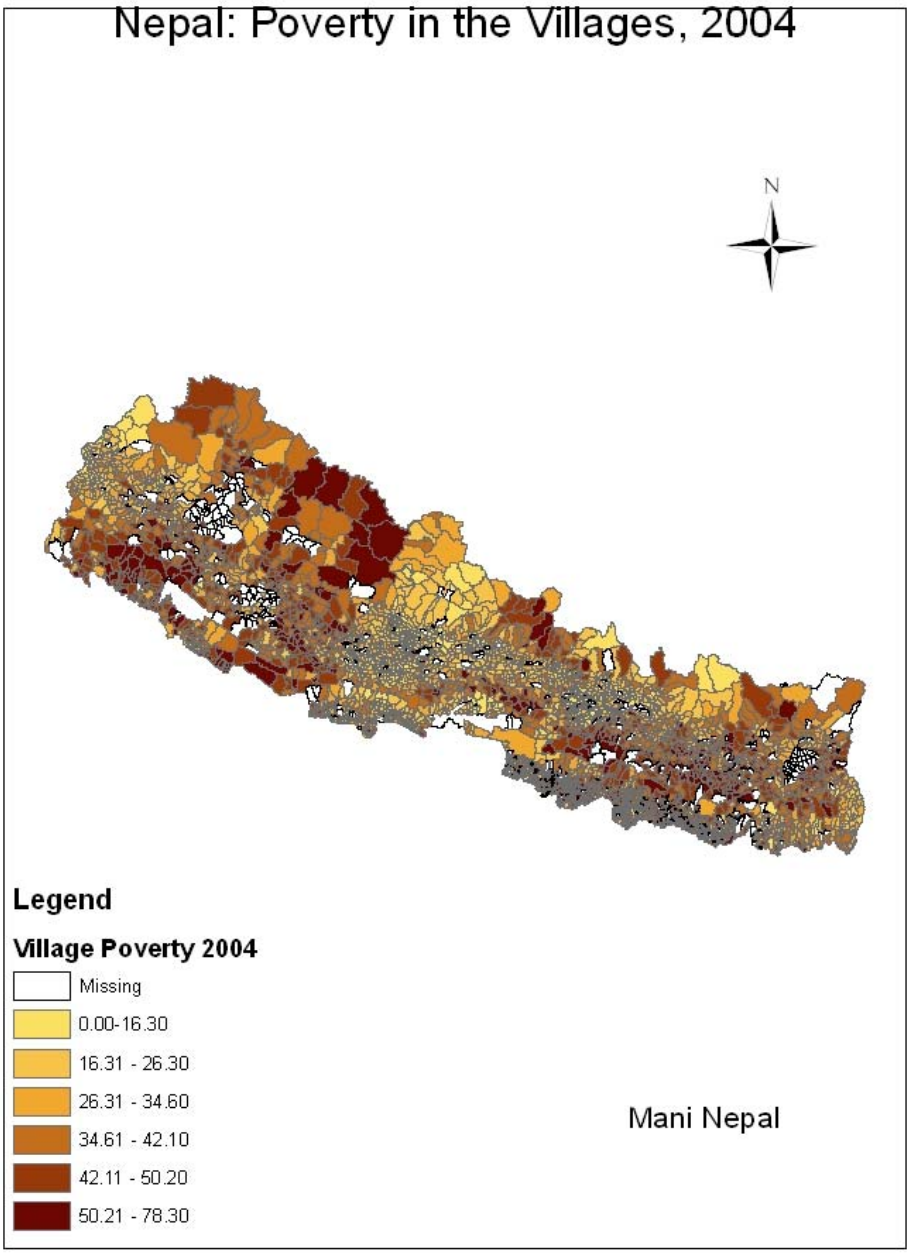


diminishing marginal productivity). Also some of households receive remittances sent by the household members who left the village that help to increase household expenditures. We suspect that it may be one of the reason why the western part of the country that is hit hard by the insurgency, and also has been considered as the least developed regions, experienced higher rate of reduction of the poverty in comparison to the eastern and the central regions.

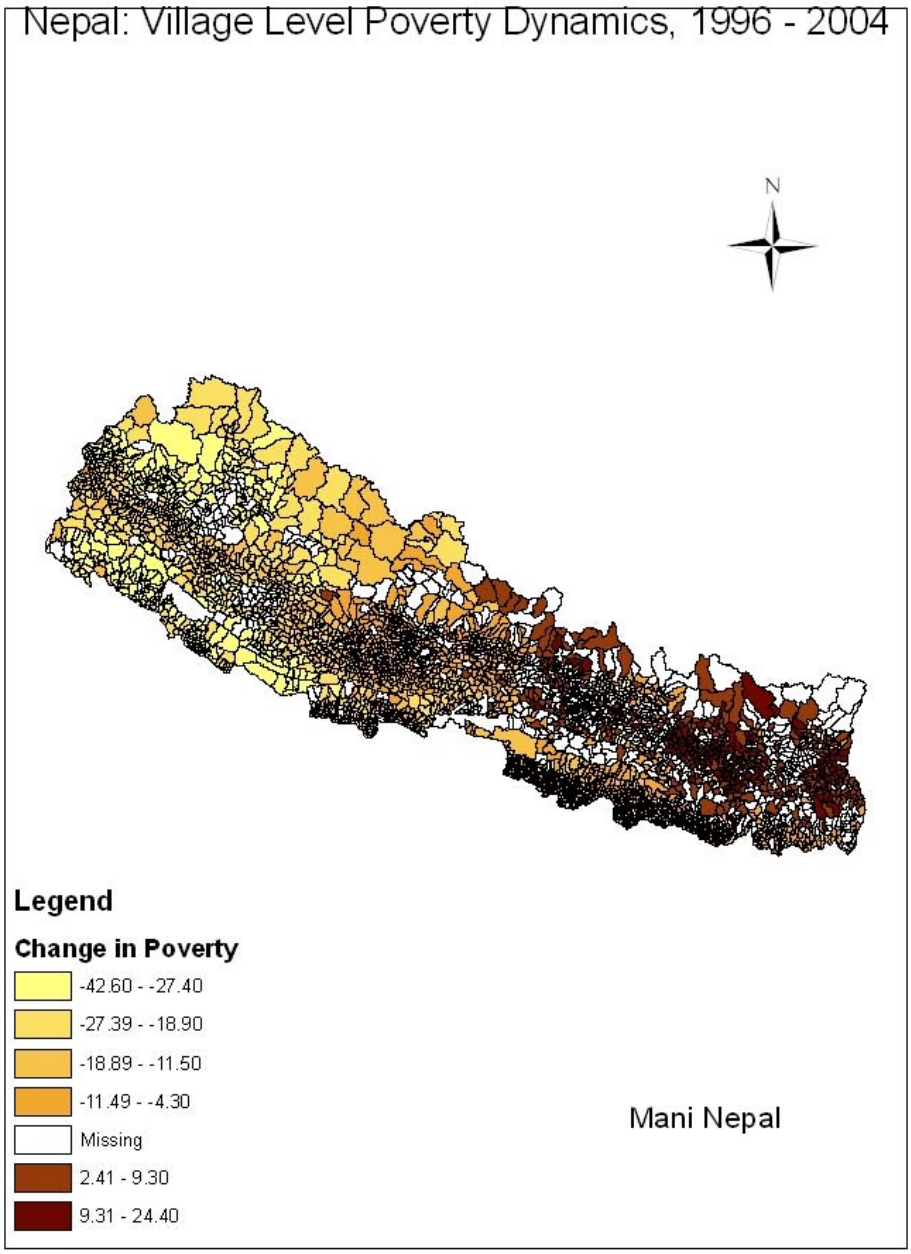
Map 2.4: Village Level Poverty, 1996



Map 2.5: Village Level Poverty, 2004



Map 2.5: Village Level Change in Poverty, 1996-2004



2.5. Empirical Estimates of Inequality Indicators

A study conducted by Nepal Central Bureau of Statistics (CBS 2005) shows that inequality worsened in Nepal between 1995/96 and 2003/04. This section presents the estimates of inequality across different regions, districts, and villages of Nepal including the inequality between different caste/ethnic groups.

2.5.1. Inequality among Caste/Ethnic Groups

Table 2.6 shows the estimated expenditure inequality in Nepal during the years 1995/96 and 2003/04. The inequality measured by the Gini index increased at the national level, regional level, rural-urban, and among different caste/ethnic groups. The increase in the Gini index is significant in four regions (except in the Eastern region). In terms of ecological regions, Hills and Terai regions experienced significant increased in the inequality index which is also true in the case of urban areas. In the case of the caste/ethnic groups, the Gini index went up significantly in the case of Bahun-Chhetri, Newar, Tamang, Magar, Gurung, Rai and Limbu. In the case of Newar, an ethnic group with the highest per capita household expenditure (and income) in the country, the inequality went up the most, indicating that inequality increases with the increase in the household income.

The relative position or the inequality ranking of the five regions, three ecological belts and rural-urban areas has not been changed between 1995/96 and 2003/04. In the case of caste/ethnic groups, there is only one change in the ranking that the Newar and Bahun-Chhetri groups changed their respective ranks (from 6^{th} to the 7^{th} position and vice-versa). The relative inequality position of other caste/ethnic groups did not change.

Table 2.6: Regional, Rural-Urban, and Caste/Ethnic Inequality, 1995/96 and 2003/04

		1995/96	Rank	2003/04	Rank	Diff	t-value
5-Regions	MIDWEST	0.323	1	0.353	1	0.03***	3.75
	FARWEST	0.33	2	0.357	2	0.027*	1.69
	WESTERN	0.364	4	0.396	3	0.032***	2.67
	EASTERN	0.34	3	0.397	4	0.057	1.10
	CENTRAL	0.404	5	0.469	5	0.065***	4.06
Eco-Belts	MOUNTAIN	0.333	1	0.334	1	0.001	0.07
	TERAI	0.367	2	0.406	2	0.039***	3.55
	HILLS	0.391	3	0.447	3	0.056***	5.60
Rural-Urban	RURAL	0.343	1	0.358	1	0.015*	1.87
	URBAN	0.371	2	0.447	2	0.076***	5.43
Caste/Ethnic Groups	DAKASA	0.337	1	0.354	1	0.017*	1.89
	TERAICASTE	0.342	2	0.359	2	0.017	1.55
	TAMAGURALI	0.349	3	0.382	3	0.033***	2.75
	MUSLIM	0.354	4	0.395	4	0.041*	1.86
	OTHER	0.361	5	0.401	5	0.04	1.48
	NEWAR	0.373	6	0.449	7	0.076***	4.00
	BAHUNCHETRI	0.386	7	0.422	6	0.036***	2.77
Total	NEPAL	0.385		0.427		0.042***	3.82

2.5.2. Regional Inequality

The regional inequality among 15 regions is presented in Table 2.7. The inequality declined in the Far-West mountain region (MFWEST), but the reduction is insignificant. The Central hill region (HCENTRAL) experienced the highest increase in the inequality, more than the national average. The inequality is below the national average in all other regions. This is basically due to the fact that when inequality is computed at the disaggregate levels, it generally goes down as compared to the national average.

Table 2.7: Regional Inequality, 1995/96 and 2003/04

	1995/96	Rank	2003/04	Rank	Diff	t-value
MMWEST	0.292	1	0.319	4	0.027	1.57
MEAST	0.298	2	0.312	2	0.014	1.16
HMWEST	0.307	3	0.323	5	0.016	1.19
MFWEST	0.310	4	0.309	1	-0.001	-0.05
HEAST	0.311	5	0.335	6	0.024	1.99**
HFWEST	0.315	6	0.317	3	0.002	0.11
MWEST	0.322	7	0.353	8	0.031	1.51
MCENTRAL	0.326	8	0.350	7	0.024	1.46
TFWEST	0.337	9	0.400	12	0.063	1.85*
TMWEST	0.341	10	0.385	9	0.044	0.99
TCENTRAL	0.358	11	0.408	13	0.050	2.81***
HWEST	0.359	12	0.393	10	0.034	1.85*
TEAST	0.361	13	0.414	14	0.053	2.67***
TWEST	0.362	14	0.396	11	0.034	1.92*
HCENTRAL	0.386	15	0.474	15	0.088	4.14***

2.5.3. District-level inequality

Table 2.8 displays the district level Gini index in 1995/96 and 2003/04, their Gini ranks, and the difference in Gini index between the given years. The inequality in the mountain and hilly regions is relatively smaller than the case of terai region. The inequality went up significantly in 32 districts (out of 75). There are some instances

where inequality went down, but those changes were insignificant. Comparing Table 2.8 with Table 2.5, we can see that the districts with lower degree of inequality have higher head-count ratios and higher poverty gap (the rank correlation between head-count and Gini index is -0.29 for 1995/96, and -0.38 for 2003/04) indicating a trade-offs between poverty and inequality.

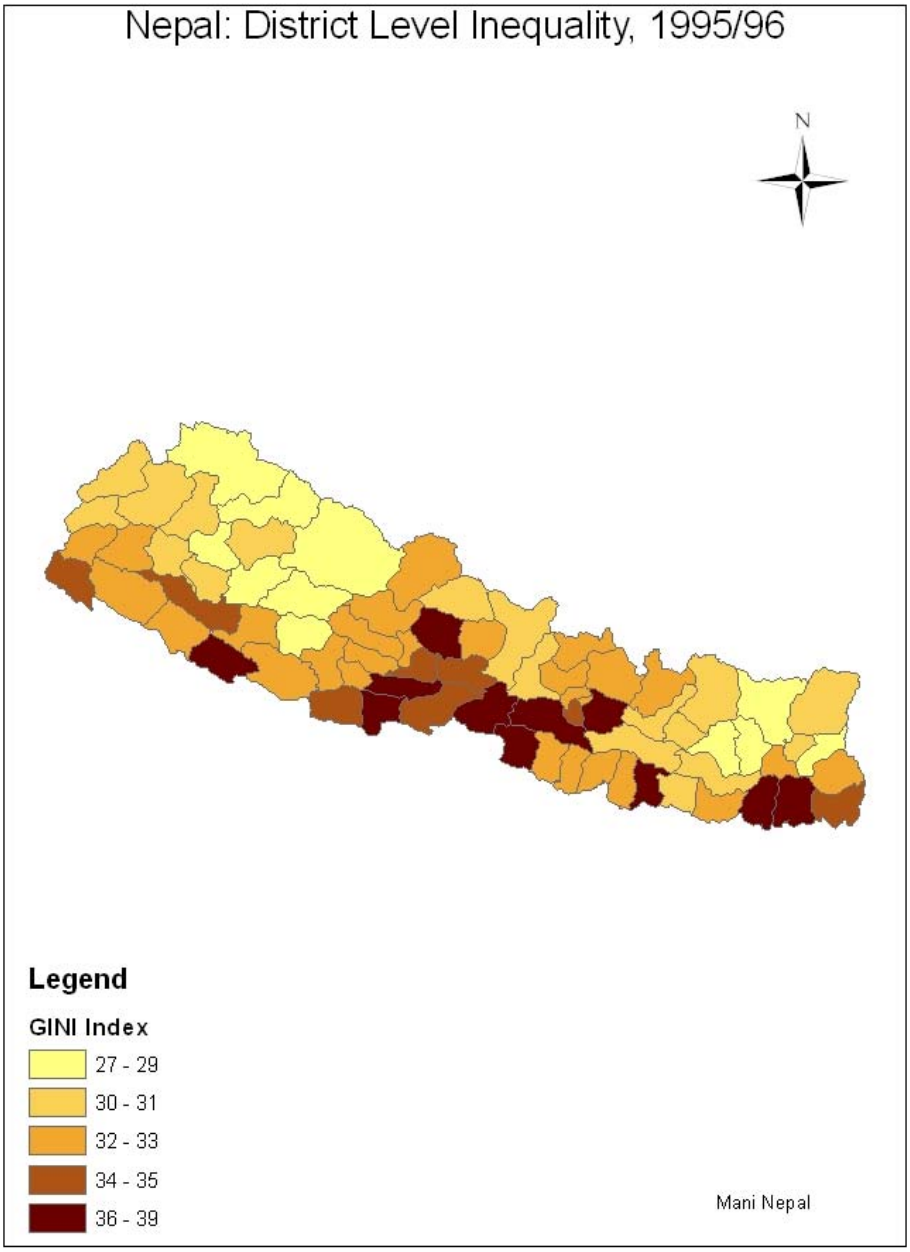
Table 2.8: The Comparison of the District Level Inequality in Nepal, 1996 and 2003

	1996		2003			
DIST	GINI	Rank	GINI	Rank	Diff	t-value
KALIKOT	0.265	1	0.288	5	0.023	1.45
HUMLA	0.272	2	0.283	2	0.011	0.97
DOLPA	0.275	3	0.301	12	0.026	1.53
MUGU	0.280	4	0.289	6	0.009	0.48
JAJARKOT	0.283	6	0.282	1	-0.001	-0.05
RUKUM	0.283	5	0.287	4	0.004	0.11
PANCHTHAR	0.287	7	0.295	7	0.008	0.36
ROLPA	0.288	9	0.285	3	-0.003	-0.18
BHOJPUR	0.288	8	0.305	14	0.017	1.34
KHOTANG	0.292	10	0.305	15	0.013	1.02
SANKHUWASABHA	0.293	11	0.308	18	0.015	1.01
DAILEKH	0.296	13	0.297	9	0.001	0.07
SOLUKHUMBU	0.296	12	0.306	16	0.010	0.88
ACHHAM	0.297	14	0.295	8	-0.002	-0.12
TAPLEJUNG	0.299	15	0.316	21	0.017	0.88
BAJHANG	0.300	17	0.298	10	-0.002	-0.13
SINDHULI	0.300	16	0.313	19	0.013	0.30
BAJURA	0.302	20	0.300	11	-0.002	-0.13
OKHALDHUNGA	0.302	18	0.304	13	0.002	0.06
MANANG	0.302	19	0.333	32	0.031***	2.92
RAMECHHAP	0.303	21	0.307	17	0.004	0.26
TERHATHUM	0.308	22	0.326	28	0.018	1.02
JUMLA	0.309	23	0.349	40	0.040**	2.02
SIRAHA	0.310	24	0.339	34	0.029	0.73
DARCHULA	0.312	26	0.316	22	0.004	0.18
UDAYAPUR	0.312	25	0.341	37	0.029	0.53
DHADING	0.313	27	0.316	23	0.003	0.17
BAITADI	0.314	29	0.319	25	0.005	0.29
GORKHA	0.314	28	0.336	33	0.022	1.24
PYUTHAN	0.317	30	0.327	30	0.010	0.61
DOTI	0.319	31	0.327	31	0.008	0.31
ARGHAKHANCHI	0.321	33	0.313	20	-0.008	-0.38
SINDHUPALCHOK	0.321	32	0.340	35	0.019	0.96
DADELDHURA	0.322	37	0.317	24	-0.005	-0.20
GULMI	0.322	35	0.322	26	0.000	0.00
KAILALI	0.322	36	0.371	51	0.049**	2.45

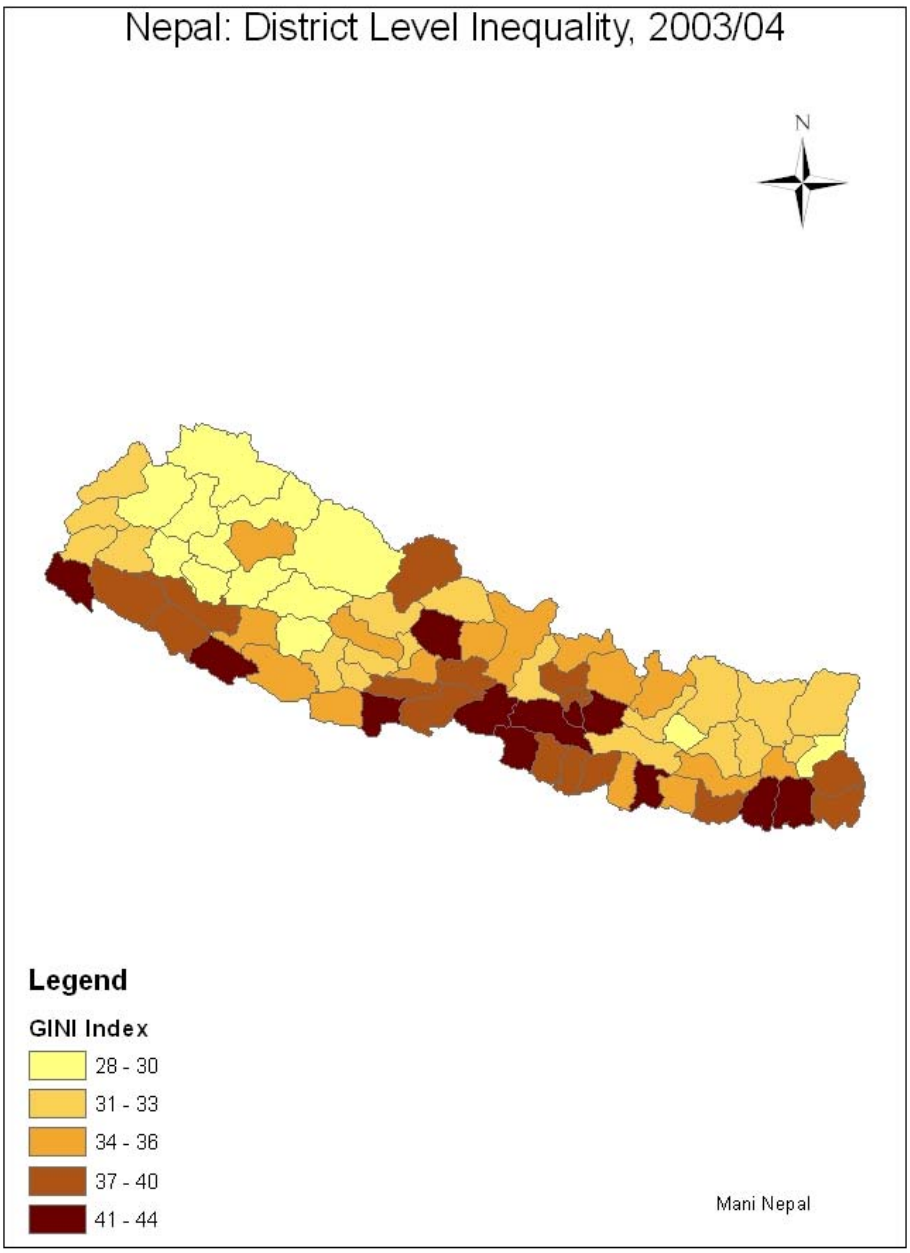
RAUTAHAT	0.322	34	0.376	55	0.054***	2.94
KATHMANDU	0.323	38	0.382	58	0.059***	3.31
SALYAN	0.324	40	0.345	38	0.021	1.35
MAHOTTARI	0.324	39	0.362	44	0.038*	1.65
RASUWA	0.325	43	0.350	41	0.025	0.57
BARDIYA	0.325	44	0.373	52	0.048**	2.42
SARLAHI	0.325	41	0.379	56	0.054*	1.87
BHAKTAPUR	0.325	42	0.396	62	0.071***	3.94
PARBAT	0.327	46	0.322	27	-0.005	-0.30
DHANKUTA	0.327	45	0.362	45	0.035**	2.13
MYAGDI	0.328	47	0.326	29	-0.002	-0.14
DANG	0.328	48	0.345	39	0.017	0.82
BARA	0.329	49	0.380	57	0.051***	2.77
MUSTANG	0.330	51	0.367	48	0.037***	2.60
SAPTARI	0.330	50	0.385	61	0.055***	3.35
BAGLUNG	0.331	54	0.340	36	0.009	0.60
DOLAKHA	0.331	53	0.363	46	0.032***	2.25
ILAM	0.331	52	0.368	50	0.037***	2.60
LAMJUNG	0.333	55	0.356	43	0.023	0.90
NUWAKOT	0.334	56	0.367	49	0.033**	2.32
KAPILBASTU	0.336	57	0.353	42	0.017	1.00
SYANGJA	0.337	58	0.363	47	0.026	0.89
NAWALPARASI	0.341	60	0.374	53	0.033*	1.72
SURKHET	0.341	61	0.384	60	0.043***	2.72
LALITPUR	0.341	59	0.415	64	0.074***	3.59
TANAHU	0.347	62	0.375	54	0.028**	2.19
JHAPA	0.348	63	0.404	63	0.056*	1.94
KANCHANPUR	0.350	64	0.425	69	0.075**	2.04
DHANUSA	0.355	65	0.416	65	0.061***	5.07
PALPA	0.356	67	0.383	59	0.027***	2.24
KAVRE	0.356	66	0.442	74	0.086***	4.30
KASKI	0.363	68	0.438	73	0.075***	3.53
BANKE	0.366	69	0.417	66	0.051***	2.77
CHITAWAN	0.368	70	0.422	67	0.054***	3.03
MORANG	0.370	71	0.433	70	0.063***	3.84
MAKWANPUR	0.371	72	0.437	72	0.066**	2.34
SUNSARI	0.376	73	0.436	71	0.06***	3.12
RUPANDEHI	0.382	74	0.424	68	0.042**	2.04
PARSA	0.390	75	0.444	75	0.054**	2.18

The district level inequalities in 1995/96 and 2003/04 are also shown in Map 2.7 and Map 2.8. The relative change in the district level inequality is shown in Map 2.8.

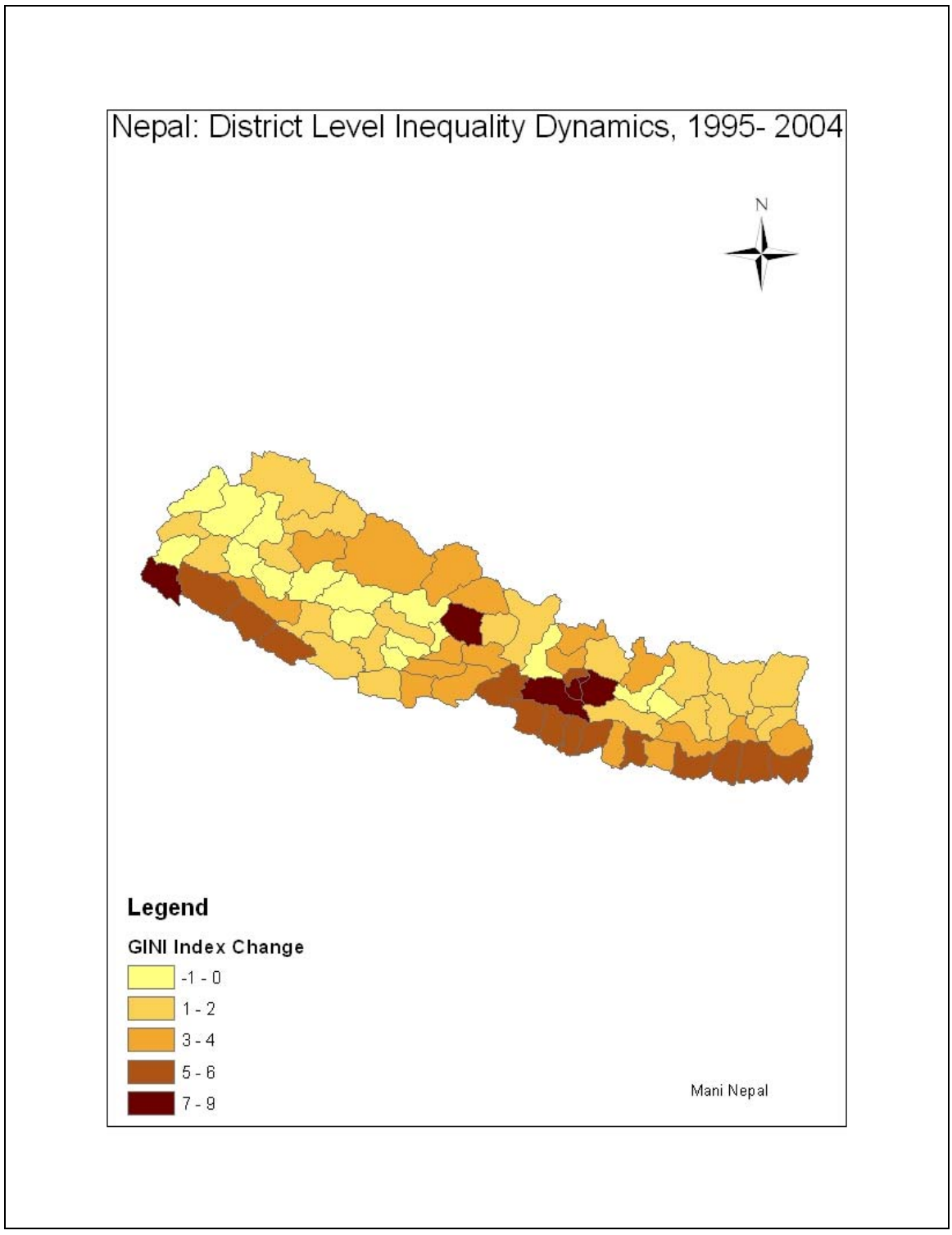
Map 2.7: District Level Expenditure Inequality Rates, 1995/96



Map 2.8: District Level Expenditure Inequality, 2003/04

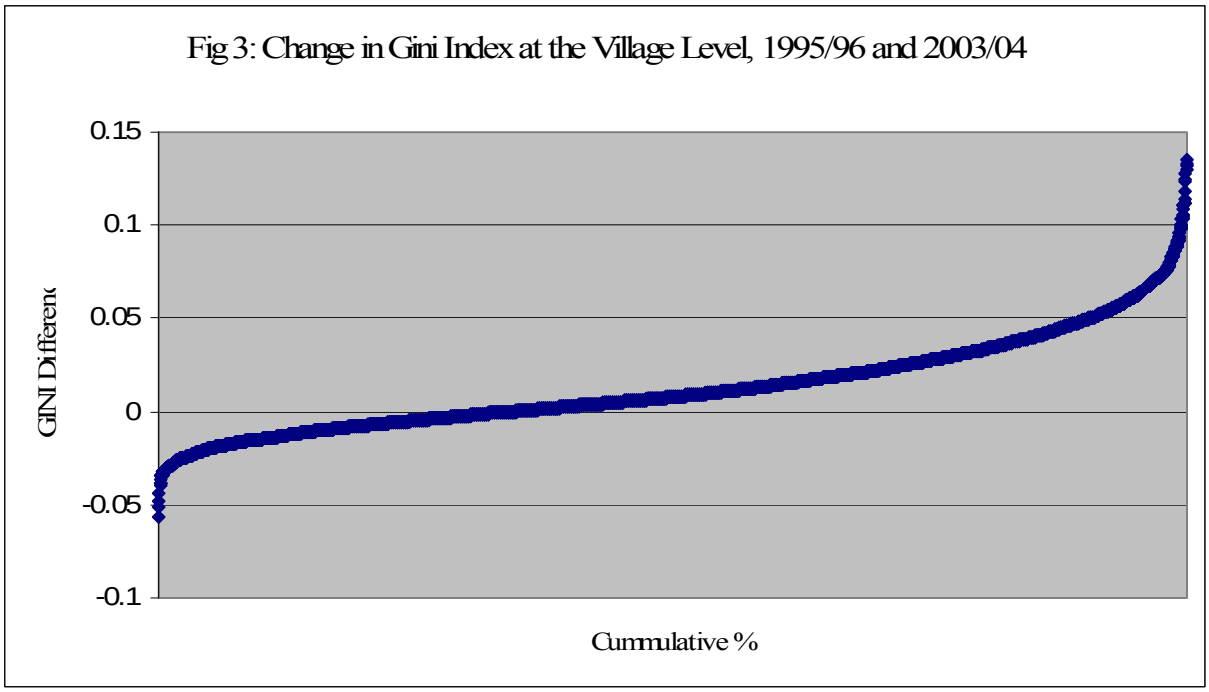


Map 2.9: Change in District Level Expenditure Inequality, 1995/96- 2003/04

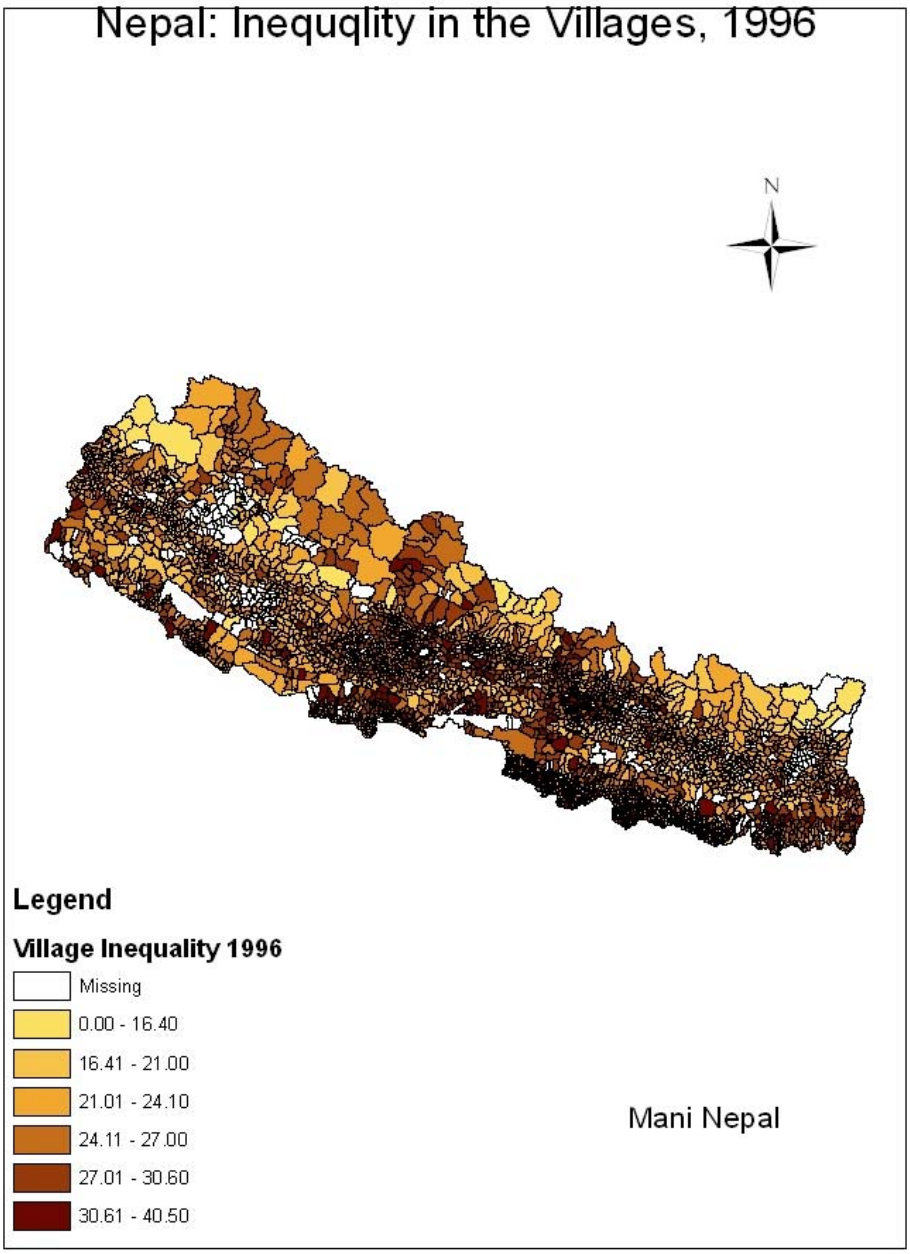


2.5.4. Village-level inequality

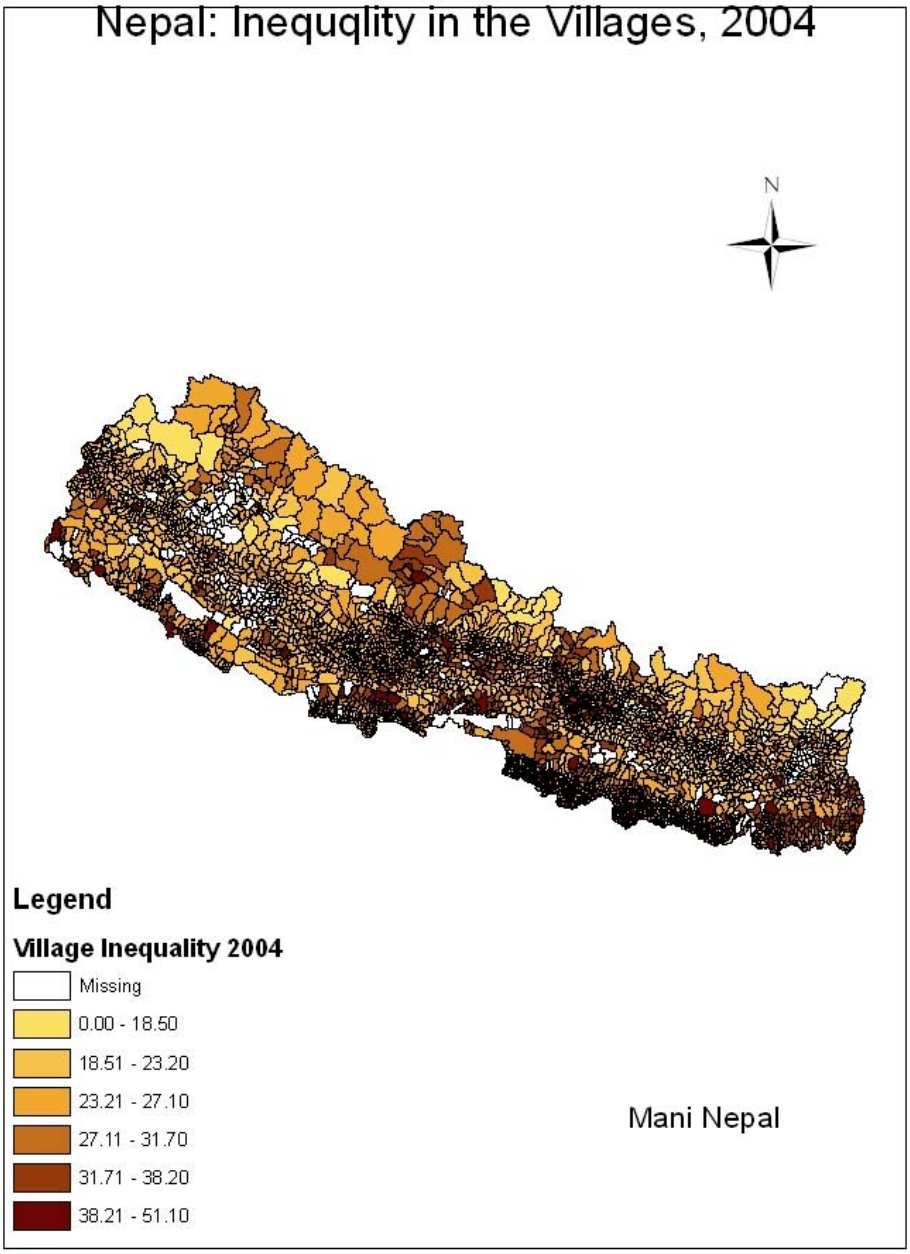
Fig. 3 shows the change in the village level inequality from 1995/96 to 2003/04. This figure shows that the inequality went up in majority of the villages between 1995/96 and 2003/04. The geographical distribution of inequality between 1995/96 and 2003/04 is shown in Map 2.7 and Map 2.8, and the relative change in the village level inequality is shown in Map 2.9.



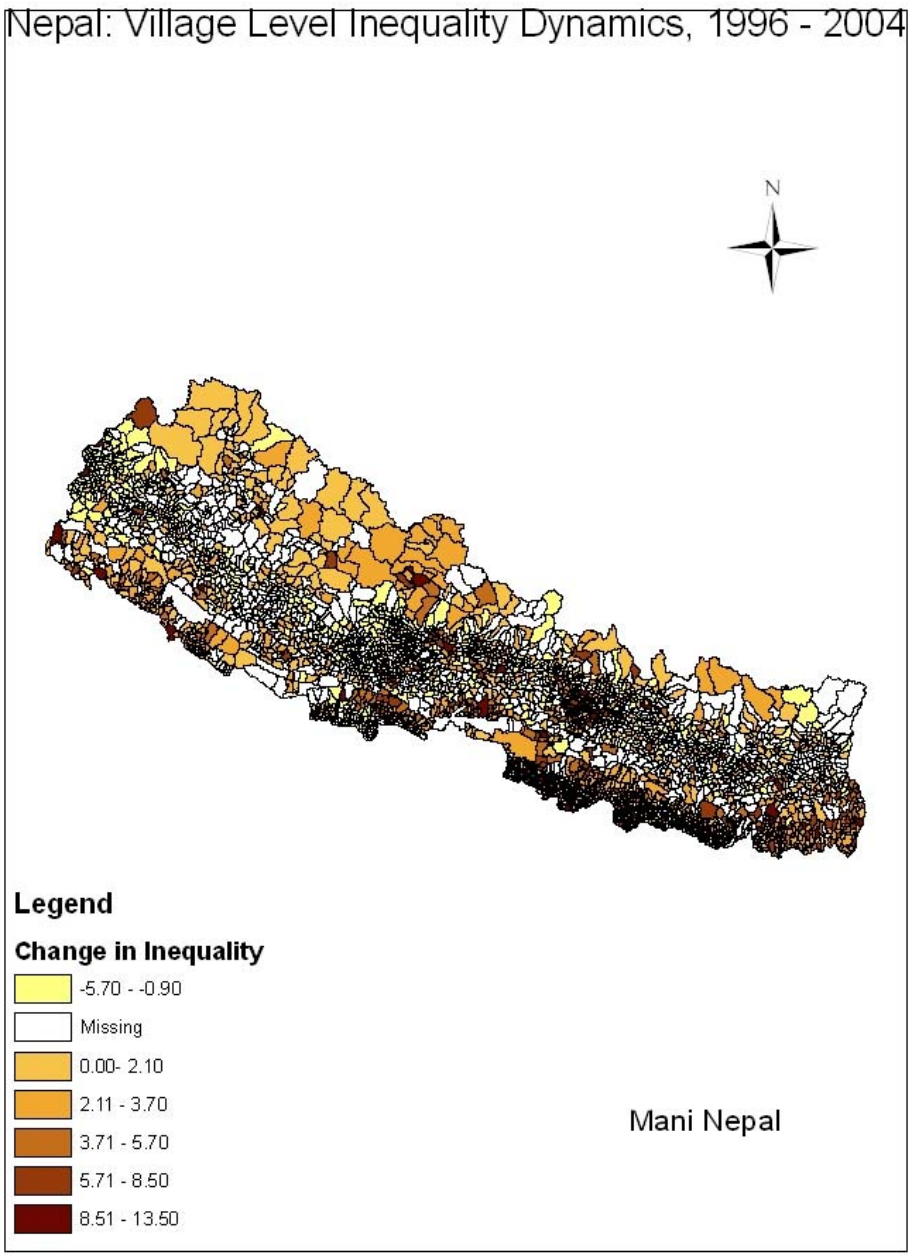
Map 2.10: Village Level Inequality, 1996



Map 2.11: Village Level Inequality, 2004



Map 2.12: Village Level Change in Inequality, 1996- 2004



2.6. Inequality Decomposition

2.6.1. Inequality Decomposition by Factor Components

This section presents the decomposition of inequality by expenditure categories and income sources. First we present the results of inequality decomposition by expenditure sources. As a first step, we estimate an expenditure function where log-expenditure is assumed to be a linear function of household demographics (average age of the household , percentage of males in the household, and household size), schooling (high school, college and higher education), housing structure, information sources (TV), location of the household (regions: eastern, western, mid-western and far-western; ecological belt: mountain and hills), sanitation facilities (piped water, flush-toilet), utilities (electricity, gas), and caste/ethnicity of the household. The regression results are presented in Table 2.9. We see that in both years, most of the explanatory variables are statistically significant at conventional levels and they jointly explain about 64% of the variations of the log-expenditures in both years.

The expenditure equation can be used to answer two types of questions: i) Of these explanatory variables, how much each of them would account for the levels of inequality in 1995/96 and 2003/04, and ii) how much of the increase in expenditure inequality is due to each of the exogenous factors. The answers of these questions are reported in Table 2.10 where the first two columns under the title 'Factor Weights' give the answer to the first question for 1995/96 and 2003/04, and the third column under the heading 'Factor Contribution in Inequality Change' provides the answer to the second question. In both years, availability of television (TV), electricity, gas, flush-toilet and

permanent housing structure are the most important variables, other than the residuals, with significant factor weights for the expenditure inequality.

Table 2.9: Expenditure Equation Results, 1996 and 2003 (Dep. Variable: Log of HH Exp.)

Var. Group	Variables	1995/96	2003/04
		-0.001	0.002**
DEMOGRAPHIC	HHAGE	(0.001)	(0.001)
		0.100***	0.118***
	HHSIZE	(0.004)	(0.004)
		0.162***	0.069***
	MALE	(0.027)	(0.024)
		0.149***	0.126***
EDUCATION	HIGHSCHOOL	(0.021)	(0.019)
		0.324***	0.279***
	COLLEGE	(0.053)	(0.060)
		0.435***	0.507***
	HIGHEREDU	(0.074)	(0.061)
		0.202***	0.251***
HOUSING	PERMANENTHOUSE	(0.029)	(0.027)
		0.317***	0.636***
INFORMATION	TV	(0.039)	(0.040)
		0.089***	0.023
REGIONS	EASTERN	(0.024)	(0.023)
		-0.037	0.102***
	WESTERN	(0.025)	(0.025)
		-0.291***	-0.043
	MWESTERN	(0.030)	(0.027)
		-0.263***	-0.055
	FWESTERN	(0.035)	(0.032)
		0.106***	0.133***
ECOLOGICAL BELTS	MOUNTAIN	(0.034)	(0.0310
		0.090***	0.050**
	HILLS	(0.027)	(0.025)
		0.054**	0.060***
SANITATION	WATERPIPED	(0.024)	(0.021)
		0.247***	0.268***
	TOILETFLUSH	(0.039)	(0.030)
		0.232***	0.246***
UTILITIES	ELECTRICITY	(0.029)	(0.0220
		0.198***	0.236***
	GAS	(0.038)	(0.035)
CASTE	BAHUNCHHETRI	0.115***	0.189***

		(0.027)	(0.028)
		0.086***	-0.034
	TAMAGURALI	(0.032)	(0.029)
		-0.043	-0.037
	DAKASA	(0.036)	(0.036)
		0.095***	0.037
	TERAICASTE	(0.032)	(0.032)
		0.105***	0.240***
	NEWAR	(0.039)	(0.042)
		-0.060	-0.075*
	MUSLIM	(0.043)	(0.043)
		9.279***	9.730***
CONSTANT	CONSTANT	(0.046)	(0.045)
R^2		0.636	0.642
F		193.7***	217.6***
N		3346	3912

Robust standard errors in the parentheses; ***, ** and * indicate significance at 1%, 5% and 10% level.

As these facilities are generally absent from the rural areas, our results indicate that the inequality would be higher in the urban areas (Table 2.6 verifies this result). Other variables with sizable shares in the inequality are household size, and schooling. The regional variables and caste/ethnicity have very low shares in the expenditure inequality.

The factor contribution in the inequality change is given in columns 3 and 4 of Table 2.10. The caste/ethnicity is single largest source (35.4%) of the increase in expenditure inequality where the two dominant caste/ethnic groups (Newar 17.5% and Bahun-Chhetri 12.8%) are accounting for over 30% of the increase in the expenditure inequality. The urban-biased facilities such as electricity, gas and flush-toilet account for over 63% of the increase in the expenditure inequality between 1995/96 and 2003/04. Unlike Fields (2002) who finds that where schooling was the largest contributor (56%) in the inequality increase between 1979 and 1999 in the US, we find that the contribution of school education as a group in the increase in expenditure is negative in Nepal.

Table 2.10: The Contribution of Each Factor to Expenditure Inequality and to the Change in Inequality, 1995/96-2003/04.

		Factor Weights		Factor Contribution in Inequality	
Var. Group	Variables	1996	2003	Change	Group's Contribution
DEMOGRAPHIC					
	HHAGE	0.001	-0.001	-0.018	
	HHSIZE	0.121	0.103	-0.057	
	MALE	0.011	0.004	-0.059	
SCHOOLING					-0.014
	HIGHSCHOOL	0.022	0.013	-0.073	
	COLLEGE	0.020	0.008	-0.105	
	HIGHEREDU	0.016	0.031	0.164	
HOUSING	PERMANENT	0.041	0.063	0.266	
INFORMATION	TV	0.160	0.140	-0.045	
REGION					-0.268
	EASTERN	-0.002	-0.002	0.005	
	WESTERN	0.000	0.002	0.022	
	MWESTERN	0.020	0.002	-0.164	
	FWESTERN	0.015	0.001	-0.131	
ECO BELTS					-0.084
	MOUNTAIN	-0.005	-0.005	-0.003	
	HILLS	0.014	0.005	-0.081	
SANITATION	WATERPIPED	0.011	0.009	-0.011	
	TOILETFLUSH	0.062	0.084	0.287	
UTILITIES	ELECTRICITY	0.069	0.074	0.122	
	GAS	0.048	0.066	0.234	
CASTE/ETHNICITY					0.354
	BAHUNCHHETRI	0.002	0.014	0.128	
	TAMAGURALI	-0.001	0.002	0.036	
	DAKASA	0.002	0.002	-0.005	
	TERAICAST	-0.002	-0.001	0.016	
	NEWAR	0.011	0.027	0.175	
	MUSLIM	0.001	0.001	0.004	
RESIDUAL	RESIDUAL	0.365	0.358	0.295	
GINI		0.385	0.427		

Disaggregating the school education data into below high-school, high-school, college and higher level education shows that high school and college level education tend to reduce the expenditure inequality while higher education tends to increase it. This indicates that putting more focus on the high-school and college level education may be a good way to deal with increasing expenditure inequality. Another notable result is that as

a group,[15] the variable region (regional dummies) has negative (-26.8%) contribution in the inequality change where the mid-west and far-west regions accounted for the most negative contributions.[16]

2.6.2. Inequality Decomposition by Income Sources

In order to perform inequality decomposition by the income sources, we identify different sources of household income. In the survey, the total income is subdivided into agriculture, livestock, home production, wage, rental, enterprise, proprietor, remittance, house rent, and other incomes (Table 2.11). There is a significant change in the composition of income between 1995/96 and 2003/04. In 1995/96, the shares of wage income, agriculture income and enterprise income were 34.13%, 21.75% and 13.16% respectively. Within the eight-year period, the composition of household income has changed significantly. In 2003/04, the contribution of these three sources became 24.84%, 14.97% and 20.90% respectively. Another notable change in the composition of household income in Nepal is coming from the remittances. In 1995/96, the share of remittance income was 6.95%, and it increases to 12.14% by 2003/04.

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[15] The contribution of variables within a group can be added up if a group is composed of with more than one indicator variables (several dummies). Here we have four such groups (schooling, regions, eco belt, and caste/ethnicity). Other variables that are put under groups are not the indicator variables with several dummies and their values as a group's contribution cannot be added up.

[16] These two regions have been experiencing high intensity conflicts for a decade since 1996.

Table 2.11: Inequality Decomposition by Income Sources, 1995/96 and 2003/04

	Income Share (%)		Relative Inequality		Inequality Correlation		Inequality Share (%)		Marginal Effect (%)	
Income Source	1996	2003	1996	2003	1996	2003	1996	2003	1996	2003
AGRICULTURE	21.75	14.97	0.720	0.649	0.597	0.340	15.76	06.30	-5.99	-8.68
LIVESTOCK	02.58	02.57	1.278	1.284	0.281	0.190	01.56	01.20	-1.02	-1.37
HOMEPROD	02.86	03.31	0.758	0.721	0.251	0.291	00.91	01.32	-1.94	-1.99
WAGE	34.13	24.84	0.765	0.752	0.688	0.605	30.26	21.55	-3.86	-3.29
RENTAL	00.88	01.24	1.739	1.093	0.401	0.561	01.04	01.45	0.15	0.21
ENTERPRIZE	13.16	20.90	1.485	0.925	0.822	0.800	27.07	29.48	13.91	8.58
PROPRITER	02.72	02.00	0.994	0.990	0.899	0.893	04.10	03.38	1.38	1.37
REMITTANCE	06.95	12.14	0.949	0.901	0.573	0.641	06.37	13.39	-0.59	1.25
HOUSERENT	12.37	13.16	0.782	0.795	0.650	0.788	10.59	15.73	-1.77	2.57
OTHER	02.59	04.86	0.957	0.940	0.558	0.711	02.33	06.20	-0.26	1.34

Table 2.11 also shows the inequality share and marginal effects of different income sources on total inequality in 1995/96 and 2003/04. In 1995/96, the first three major income sources with the larger share of inequality were wage income (30.3%), enterprise income (27.1%) and agriculture income (15.8%). In 2003/04, the trend changed significantly where the first three income sources with the larger share of inequality are enterprise (29.5%), wage (21.6%) and house rent (15.7%) incomes. A notable change in 2003/04 is that the inequality share of agricultural income went down from 15.8% to 6.3%, while the inequality share of remittance income went up from 6.4% to 13.4%. The enterprise income not only has the largest inequality share but also has the largest marginal effect (8.6%) on total inequality. The marginal effects of agricultural, livestock, wage and home production incomes on total inequality are negative in both of the years whereas the marginal effect of remittance and house rent income on total inequality turned from negative (1995/96) to positive (2003/04). Our results show that the recent trend of increased income inequality between 1995/96 and 2003/04 is probably due to the increasing share of enterprise income (13.2% to 20.9%) and remittance income (6.9% to 12.1%), and decreasing share of agricultural income (21.7% to 15.0%) and wage income (34.13% to 24.8%). Compared to the relative income shares, the enterprise income not only has higher share of inequality but also has the higher marginal contribution on total inequality. The agricultural income has the opposite trend, larger but diminishing share in total income, small share on total inequality and yet larger negative marginal effect on the total inequality indicating that income from agriculture helps to reduce the inequality.

CHAPTER 3

INEQUALITY, POLARIZATION AND VIOLENT CONFLICT: THE MAOIST INSURGENCY IN NEPAL

3.1. Introduction

Is inequality associated with conflict? Sociologists, political scientists, and recently economists, have contributed to a rich theoretical literature in their attempts to answer this question. There is little doubt about the importance of this question and the implications it has for governance and government. Conflict is costly for society. In its cheapest form it alters the social and productive fabric of society that has been built over generations and in its more expensive form can destroy them beyond repair. If ameliorating inequality can forestall conflict, the role of government as an agency that can capably redistribute wealth and income is critical. To be sure, inequality need not be the only source of conflict. Weak rule of law, biased or ineffective enforcement of property rights and dearth of social capital are examples of poor or missing institutions that may mitigate conflict. Their absence can trigger conflict independently of inequality (Easterly 2001). When interacted with weak institutions, it is a trigger.

The objective of this chapter is to empirically examine this association between inequality and conflict. The setting is the Maoist rebellion in Nepal that has claimed thousands of lives since it began in 1996. The regional variations across villages in Nepal afford a rich experiment without using cross-country data, for exploring the nature of the association between conflict and inequality. While using cross-country data, the heterogeneity in cross-cultural norms, institutions and unique historical settings can

produce different reference points or anchors, and a lack of common anchor within the sample can bias the perception of the threat and hence the measurement of such variables. Cultural and historical differences may influence the perception of acceptable levels of violence in cross-country settings. Our micro level sub-national data avoids such cross-cultural heterogeneity and differential perceptions (Bohara, Mitchell and Nepal 2006).

The first contributions in this area were made theoretically by Gurr (1970) and empirically by Sigelman and Simpson (1977).[17] Cross-country studies of conflicts are not unequivocal about the relationship between inequality and conflict.[18] Using the terrorist conflict in Basque Country, one of the seventeen regions in Spain, as a case study, Abadie and Gardeazabal (2003) find a considerable reduction of per capita GDP in the Basque Country relative to a synthetic control region without terrorism. In a cross-national study of African countries, Easterley (2001) finds that ethnic fractionalization increases the likelihood of war casualties, and good institutions are effective in mitigating this threat.

We depart from previous empirical studies in three respects. First, the empirical specification is motivated by rational choice theory. The theory, due to Milante (2004),

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[17] On sociology-of-conflict theories, see also Gurr (1980), and the survey in the four papers by Eckstein, Zimmerman, Gurr and Pirages. Cross-country studies of conflict and inequality pervaded the early literature since this seminal paper. See e.g. Collier (2000), Mueller (1985), Mueller and Seligson (1987), Selbin (2002), Wang et al. (1993), Weede (1986, 1987), and Williams and Timberlake (1984).

[18] Lichbach's (1989) survey indicates both positive and negative relationships in the literature.

clearly brings out the logic for why, when society becomes unequal, agents may resort to forcible redistribution by unlawful means. In the absence of effective institutions these means can and do turn violent. The theory is used to produce testable hypotheses about the relationship between inequality and conflict. The issue variables in our model thus have a strong link with underlying theory. Second, our data are sub-national within Nepal. Thus, they suffer less from the heterogeneity problem than do cross-country data that have been popularly used in the literature. Our data, assembled from human rights reports, are the number of deaths inflicted by the Maoist forces in each Nepalese village between 1996 and 2003. Empirically, we model killings by Maoists using a hierarchical (count-data) model in order to account for the remaining heterogeneity in the data. Third, and perhaps most important, we go beyond the popularly used Gini index to measure inequality. We employ measures of polarization proposed in Esteban and Ray (1994, 1999). Since the polarization measures quantify wealth distances, they may be uncorrelated with the Gini index.

This chapter proceeds as follows. In Section 3.2 we describe a theory that focuses on inequality as a cause of conflict. In Section 3.3, we advance three hypotheses based on the theory that we test using village-level data from Nepal. The Nepalese data are described in detail, and the estimating equation is motivated. In Section 3.4 we discuss the results.

3.2. Theory

Milante's (2004) simple model starkly demonstrates how inequality causes conflicts. In anticipation of the empirics, the theory focuses on inequality in wealth.

Consider a two-period model of an economy with *N* agents. The agents are indexed in ascending order of their initial wealth w_n. Thus $w_1 < w_2, ..., < w_N$. Let the total wealth of all agents be normalized to unity so that w_n is agent *n*'s share. The main conclusions are particularly clearly demonstrated with a geometric distribution of initial wealth parameterized by $\Delta > 1$, and given by $w_n = \Delta w_{n-1}, \ n = 1, ...N.$ Then agent *n*'s wealth may be written as a function of just agent *1*'s wealth as

$$w_n = \Delta^{n-1} w_1, \ n = 1, ..., N. \qquad [3.1]$$

Summing across all agents and using [3.1], w_1 is solved as

$$w_1 = \frac{\Delta - 1}{\Delta^N - 1}. \qquad [3.2]$$

Perfect equality is represented by $\Delta = 1$. As Δ diverges from unity, inequality increases.[19] The parameter Δ determines the "distance" between the wealth endowments of any two agents. Clearly, the larger is the Δ the greater the inequality in the distribution of wealth by any standard measure such as the Gini index. Δ is also directly linked with Esteban and Ray's (1994) concept of polarization. The wealth of agent *n* as a function of Δ is given as

$$w_n(\Delta) = w_1 \Delta^{n-1} = \frac{\Delta^{n-1}(\Delta - 1)}{\Delta^n - 1}. \qquad [3.3]$$

3.2.1. Redistribution

In economic models, conflict is defined and modeled as resources devoted to redistribution or the amount of redistribution itself. Esteban and Ray (1999), for example,

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[19] By L'Hopital's rule, $\lim_{\Delta \to 1} \frac{\Delta^N - 1}{\Delta - 1} = N$, and from [3.2] $N w_1 = 1$ or $w_1 = 1/N$.

view conflict as the total amount of spending by agents to bend policy in the direction of their ideal preference. Persson and Tabellini (1994) and Perotti (1993) similarly define conflict in terms of redistributive activity (which increases with inequality). In Milante's (2004) model conflict is measured as the net change in wealth, after resources are spent on redistributive activities that "appropriate". Extending Milante's model to one in which a constraint is reached on the ability of some groups to come up with the resources necessary to prevent further redistribution, their deprivation increases and produces violent conflict beyond a threshold level.[20]

Suppose agents are able to expend part of their wealth on activities devoted to redistributing the total wealth in the economy in their favor. These activities take a variety of forms. In models of crime this consists of theft of property and wealth, and expenditures on armed guards to prevent such theft (Kelly 2000). In models of governmental corruption this takes the form of bribing officials or else productive activity is blocked (Bardhan 1997). In political-economy models this takes the form of lobbying politicians to bend policy and satisfying the resources politicians need to finance reelection campaigns (Baye, Kovenock and de Varies 1993). Denote the resources spent on appropriation activity by agent *n* as $g_n \in [0, w_n]$.

Governments must take steps to ensure that both rich and poor have equal access to institutions that redistribute. Otherwise, as we will see, inequality increases to a point of instability of the system that compels redistribution via violence and force. In this

[20] In Milante (2004) violence is disallowed, and a "privation" effect works to reduce the amount of redistribution.

framework, agent *n*'s activity devoted to redistribution can take a form of violence if the required spending on such activity exceeds his available wealth, $g_n > w_n$.

The amount of the economy's wealth that is appropriable or redistributable depends on the extent of property rights laws and their enforcement. Denote by $0 \le \beta \le 1$ the fraction of any agent's wealth that cannot be redistributed or contested. Thus, the redistributable wealth of the economy is given by

$$(1-\beta)\sum_{i=1}^{N}(w_i - g_i), \qquad [3.4]$$

All individuals have equal access to this redistributive wealth.[21] Suppose the fraction of the contestable wealth captured by agent *n* is determined by the ratio of the resources devoted to redistribution by agents *n* to the total resources devoted by all agents towards redistributive activity, or $g_n / \sum_i g_i$.[22] Then agent *n*'s payoff, I_n, is the sum of his uncontested income and the amount of wealth he appropriates from the economy's pool of contestable wealth,

$$I_n = \frac{g_n}{\sum_{i=1}^{N} g_i}(1-\beta)\sum_{i=1}^{N} w_i - g_i) + \beta(w_n - g_n). \qquad [3.5]$$

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[21] In economies with weak legal institutions, this is not typically the case. In fact, agents in the position of power or with access to wealth have greater access to policy instruments that are used by politicians to redistribute wealth. In that case, the wealth inequality is further exacerbated.

[22] Different models differ in this assumption. Esteban and Ray (1999) have a full behavioral model in which the redistribution is a positive but a convex function of the amount of lobbying so that redistribution is expensive.

Agent *n* chooses g_n to maximize this objective function. Milante (2004) shows that the optimal spending on redistributive activity is the same for every agent,[23]

$$g_n = g^* = \frac{(N-1)(1-\beta)}{N^2}, \qquad n = 1,...,N. \tag{3.6}$$

Thus, the less contestable is other people's wealth, the lower is the per capita spending on redistributive activity.[24] At this optimal solution, the income of agent *n* is

$$I_n(\Delta) = (1-\beta)\frac{1}{N} - g^* + \beta w_n(\Delta). \tag{3.7}$$

This leads to the main result about inequality and total redistribution. Define by $r_n(\Delta)$ the net change in agent *n*'s wealth (as a function of Δ). Then,

$$r_n(\Delta) \equiv I_n(\Delta) - g^* - w_n = (1-\beta)[\frac{1}{N} - w_n(\Delta)]. \tag{3.8}$$

Note that this redistribution sums to zero over the full population: $\sum_n r_n(\Delta) = 0$. Let $\bar{n}$ index the individual with the mean income. Since $w_{\bar{n}} = 1/N$, $r_{\bar{n}} = 0$. Denote by $R^+(\Delta)$ the total net wealth change accruing to the population with above mean income

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[23] In Esteban and Ray's (1999) more general behavioral model, different groups generally expend different amounts depending on the antagonism in that society. Antagonism is measured by "distance" of the utilities of each group's preferred positions from every other group's preferred position.

[24] Multiplying both sides of [3.6] by N yields total spending on redistributive activity as $Ng^* = (1-\frac{1}{N})(1-\beta)$. Thus, the fraction of the economy's total wealth devoted to redistribution is increasing and concave in N.

and by $R^{-}(\Delta)$ the total net wealth change accruing to the population with below mean income. Then

$$R^{+}(\Delta) = \sum_{n=\bar{n}}^{N} (1-\beta)[\frac{1}{N} - w_n(\Delta)], \qquad [3.9]$$

And, $$R^{-}(\Delta) = \sum_{n=1}^{\bar{n}} (1-\beta)[\frac{1}{N} - w_n(\Delta)]. \qquad [3.10]$$

Clearly, if $\Delta = 1$, indicating no inequality, $R^{+} = R^{-} = 0.$ However, with inequality, Milante (2004) shows that

$$\frac{\partial R^{+}}{\partial \Delta} < 0, \qquad [3.11]$$

And $$\frac{\partial R^{-}}{\partial \Delta} > 0. \qquad [3.12]$$

There are two important messages. The first is that in the presence of institutions that afford equal access to redistributive resources, redistribution reduces inequality. To take an example, suppose that the only instrument of redistribution is via taxes levied by the government which is "earned" by each individual according to their lobbying expenditures g^{*}. Then under plausible conditions (more on this below), redistribution takes away from the above-mean-income individuals and gives to below-mean-income population, making the wealth distribution more equal. The second message is that the greater the inequality, the greater the redistribution.

This is a plausible story for developed countries which have developed such institutions. But two critical assumptions are required if the story is to end here. They are:

- The required pre capita spending on redistributive activity does not exceed initial wealth, $g^{*} < w_n,\ n = 1,....,N,$ and

- There is equal access to all individuals to instruments of redistribution, that is, the contestable wealth is equally accessible to all.

Suppose, as is often true is the developing world, these assumptions are violated. In addition, suppose legal institutions are weak. Specifically:

- There is weak enforcement of the law.

Then theft and violence also become instruments of redistribution, making the situation combustible. The same mechanism that would foster equality in the presence of requisite institutions now endangers violence. If only a small numbers of agents relative to the population experience deprivation in the sense of $g^* > w_n$, they will probably find it hard to organize, and will go about their appropriation activities individually.[25] However, if there is a great number of agents whose income falls below their optimal expenditure on appropriable activity, the coordination problems that prevented them from organizing due to their small numbers is overcome. This is especially true, as in the case of organized violence, if there are increasing returns to organizing. Then destructive inter-group conflict becomes a reality. In sum, a threshold level of inequality that leads to deprivation for a significant section of society lays the basis for violent conflict. When this section is too poor to afford the required resources for (peaceful) redistribution, then they must resort to violence as a means of redistribution, if that instrument is possible. The haves are able to continue to provide g^*, exacerbating the inequity. Violence is the only means at the disposal of the have-nots to prevent further deterioration in their wealth distribution. Where enforcement is weak, and critical mass is organized for violence, we see it unleashed.

[25] Risk-aversion on the part of agents works to further control the situation.

The sociology literature contains the most sophisticated early analysis. According to Gurr (1970), relative deprivation (RD), defined as a person's perception of the discrepancy between his income expectations and income capabilities, foments conflict.[26] The potential for collective violence varies strongly with the intensity and scope of relative deprivation among members of a group.[27]

Our analysis has thus far taken as given the existence of the inequality in order to demonstrate the potential for inequality to lead to conflict. More commonly, inequality is the results of decades, even generations, of oppression by those in power. Granovetter and Tilly's (1988, p.180) analysis of why inequality exists and persists identifies five actors: capitalists, workers, organizations, households and government. These actors "contend over the rewards of labor in the three arenas of employment status, jobs, and labor market and do so primarily by attempting to influence the process of ranking and sorting".

The relative bargaining strengths of these actors are responsible for the (equilibrium) labor market outcome of the ranking and sorting processes. These translate

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[26] Gurr uses the term "value" expectations and "value" capabilities, which is a more inclusive term than our interpretation. Value expectations, in Gurr's terminology refers to goods and conditions of life to which people believe they are rightfully entitled.

[27] In the theoretical model inequality is captured by the parameter Δ. If, as the theory has assumed, all agents have the same capabilities and expectations, this parameter is an adequate measure of RD. Modeling inequality with heterogeneity in capabilities and expectations within and across groups is more complex, but our polarization measures are designed to empirically capture this heterogeneity.

into the nature and extent of income inequality, consumption inequality and wealth inequality in that society. The threat points in this bargaining game are importantly determined by the ability of these actors to solve internal organizational problems and coalesce in order to exert the greatest pressure during the sorting and ranking processes. Ebbs and tides in the relative threat points of these actors are determinants of historical changes in inequality. For example, if the monopsony power of landlords in rural labor markets gives rise to rural inequality, then the inequality persists and worsens as landlords' positions get stronger. If, however, property rights are not enforceable publicly by the government or privately by the landlords, the increasing inequality induces rural workers to organize and conduct appropriation activities as predicted by the theory.

In their analysis of the American experience with inequality, Willimson and Lindert (1980) suggest that uneven technological development, rapid increase in the supply of unskilled labor (due to the lack of education), and accelerated capital accumulation were the three most important factors behind the increases in inequality. Uneven technological development and accelerated capital accumulation sharply biased the receipt of rewards, while an increase in the supply of unskilled labor lowered the bargaining strength of labor.

If institutions that can peacefully redistribute come into being, or if the prevention of theft can be effectively enforced, the mechanism described above may be forestalled. Even in the absence of such legal institutions, other self-enforcing institutions may emerge to limit the amount of violent redistributive activity. While there is debate over how social capital (that measures civic engagement and social connectedness as defined by Putnam (1995)) influences institutions, there is a general acceptance of the idea that

"good social capital" provides a solid foundation for democratic institutions. Putnam's (2000) definition of social capital as the collective value of all social networks and the "inclinations that arise from these networks to do things for each other" motivates our measurement of social capital. Often, the source of such institutions in developing countries is the learning that equitable sharing of the peace dividend from avoiding conflict is collectively and individually preferable to a situation with forcible appropriations, which is risky and in which only a few benefit. Lin (2001) likens social capital as economic investment in social relations motivated by market returns. Fukuyama (1995) suggests that social capital makes up for missing institutions by creating a set of informal values and norms within groups that encourage members of the group to cooperation, Alesina and Angeletos (2005) bring focus on individual preferences and belief regarding what determines income in preventing extreme outcomes. Thus, culture and social capital voluntarily limit forcible appropriations.

Alternatives to engaging on such violent conflict would be voting with one's feet (Tiebout 1956) or use of ballots with the hope that the outcome will change the existing situation (Black 1948). The above model predicts that if government makes a commitment towards non-distortionary tax through the agreed upon political process, and formulates credible redistribution programs with benefits that are at least as much as the agent's expected payoffs from appropriation activities, the government can avoid violent conflict. Effective social programs raise the opportunity cost of engaging in violence. If the expected net benefit from such alternatives is greater than that from violent acts, the probability of observing violent conflict is lowered. When institutions do not support outcomes based on voting with one's feet or at the ballot to restore equality, then, as

Mueller (2003) observes, violence becomes a viable options. If the wealth distance is large, inter-group alienation works to unify groups into polarized entities (Esteban and Ray 1999, Akerlof and Kranton 2000), increasing the probability and intensity of violence, perhaps dramatically.

3.3. Hypotheses and Data

3.3.1. Hypotheses

We will empirically consider the Nepal situation where violence has broken out in 1996. Although the decade's old Maoist People's War ended after signing the Comprehensive Peace Accord between the Nepal government and the Maoist on November 21, 2006, the potential still exists for the conflict to escalate in the future as long as the underlying causes remain unresolved. The motivation for the paper is to understand the root causes. The theory identifies them and also identifies other factors that work to prevent conflict. We focus on the main hypotheses that emerge from the theory, which help us to clarify what problems policy should target. We state the main hypotheses from the model as follows:

H1: *Greater inequality is associated with higher incidence of violent conflict*.

The extent of appropriable wealth in a society depends on property rights and their enforcement. In the case of high intensity conflict, the formal property rights enforcement mechanism may not be functional for obvious reasons. In fact, property rights enforcement is weak to begin with, which, in the presence of rising inequality, is the source of forcible appropriation and redistribution of wealth by violent means. In countries that have experienced weak institutions, institutions evolve in communities due

to the need to keep continual disorder from impoverishing the community's wealth. These institutions are built around social values, norms and networks. They help to enforce property rights informally, which is in the best interest of the community. We postulate that conflict is lower in communities with stronger social capital as measured by social networks that are built to endure. They work by providing mechanisms for shared governance and problem solving within the community without recourse to government institutions that are perceived as being ineffectual at best, and corrupt and biased at worst. Thus, while social capital may not lower inequality, it succeeds in reducing social tension in an unequal society. It provides a platform for the exchange of information among members of the community that promotes mutual understanding and tolerance. The potential for violent conflict is thus reduced.

H2: *Greater social capital is associated with lower incidence of violent conflict*.

Finally, the government can and does play a role in lowering poverty. To the extent that it succeeds in stemming the deterioration in the standards of living of the poorest, it may actually forestall conflict. To the extent government measures are unsuccessful, it fails in its bid to prevent the outbreak of violence. We advance two hypotheses about the ability of the government's social welfare programs to effectively lower the incentive for forcible redistribution by individuals.

H3a: *Larger transfers by the government are associated with a lower incidence of violent conflict*.

H3b: *Greater poverty is associated with a higher incidence of violent conflict*.

Thus, all else held constant, the theory explains conflict as:

$$CONFLICT = f(\underset{+}{INEQUALITY}, \underset{-}{SOCIALCAPITAL}, \underset{-}{GOVTGRANT}, \underset{+}{POVERTY}) \quad [3.13]$$

where *GOVTGRANT* refers to government transfers, and the sign below the variables indicates the type of relationship that we expect *a priori* between the respective variables and the dependent variable, *CONFLICT*.

3.3.2. Data and Measurement

The empirical setting in which we will investigate the hypotheses about violent conflict is the Maoist uprising in Nepal that began in 1996. Never since its unification in 1768 has Nepal experienced such a violent division within its own rank and file. Ganguly and Shoup (2005) provide an account of experiments with democracy, their failure to improve the average Nepalese citizen's living standards, and the rise of the Maoists.

During and after the 1990 People's Movement that re-introduced multi-party democracy in Nepal, key figures of the Maoist movement took part in the multiparty politics. The democratic reforms implemented under the 1990 constitution were illusory because they failed to address the fundamental problems facing most Nepalese citizens – inequality and widespread poverty (that is reflected in terms of high infant-mortality, lack of access to basic amenities like power and clean water, and more importantly the rural-urban divide). These shortcomings were dire in the countryside. Further, the upper-caste Hindu led parties pursued interests that were distant from the median voter – illiterate, with stronger ties to an ethnic community than to the nation.

In 1991 the communist party (United People's Front, UPF) was the third largest political party in the lower house of the parliament. In 1994, a fraction of the UPF broke away from its parent party and ran a parallel party, boycotted the mid-term elections, and planned to start a violent campaign. On February 13, 1996 they did. The People's War

began with a simultaneous attack on three remotely stationed police outposts, a bank branch, a soft-drink bottling plant, a liquor factory and private house. Their strategy was of a guerilla nature – establishing bases in the rural and remote areas with the objective of surrounding urban centers in order to seize state power. In their base areas, the Maoist redistributed the captured land from the absentee landlords and feudal interests to the locals to farm and use as cooperatives. What started as an insignificant and isolated incident in 1996 transformed into a devastating conflict claiming more than 13,000 lives and displacing over 200,000 people over the next ten years.[28] On November 21, 2006 the Maoist People's War was formally ended with signing of historic peace deal with Nepal government.

Why did the Maoist outbreak occur and catapult out of control for such a long time? Arguably, the continued expansion of Maoist membership and the increased scale of their activities are due to the prevalent socio-economic deprivation of the people based on caste, gender and ethnicity, which had degraded visibly in the past decades. The mechanism for the violent outburst is captured by the theory which underscores deprivation, inequality and polarization as sources of violent conflict, especially in a system characterized by weak institutions.

The empirical challenge before us is to measure the variables as accurately as the theory requires. Nepal is administratively divided into 75 districts, with each district further subdivided into village development committees (VDCs, or 'villages'). There are over 4000 villages. For each village, the dependent variable, conflict, is measured as the

[28] Mahat (2005) and Gurung (2003) describe the Maoist People's War in Nepal in detail.

number of persons killed by Maoists.[29] These data are drawn from annual reports over the 1996-2004 period of the Informal Sector Services Center (INSEC), a non-profit national human rights organization. The annual reports contain details such as the date of each event that resulted in human casualties, the circumstances surrounding the event, and the number of deaths. The casualty data are summed over the eight-year period from these reports. Due to unavailability of time-series data on important variables such as inequality, polarization and poverty, the natural experiment yields a cross-section. The dependent variable is measured as stock over an eight-year period that leads other variables by many years. This reduces, but may not eliminate, concerns about endogenity.

The inequality measures we use are (i) the Gini index, and (ii) measures of polarization. Since data on assets or wealth are not available at the household level, we use consumption expenditure data that are available in the nationally representative household survey. Since the survey does not cover all the villages, we use recently developed micro-level estimation technique (described below) for survey-to-census imputation of household expenditures for all villages. The first step is to construct complete household expenditure data in order to measure inequality at the village level. We thus begin with a description of the household survey and the census data.

The data to construct our main explanatory variables are drawn mainly from World Bank's Living Standard Measurement Survey for Nepal conducted in 1995-96 (jointly with Nepal's Central Bureau of Statistics (CBS)), and the 2001 Nepal Population

[29] An alternative to the count of deaths due to the violent activities would be percentage of people killed during the violence in each village. As an alternative of computing such percentages, we control for population densities of the respective villages.

Census. We refer to the Nepal study as the Nepal Living Standard Survey (NLSS). The NLSS consists of nationally representative household survey responses to questions about household income and expenditures, and several socio-economic and demographic characteristics. The data set contains a national sample of 3373 rural and urban households. These households were selected from 274 primary sampling units around the country, or communities, based on a probability-proportional-to-size (PPS) sampling plan. In addition to the household survey, the NLSS also conducted a community-level survey designed to elicit information about community characteristics and the kinds of social networks present in the communities to which the surveyed households belonged.

The 2001 Nepal Population Census, conducted by the CBS, administered two types of forms – a complete enumeration (the "short" form) and sample enumeration (the "long" form). The long form was administered to one in every eight housing units, yielding a sample of 520,624 Nepalese households. In order to construct inequality variables (such as the Gini and polarization indices) and poverty-gap indices for all villages, we require detailed expenditure data for a thicker sample than provided by the NLSS sample.[30] The census sample is far more inclusive but lacks the all-important expenditure (and income) variables. We use a recently developed micro-level estimation technique, developed from small area statistics (Ghosh and Rao 1994) to impute expenditures of the census-level households. Elbers, Lanjouw and Lanjouw (2003) provide the theoretical foundation of the micro-level estimation technique.

[30] As self-reported household income is less reliable than the measures of household expenditures (Deaton 2000) we use household expenditure as indicators of household welfare.

Essentially, we use the NLSS sample to impute expenditures for the census long-form sample using information on covariates that are common to both NLSS and the census. Let y_l be household *l*'s expenditure obtained from the NLSS survey. A regression of y_l on a vector of covariates X_l, where X_l are chosen so that they are also available for the census sample, is then estimated using generalized least squares. The estimated model is used to impute the census household expenditures. The (long form) census sample with the imputed expenditures is then used to construct our inequality and poverty measures as follows.

Let y_l denote the per capita consumption expenditure of household *l* in the given village. Then the Gini index for the village is given by (Deaton 2000, p. 139):

$$GINI = \frac{1}{\mu N(N-1)} \sum_{i>j} \sum_{j} | y_i - y_j | \qquad [3.14]$$

where μ is the average expenditure, *N* is sample size, $| y_i - y_j |$ is the absolute deviation of expenditure between a pair of households. An alternative, but related formulation of the Gini index is given by (Deaton 2000, p.139):

$$GINI = \frac{N+1}{N-1} - \frac{2}{N(N-1)\mu} \sum_{i=1}^{N} \rho_i y_i \qquad [3.14a]$$

where ρ_i is the rank of individual *i* in the y-distribution, counting from top so that the richest has the rank 1. For computational purpose, we use [3.14a].

Esteban and Ray (1999) show that the concept of polarization is fundamentally different from inequality as measured by the Gini coefficient, although the Gini is a special case of the polarization index. In our context, their approach posits that an adequate polarization measure for consumption spending must reflect three

characteristics: (i) in each village, the measure must partition the distribution of consumption spending into more than one group, and preferably not too many; (ii) there must be a high degree of intra-group homogeneity as measured by a large mass within each partition; and (iii) there must be a high degree of inter-group heterogeneity as measured by significant distances between the partitions.[31] Satisfying these conditions leads to a measure that may or may not be correlated with often-used inequality measures like the Gini coefficient. The polarization concept seeks to measure potential hostility or antagonism among the groups, and therefore captures a different dimension of inequality than does the Gini index. This antagonism is a potent source of social tensions that can break down norms and institutions that may have existed for generations, abiding by which had provided peaceful co-existence. The Esteban-Ray polarization measure (for a village) is essentially a mapping of the distribution of consumption spending by families in the village into a value. The higher this value, the greater is the degree of polarization. The polarization index is measured for a specific village as (Esteban and Ray 1994, p. 834):

[31] Axiomatically, their measure purports to satisfy all three conditions: First, the joining of two neighboring probability masses into one mass exacerbates polarization in the presence of another separately identifiable point mass. Second, given three point masses (or partitions), moving a point mass closer away from the center towards an extreme value, however small the move, increases polarization. Third, given two point masses (or partitions), breaking the more centrist point mass equally into two and distributing them at two opposite more extreme points increases polarization.

$$POLARIZATION(\alpha) = K\sum_{i=1}^{L_i}\sum_{j=1}^{N_j}\pi_i^{1+\alpha}\pi_j \mid y_i - y_j \mid, \qquad [3.15]$$

where $\mid y_i - y_j \mid$ is the size of absolute difference in the consumption expenditure of households *i* and *j*, π_k is the k^{th} household's proportional weight[32] and L_k is the number of households sampled from k^{th} village. *K* is a positive constant. In [3.15] α measures the intensity of group identification, or what Esteban and Ray term the "degree of polarization sensitivity". It ranges in value between 0 to 1.6 (Esteban and Ray 1994). If α=0 and *K*=1, then *POLARIZATION*(0) approximates Gini.[33] The larger the value of α, the greater is the departure of the inequality measure from polarization. We employ the kernel estimation method in Duclos, Esteban and Ray (2004) in order to construct three Esteban-Ray polarization measures at the village level, corresponding to α = 0, 1 and 1.5. They are termed $POLARIZATION_0$, $POLARIZATION_1$ and $POLARIZATION_{1.5}$ respectively.[34]

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[32] Since we use the census sample that includes only one in eight households, we construct the household's proportional weight using information about population size of each village and the size of the census-sampled households.

[33] As Montalvo and Reynal-Querol (2005) show, the Gini index is given by

$$GINI = \sum_{i=1}^{L_i}\sum_{j=1}^{N_j}\pi_i\,\pi_j \mid y_i - y_j \mid,$$

[34] The continuous time counterpart of [3.15] is given by (Duclos, Esteban and Ray 2004, p. 1744):

$$P_\alpha(f) \equiv \iint f(x)^{1+\alpha} f(y) \mid y - x \mid dydx,$$

The poverty measure we construct is the Foster-Greer-Thorbecke (FGT) poverty-gap index for the year 1995-96. It measures the percentage of households (in a village) below the poverty line as:

$$POVERTY = \frac{1}{n}\sum_{i \in L_p}^{q} \left(\frac{z - y_i}{z}\right)^{\gamma} \qquad [3.16]$$

where *z* defines a household's poverty expenditure threshold,[35] y_i is household *i*'s expenditure, *n* is the number of households, and L_p is the set of households (*n* and L_p

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where $f(.)$ is the density function of the distribution. They also show that for every distribution function *F* with associated density *f* and mean μ, [3.16] can be written as

$$P_\alpha(F) = \int_y f(y)^\alpha a(y) dF(y),$$

where $a(y) \equiv \mu + y(2F(y) - 1) - 2\int_{-\infty}^{y} x dF(x)$. Using a random sample of *n* (iid) observations *{y_i}* drawn from *F(y)* and ordered so that $y_1 \le y_2 \le ....y_n$, Duclos, Esteban and Ray (2004, p. 1750) numerically estimate $P_\alpha(F)$ as:

$$P_\alpha(\hat{F}) = n^{-1}\sum_{i=1}^{n} \hat{f}(y_i)^\alpha \hat{a}(y_i)$$

where y_i refers to the data on the ith observations. In this equation, $\hat{f}(y_i)^\alpha$ is estimated nonparametrically using kernel estimation procedures, and

$\hat{a}(y_i) = \hat{\mu} + y_i(n^{-1}(2i-1) - 1) - n^{-1}(2\sum_{j=1}^{i-1} y_j + y_i)$, where $\hat{\mu}$ is the sample mean.

[35] We adopted the poverty line of *Rs*. 4404 that was estimated by Nepal Central Bureau of Statistics at 1995/96 constant price (CBS 2005).

vary across villages) below the poverty line. $\gamma > 0$ is a poverty aversion parameter. With $\gamma = 0$ [3.16] simply measures the proportion of households below the poverty line or the "headcount" index. With $\gamma = 1$ [3.16] measures the average poverty-gap index or the average shortfall of household expenditure from the poverty line.

Finally, we measure the presence and strength of social capital from information contained in the community-level surveys in the NLSS. In the rural sub-sample of the NLSS, five different types of network groups are reported at the community level: forest user groups, farmer groups, water management associations, women in development groups, and credit groups.[36] For each group four characteristics were recorded: (i) years in operation, (ii) proportion of households involved in a particular group, (iii) percentage of women members in a group, and (iv) the average number of meetings per year. Together, they cover four important dimensions of social capital in village communities. We compute a composite social capital measure for each group that aggregates across the four social capital dimensions. Since the social capital index is computed from the rural sub-sample of NLSS that draws survey information from less than 274 villages across Nepal, we do not have the social capital information for all villages. Rather than lose a significant proportion of our village sample, we choose to compute instead the district-level social capital index, which is then replicated at the village level.

[36] One additional social network, others, is also reported in the data set, but as several categories of social networks are lumped together to create this categories, we drop it from empirical analysis.

The social capital variables are constructed for each of the five networking groups as in Nepal, Bohara and Berrens (2007). For example, the social capital contributed by the farmer group is defined as:

$$FARMERGRP_i = \sum_{n=1}^{4} \frac{X_{ni} - \min_i \{X_{nj}\}}{max_i \{x_{nj}\} - \min_i \{X_{nj}\}}, \qquad [3.17]$$

where n indexes the four dimensions of social capital described above and i indexes the district. $FARMERGRP_i$ is thus a unit-free index that combines the age, participation, reach, and intensity of the activity of farmer group networks in district i. We use equal weights to each of these characteristics of the network categories in the absence of *a priori* assumption.

Control variables employed at the village level are: percentage of farmers population (*FARMER*), average years of schooling (*EDUCATION*), percentage of people whose primary language is Nepali (*NEPALI*), and binary indicators for whether the village is in rural (*RURAL*) area and ecologically mountainous or hilly (*MOUNTAIN, HILLS*). Population density (*DENSITY*) is at the district level. The data for these variables are from 2001. The poverty measures in [3.16] for different values of γ are highly correlated in our sample, and so we use the headcount measure ($\gamma = 0$) in the econometric analysis.

3.3.3. Methodology

Since the dependent variable, *CONFLICT*, is an event-count, we employ count data methods. We use the Negative Binomial (NB) model which is well-suited to model

over-dispersed count data. A likelihood ratio test (Greene 2000) indicates that the NB model is preferable to the Poisson model in our case.

Villages within any district are likely to share the characteristics of their district and be relatively heterogeneous from villages in other districts. An important feature of Nepal data is that villages are relatively homogeneously clustered according to the district to which they belong. The districts of Nepal are heterogeneous in their socio-economic characteristics, ethnic composition, political representation, cultural landscape and government programs. For this reason, we employ a hierarchical regression method in which the villages are modeled as being nested within districts.[37] The alternative method

[37] The basic hierarchical (multilevel) regression model (as in Goldstein 1995, Hox 2002) is given by: $Y_{ij} = \gamma_{00} + \gamma_{p0} X_{pij} + \gamma_{0q} Z_{qj} + u_{0j} + e_{ij}$, where Y_{ij} is the dependent variable, X_{pij} are the *p* explanatory variables at the village level, Z_{qj} are the *q* explanatory variables at the district level, γ_{00} is the intercept, γ_{p0} and γ_{0q} are the slopes, u_{0j} and e_{ij} are the residuals at the district level and the village level. The model is generally called the variance component model as it allows decomposing the intercept variance into different components for each hierarchical level. Here we are assuming that the regression intercept varies across the districts, but the slops do not vary. If the slope also varies for village level variables, then the above model can be written as:
$Y_{ij} = \gamma_{00} + \gamma_{p0} X_{pij} + \gamma_{0q} Z_{qj} + u_{pj} X_{pij} + u_{0j} + e_{ij}$. This model is called the random coefficient model where u_{pj} are the district level residuals of the slopes of the village level explanatory variables X_{pij}. As the dependent variable is event count, we use negative binomial (NB) estimation method.

of aggregating data to the district level is unattractive because we lose the rich variation in the data at the village level. In sum, we estimate a hierarchical Negative Binomial model. We estimate a two-level model which is accomplished by random effect specification.[38] The model we estimate is

$$CONFLICT_{ij} = \beta_1 INEQUALITY_{ij} + \beta_2 SOCIALCAPITAL_i + \beta_3 GOVTGRANT_{ij} + POVERTY_{ij} + X_{ij}B + Z_iD + u_i + \varepsilon_{ij}, \quad [3.18]$$

where the $CONFLICT_{ij}$ is the number of deaths inflicted by Maoists in village *j*, which is nested in district *i*. The issue variable for testing Hypothesis 1, *INEQUALITY*, is measured, respectively as *GINI* and the three variants of *POLARIZATION*. These measures are strongly correlated and including them together induces multi-colinearity. We thus estimate their effects separately. The issue variables for Hypotheses 2 and 3 are *SOCIALCAPITAL*, *GOVTGRANT*, and *POVERTY*. All issue variables are measured at the village level, with the exception of *SOCIALCAPITAL* which is measured at the district level and replicated at the village level. The vector X_{ij} includes control variables measured at the village level, while the vector Z_i includes controls measured at the district level. u_i is the district-effect, which is modeled as a random effect and presumed

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[38] One option is to include district-fixed effects for the 74 districts. With fixed-effects each village in a district would be treated as a repeated experiment of an essentially homogeneous entity in the district. But this would not necessarily be true since villages in a district may have considerable unobserved heterogeneity that is not captured by the measured variables.

to be uncorrelated with the regressors. ε_{ij} is the village level error term which is assumed to be (conditionally) identically and independently distributed across observations.

3.4. Empirical Results

3.4.1. Basics

Table 3.1 presents descriptive statistics of the variables used in the empirical analysis across 3857 villages. The dependent variable is the number of people killed by Maoist (*KILLINGS*) over the eight-year period (1996-2003). The *KILLINGS* data are compiled from INSEC's Nepal Human Rights yearbooks for those years. The per-village average over the eight-year period is 0.68, or a total of 2623 killings across villages. The main issue variable, inequality, is measured using three distinct variables: *GINI*, and two polarization measures ($POLARIZATION_1$ and $POLARIZATION_{1.5}$). The population-weighted averages, though not reported here, are not greatly different. For α =1, *GINI* and *POLARIZATION* have a sample correlation equal to 0.47. But the correlation of *GINI* with $POLARIZATION_{1.5}$ drops to 0.18. As Esteban and Ray (1994) conjecture, in our sample the polarization and Gini indices measure fundamentally different aspects of inequality. While *GINI* measures the distribution of consumption spending in a continuous setting, *POLARIZATION* measures consumption distances within a community. In our sample, even when the Gini is relatively small, wealth distances appear to be significant.

The issue variable social capital is measured by a group of unit-free indices. They quantify the coverage and intensity of five types of network groups: farmer group (*FARMERGRP*), water user groups (*WATERUSERGRP*), forest user groups

(*FORESTUSERGRP*), groups receiving micro-credit (*CREDITGRP*), and women groups (*WOMENGRP*).

Table 3.1: Variable's Definition and Basic Statistics (N= 3857)

VARIABLE	Definition	Mean	Std. Dev.
KILLINGS	No. of people killed by the Maoists in the villages (1996−2003)	0.68	3.72
GINI	Consumption GINI Index	0.24	0.04
POLARIZATION (α=1)	Polarization Index when α = 1 (see Section 3)	0.15	0.01
POLARIZATION (α=1.5)	Polarization Index when α = 1.5	0.17	0.03
SOCIALCAPITAL	Social network index	1.25	0.61
FARMERGRP	Network index of farmers	0.04	0.10
WATERUSERGRP	Network index of water user group	0.06	0.12
FORESTUSERGRP	Network index of forest user group	0.10	0.21
CREDITGRP	Network index of credit user group	0.02	0.08
WOMENGRP	Network index of women	0.12	0.27
GOVTGRANT	Per capita grant (Rupees 100) [district level]	0.43	0.56
POVERTY	% below poverty line	0.44	0.18
POPDENSITY	Population POPDENSITY 100 persons per sq km	2.93	3.66
FARMER	% farmers	0.34	0.14
EDUCATION	Average years of schooling in each village (VDC)	3.61	1.09
RURAL	1 if rural, 0 otherwise	0.98	0.12
MOUNTAIN	1 if Mountain, 0 otherwise	0.13	0.33
HILL	1 if Hills, 0 otherwise	0.52	0.50
TERAI	1 if Terai, 0 otherwise	0.36	0.48
ETHNICITY	Percentage of people who speak Nepali as primary language	0.51	0.38
EMPLOYMENT	Mean months of employment	5.60	1.35
INCOME	Mean income (Rupees '000)	9.24	3.46

Notes:

1. Data Sources:
    a. KILLINGS compiled from Informal Sector Service Center (INSEC): Nepal Human Rights Year Books (1996−2004).
    b. GINI, POL_0, POL_1, $POL_{1.5}$, POVERTY, INCOME, SOCIALCAPITAL constructed from data obtained from Central Bureau of Statistics, 1996 Nepal Living Standards Survey (NLSS), and Nepal Population Census 2001; Variables measured using survey−to−census imputation.
    c. POPDENSITY, FARMER, EDUCATION, RURAL, MOUNTAIN, HILL, TERAI, ETHNICTY, EMPLOYMENT obtained from Nepal Population Census 2001, Central Bureau of Statistics, Kathmandu. Variables measured in 2001.
2. All variables measured at the village level except GOVTGRANT, SOCIALCAPITAL, FARMERGRP, WATERUSERGRP, CREDITGRP, CREDITGRP, and WOMENGRP which are at the district level and replicated at the village level.

The mean for the issue variable *GOVTGRANT* indicates that the mean grant is 43.21 Rupees per person per year. Although only $0.70 in 1996 dollars, owing to the widespread poverty this is not a trivial amount in rural Nepal. The sample mean of 0.44 for the variable *POVERTY* (poverty headcount) indicates that approximately, 44% of the population lives below poverty line.[39]

The remaining variables are the control variables for our analysis. The statistics indicate that Nepal is an economically, geographically and ethnically diverse country. The village population is largely rural and just half of them speak Nepali as their primary language. It has a low level of education on average and long duration of unemployment. Per capita income in the sample is approximately Rupees 9240 or $145 in 1996 dollars. The geography variables indicate that 13% of our sample comes from the mountainous northern part of Nepal, and 52% comes from the hilly middle part of the Nepal (the remaining 36% comes from the wooded Terai in the lower part of the country).

3.4.2. Testing H1

Table 3.2 presents our first set of results from a two-level hierarchical Negative Binomial model. First consider Hypothesis 1, which predicts a positive relationship between inequality and violent conflict measured by *KILLINGS*. Regardless of how we measure inequality, the results show a strong association between inequality and the number of Maoist killings as predicted by the theory.[40]

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[39] The population-weighted average is not greatly different.

[40] The asterisks on the issue variables indicate statistical significance of one-tailed tests in the direction indicated by theory.

Table 3.2: Conflict and (i) Inequality, (ii) Social Capital, and (iii) Government Policy
Dependent Variable: Number of persons killed by Maoists
Estimates from 2−level Hierarchical Negative Binomial Model

		GINI	POL (α=1)	POL (α=1.5)
INEQUALITY	GINI	6.33***		
		(1.98)		
	POLARIZATION(α=1)		12.16***	
			(6.24)	
	POLARIZATION(α=1.5)			5.79***
				(2.16)
SOCIAL CAPITAL	FARMERGRP	−2.55***	−2.72***	−2.69***
		(1.06)	(1.05)	(1.04)
	WATERUSERGRP	−0.80	−0.70	−0.76
		(0.91)	(0.90)	(0.89)
	FORESTUSERGRP	**0.87**	**0.91**	**0.93**
		(0.56)	**(0.55)**	**(0.55)**
	CREDITGRP	−0.37	−0.18	−0.16
		(1.11)	(1.10)	(1.09)
	WOMENGRP	−0.60**	−0.55*	−0.51*
		(0.35)	(0.34)	(0.34)
GOVT. POLICY	GRANT	−0.57***	−0.54***	−0.56***
		(0.23)	(0.23)	(0.23)
	POVERTY	3.07***	3.19***	3.10***
		(0.85)	(0.85)	(0.85)
	INCOME	0.11***	0.14***	0.15***
		(0.04)	(0.04)	(0.04)
	EDUCATION	0.02	0.05	0.06
		(0.09)	(0.09)	(0.09)
	EMPLOYMENT	−0.02	−0.004	0.004
		(0.07)	(0.07)	(0.07)
	FARMER	−0.33	−0.35	−0.25
		(0.95)	(0.95)	(0.95)
	POPDENSITY	−0.11***	−0.12***	−0.12***
		(0.03)	(0.03)	(0.03)
	ETHNICITY	0.72***	0.78***	0.75***
		(0.29)	(0.29)	(0.29)
	RURAL	−2.03***	−2.18***	−2.07***
		(0.57)	(0.57)	(0.57)
	MOUNTAIN	0.83**	0.76**	0.73**
		(0.42)	(0.42)	(0.41)
	HILL	0.62**	0.60**	0.56**
		(0.31)	(0.31)	(0.30)
	CONSTANT	0.83	1.02	0.93
		(0.61)	(0.61)	(0.61)
	σ^2_i	0.18	0.16	0.15
		(0.09)	(0.08)	(0.08)
	N	3857	3857	3857

Notes: 1. Standard errors in parentheses; ***, **, * indicate statistical significance at 1%, 5% and 10% respectively. For issue variables (Inequality, Social Capital, Government Policy) statistical significance is based on one−tailed tests as per hypotheses H1−H3. For all other variables, statistical significance is based on two−tailed tests.

The coefficient of 6.33 measures by what percentage the number of killings increases with a unit change in the Gini coefficient. The reported estimates are from the log-link function and can be interpreted as estimates from a log-linear model. Therefore, an increase in *GINI* of 0.1 is associates with a 0.63 or 63.3%, increase in killings by Maoists. The 0.1 change in the Gini is approximately the amount by which the Gini for Nepal has changed for the last eight years (1996 – 2004, CBS 2005). Evaluated at the sample mean, the 63% increases in killings translate into a total (across all villages) of additional 1652 deaths over an eight-year period. When *POLARIZATION* is measured with α=1, a 0.10 increase in polarization leads to a 121.6% increase in Maoist killings, or a total of 3189 more deaths over an eight-year period. When *POLARIZATION* is measured using α=1.5, an increase of 0.10 in this measure is associated with an increase in Maoist killings by 57.9% or 1518 over an eight-year span. The quantitative implications of these estimates are, therefore, considerable regardless of the measure of inequality used.

3.4.3. Testing H2

Social capital is the shared knowledge, understandings, norms, rules, and expectations about patterns of interactions that groups of individuals bring to recurrent activities (Ostrom 1990). Our measure of village level social capital may or may not have a connection with trust in central government (Putnam 2000), but they are fundamentally tied to civic participation and governance at the village level. Village networks may enhance the presence of central government where it is effective, but more likely, they emerge as mechanisms of self-governance where government institutions have failed

repeatedly. Social capital in Nepal takes the form of investment in social relations motivated by market returns (as in Lin 2001), and social capital creates a set of informal values and norms within villages that encourages members of the village to cooperate (as in Fukuyama 1995).

We measure social capital contributed by five user-groups. Members join these groups because they perceive economic and social benefits from subscribing to the norms developed within the group. If cooperation among group members is reinforced by actual improvements in social outcomes, market outcomes, and conflict-mitigation, then the groups are long-lived. These five user groups are long-lived. Lam's (1998) study of 150 irrigation systems in Nepal documents the effectiveness of farmer groups and water-user groups in solving common-resource pool problems. Irrigation systems governed by the farmers are in better condition and deliver more water at the end of the system, thus enhancing farm productivity, than systems governed by the Nepal Department of Irrigation. Ostrom (1992) models the mechanisms of why this result is consistent with the idea of social capital manifest in collective action by water user groups. Varughese and Ostrom (2001) study 18 forest-user groups in Nepal. They find that those groups that are able to overcome group heterogeneity (distance from the forests, wealth and ethnicity) and organize for collective action, have above-average forest stocks and improving trends in forest conditions. Those that fail to organize experience worsening forest conditions. Finally, women groups are motivated by increasing the social status of women and also increasing economic opportunities, and credit groups allow access to credit by lowering the risk to lenders of non-payment by individuals in the group. Norms developed in credit groups enable group of individuals and make it costly for individuals to default.

Does social capital in Nepalese villages have valuable spillover effects in deterring violent conflict? Table 3.2 supports this view. Farmer groups and women groups appear to deter Maoist killings. The quantitative implications are significant. In the first model, for example, as increase in the farmer group index of 0.10 (a one standard deviation change) is associated with a 25.5% reduction in Maoist killings. This result applies approximately across the three models reported in Table 3.2. An increase in the women group index of 0.27 (one standard deviation change) is associated with a 16.2% decline in Maoist killings. These are additive. Thus, villages in which both networks are active may be expected to have 41.7% lower level of Maoist killings than a village in which neither network exists. While credit groups and water-user groups may serve an economic purpose, they do not appear to have any beneficial spillover effects on violence.

The coefficient of forest group is positive that is contrary to *a priori* expectation (*H2*), which deserves explanation. There are alternative candidate explanations. In order to reverse the deforestation that took place after the nationalization of forests in 1957, the Nepal government began a policy in the late 1970s to decentralize forest resources by encouraging the formation of forest user-groups which would self-govern this common-resource pool. Agrawal and Ostrom's (2001) comparative study of forestry decentralization in India and Nepal concludes that in Nepal, "….despite claiming participatory decentralization, the forestry program has devolved such limited property rights that it can scarcely be classified as a case of decentralization" (p. 503). User groups can only claim to have somewhat attenuated use of access rights. Further, they have no managerial discretion or exclusive use rights, and constitutional choice authority

is retained by the government. In other words, our measure of social capital does not capture the more complex structure of disincentives under which user groups must operate. Conflicts have thus aggravated not only between user groups and the government but also with the user groups and the Maoists.[41]

To the extent that user groups have improved the conditions of forests (Nepal *et al*. 2007), the positive coefficient requires a different explanation. Then, in villages without forest-user groups, deforestation has forced the emigration of the ablest, making them home to the poorest. If villages with forest user groups are pro-government or anti-Maoists on average while villages without such groups are pro-Maoist, then this political preference (not captured by other variables) causes the positive coefficient on this variable. The poorer villages (those without forest-user groups) then are refuges for the rebels, but not the territory over which Maoist carried out violent activities.

Women's groups do appear to be effective in thwarting violent conflict. A growing number of the new members of the Maoist rebel groups have been women. The existence of women's groups may discourage their participation in violence by offering alternative avenues for them to voice their frustrations or by enabling them to use the network to solve their problems. Taking up the gun then becomes the final, and possibly distant, resort. Farmer and women groups therefore appear to perform the function of real democratic institutions – developing widely accepted social norms that enable peaceful

[41] Despite the fact that the property rights are not properly allocated in favor of the forest user groups, the community forests have become a good source of income for the villagers, and given the lawlessness in the rural Nepal during the MPW, it created a conflict between the villagers and the Maoists about sharing the forest income.

solutions to problems. Thus, Hypothesis 2 is supported by the negative signs on these two coefficients.[42] It appears that this hypothesis is not supported by the social network related to forest user groups. We present an alternative way of looking at the role of social capital in reducing the violent conflict when we discuss about the non-linearity issue using interactive terms.

3.4.4. Testing H3

The two government policy variables – *GOVTGRANTS* and *POVERTY* are both estimated with the predicted signs in Hypotheses 3a and 3b. An increase in per capita government grants by 0.56 (56 Rupees, or one standard deviation increase) is associated with a 32% decrease in Maoist killings, or 839 fewer deaths over an eight-year period. This estimate implies that these 839 lives could be saved by increasing spending by less than $0.10 per Nepalese per year! A decrease in the poverty headcount by 18 percentage points (one standard deviation) is associated with a substantive impact on the number of Maoist killings. Across all three models, that magnitude of decline in poverty would reduce Maoist killings by 55% or by 1500 over an eight-year period. Thus, a policy that combines government grants with additional transfers targeted at reducing poverty can potentially solve much of the problem for which the Maoists are blamed. The results produce the message that a focused strategy of negotiating with Maoists on only these two aspects of government policy may not merely bring them to the table, but may convince Maoists to call off their violence. Of course, poverty reduction is a slow and

[42] Though insignificant, the coefficients of WATERUSERGRP and CREDITGRP are also negative.

expensive process. Perhaps there is a role for international agencies not only as donors, but in ensuring that government funds find their way to the intended beneficiaries so that the transfers achieve their goals.

Many of the control variables are statistically significant. The negative sign on population density indicates that Maoist killings occur in less dense areas. Population density also serves to control for scale effects. The higher the proportion of the population that speaks Nepali as the primary language, the greater is the number of Maoist killings. Rural areas experience fewer killings. The upper regions of Nepal consisting of mountainous and hilly areas experience more killings that the lower (Terai) region.

Among the variables we use as controls, *INCOME* has a more direct link with the theory. While the theoretical model abstracts from differences in the level of income, Milante (2004) posits that being extremely poor puts violence beyond the economic means of the people. Provoking widespread unrest requires the purchase of weaponry and the ability to carry out the conflict over a long time period. This may be beyond the means of some villages. Theoretically, the optimal is a corner solution due to a "privation constraint". Then very low income villages would have low level of violence. Such an association between income and violence is affirmed by the positive coefficient on *INCOME*. A simpler mechanism may be at work, especially if the privation constraint is overcome by inter-village Maoist networks. While the Maoist movement may have its source in these impoverished villages, they export violence from areas where their voice is heard the loudest to high-income villages. According to the first model, an increase in income of 3460 Rupees (one standard deviation) is associated with an increase of 1468

Maoist killings over an eight-year span. The third model indicates that a similar increase in income is associated with more than 2000 additional killings over an eight-year period.

Interestingly, the *ETHNICITY* variable has significant and positive association with Maoist violence, indicating that people whose mother tongue is Nepali are relatively more victimized than other ethnic groups. This result is consistent with the Maoist organizational strategy of attracting ethnic population towards their movements by promising separate states for those ethnic groups if their movement succeeds. Such promise of creating different states within a proposed federal system based on language and ethnicity became very attractive during the MPW, and even after the end of MPW, several ethnic groups are now demanding federal structure based on language/ethnicity.

3.4.5. Non-linearity

Milante (2004) posits a possibly non-linear relationship between inequality (and income) and violence, an idea we now explore. Specifically, we estimate the two sets of interaction coefficients: the first set is the interaction of the inequality variables with social capital. They answer the question of whether social capital ameliorates the impact of inequality in Maoist killings. The second is the interaction of inequality variables with (mean) income. It answers the question of whether an increase in income ameliorates or worsens the impact of the inequality on Maoist killings.

Table 3.3 provides partial answers. Estimates on the issue variables are reported in Table 3.3 for two models, one that uses *GINI* to measure inequality and another that uses $POLARIZATION_{1.5}$ to measure inequality.

Table 3.3: Models with Interactions of GINI and POL with (i) Income and (ii) Social Capital.

Dependent Variable: Number of persons killed by Maoists
Estimates from 2−level Hierarchical Negative Binomial Model

		GINI	POL (α=1.5)
INEQ	GINI	6.43*** (2.15)	
	POLARIZATION (α=1.5)		4.60* (2.84)
SOCIAL CAPITAL	FARMERGRP	−2.61*** (1.03)	−2.47*** (1.02)
	WATERUSERGRP	−0.41 (0.89)	−0.50 (0.87)
	FORESTUSERGRP	**0.85** **(0.54)**	0.60 (0.54)
	CREDITGRP	−0.44 (1.10)	−0.11 (1.07)
	WOMENGRP	−0.50* (0.35)	−0.51* (0.33)
INTERACTIONS	INCOME	0.16*** (0.05)	0.19*** (0.04)
	INEQ*INCOME	−0.96** (0.50)	1.85** (0.74)
	INEQ*FARMERGRP	−2.24 (19.06)	17.74 (26.34)
	INEQ*WATERGRP	−21.50 (18.83)	−1.10 (23.95)
	INEQ*FORESTGRP	13.93 (11.19)	−33.07** (15.88)
	INEQ*CREDITGRP	−9.93 (21.45)	1.80 (23.63)
	INEQ*WOMENGRP	−5.74 (6.30)	7.03 (9.42)
CONTROLS	GRANT	-0.58** (0.23)	-0.54** (0.22)
	POVERTY	3.58*** (0.86)	3.58*** (0.84)
	INCOME	0.16*** (0.05)	0.19*** (0.04)
	EDUCATION	0.02 (0.09)	0.06 (0.09)
	EMPLOYMENT	-0.03 (0.07)	0.00 (0.07)
	FARMER	-0.28 (0.92)	-0.22 (0.92)
	DENSITY	-0.11*** (0.03)	-0.12*** (0.03)
	ETHNICITY	0.74*** (0.28)	0.73*** (0.28)
	RURAL	-2.53*** (0.58)	-1.76*** (0.56)

MOUNTAIN	0.91**	0.85**
	(0.41)	(0.40)
HILL	0.64**	0.63**
	(0.29)	(0.30)
CONSTANT	1.38**	0.58
	(0.63)	(0.59)
$\sigma^2_{CONSTANT}$	0.17*	0.14*
	(0.09)	(0.08)
Hausman χ^2 (1)	2.67	4.96**
N	3857	3857

Notes: 1. Standard errors in parentheses; ***, **, * indicate statistical significance at 1%, 5% and 10% respectively. For issue variables (Inequality, Social Capital, Government Policy) statistical significance is based on one−tailed tests as per hypotheses H1−H3. For all other variables, statistical significance is based on two−tailed tests.
2. Estimates are from the underlying log−link function and therefore to be interpreted as coefficients from a log−linear model.

In the former, the income-interaction effects indicate that higher mean-village income is associated with lower marginal impact of inequality on Maoist violence. That is, as the level of the village income rises, it dampens the impact that inequality has on violence. One reason for this finding is an obvious one. The more (less) affluent village is more (less) able to protect itself against Maoist violence by convincing the government to divert the services of the army and the police to their region and/or purchase protection privately by donating money to the Maoists. A less obvious reason is that the same Gini in high and low-income villages translates into a better standard of living for all residents in the high-income village relative to the low-income villages.[43] Thus, the impact of inequality on the intensity of violence is less in high-income villages. Beyond a certain threshold level of income, inequality has no influence on violence. It is in areas where inequality is large and the average income is low where Maoist violence is at its worst.

[43] In the sample, *GINI* and *INCOME* have a correlation of 0.50. In contrast, $POLARIZATION_{1.5}$ has a small negative correlation with *INCOME*.

This finding indicates that when income level of the villagers goes up, the opportunity cost of the violent activities would go up for the given level of inequality, resulting into reduced level of violent activities.

A fundamental difference between our two measures of inequality is that measuring inequality by $POLARIZATION_{1.5}$, leads to the opposite inference. The positive sign on the interaction of $POLARIZATION_{1.5}$ and *INCOME* indicates that higher (mean) income in fact exacerbates the marginal impact of polarization on Maoist violence. The same level of $POLARIZATION_{1.5}$ in high and low-income villages does not necessarily translate into a higher standard of living for all residents in high-income village relative to the low-income village. This distinguishes the impact of polarization on conflict from the impact of the Gini on conflict. If there is a causal connection between inequality and conflict (we explore this further below), growth without redistribution that adequately decreases polarization (not merely the Gini), will have little impact on reducing killings by Maoists. Thus, high economic growth rate is not only desirable but extremely essential for the long run solution of the ongoing violent conflicts in Nepal.

The model with the Gini shows that the interaction of *GINI* with social capital measures has no noticeable influence on the marginal impact of inequality on Maoist violence. On the other hand, the model with polarization indicates that activities of forest groups do ameliorate the impact of increased polarization on Maoist killings. The cross-partial coefficient of -33.07 is economically significant, indicating that a one-standard deviation increase in *FORESTGRP* (=0.21) ameliorates the impact of a one-standard deviation increase in *POLARIZATION* (=0.03) on Maoist killings by 546 deaths over an eight-year period. Thus, while income growth reverses the deleterious impact of a

deteriorating Gini, it takes a specific type of social capital (forest groups) to reverse the deleterious impact of worsening polarization.

3.4.6. Endogenity

So far, we have presumed the inequality measures to be exogenous. Arguably, they are since *GINI* and *POLARIZATION* move slowly over time. It is possible, however, that shocks to the error term, for instance due to a sudden outbreak of violence in a region, are correlated with similar movements in these variables. If there is significant out-migration of, say, wealthy landlords or high-income families in response to sudden outbursts of violence, then they are negatively correlated with the error term, and their coefficient estimates are downward biased. In order to instrument for possible endogenity of *GINI* and $POLARIZATION_{1.5}$ we construct four instruments using data from the 1984 Nepal statistics. They are: log of the number of students in school in the district, percentage of the district's population with secondary-level education, log of the district's land area, and percentage of the district land area under paddy cultivation. Arguably, these are exogenous. The first-stage F-statistic for the four instruments in the GINI is 19.48 and in the $POLARIZATION_{1.5}$ equation is 7.40. The first-stage F-statistics indicate that the four variables do not suffer from a weak instrument problem (Stock and Watson 1997). Having instrumented for endogenity, the theory allows use to make causal inferences.

The results from the second-stage estimation of the two-level hierarchical negative binomial model are reported in Table 3.4. As surmised, the uninstrumented models understate the impact of inequality on violent conflict.

T**able 3.4:** Models with Instrumented GINI and POLARIZATION
Dependent Variable: Number of persons killed by Maoists
Estimates from two−stage 2−level Hierarchical Negative Binomial Model

		GINI	POL (α=1)	POL (α=1.5)
INEQUALITY	GINI	32.55**		
		(15.26)		
	POLARIZATION (α=1)		165.04**	
			(94.27)	
	POLARIZATION (α=1.5)			50.88**
				(29.34)
SOCIAL CAPITAL	FARMERGRP	−2.38***	−2.72***	−1.96**
		(1.00)	(1.01)	(1.11)
	WATERUSERGRP	−1.75**	−1.93**	−1.86*
		(0.97)	(1.14)	(1.15)
	FORESTUSERGRP	**1.29**	**1.25**	**0.90**
		(0.58)	**(0.59)**	**(0.54)**
	CREDITGRP	−1.77*	−0.74	−0.08
		(1.23)	(1.12)	(1.07)
	WOMENGRP	−0.73**	−0.42	−0.25
		(0.33)	(0.35)	(0.40)
GOVT. POLICY	GRANT	−0.72***	−0.79***	−0.87***
		(0.24)	(0.27)	(0.30)
	POVERTY	3.42***	2.69***	1.23
		(0.84)	(0.90)	(1.48)
	INCOME	−0.05	0.07	0.18***
		(0.10)	(0.06)	(0.05)
	EDUCATION	0.02	0.02	0.01
		(0.09)	(0.09)	(0.09)
	EMPLOYMENT	−0.02	−0.12	−0.13
		(0.07)	(0.11)	(0.11)
	FARMER	1.71	2.54	1.44
		(1.42)	(2.12)	(1.62)
	POPDENSITY	−0.03	−0.06	−0.12
		(0.05)	(0.05)	(0.03)
	ETHNICITY	0.30	0.98***	0.90***
		(0.39)	(0.30)	(0.30)
	RURAL	−1.16	−1.22	−0.65
		(0.76)	(0.83)	(1.09)
	MOUNTAIN	1.37***	1.08***	0.45
		(0.50)	(0.46)	(0.44
	HILL	1.04***	1.10***	0.52*
		(0.38)	(0.43)	(0.30)
	CONSTANT	−0.36	−0.24	−0.41
		(0.940	(1.00)	(1.08)
	σ^2_i	0.12	0.11	0.12
		(0.07)	(0.07)	(0.08)
	N	3857	3857	3857

Note:
1. Standard errors in parentheses; ***, **, * indicate statistical significance at 1%, 5% and 10% respectively.

The estimate of 32.55 on *GINI* indicates that an increase of 0.026 in *GINI* (a one standard deviation change in the instrumented Gini) causes an 85% increase in Maoist killing, or total of 2219 additional deaths over an eight-year period. The estimate of 50.88 on $POLARIZATION_{1.5}$ indicates that a 0.011 increase in $POLARIZATION_{1.5}$ (a one-standard deviation change) causes an increase of 56% in Maoist killings, or 1468 more deaths over an eight-year period. These estimates are substantially larger than their uninstrumented counterparts in Table 3.2.

Of interest are the interaction terms in Table 3.5. *INCOME* is no longer statistically significant in the model with *GINI*, but their interaction is negative and statistically significant, just as in the uninstrumented case, indicating that an increase in income ameliorates the marginal impact of the Gini on Maoist killings. In contrast, if inequality is measured by $POLARIZATION_{1.5}$, an increase in income no longer exacerbates the marginal impact of polarization on Maoist killings. There are two significant differences between the uninstrumented results in Table 3.3 from those in Table 3.5. The interactions of *POLARIZATION* with credit groups and women groups are statistically significant and economically large positive coefficients. While credit groups alleviate Maoist killings (coefficient of -2.66), the greater is $POLARIZATION_{1.5}$ the less effective are credit groups in ameliorating the impact of polarization on violence (positive coefficient on interaction term). The positive coefficient on the interaction of $POLARIZATION_{1.5}$ with women groups is somewhat of a puzzle. While women groups themselves are not necessarily influential in lowering the number of killings, the presence of women groups actually heightens or exacerbates the marginal influence of polarization on Maoist violence.

Table 3.5: Models with Instrumented GINI and POLARIZATION and their interactions
Dependent Variable: Number of persons killed by Maoists
Estimates from two−stage 2−level Hierarchical Negative Binomial Model

		GINI	POL (α=1.5)
INEQ	GINI	30.39**	
		(14.78)	
	POLARIZATION (α=1.5)		63.29***
			(26.52)
SOCIAL CAPITAL	FARMERGRP	−2.26***	−2.51***
		(0.96)	(1.10)
	WATERUSERGRP	−1.31*	−1.74**
		(0.94)	(1.04)
	FORESTUSERGRP	**1.18**	**1.12**
		(0.57)	**(0.53)**
	CREDITGRP	−2.00*	−2.66**
		(1.35)	(1.27)
	WOMENGRP	−0.75**	0.43
		(0.34)	(0.41)
INTERACTIONS	INCOME	0.07	0.23***
		(0.11)	(0.05)
	INEQ*INCOME	−1.45***	1.54
		(0.55)	(1.93)
	INEQ*FARMERGRP	3.31	−67.79
		(29.84)	(99.48)
	INEQ*WATERGRP		101.84
		-	(78.91)
	INEQ*FORESTGRP	−3.52	−17.06
		(17.61)	(51.32)
	INEQ*CREDITGRP	−1.65	306.09**
		(39.00)	(136.51)
	INEQ*WOMENGRP		104.24***
		-	(32.67)
CONTROLS	GRANT	-0.72***	-1.18***
		(0.24)	(0.28)
	POVERTY	4.58***	1.37
		(0.93)	(1.38)
	EDUCATION	0.03	-0.05
		(0.09)	(0.09)
	EMPLOYMENT	-0.04	-0.17
		(0.07)	(0.10)
	FARMER	1.75	2.28
		(1.38)	(1.50)
	DENSITY	-0.05	-0.12***
		(0.05)	(0.03)
	ETHNICITY	0.26	0.99***
		(0.38)	(0.28)
	RURAL	-1.88**	-0.22
		(0.80)	(1.10)
	MOUNTAIN	1.50***	0.44
		(0.49)	(0.41)

HILL	1.10*** (0.37)	0.46 (0.29)
CONSTANT	0.39 (0.96)	-0.82 (1.09)
$\sigma^2_{CONSTANT}$	0.11 (0.07)	0.04 (0.06)
N	3857	3857

Notes:

1. Standard errors in parentheses; ***, **, * indicate statistical significance at 1%, 5% and 10% respectively. For issue variables (Inequality, Social Capital, Government Policy) statistical significance is based on one−tailed tests as per hypotheses H1−H3. For all other variables, statistical significance is based on two−tailed tests.
2. Estimates are from the underlying log−link function and therefore to be interpreted as coefficients from a log−linear model.
3. INEQ in the interactions refers to the instrumented GINI or OLARIZATION.
4. Including GINI*WATERGRP and GINI*WOMENGRP cause the Hessian to be near-singular and so are dropped from the first model.

Have women groups in highly polarized villages redefined themselves as Maoist activists? If so, this disturbing phenomenon deserves further study. There is evidence of increasing participation of women in Maoist groups.[44] This appears to be a most pernicious impact of increased polarization. A group that heretofore tried to achieve more equality by contributing social capital is now driven to achieve the same goal by any means possible.

[44] It is reported that in the Maoist organization about 50% cadres at the local level and 30% of the soldiers are women (SATP n.d.).

CHAPTER 4

CONSUMPTION INSURANCE UNDER UNCERTAINTY: A CASE OF NEPAL DURING MAOIST INSURGENCY

4.1. Introduction

In most of the developing countries credit and insurance markets are either poorly functioning or completely absent leaving households exposed to different kinds of risks. But, surprisingly, various studies show that households in developing countries are mostly insured against the idiosyncratic shocks even in the absence of formal credit or insurance mechanisms. Generally, informal social mechanisms and institutions may fill the gap in the absence of formal credits and insurance markets; then, the fear is that any attempt to provide formal insurance may crowd-out the existing social insurance systems. But, during civil wars or violent conflicts, the probability of reneging on contracts would be high as violent conflicts or civil war destabilizes the existing social institutions, and the contract enforcement would be weaker if the borrower threatens violence. Such behavior may compel households to opt for costly self-insurance, destabilizing the existing social insurance system that would otherwise help the community to share the risks in times of need.

The full consumption insurance hypothesis asserts that in the case of risk-sharing and resource pooling, individual household consumption would be related to the aggregate consumption of the community regardless of the household's income change. But, such risk-sharing and resource pooling may be absent during violent conflicts. If this is the case, then as asserted in Mace (1991), the growth rate of per capita household consumption would be more closely related to household income rather than to aggregate

consumption of the community. Such expectations about the nature of relationships between the household consumption with household income and aggregate consumption of the community permit an empirical distinction between the two benchmarks of risk sharing and autarky even in the situation of violent conflict.

The objective of this research is to investigate to what extent households can insure their consumption against idiosyncratic shocks during such violent conflicts. In earlier studies of the theory of full consumption insurance, shocks such as illness, unemployment, and the likes are considered as idiosyncratic. In this study we consider a different set of shocks: In addition to the income shock, we also consider positive shocks such as remittances, and negative shocks such as violent conflicts and natural disaster. Our main goal is to investigate about: Is household consumption growth immune from the transfer income, such as remittances? Can the local traditional institutions guard the consumption loss of households during times of violent conflict or natural disasters by pooling their resources?

Basically, our interest is to investigate to what extent households are insured not only against non-transfer income shocks as analyzed in the existing literature but also against transfer income shocks, and other non-traditional shocks such as natural disasters and deaths of family members or neighbors due to violent conflicts. For our analysis, we derive the implications of the full consumption insurance theory and use Nepali household surveys for empirical investigation. We identify the primary sampling unit (PSU) as an effective insurance community. It is because within a PSU, households are geographically close to each other and can enforce informal insurance by creating credible threat of non-cooperation in case of non-compliance by any participating

household.[45] In such a community, each household can get signals about other household's income or wealth and can work together so that they can establish regular contact to enforce an informal implementation mechanism by creating trust, a necessary element that determines the success or failure of any informal social insurance within networks. Such a closely-knitted community would be able to lower the transaction costs by creating trust (Jarillo 1990), prevent moral hazard and incentive-related problems and solve the Pareto optimal planning problem for the community where households pool their resources and insure each other using informal mechanisms if they are allowed to interact for a long period of time (Fafchamps 1992). Such informal insurance system may take a varieties of forms, such as, interest free loans, exchange of labor, rent free access to cultivating land, grain transfers in times of need, etc., (as in Plattaeu 1991). In a large community, these criteria are unlikely to be met, partly because of the free-rider (monitoring) problem and partly because of the transaction cost, contrary to the small or closely-knitted community.

The theory of full consumption insurance predicts that household consumption should depend on aggregate shocks but not on idiosyncratic shocks. Using panel data from Nepal, we test the implication of the full consumption insurance hypothesis in the presence of economic, natural and violence related shocks. We find a positive significant relationship between the growth rate of household consumption and aggregate shocks indicating the presence of effective risk pooling in the given community. At the same

[45] Using data from the Phillipines, Fafchamps and Gubert (2005) show that the informal insurance systems tend to spread risk over households who live in proximity and have similar income and occupations.

time, we also find significant impact of idiosyncratic shocks on the household consumption implying the rejection of the notion of the full consumption insurance, but the impact of different shocks is not homogeneous to all households. We find that the poor, socially disadvantaged caste/ethnic groups and households with low education levels are more vulnerable to the idiosyncratic shocks than their counterparts.

The chapter is organized as follows. In Section 4.2, we present the theory of full consumption insurance, and derived testable hypotheses form the theory. Section 4.3 provides the description of the data used for empirical analysis. In Section 4.4, we summarize the econometric methodology adopted for the analysis followed by the empirical results in Section 4.5.

4.2. Consumption Insurance

4.2.1. Basic Theory

As in Cochrane (1991), Mace (1991) and Townsend (1994), consider an economy with N households where household h has a time separable, state contingent utility $U[C_{ht}(s_{\tau t}), \delta_{ht}(s_{\tau t})]$ that depends on household consumption $C_{ht}(s_{\tau t})$ at time t, event τ and preference shifters $(\delta_{ht}(s_{\tau t}))$. Also assume that each household has a finite time horizon (T), and experiences a variety of events $(s_{\tau t})$ at time t with probability $\pi(s_{\tau t}) \in [0,1]$ and $\tau = 1, 2, \ldots, S$, where each event is a collection of states of the world. In the absence of formal credit and insurance markets, if all of the households pool their resources and insure each other against idiosyncratic shocks, then the risk-sharing Pareto-optimal consumption allocation can be derived from the social planner's perspective that maximizes a weighted sum of the individual households' life-time utilities:

$$max \sum_{h=1}^{N} \lambda_h \sum_{t=1}^{T} \sum_{\tau=1}^{S} (\rho_h)^t \pi(s_{\tau t}) U[C_{ht}(s_{\tau t}), \delta_{ht}(s_{\tau t})], \qquad [4.1]$$

where λ_h is the Pareto (or planner's) weight for household *h* such that $\lambda_h \in (0,1)$ and $\sum_{h=1}^{N} \lambda_h = 1$, and ρ_h is the subjective time discount rate of household *h*. The resource constraint is that the aggregate consumption ($C_t^A(s_{\tau t})$) must not exceed the sum of resources, composed of transfer income (A_{ht}) and non-transfer income (Y_{ht}) of all households at each date and each state:

$$C_t^A(s_{\tau t}) \equiv \sum_{h=1}^{N} C_{ht}(s_{\tau t}) \leq \sum_{h=1}^{N} (A_{ht}(s_{\tau t}) + Y_{ht}(s_{\tau t})) \equiv E_t^A(s_{\tau t}), \qquad [4.2]$$

where $E_t^A(s_{\tau t})$ is the total amount of consumption good available at period *t*. Now the planning problem is to maximize [4.1] subject to [4.2]. The first order conditions with respect to $C_{ht}(s_{\tau t})$ are given by:

$$(\rho_h)^t \pi(s_{\tau t}) \lambda_h U_C(C_{ht}(s_{\tau t}), \delta_{ht}(s_{\tau t})) = \mu_t(s_{\tau t}), \qquad [4.3]$$

where $\mu_t(s_{\tau t})$ is the Lagrange multiplier at time *t* in state τ that does not depend on the particular household's resources. Eq. [4.3] indicates that optimization of the planning problem generates the equality of weighted marginal utilities across the individual households as the equilibrium condition. The *ex-ante* uncertainty related to [4.3] disappears once the households realize state τ, and the household fixed effect can be eliminated by taking the ratio of [4.3] for an individual household at two different dates resulting into:

$$\rho_h \frac{U_C(C_{h(t+1)}, \delta_{h(t+1)})}{U_C(C_{ht}, \delta_{ht})} = \frac{\mu_{t+1}}{\mu_t} \qquad [4.4]$$

Eq. [4.4] indicates that the discounted growth rate of marginal utility is constant across households and it is determined by the growth rate of the Lagrange multiplier that itself is unrelated to household *h* income or the endowment. As the Lagrange multiplier is a function of the aggregate resource available to the community at two different dates, not the individual household's resource growth, the full consumption insurance hypothesis predicts that the growth rate of the household's marginal utility is independent of the growth rate of the individual household's resources.

In order to put the full consumption insurance into empirical testing, we need to derive the form of the equation that needs to be estimated. For this purpose, consider a power utility function with multiplicative preference shocks (Mace 1991; Cochrane 1991):[46]

$$U(C_{ht},\delta_{ht}) = e^{\sigma\delta_{ht}}\frac{1}{\sigma}(C_{ht})^{\sigma}, \qquad [4.5]$$

where $(1-\sigma)$ is the coefficient of relative risk aversion that is assumed constant across households and we need $\sigma<1$ for concavity. The marginal utility with respect to C_{ht} is given by

$$U_C(C_{ht}) = e^{\sigma\delta_{ht}}(C_{ht})^{\sigma-1} \qquad [4.6]$$

Combining [4.4] with [4.6] and taking logs gives

$$\ln\left(\frac{C_{h(t+1)}}{C_{ht}}\right) = \frac{1}{1-\sigma}\left(\ln\left(\frac{\mu_{t+1}}{\mu_t}\right)-\sigma(\delta_{h(t+1)}-\delta_{ht})-\ln(\rho_h)\right) \qquad [4.7]$$

[46] Given our short panel data with several year's gap in between, we use a growth rate model which can be derived from the power utility function.

Eq. [4.7] implies that for a power utility function there is a positive linear relationship between the growth rate of individual household consumption and the growth rate of aggregate consumption. Generally, panel data are affected by nonseparability, functional form, and generalization of preference shocks. While running a regression based on [4.7], the right hand side variables must be uncorrelated over time with variation in the growth of the Lagrange multiplier, as well as preference shocks and measurement errors. To control for this problem, most of the researchers including Mace (1991) and Townsend (1994) include aggregate consumption growth on the right hand side variable as aggregate shocks. Cochrane (1991) argues that the use of the aggregate consumption growth taken over the sub-sample being studied, not the entire population of the community, may not serve its purpose due to the small sample. To avoid the correlation issue raised by Cochrane, we use the village specific aggregate consumption growth of the entire household, not the aggregate consumption growth of sub-sample being studied. As indicated by Eq. [4.7], the regression model should not include any level variables as it is the standard approach of panel data analysis (Stock and Watson 2003). We specify our econometric model as

$$\Delta \ln C_{ht} = f(\Delta \ln C_t^A, \Delta \ln Y_{ht}, \Delta X_{ht}; \beta) + u_{ht} \qquad [4.8]$$

where $\Delta \ln C_{ht}$ is per capita household consumption growth rate, $\Delta \ln C_t^A$ is (are) the aggregate shock(s) to the community (aggregate consumption growth at the community level), $\Delta \ln Y_{ht}$ is a vector of idiosyncratic shocks to individual households (growth rate of the household resources measured in terms of the non-transfer income and transfer income, e.g., remittances), ΔX_{ht} is the change in the preference shifters of the household

(e.g., changes in household size, age and sex compositions between two dates[47]), u_{ht} is the error term that captures the measurement errors of the dependent variable and the change in the household *h* unobservable preference shifters, and β is a vector of regression parameters that are to be estimated econometrically.

The growth rate specification of [4.8] avoids the correlation from omitted unobserved household characteristics, and hence avoids problems of omitted variables bias. This specification is similar to Mace (1991), Cochrane (1991), Townsend (1994) and many other studies with the fundamental difference that we do not use the level-value of any arbitrary variable as the right hand side variables. As asserted by Stock, Wright and Yogo (2002), we use the generalized method of moments (GMM), where the choice of the right-hand variables is dictated by the first-order conditions, not by a debatable exclusion principle as using first order conditions derived from economic theory and careful consideration of instrument exogeneity is a standard part of any empirical analysis using GMM.

4.2.2. Hypotheses

The full consumption insurance theory described above generates two testable hypotheses.

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[47] One can make a point that level of education can be a good candidate of the preference shifters. Within the given analytical framework, level of education affects income, not the consumption, so level of education is used as an instrument, not as an argument of the growth rate of the household consumption.

H1: Given that households in their insurance community pool resources and insure each other for unforeseen shocks, then the per capita growth rate of the household consumption should grow linearly at the aggregate growth rate of community level consumption, *i.e.*, $\beta_{\Delta \ln C_t^A} = 1$.

H2: As the household level resources does not enter into the first order conditions [4.4], the effect of idiosyncratic shocks to growth rate of the per capita household consumption should be zero, *i.e.*, $\beta_{\Delta \ln Y_{ht}} = 0$.

In empirical settings, we will test these two hypotheses jointly as predicted by the theory as

H3: $\beta_{\Delta \ln C_t^A} = 1 \;\&\; \beta_k = 0\,,\ \forall k$.

Inclusion of more shocks may change the number of parameters to be tested, but the basic idea remains the same. We will test this hypothesis jointly where we use more than one idiosyncratic shock.

4.2.3. *Earlier works and results*

Several authors have developed and tested the idea of consumption insurance. Theoretical works by Diamond (1967) and Wilson (1968) show that a household's consumption does not depend on idiosyncratic income shocks once aggregate shocks are taken into account under a Pareto-optimal consumption plan. Using data from the Panel Study on Income Dynamics (PSID) of the US households, Cochrane (1991) finds some support to the theory of consumption insurance, but not against all types of shocks.

Mace (1991) reports mixed support for the theory of full consumption insurance using a panel from the US Consumer Expenditure Survey (1980-83). Townsend (1994)

provides evidence of risk-sharing among the villagers in rural India where formal credit and insurance markets are absent. Using the same PSID date set, Hayashi et. al. (1996) find no support for the intra- as well as inter-family full risk-sharing. Using a panel data set from Indonesia, Gertler and Gruber (2002) document imperfect consumption insurance over major illnesses as a measure of idiosyncratic shock. More recent studies (Skoufias 2003; Mu 2006) reject the hypothesis of perfect consumption insurance in Russia, but find that food-consumption is better protected than non-food consumption.

4.3. Data Descriptions

The data used for this research come from two rounds of Nepal Living Standard Survey (NLSS) conducted in 1995/96 and 2003/04 by the Nepal Central Bureau of Statistics (CBS) in collaboration with the World Bank. Both of these surveys followed the World Bank's Living Standards Measurement Survey (LSMS) methodology and a two-stage stratified sampling was used to collect nationally representative samples. In both rounds, two sets of questionnaires, at the household and community level, were administered and the data were collected during a one-year period to cover a complete cycle of agricultural activities and to capture seasonal variations in different variables. In the first round of NLSS (1995/96), 3373 households are included in the survey and in the second round (2003/04), the sample size is 3912 households. Along with these main surveys, CBS also collected panel data from 962 households around the country during those surveys. We use panel data for this research along with the data from the main surveys. Other than the village level aggregate consumption, and violence related

information, all other variables used in this paper are drawn from the panel aspect of the NLSS.

The conflict-related data are collected from the Informal Sector Services Center (INSEC), a not-for-profit national human rights organization in Nepal. The number of deaths in the villages due to the violent conflict since 1996 are obtained from the annual reports (1996-2004) of the INSEC, and aggregated up to 2004. We personally converted all the reported deaths due to the violence in those reports in the usable format as those human rights reports contain the narrative of the events, not the casualty data in a usable format. Another source of our data is population census of 2001. In our panel data or full NLSS samples, small numbers of households were chosen from each Primary Sampling Unit (PSU) to collect household information. Due to the small sample, any single household consumption may have significant effect on the community (PSU) level consumption. In order to avoid influence of individual household on the community level consumption aggregate, a variable that we use as a measure of aggregate shocks in the community, we use village level average consumption. But the NLSS samples do not have the village level consumption information. In order to overcome deficiency of village level consumption information we use the population census for imputing the household consumption using the recently developed micro-level estimation techniques (Elbers, Lanjouw and Lanjouw 2003).

Basically, we use the full NLSS samples to impute expenditures for the households that are enumerated in the population census as the census data do not have the households' welfare measures such as income or expenditures. We use the following procedure for imputation. Let y_h be the household h's expenditure obtained from the

NLSS survey. A regression of y_h on a vector of covariates X_h, where X_h are chosen so that they are available in the NLSS as well as in the census data, is estimated using the generalized least squares method. Then the estimated model is used to impute the census household expenditures from which we computed community (village) level expenditures. Table 4.1 presents descriptive statistics and definition of the variables used in the empirical analysis.

4.4. Econometric Methods

In this chapter we test the full consumption insurance hypothesis using household survey data from Nepal. This section describes the econometric method used for estimating the model presented in Section II (Eq. 4.8) and testing the hypotheses implied by the theory. Though we are using panel data, we have only two observations for each household, and these observations are several years apart. Therefore, we use the power utility in order to test the proposed hypotheses as this functional form allows us to use growth rates of the relevant variables, not just the difference.[48] As noted in Cochrane (1991) and Hayashi, et al. (1996), the panel data with longer gaps may be a blessing in disguise as it helps to avoid certain deficiencies present in the more frequent panel data with shorter horizon. The longer period allows more households to receive shocks while

[48] In such a specification, the individual fixed effects are removed when the observations are first differenced. Given that consumption and income are in logarithms, it accounts for potential differences in the inflation rate across communities (Skoufias 2003).

the timing problems that result form using a discrete-time model to study time aggregates would be reduced.[49]

For analytical purposes, we disaggregate the total household expenditure into food-expenditure and non-food expenditure. As we use the household's expenditure growth rates as dependent variable, ordinary least squares (OLS) would be the starting point for econometric estimation as it is the most common estimation method used in the earlier studies. But, as specified in Eq. [4.8], the growth rate of household income also enters as a right-hand-side variable, and measured income is likely to be correlated with the measurement error in household consumption that violates the fundamental assumption of OLS. Additionally, the Anderson-Rubin endogenity test (Baum, Schaffer and Stillman 2003) shows that some of the right-hand variables are endogenous. So, inferences from OLS estimates would not be valid for hypotheses testing.

An alternative to the OLS is two-stage least squares (TSLS) or instrumental-variable (IV) estimation that takes into account the endogenity of income or some other variables used as right-hand side variables. Both of these methods basically inherit the basic assumption of homoskedasticity from the OLS. In our sample data, the White-Koenker test (White 1980; Koenker 1981) shows that the errors in IV-method are heteroskedastic. If the error terms exhibit heteroskedasticity of unknown form, as in our

[49] But the longer periods may also capture the change in living standards over many years rather than the effects of the sudden shocks that might more plausibly be insured (Cochrane 1991). If short term income is dominated by transitory income changes, such as remittances, the orthogonality conditions may have low power in GMM estimation (Hayashi, Atonji and Kotlikoff 1996).

sample, then the inference about hypothesis testing under IV-method is again invalid even if one uses standard errors robust to heteroskedasticity (Dufour 2003) and diagnostics for endogenity and over-identifying restrictions would also be invalid (Baum, Schaffer and Stillman 2003). Furthermore, the household surveys that we are using are designed using multi-stage stratified cluster-sampling. In such a situation it is possible that error terms are correlated within but not across the clusters. The consequence of such clustering resembles that of the presence of heteroskedasticity where traditional IV estimation becomes problematic. As an alternative to IV estimation, one can use the generalized methods of moments (GMM) proposed by Hansen (1982) in the presence of heterogeneity of unknown form.

The GMM makes use of the orthogonality conditions to allow efficient estimation in the presence of heterogeneity of unknown form, but it still requires strong instruments for the endogenous variables.[50] If model is poorly identified, then as discussed in Stock and Write (1995), continuously- updated GMM provides better estimates. Use of strong instruments is the basic requirement for efficient GMM estimates, and finding such strong instruments is an arduous task; we utilize the continuously-updated GMM method (also called continuously-updated estimation (CUE)) in which the test statistic is robust in the light of weak instruments. Hansen, Heaton and Yaron (1996) develop the idea of

[50] The validity of the instruments is a serious issue in GMM estimation, where validity implies orthogonal to the errors but correlated to endogenous regressors. If instruments are irrelevant or weak, then the sampling distributions of GMM as well as IV statistics are non-normal and standard GMM and IV point estimates, hypothesis tests, and confidence intervals are unreliable.

CUE and show that this estimation technique has several advantages over the TSLS, IV, or GMM, such as more reliable test statistics and insensitivity to parameter-dependent scale factors.[51]

4.5. Empirical Results

Table 4.1 presents the descriptive statistics of the variables used for empirical analysis. For empirical analysis, we divide total household consumption per capita, the dependent variable, into food and non-food consumption and separately use the growth

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[51] For a regression model: $y = X\beta + u$, if $E(X_t u_t) \neq 0$, one can use the IV method for estimation, which is a special case of GMM. If the error variance is heteroskedastic, then one needs to use GMM. The idea of continuously updated GMM estimator (CUE) can be summarized as follows (Hansen, Heaton and Yaron 1996). Write the moment conditions as $E[\varphi(X_t, \beta)] = 0$, where β is *k*-dimensional vector of interest, $\varphi(.)$ has $n \geq k$ coordinates, and $\{T^{-1/2}\sum_{t=1}^{T}\varphi(X_t, \beta)\} \rightarrow N(0, V(\beta))$. Then an efficient GMM estimator of the parameter vector β is constructed by choosing β_c (consistent estimator of β) that minimizes $[T^{-1}\sum_{t=1}^{T}\varphi(X_t, \beta_c)]'[V_T(\beta_c)]^{-1}[T^{-1}\sum_{t=1}^{T}\varphi(X_t, \beta_c)]$, where $V_T(\beta)$ consistent (but infeasible) estimator of covariance matrix that also works as a weighting matrix in GMM estimation. Instead of taking the weighting matrix as fixed, if we consider an estimator in which the covariance matrix is continuously updated as β_c changes in the above minimization problem, then we get an alternative GMM estimator, called the continuously-updated estimator (CUE).

rate of per capita household consumption (*GRHPCTCON*), growth rate of household per capita food consumption (*GRHPCFCON*) and growth rate of household per capita non-food consumption (*GRHPCNFCON*) as the dependent variables.

The major explanatory variables are the growth rate of per capita consumption (*GRVPCCON*) at the village level, growth rate of household per capita income (*GRHPCINC*) and the change in remittance (*DREMITTANCE*) received by the households between 1995/96 and 2003/04.[52] The first explanatory variable (*GRVPCCON*) is used as a proxy for aggregate shocks to the households in the given community, and the other two variables (*GRHPCINC* and *DREMITTANCE*) are used as the proxy of idiosyncratic shocks at the household level.

We also use the number of people killed during 1996-2003 (cumulative deaths due to the Maoist rebels (*MKILL*) as well as the cumulative total deaths (*TOTKILL*)) in the villages as an additional regressor.[53] Definitely, these variables measure shocks to the

[52] Use of the growth rate of remittances received by the households is problematic as not all households in 1995/96 had received remittances. If some household received remittances in 2003/04 but not in 1995/96, then the growth rate goes to infinity creating a practical problem in empirical analysis. To avoid such practical difficulties, we use difference(s), not the growth rate(s) of those variables that did not have values in both ends.

[53] As the number of deaths due to government forces is about two-thirds of the tatal, and it is highly correlated with the total number of deaths, we exclude this measure from our analysis. Our approach of cumulating regressors resembles Cochrane (1991), where right hand side variables are cumulated for three years, and the growth rate of the dependent

households, but whether it is idiosyncratic or aggregate to the households is an open question. If a family lost its member(s) due to the conflict that may be idiosyncratic to the household, and for the rest of the community that may serve as an aggregate shock. In our data set, we have the total number of deaths in each village, but we do not have a separate account of the deaths where one can see which household in the given community lost their family member(s).

Along with the variables that are used to measure various shocks to the households, we also use three more variables as the measure of preference shifters of the households. They include the change in the household size (*DHHZIZE*), the change in the age (*DHHAGE*) and sex (*DHHSEX*) compositions of the households. An obvious advantage of our panel data with more than a year span is apparent here since we can observe significant changes in these preference shifters that may be absent in the case of more frequent panel data.

The main idea of the full consumption insurance theory is that the growth of the per capita consumption will not depend on changes in household resources that are uncorrelated with shifts in preferences once the growth in community resources are taken into account. We use the household per capita income growth as a measure of idiosyncratic shocks. In developed countries, most of the incomes are insured, but in developing countries, such as Nepal, the household income is not insured at all indicating

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variable (food consumption) was measured for a three-year period, not as a year-to-year basis. The longer period analysis can be viewed as a test of the change in the standard of living over many years (rejection of full consumption may indicate slow changes in the living standards over many years).

that household income serves better proxy for the idiosyncratic shocks. Still, household income alone may not capture all types of risks and shocks; we also include direct measures of shocks/risks, such as the non-transfer income (remittances), risks due to violent conflict, and environmental shocks, such as flooding.

Obtaining accurate measurement of household income or expenditure through survey is difficult if not impossible. Deaton (2000) asserts that in many surveys, household consumption and income suffer significant levels of measurement error. Also, the number of people killed in the given village may depend on several factors including political activities of the rebels, presence of social capital in the community, presence of security forces, population density, distributional issues like inequality, and so on. In Table 4.1, we can see the wider cross-sectional variations in household consumption, income and the measure of violence, such as *MKILL* (number of people killed by Maoist) and *TOTKILL* (total deaths due to the violence), indicating that there is good deal of measurement error in our data. Therefore, we suspect that growth rate of household per capita income (*GRHPCINC*) and the number of people killed (*MKILL* and *TOTKILL*) may be endogenous. The Anderson-Rubin (1950) endogenity test shows that these two variables are actually endogenous. We use several variables as the instruments to correct for the endogenity, including the household and community characteristics that are expected to be correlated to the growth rate of the household per capita income and the violence, but orthogonal to the error term.[54]

[54] See Table 4.1 footnote for the list of instruments.

Table 4.1: Variables Definitions and Descriptive Statistics

		Sample Mean (S.D.)	
Variables	Definition	1995/96	2003/04
PCHTCON	Household per capita total consumption (Rs.)	9924	19557
		(11589)	(22270)
PCHFCON	Household per capita food consumption (Rs.)	5820	10944
		(6149)	(11813)
PCHNFCON	Household per capita non-food consumption (Rs.)	4104	8993
		(8336)	(16318)
VPCCON	Village per capita Consumption(Rs)	9761	18094
		(5079)	(11515)
PCHINC	Household per capita income excluding remittance (Rs.)	11622	17352
		(34858)	(25114)
MKILL	Number of deaths due to Maoist in each village		2.57
		-	(5.37)
TOTKILL	Number of total deaths in each village		7.20
		-	(15.61)
REMITTANCE	Household remittance income (Rs.)	4637	11913
		(45031)	(44725)
HHSIZE	Household size	6.00	5.75
		(2.74)	(2.73)
HHAGE	Average age of household members	25.39	29.18
		(10.24)	(12.65)
HHSEX	Percentage of male in household	0.49	0.48
		(0.17)	(0.18)
FLOOD	Binary variable (1 if flood in the past five years, else 0)	0.17	0.15
		(0.38)	(0.36)

Note: Standard deviations within parentheses.
1. Data sources:
PCHTCON, PCHFCON, FCHNFCON, PCHINC, REMITTANCE, HHSIZE, HHAGE, HHSEX, and *FLOOD*-- Nepal Living Standard Surveys (Panel) 1995/96 and 2003/04, Central Bureau of Statistics (Nepal) and the World Bank; *MKILL* and *TOTKILL*-- Informal Sector Services Center (INSEC); *VPCCON* -- Survey-to-Census imputation through small area estimates.

2. Instruments (figures within parentheses are average values):
i) Categorical variables: if the caste/ethnicity is low (31%) or middle (37%), if the electricity is available (36%), if child works (2%), if household owns house (95%);
ii) Household (per capita) level variable: schooling (4.48 years/member), employment (5.32 months/year), illness (3.26days/year); members working in farm (27%); number of livestock (4.2/household);
iii) Change in community level social network indices between 1995/96 and 2003/04: farmer network index (27%), water network index (23%), forest network index (38%), and women network index (39%);
iv) Others: district's population density in 2001 (541/sq km); public facility index (59%).

In order to see the relevancy and sufficiency of these instruments, and the need of the particular estimation method, we perform several statistical tests as described in section 4.4 All of these test statistics are summarized in the respective tables.

4.5.1. Non-Food Consumption

Table 4.2 presents the results from the continuously updated GMM (also called CUE) estimates where the dependent variable is the growth rate of the household per capita non-food consumption (*GRHPCNFCON*). All together, the results from four different models are presented in Table 4.2. Model-A1 and Model-A2 are similar except that the former uses *MKILL* and the latter uses *TOTKILL* as a measure of risk coming from the violent conflict. In the next two models, we add one more explanatory variable, *DFLOOD*, in order to check the robustness of the model specifications.

Before discussing about the actual results, the lower-half of Table 4.2 deserves proper explanation as it reports several tests statistics about the presence of heteroskedasticity, instrument relevance, and under and over-identification issues.[55] The *White-Koenker* test for the presence of heteroskedasticity indicates the strong presence of heteroskedasticity of unknown form in all models. As we are using more than one endogenous variables, the usual first-stage *F*-statistics[56] or partial R^2 may not provide sufficient information about the relevancy and sufficiency of the instruments.

[55] We also report these test statistics in all other tables as well.

[56] For a single endogenous variable, F < 10 in the first-stage is a cause for concern, but with multiple endogenous variables, such a rule of thumb is not applicable (Staiger and White 1997).

Table 4.2: Continuously Updated GMM Estimates (Dep. Var.: Non-Food Exp.)

	Ind. Var.↓	Model-A1	Model-A2	Model-A3	Model-A4
AGG. SHOCK	*GRVPCCON*	0.364*** (0.071)	0.361*** (0.072)	0.339*** (0.082)	0.339*** (0.082)
INCOME SHOCKS	*GRPCHHINC*	0.062 (0.070)	0.070 (0.072)	0.114* (0.088)	0.125* (0.090)
	DREMITTANCE	0.008** (0.004)	0.008** (0.004)	0.009** (0.004)	0.010*** (0.004)
MAN MADE SHOCKS	*LMKILL*	0.051 (0.053)	-	0.015 (0.061)	-
	LTOTKILL	-	0.030 (0.040)	-	0.004 (0.046)
NATURAL SHOCK	*DFLOOD*	-	-	0.095 (0.116)	0.095 (0.116)
PEFERENCE SHIFTERS	*DHHSIZE*	-0.066*** (0.012)	-0.066*** (0.012)	-0.063*** (0.012)	-0.063*** (0.013)
	DHHAGE	0.009*** (0.003)	0.009*** (0.003)	0.008*** (0.003)	0.008*** (0.003)
	DHHSEX	0.166 (0.133)	0.170 (0.133)	0.164 (0.132)	0.165 (0.132)
	CONSTANT	0.403*** (0.053)	0.404*** (0.055)	0.428*** (0.063)	0.429*** (0.065)
[a] *White-Koenker* nR^2*-Stat.* (χ^2_{22})		41.65***	41.91***	41.85***	41.65***
[b] *Anderson LR-Stat.*(χ^2_{16})		70.86***	66.94***	50.20***	48.58***
[c] *Hansen J-Stat.* (χ^2_{15})		5.92	6.17	5.06	5.10
[d] *Anderson-Rubin Endo. Stat.* (χ^2_{17})		26.63*	26.63*	26.78**	26.78**
[e] $\chi^2_{(k)}$ [*H0*: $\beta_{\Delta \ln C_t^A} = 1$ & $\beta_k = 0,\ \forall k$]		85.67***	84.60***	82.84***	82.16***
Over-all R^2		0.542	0.543	0.545	0.544
No of Instruments		17	17	17	17
No of Observations		922	922	922	922

Notes: [a] *White-Koenker* test of the presence of heteroskedasticity of unknown form (H0: disturbance is homoskedastic); [b] *Anderson* canonical correlation test of under identification /IV irrelevance (H0: instruments are irrelevant/under ID); [c] *Hansen* test of relevancy/ over-identification of all instruments (H0: all instruments are relevant/over ID); [d] *Anderson-Rubin* endogenity test of suspected regressors (H0: coefficient of endogenous variables are jointly insignificant); [e] Joint hypothesis of full consumption insurance where *k= 4* for first two models and *k=5* for the last two models; Cluster-robust standard errors are within parentheses; *, **, and *** refer to significant at 1%, 5% and 10% level, respectively. For all the shocks the test is one-tailed as predicted by the theory.

So, we perform *Anderson* canonical correlation test (Anderson 1977) for the under-identification of the moments conditions. The test statistic shows that our models do not suffer from an under-identification problem (the null of under-identification is strongly rejected). An alternative to the Anderson canonical correlation (LR) statistics is Hansen (1982) *J*- statistic. This is a test of the joint hypotheses of correct specification of the model and the orthogonality conditions. The *J*-statistics are sufficiently small so that we cannot reject the null of instrument relevancy and over-identification. Such a failure to reject the null in our sample implies proper identification and orthogonality of the instruments, the necessary conditions to make any inferences using the estimated coefficients.[57]

As indicated by all of the test statistics, the models are correctly identified and the instruments are properly chosen.[58] Table 4.2 presents our first set of results using four models were the dependent variable is growth rate of household per capita non-food

[57] Since the GMM method suffers the weak identification problem we use CUE, as this procedure is robust to weak identification (Stock, Wright and Yogo 2002).

[58] As we use a relatively larger set of excluded instruments, we also perform redundancy as well as orthogonality tests of a subset of instruments using 'difference-in-Sargan' test, also called *C-test* (Hayashi 2000). In the case of the redundancy test, the null of redundant instruments is strongly rejected, and in the case of the orthogonality test for a subset of instruments, we failed to reject the null hypothesis that both sets (suspected set and the remaining set) of instruments are orthogonal and valid. As the *C-test* shows that the suspected sub-set of instruments is relevant and we retain all 17 instruments for estimation.

consumption. The only difference in the first two models (Model-A1 & A2) is that Model-A1 has *MKILL* and Model-A2 has *TOTKILL* as an explanatory variable. The last two models have one additional explanatory variable (*DFLOOD*) that is used to test robustness of the model specifications. Regardless of the model specifications, our results indicate that for every 10% increase in village level aggregate consumption, the per capita household consumption increases by 3.6%, an indication of weak association between those two variables. Over all, the results show that there is less than perfect but positive ($\beta_{\Delta \ln C_t^A} = 0.36$) association between *GRVPCCON* and *GRHPCNFCON* implying that partial risk-sharing in non-food consumption is taking place in the communities where sample households are residing. The coefficient of *GRHPCINC* is positive but insignificant in the case of Model-A1 and Model-A2, and it is weakly significant in the case Model-A3 and Model-A4. Numerically, for every 10% increase in the growth rate of the household per capita income, the per capita non-food consumption grows in the range of 0.62% - 1.2%, depending on the model that we use. Statistically, these coefficients are mostly insignificant, indicating that the growth rate of non-food consumption is not significantly affected by the growth rate of household income. This is an indication of the presence of risk pooling in the case of non-food consumption within the given community.

The coefficient of *DREMITTANCE* in Model-A1 is 0.008 and significant at 5% level, indicating that an additional 1000 Rupees remittance for every household leads to an increase in non-food consumption by 0.008%.[59] The coefficient of *DREMITTANCE* is

[59] We measure the remittance in 1000 Rupees in order to account for the scale issue. If we use growth rate of remittance, it forces us to drop a significant number of households

not significantly different among the four models. There might be several implications of the significant coefficients of this transfer income, which is available only for the one-third of the sample households. First, household consumption is not fully protected from the shocks originating from transfer incomes. Second, as remittances cause non-food consumption to grow significantly, and only one-third of households are receiving the remittance income in 2003/04, it may be contributing to the widening expenditure inequality in the country.

The effect of the violence related shocks (*MKILL* and *TOTKILL*) appears to be positive but insignificant on the growth rate of household's per capita non-food consumption indicating that the violent conflict does not tend to affect household's non-food consumption. This result is surprising on the ground that it is contrary to *a priori* expectation of a negative effect of conflict on household non-food consumption. The insignificant impact of violent conflict on non-food consumption can be explained with the widespread poverty in the country where the non-food consumption share is very small for a majority of households, and this portion of consumption may be already so low or it may be the bare minimum level that is required for survival of the households and cannot go down further even in the face of the violent conflict.[60]

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from our analysis as not all households that are receiving remittances in 2003/04 had remittance income in 1995/96.

[60] In our sample, the share of non-food consumption ranges from 1% - 88% with the mean share 35%, implying that, on average, about 65% of total household expenditure goes to food consumption. In the case of low income households, the share of non-food

After including an environmental shock (*DFLOOD* in Model-3A and Model-4A), a variable that measures the occurrence of natural disasters, such as flooding in the given community, the basic results do not change. This variable measures the presence or absence of flooding in the given community during the past five years before conducting each survey. The coefficient of *DFLOOD* is positive but insignificant indicating that shocks coming from natural disasters, such as flood, are basically insured within the local community, a result consistent with the existing literature (Mace 1991; Cochrane 1991; Townsend 1994; Gertler and Gruber 2002). However, the joint hypothesis of the full consumption insurance ($\beta_{\Delta \ln C_t^A} = 1$ and $\beta_k = 0,\ \forall k$) is strongly rejected at 1 percent level. This rejection is basically because of the less than perfect relationship between the aggregate shock and non-food consumption ($\beta_{\Delta \ln C_t^A} < 1$) but not because of the significant impact of idiosyncratic shocks ($\beta_k > 0,\ \forall k$) on the household non-food consumption. In all cases, we use cluster-robust standard errors as our panel data are clustered in the primary sampling units (PSUs), a section of a village from where the sample was taken using multi-stage stratified sampling scheme.

Other control variables used to account for the shift in household preferences are change in household size (*DHHSIZE*), change in household age (*DHHAGE*) and sex (*DHHSEX*) compositions. The significant negative coefficient for *DHHSIZE* indicates that given the resources and preference shifters, increased household size drags down the non-food consumption growth rate of the households. This result is consistent across

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consumption on total expenditure is even smaller indicating that food-consumption may have suffered due to the violent conflict.

different models. The increase in household's average age has a positive significant effect on the growth rate of the household's per capita consumption, while the change in sex composition has no significant effect on the consumption growth indicating that the non-food consumption growth is not gender sensitive.

4.5.2. Food Consumption

Table 4.3 presents the continuously updated GMM estimates when dependent variable is the growth rate of household per capita food consumption (*GRHPCFCON*). Except for the change in the dependent variable, we use the same set of right hand side variables that are used for different models presented in the Table 4.2. Here, the coefficient of *GRVPCCON* is significantly higher than what we have in Table 4.2 for non-food consumption. The coefficient of 0.70 (approximately equal across all four models) indicates that for every 10% increase in *GRVPCCON*, there is 7% increase in the growth rate of per capita household food consumption. The impact of per capita household income is significant and much higher in food consumption than for the case of non-food consumption.

The coefficients of *DREMITTANCE* across different models are smaller and barely significant at 10% in some cases, whereas in the case of non-food consumption (Table 4.2), the remittance has a positive significant effect. This finding indicates that the household level food consumption growth is more vulnerable than the non-food consumption growth to the change in household non-transfer income. This finding contradicts the Skoufias' (2003) finding for Russia where food consumption is relatively better insured than the non-food consumption.

Table 4.3: Continuously Updated GMM Estimates (Dep. Var.: Food Exp.)

	Ind. Var.↓	Model B1	Model B2	Model B3	Model B4
AGG. SHOCK	*GRVPCCON*	0.714*** (0.073)	0.673*** (0.078)	0.733*** (0.077)	0.705*** (0.080)
INCOME SHOCKS	*GRPCHHINC*	0.200** (0.090)	0.181** (0.082)	0.215** (0.095)	0.217*** (0.093)
	DREMITTANCE	0.005* (0.003)	0.004* (0.003)	0.006* (0.004)	0.005 (0.004)
MAN MADE SHOCKS	*LMKILL*	-0.147** (0.066)	-	-0.170*** (0.073)	-
	LTOTKILL	-	-0.084** (0.042)	-	-0.117** (0.052)
NATURAL SHOCK	*DFLOOD*	-	-	-0.048 (0.051)	-0.039 (0.054)
PEFERENCE SHIFTERS	*DHHSIZE*	-0.054*** (0.010)	-0.057*** (0.010)	-0.054*** (0.010)	-0.054*** (0.010)
	DHHAGE	0.013*** (0.003)	0.013*** (0.003)	0.013*** (0.003)	0.013*** (0.003)
	DHHSEX	0.007 (0.154)	0.007 (0.155)	0.048 (0.154)	0.038 (0.157)
	CONSTANT	0.064 (0.053)	0.080 (0.057)	0.053 (0.055)	0.072 (0.060)
[a] *White-Koenker* nR^2*-Stat.* $(\chi^2_{(22)})$		38.92***	42.84***	39.99**	43.56***
[b] *Anderson LR-Stat.* $(\chi^2_{(16)})$		50.28***	48.67***	50.11***	47.60***
[c] *Hansen J-Stat.* $(\chi^2_{(15)})$		17.4	19.59	17.76	20.14
[d] *Anderson-Rubin Endo. Stat.* $(\chi^2_{(17)})$		44.55***	44.55***	49.85***	49.85***
[e] $\chi^2_{(k)}$ [*H0*: $\beta_{\Delta \ln C_t^A} = 1$ & $\beta_k = 0,\ \forall k$]		18.62***	21.13***	19.54***	20.92***
Over-all R^2		0.583	0.588	0.573	0.567
No of Instruments		17	17	17	17
No of Observations		922	922	922	922

Notes: [a] *White-Koenker* test of the presence of heteroskedasticity of unknown form (H0: disturbance is homoskedastic); [b] *Anderson* canonical correlation test of under identification /IV irrelevance (H0: instruments are irrelevant/under ID); [c] *Hansen* test of relevancy/ over-identification of all instruments (H0: all instruments are relevant/over ID); [d] *Anderson-Rubin* endogenity test of suspected regressors (H0: coefficient of endogenous variables are jointly insignificant); [e] Joint hypothesis of full consumption insurance where *k= 4* for first two models and *k=5* for the last two models; Cluster-robust standard errors are within parentheses; *, **, and *** refer to significant at 1%, 5% and 10% level, respectively. For all the shocks the test is one-tailed as predicted by the theory.

However, the food consumption growth rate is less responsive to the change in transfer (remittance) income as there is very weak statistical evidence for it (hardly significant at 10% level with one-tailed test).

Here, we can observe some fundamental differences in the results presented in Table 4.3 from the results from Table 4.2. In the case of the food consumption (Table 4.3) , the effect of the violence-related shocks is negative and significant, indicating that household food security has declined due to the violence. The coefficient of *LMKILL* (-0.147 in Model-B1 and -0.170 in Model-B3) suggests that for every 10% increase in violence due to the Maoists, the growth rate of the food consumption declines in the range of 0.015% - 0.017%. This number is significantly smaller (0.008% in Model-B2 and 0.012% in Model-B4) in the case of *LTOTKILL*, indicating that the negative impact of the violence related shocks (level of insecurity) among the villagers may be different depending on who was responsible for creating the terror in the given community. First, regardless of who killed the people in the village, the impact of violence on the household food consumption is negative. Second, the decline, however, is not the same for killings by the Maoists and the overall deaths. The higher reduction in the food consumption growth in the case of *LMKILL* as compared to the reduction in food consumption due to *LTOTKILL* suggests that supporters of the Maoists who are living side by side in the villages may suffer relatively less than others who do not support the Maoist cause, a finding consistent with a common perception.

4.5.3. Total Consumption

In Table 4.4, we present the continuously updated GMM estimates where the dependent variable is the growth rate of per capita household total expenditure. Here again, we use the same set of right hand side variables as in the previous tables. The coefficient of *GRVPCCON* is 0.75 and is approximately the same for all four models. It indicates that for every 10% increase in the growth of the aggregate consumption, household consumption increases by 7.5%, *ceteris paribus*. Such a less-than-perfect but high association between the household consumption growth and the community level aggregate consumption growth provides evidence of partial insurance of the household consumption within the local insurance community. This number is much higher than for the case of non-food consumption (Table 4.2). The coefficient of *GRPCHINC* (0.12 and it is approximately the same across different models) is positive and significant indicating that for every 10% increase in household income growth there would be a 1.2% increase in household consumption growth. These coefficients are larger than the predictions made by the permanent income hypothesis (PIH) under no risk sharing (1% increase in transitory income increases consumption by 1% times the interest rate (Cochrane 1991)). This indicates that household consumption is not protected from idiosyncratic shocks.

The coefficient of transfer income (*DREMITTANCE*) is positive and significant across the models, indicating that remittance has a positive effect on household consumption growth. Given that only one-in-three households received the remittances in 2003/04 in our sample, and the remittance income is contributing significantly to the

growth rate of household consumption, the expenditure inequality must have been rising in Nepal.[61]

The effect of violence (*MKILL* and *TOTKILL*) is negative but insignificant on the growth rate of household's per capita consumption indicating that the violent conflict is lowering the overall consumption growth of the households, but the reduction is not significant. This result is surprising on the grounds that it is contrary to *a priori* expectation of the effect of conflict on the household consumption. The implication is that the overall consumption growth rate is least affected by the ongoing conflict. The joint hypothesis of the full consumption insurance ($\beta_{\Delta \ln C_t^A} = 1$ and $\beta_k = 0, \ \forall k$) is strongly rejected at the 1 percent level. The rejection of the full consumption insurance may also be related to the slower pace of change in living standards (Cochrane 1991) as we are using growth rates over a seven-year period. After including the environmental shock (Model-A3 and Model-A4), a variable that measures the occurrences of natural disasters, such as flood, the basic results do not change. The coefficient of *DFLOOD* is negative but insignificant indicating that the shocks coming from natural disasters are basically insured within the insurance community. The coefficients of the remaining control variables are qualitatively similar to the previous results.

[61] Our finding is supported by the increasing expenditure inequality between 1995/96 and 2003/04 in Nepal. CBS (2005) reports that the expenditure GINI index has been increased from 0.34 to 0.42 between these two years that is also confirmed in previous chapter (chapter 2).

Table 4.4: Continuously Updated GMM Estimates (Dep. Var.: Total Exp.)

	Ind. Var.↓	Model-C1	Model-C2	Model-C3	Model-C4
AGG. SHOCK	*GRVPCCON*	0.754*** (0.042)	0.750*** (0.042)	0.767*** (0.042)	0.761*** (0.042)
INCOME SHOCKS	*GRPCHHINC*	0.127** (0.061)	0.116** (0.057)	0.127** (0.061)	0.112** (0.057)
	DREMITTANCE	0.007*** (0.002)	0.006*** (0.002)	0.007*** (0.002)	0.006*** (0.002)
MAN MADE SHOCKS	*LMKILL*	-0.039 (0.040)	-	-0.041 (0.040)	-
	LTOTKILL	-	-0.022 (0.026)	-	-0.021 (0.026)
NATURAL SHOCK	*DFLOOD*	-	-	-0.043 (0.042)	-0.033 (0.042)
PEFERENCE SHIFTERS	*DHHSIZE*	-0.053*** (0.009)	-0.054*** (0.009)	-0.053*** (0.009)	-0.054*** (0.009)
	DHHAGE	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)	0.011*** (0.002)
	DHHSEX	0.087 (0.122)	0.066 (0.123)	0.079 (0.122)	0.061 (0.122)
	CONSTANT	0.066** (0.032)	0.069** (0.032)	0.060* (0.032)	0.064** (0.032)
[a] *White-Koenker* nR^2*-Stat.* (χ^2_{22})		57.74***	57.93***	58.83***	59.25***
[b] *Anderson LR- Stat.* (χ^2_{16})		50.28***	48.67***	50.20***	48.58***
[c] *Hansen J- Stat.* (χ^2_{15})		14.45	14.78	14.02	14.47
[d] *Anderson-Rubin Endo. Stat.* (χ^2_{17})		27.87**	27.87**	27.58**	27.58**
[e] $\chi^2_{(k)}$ [*H0*: $\beta_{\Delta \ln C_t^A} = 1$ & $\beta_k = 0,\ \forall k$]		38.32***	39.82***	37.07***	38.65***
Over-all R^2		0.674	0.677	0.675	0.678
No of Instruments		17	17	17	17
No of Observations		922	922	922	922

Notes: [a] *White-Koenker* test of the presence of heteroskedasticity of unknown form (H0: disturbance is homoskedastic); [b] *Anderson* canonical correlation test of under identification /IV irrelevance (H0: instruments are irrelevant/under ID); [c] *Hansen* test of relevancy/ over-identification of all instruments (H0: all instruments are relevant/over ID); [d] *Anderson-Rubin* endogenity test of suspected regressors (H0: coefficient of endogenous variables are jointly insignificant); [e] Joint hypothesis of full consumption insurance where *k= 4* for first two models and *k=5* for the last two models; Cluster-robust standard errors are within parentheses; *, **, and *** refer to significant at 1%, 5% and 10% level, respectively. For all the shocks the test is one-tailed as predicted by the theory.

One might argue that the households may adopt costly and inefficient self-insurance activities during the violent conflict as conflict imposes higher transaction costs and contract enforcement becomes costly if the borrower threatens violence. In the face of uncertainty about the future due to the high intensity violent conflict, it would be hard to find the lender and households may be forced to opt for autarky. In the case of autarky, the household's consumption is more closely related to household income than to the community level aggregate consumption, a scenario that is absent in our data. In all three consumption categories (non-food, food and total) the coefficient of aggregate consumption is positive and significant, and always greater than the coefficient of household income suggesting that even under high-intensity conflicts, some form of risk sharing is taking place within the local village (insurance community).

4.5.4. Vulnerability to Food Consumption

So far we have seen that there is partial insurance of household consumption in a given community, and food consumption is less insured (more vulnerable) than non-food and total consumption. In this section we explore the level of food consumption vulnerability of households based on their characteristics. We identify three such characteristics: socially disadvantaged low caste/ethnicity (*LOW-CASTE*), low education (*LOW-EDU*), and low income (*POOR*).[62] In our sample, about 32% households are from

[62] Banerjee and Dulfo (2007) document the economic lives of the poor/extremely poor households from 13 different countries where they find that poor have very little access to formal insurance and consumption is strongly affected by variations in their incomes, and evidence of consumption vulnerability of the poor.

socially disadvantaged, low caste/ethnic groups that are considered as the most deprived social strata in Nepal. Over 35% of households have a very low education level, and 50% are relatively poor.[63] We identify these characteristics in order to analyze the relative vulnerability of households in food consumption as food expenditure comprises over 65% of overall households' expenditure in our sample. The relative vulnerability is measured in terms of the coefficient of the interaction between growth rate of per capita income and one of the characteristics of the households we just mentioned. We estimate the following equation:

$$\Delta \ln C_{ht} = \alpha_0 + \alpha_1 \Delta \ln C_t^A + \alpha_2 \Delta \ln Y_{ht} + \alpha_3 Z_{ht} + \alpha_4 (\Delta \ln Y_{ht} \times Z_{ht}) + \alpha_5 \Delta X_{ht} + u_{ht}, \quad [4.9]$$

Where Z_{ht} = 1 if $\{LOW\text{-}CASTE, LOW\text{-}EDU, POOR\}$, 0 otherwise. In this setting, the coefficient of the interaction term (α_4) measures the relative vulnerability (if $\alpha_4 > 0$ and significant) of households with chosen characteristics, Z_{ht}. In order to avoid multi-colinearity, we use one characteristic at a time when estimating equation [4.9] as these

[63] We identify the socially disadvantaged households as the so called 'untouchables', and other households with similar social status. In the NLSS surveys, households are identified by based on their caste/ethnicity that we use for identifying the low caste/ethnic households. For expositional purpose, we use two years or less of average household schooling to identify the households with low education level since less than three years of schooling is below the primary level education, and we assume that less than primary level education is equivalent to no education at all. We use two-thirds of the national average income in order to identify the relatively poor households, but our results remain robust with the change in the cut-off income for relatively poor households.

characteristics are correlated with each other.[64] The rest of the variables used in [4.9] are already defined in [4.8].

Table 4.5 presents the continuously updated GMM estimates for equation [4.9]. The coefficient of the interaction term (*LOW-CASTE*INCOME*) in Model-D1 is negative and insignificant (α_4 = -0.193) indicating that the level of food-consumption vulnerability for the low caste/ethnic households is not significantly different from the reference group. The coefficient of the interaction term in Model-D2 (*LOW-EDU*GRPCHINC*), which measures the marginal effect of the growth rate of household income on food consumption if the household's education level is low, is positive and significant (0.774). It indicates that for households with no or very low level of education, a 10% increase in the growth rate of household income leads to increase the household food consumption growth by 7.74%, an indication of high vulnerability of the households' food consumption growth with low level of education relative to households with higher level of education. The coefficient of the *POOR*GRPCHINC* in Model-D3 is positive and significant (0.369), indicating that food-consumption vulnerability of poor households is much higher than for non-poor households.

[64] The correlation between low-caste and poor is 0.28; it is 0.22 between low-caste and low-education, and 0.27 between poor and low-education.

Table 4.5: Continuously Updated GMM Estimates for Comparing Vulnerability of Households under Different Characteristics (Dep. Var.: Food Exp.)

	Ind. Var.↓	Model-D1	Model-D2	Model-D3
AGG. SHOCK	*GRVPCCON*	0.762*** (0.068)	0.745*** (0.099)	0.818*** (0.069)
INCOME SHOCKS	*GRPCHINC*	0.240** (0.122)	0.270** (0.136)	0.250** (0.122)
	DREMITTANCE	0.004* (0.003)	0.013** (0.008)	0.010** (0.005)
LOW-CASTE	*LOW-CASTE*	0.152** (0.069)	-	-
	*LOWCASTE*GRPCHINC*	-0.193 (0.250)	-	-
LOW-EDUCATION	*LOW-EDUCATION*	-	0.052 (0.090)	-
	*LOWEDU*GRPCHINC*	-	0.774** (0.374)	-
LOW-INCOME	*POOR*	-	-	0.193* (0.116)
	*POOR*GRPCHINC*	-	-	0.369* (0.222)
PEFERENCE SHIFTERS	*DHHSIZE*	-0.060*** (0.010)	-0.039*** (0.018)	-0.049*** (0.013)
	DHHAGE	0.010*** (0.003)	0.004 (0.006)	0.011*** (0.004)
	DHHSEX	-0.002 (0.156)	0.212 (0.255)	0.168 (0.180)
	CONSTANT	0.010 (0.068)	0.195** (0.098)	0.008 (0.107)
[a] *White-Koenker* nR^2*-Stat.* ($\chi^2_{(22)}$)		33.12*	78.16***	31.96*
[b] *Anderson LR-Stat.* ($\chi^2_{(14)}$)		23.47**	27.50**	21.57*
[c] *Hansen J-Stat.* ($\chi^2_{(13)}$)		15.65	14.83	15.16
[d] *Anderson-Rubin Endo. Stat.* ($\chi^2_{(16)}$)		37.48***	40.82***	50.73***
Over-all R^2		0.578	0.497	0.388
No of Instruments		16	16	16
No of Observations		922	922	922

Notes: [a] *White-Koenker* test of the presence of heteroskedasticity of unknown form (H0: disturbance is homoskedastic); [b] *Anderson* canonical correlation test of under identification /IV irrelevance (H0: instruments are irrelevant/under ID); [c] *Hansen* test of relevancy/ over-identification of all instruments (H0: all instruments are relevant/over ID); [d] *Anderson-Rubin* endogenity test of suspected regressors (H0: coefficient of endogenous variables are jointly insignificant); Cluster-robust standard errors are within parentheses; *, **, and *** refer to significant at 1%, 5% and 10% level, respectively. For all the shocks the test is one-tailed as predicted by the theory.

4.5.5. Consumption Insurance for Low Caste/Ethnic Households

The evidence so far indicates that low caste/ethnic households are not more vulnerable than the other households in terms of food consumption. It is contrary to the general expectation as the low caste/ethnic households are socially disadvantaged and discriminated in the society, in terms of access to education and employment. We further test the consumption insurance hypothesis for the low caste/ethnic households. Given their low social status, those households may have stronger social networks in a given village and may help each other out in times of needs. Such type of social insurance through caste/ethnicity based social networks is observed in India (Munshi and Rosenzweig 2005). If this is the case, then the low caste/ethnic households might have full consumption insurance through their own social networks in a given village. Table 4.6 presents the results from CU-GMM estimates for the sub-sample of low caste/ethnic households where the dependent variable is the growth rate of household per capita food consumption. Here, we re-estimate Models B1, B2, B3 and B4 for the sub-sample. As surmised, the coefficients of all but aggregate consumption growth are insignificant across all models, and the joint hypothesis of full consumption insurance is not rejected, indicating that full consumption insurance is taking place for low caste/ethnic households in a given village. Support to the full consumption insurance hypothesis in the case of low caste/ethnic households may be due to the fact that those households may have good social networks, and help each other out given their disadvantaged position in Nepalese society. Though the issue is interesting, the survey data does not report any such information that allows us further investigation.

Table 4.6: Continuously Updated GMM Estimates (Dep. Var.: Food Exp. for Low Caste/Ethnic HHs)

	Ind. Var.↓	Model B1	Model B2	Model B3	Model B4
AGG. SHOCK	*GRVPCCON*	0.781*** (0.134)	0.773*** (0.129)	0.839*** (0.123)	0.827*** (0.118)
INCOME SHOCKS	*GRPCHHINC*	-0.022 (0.123)	-0.027 (0.123)	-0.033 (0.122)	-0.033 (0.122)
	DREMITTANCE	0.003 (0.010)	0.003 (0.010)	0.003 (0.010)	0.004 (0.010)
MAN MADE SHOCKS	*LMKILL*	0.019 (0.172)	-	0.032 (0.171)	-
	LTOTKILL	-	0.035 (0.101)	-	0.053 (0.100)
NAT. SHOCK	*DFLOOD*	-	-	-0.119 (0.017)	-0.123 (0.104)
PEFERENCE SHIFTERS	*DHHSIZE*	-0.092*** (0.017)	-0.092*** (0.017)	-0.091*** (0.017)	-0.092*** (0.017)
	DHHAGE	0.006 (0.007)	0.005 (0.007)	0.006 (0.007)	0.004 (0.007)
	DHHSEX	-0.184 (0.317)	-0.207 (0.321)	-0.183 (0.312)	-0.225 (0.317)
	CONSTANT	0.126 (0.131)	0.123 (0.122)	0.062 (0.129)	0.063 (0.117)
[a] *White-Koenker* nR^2*-Stat.* $(\chi^2_{(20)})$		26.20	27.19	28.31	30.09*
[b] *Anderson LR-Stat.* $(\chi^2_{(14)})$		27.67**	26.96**	27.66**	27.22**
[c] *Hansen J-Stat.* $(\chi^2_{(13)})$		9.80	9.61	10.44	10.14
[d] *Anderson-Rubin Endo. Stat.* $(\chi^2_{(15)})$		30.21**	30.21**	31.09***	31.09***
[e] $\chi^2_{(4)}$ [*H0*: $\beta_{\Delta \ln C_t^A} = 1$ & $\beta_k = 0, \ \forall k$]		3.86	3.73	2.75	2.74
Over-all R^2		0.600	0.597	0.599	0.596
No of Instruments		15	15	15	15
No of Observations		922	922	922	922

Notes: [a] *White-Koenker* test of the presence of heteroskedasticity of unknown form (H0: disturbance is homoskedastic); [b] *Anderson* canonical correlation test of under identification /IV irrelevance (H0: instruments are irrelevant/under ID); [c] *Hansen* test of relevancy/ over-identification of all instruments (H0: all instruments are relevant/over ID); [d] *Anderson-Rubin* endogenity test of suspected regressors (H0: coefficient of endogenous variables are jointly insignificant); [e] Joint hypothesis of full consumption insurance where *k= 4* for first two models and *k=5* for the last two models; Cluster-robust standard errors are within parentheses; *, **, and *** refer to significant at 1%, 5% and 10% level, respectively. For all the shocks the test is one-tailed as predicted by the theory.

4.5.6. Coping Mechanisms

In the absence of formal insurance markets, households may smooth their consumption using local informal institutions and sometimes they may participate in costly self-insurance activities, such as depleting their savings and selling assets in order to protect household consumption during bad times. In our sample, it seems that the credit market is used to some extent for smoothing household consumption as the share of loans to total household consumption is over 30% for the entire sample of households, and this ratio is about 46% for the sub-sample where households actually borrowed money (over 66% of households did that) for several purposes. For those households who borrowed money for consumption purpose (over 35% of households), the average ratio of credit to total consumption is 22.2% (ranging from 0.2% to 206%). Other than borrowing, about 25% of households use self-employment as a coping mechanism, and about the same percentage of households use share-cropping as a measure of income/consumption smoothing.[65]

In this sub-section, we investigate different coping strategies of the Nepalese households. Using panel aspect of NLSS-II data, we identify three different coping strategies of households, and analyze how the households are coping with different shocks, such as, food deficit, illness, violence in the village, and flooding. We run three logit regressions in which the dependent variable is the one of the coping strategies that we mention above. We use various shocks as explanatory variables along with

[65] Jacoby and Skoufias (1997) find that during bad years, children from poor family leave schools, a tendency absent in our sample as only six households reported school drop-out out of 960 households surveyed in the sample.

households' characteristics, community characteristics, and ecological belts. For household characteristics, we use caste/ethnicity, gender, age, education, and landholdings status (land owner or landless); for community characteristic, we use the presence of various kinds of social networks, such as, forest user groups, water user groups, women groups farmer groups and credit groups, perception index of households about the adequacy of the public facilities, such as, drinking water, electricity, post-office, public-health, road, school, and telephone in the villages; and for ecological belts we use mountain or hills with flat plain as the base category.

As we can see from Table 4.7, the probability of share-cropping goes down with the presence of violence in the village and if the household members are more educated; the probability of share-cropping goes up if the household experience flooding and the household head is a male. The probability of self-employment goes down if the household receives remittances; such probability goes up if the household belong to the low caste/ethnicity, if the household is land less, if the household members are educated and if the household head is a male. The probability of borrowing for consumption purpose goes up if the household experiences food-deficit, without such borrowing it is very likely that households would starve. The probability of borrowing for consumption goes down if the household is living in a village where violence is broken out, or if the household members are educated. This makes intuitive sense as violence increases the transaction costs of borrowing, and borrowing for consumption is un-productive activity that an educated (informed) household can avoid.

Table 4.7: Logit Estimates for Household Coping Strategies (Dep Var.: Coping Strategy)

	Coping Strategy →	Share-Cropping		Self-Employed		Borrowing for Consumption	
	Variables ↓	Coeff.	dy/dx	Coeff.	dy/dx	Coeff.	dy/dx
DIFFERENT SHOCKS	*FOODDEFICIT*	0.246	0.042	0.034	0.006	0.771***	0.177***
		(0.202)	(0.036)	(0.199)	(0.033)	(0.175)	(0.042)
	ILLNESS	0.054	0.009	0.243	0.041	0.268	0.060
		(0.193)	(0.032)	(0.187)	(0.033)	(0.175)	(0.040)
	VIOLENCE	-0.152*	-0.025*	-0.004	-0.001	-0.329***	-0.072***
		(0.091)	(0.015)	(0.084)	(0.014)	(0.081)	(0.018)
	REMITTANCE	0.301	0.051	-0.803***	-0.122***	-0.040	-0.009
		(0.190)	(0.033)	(0.217)	(0.030)	(0.173)	(0.038)
	FLOOD	0.781***	0.148***	0.002	0.000	0.208	0.047
		(0.242)	(0.051)	(0.277)	(0.046)	(0.229)	(0.053)
HOUSEHOLD CHARACTERISTICS	*LOW CASTE*	-0.216	-0.035	1.382***	0.258***	-0.212	-0.046
		(0.251)	(0.040)	(0.262)	(0.051)	90.217)	(0.046)
	MID CASTE	0.153	0.026	0.221	0.037	-0.223	-0.048
		(0.219)	(0.488)	(0.229)	(0.039)	(0.194)	(0.042)
	MALE HEAD	1.030***	0.140***	0.619**	0.091**	-0.026	-0.006
		(0.264)	(0.029)	(0.276)	(0.035)	(0.203)	90.045)
	HHAGE	-0.037***	-0.006***	-0.022***	-0.004***	-0.018***	-0.004***
		(0.008)	(0.001)	(0.007)	(0.001)	(0.006)	(0.001)
	HHEDU	-0.082***	-0.013***	0.090***	0.015***	-0.066***	-0.015***
		(0.025)	(0.004)	(0.023)	(0.004)	(0.021)	(0.005)
	LANDLESS	0.010	0.002	0.521**	0.093**	-0.169	-0.037
		(0.260)	(0.043)	(0.226)	(0.043)	(0.213)	(0.045)
Wald (χ^2_{19})		102.95***		99.38***		124.37***	
$\hat{y} = \Pr(coping = j)$		0.208		0.207		0.326	
Pseudo R^2		0.103		0.128		0.118	
No of Observations		922		922		922	

Note: Other than various shocks and household characteristics, we also use community characteristics such as, presence of various kinds of social networks (forest user groups, water user groups, women groups and farmer groups), perception index of households about the adequacy of the public facilities (drinking water, electricity, post-office, public-health, road, school, and telephone) in the villages, ecological belts (mountain or hills with flat plain as a base category). Coefficients of these community characteristics as well as the constant term are not included in the table. Robust standard errors are within parentheses.

4.5.7. Instrument Sensitivity

The CUE estimates may be very sensitive to the instruments. We, therefore, estimate all of the different models presented in Tables 4.2, 4.3 and 4.4 with a different sub-sets of instruments to test the sensitivity of results with respect to the set of instruments. We do so by removing sub-sets of instruments from the original set of 17.

The instruments taken out are related to social network indices (farmer index, water index, forest index, and women index). The CUE estimates with the smaller set of instruments are reported in three additional tables below (Tables 4.8, 4.9 and 4.10). Now we can compare the results from Table 4.2 and Table 4.8, Table 4.3 and Table 4.9, and Table 4.4 and Table 4.10. A closer look reveals that there is no fundamental (qualitative or quantitative) differences between the new results and the ones presented in Tables 4.2, 4.3 and 4.4, indicating that our results are not sensitive to the particular sub-set of instruments. The stability of the coefficients and standard errors with the use of different sets of instruments also indicates that our CUE estimates do not suffer weak instruments or identification problems. If identification is weak, then estimated coefficients would be very sensitive to the different subset of instruments (Stock, Wright and Yogo 2002).

Table 4.8: Continuously Updated GMM Est. (Sub-set of Instruments, Dep. Var.: Non-Food Exp.)

	Ind. Var.↓	Model-E1	Model-E2	Model-E3	Model-E4
AGG. SHOCK	*GRVPCCON*	0.369*** (0.074)	0.370*** (0.073)	0.350*** (0.084)	0.351*** (0.083)
INCOME SHOCKS	*GRPCHHINC*	0.126 (0.104)	0.148 (0.152)	0.122 (0.104)	0.143 (0.103)
	DREMITTANCE	0.010** (0.004)	0.011*** (0.004)	0.010** (0.004)	0.010*** (0.004)
MAN MADE SHOCKS	*LMKILL*	-0.008 (0.071)	-	0.009 (0.072)	-
	LTOTKILL	-	-0.008 (0.051)	-	-0.007 (0.051)
NATURAL SHOCK	*DFLOOD*	-	-	0.084 (0.117)	0.084 (0.117)
PEFERENCE SHIFTERS	*DHHSIZE*	-0.064*** (0.012)	-0.063*** (0.013)	-0.064*** (0.012)	-0.063*** (0.013)
	DHHAGE	0.008** (0.003)	0.008** (0.003)	0.008** (0.003)	0.008** (0.003)
	DHHSEX	0.152 (0.132)	0.150 (0.132)	0.149 (0.132)	0.148 (0.132)
	CONSTANT	0.401*** (0.057)	0.406*** (0.058)	0.420*** (0.066)	0.424*** (0.068)
[a] *White-Koenker* nR^2*-Stat.* (χ^2_{19})		35.23***	34.60**	38.68***	38.18***
[b] *Anderson LR-Stat.*(χ^2_{12})		42.45***	42.43***	42.33***	42.34***
[c] *Hansen J-Stat.*(χ^2_{11})		4.16	4.15	4.23	4.22
[d] *Anderson-Rubin Endo. Stat.* (χ^2_{13})		25.07**	25.07**	24.05**	24.05**
[e] $\chi^2_{(k)}$ [*H0*: $\beta_{\Delta \ln C_t^A} = 1$ & $\beta_k = 0,\ \forall k$]		83.42***	81.37***	81.35***	79.47***
Over-all R^2		0.544	0.541	0.545	0.543
No of Instruments		13	13	13	13
No of Observations		922	922	922	922

Notes: [a] *White-Koenker* test of the presence of heteroskedasticity of unknown form (H0: disturbance is homoskedastic); [b] *Anderson* canonical correlation test of under identification /IV irrelevance (H0: instruments are irrelevant/under ID); [c] *Hansen* test of relevancy/ over-identification of all instruments (H0: all instruments are relevant/over ID); [d] *Anderson-Rubin* endogenity test of suspected regressors (H0: coefficient of endogenous variables are jointly insignificant); [e] Joint hypothesis of full consumption insurance where *k= 4* for first two models and *k=5* for the last two models; Cluster-robust standard errors are within parentheses; *, **, and *** refer to significant at 1%, 5% and 10% level, respectively. For all the shocks the test is one-tailed as predicted by the theory.

Table 4.9: Continuously Updated GMM Ests. (Sub-set of Instruments, Dep. Var.: Food Exp.)

	Ind. Var.↓	Model-F1	Model-F2	Model-F3	Model-F4
AGG. SHOCK	*GRVPCCON*	0.732***	0.735***	0.758***	0.763***
		(0.070)	(0.069)	(0.072)	(0.071)
INCOME SHOCKS	*GRPCHHINC*	0.173**	0.163**	0.167**	0.160**
		(0.081)	(0.077)	(0.078)	(0.077)
	DREMITTANCE	0.004*	0.004*	0.004*	0.003
		(0.003)	(0.003)	(0.003)	(0.003)
MAN MADE SHOCKS	*LMKILL*	-0.127**	-	-0.129**	-
		(0.062)		(0.061)	
	LTOTKILL	-	-0.083**	-	-0.085**
			(0.042)		(0.042)
NATURAL SHOCK	*DFLOOD*	-	-	-0.047	-0.052
				(0.048)	(0.049)
PEFERENCE SHIFTERS	*DHHSIZE*	-0.056***	-0.057***	-0.054***	-0.055***
		(0.010)	(0.010)	(0.010)	(0.010)
	DHHAGE	0.013***	0.013***	0.012***	0.012***
		(0.003)	(0.003)	(0.003)	(0.003)
	DHHSEX	0.029	0.016	-0.257*	-0.257
		(0.150)	(0.150)	(0.156)	(0.157)
	CONSTANT	0.061	0.071	0.174**	0.182**
		(0.053)	(0.053)	(0.084)	(0.085)
[a] *White-Koenker* nR^2*-Stat.* (χ^2_{19})		37.39***	38.52***	45.45***	45.68***
[b] *Anderson LR-Stat.* (χ^2_{12})		42.45***	42.43***	59.95***	58.79***
[c] *Hansen J-Stat.* (χ^2_{11})		15.79	16.54	15.84	16.85
[d] *Anderson-Rubin Endo. Stat.* (χ^2_{13})		35.06***	35.06***	31.26***	31.26***
[e] $\chi^2_{(k)}$ [*H0*: $\beta_{\Delta \ln C_t^A} = 1$ & $\beta_k = 0,\ \forall k$]		17.34***	18.36***	18.08***	18.25***
Over-all R^2		0.599	0.602	0.601	0.604
No of Instruments		13	13	13	13
No of Observations		922	922	922	922

Notes: [a] *White-Koenker* test of the presence of heteroskedasticity of unknown form (H0: disturbance is homoskedastic); [b] *Anderson* canonical correlation test of under identification /IV irrelevance (H0: instruments are irrelevant/under ID); [c] *Hansen* test of relevancy/ over-identification of all instruments (H0: all instruments are relevant/over ID); [d] *Anderson-Rubin* endogenity test of suspected regressors (H0: coefficient of endogenous variables are jointly insignificant); [e] Joint hypothesis of full consumption insurance where *k= 4* for first two models and *k=5* for the last two models; Cluster-robust standard errors are within parentheses; *, **, and *** refer to significant at 1%, 5% and 10% level, respectively. For all the shocks the test is one-tailed as predicted by the theory.

Table 4.10: Continuously Updated GMM Ests. (Sub-set of Instruments, Dep. Var.: Total Exp.)

	Ind. Var.↓	Model-G1	Model-G2	Model-G3	Model-G4
AGG. SHOCK	*GRVPCCON*	0.753*** (0.043)	0.749*** (0.043)	0.774*** (0.042)	0.770*** (0.042)
INCOME SHOCKS	*GRPCHHINC*	0.144** (0.068)	0.149** (0.066)	0.137** (0.067)	0.139** (0.065)
	DREMITTANCE	0.007*** (0.003)	0.007*** (0.003)	0.007*** (0.003)	0.007*** (0.002)
MAN MADE SHOCKS	*LMKILL*	-0.048 (0.045)	-	-0.047 (0.045)	-
	LTOTKILL	-	-0.035 (0.030)	-	-0.032 (0.29)
NATURAL SHOCK	*DFLOOD*	-	-	-0.046 (0.043)	-0.046 (0.044)
PEFERENCE SHIFTERS	*DHHSIZE*	-0.052*** (0.009)	-0.053*** (0.009)	-0.053*** (0.009)	-0.054*** (0.009)
	DHHAGE	0.012*** (0.002)	0.012*** (0.002)	0.011*** (0.002)	0.011*** (0.002)
	DHHSEX	0.092 (0.122)	0.074 (0.123)	0.089 (0.121)	0.074 (0.122)
	CONSTANT	0.062* (0.032)	0.066** (0.033)	0.055* (0.032)	0.057* (0.033)
[a] *White-Koenker* nR^2*-Stat.* (χ^2_{19})		53.89***	53.76***	55.29***	55.27***
[b] *Anderson LR-Stat.* (χ^2_{12})		42.45***	42.43***	42.33***	42.34***
[c] *Hansen J-Stat.* (χ^2_{11})		13.55	13.42	13.19	13.09
[d] *Anderson-Rubin Endo. Stat.* (χ^2_{13})		25.96**	25.96**	25.62**	25.62**
[e] $\chi^2_{(k)}$ [*H0*: $\beta_{\Delta \ln C_t^A} = 1$ & $\beta_k = 0, \ \forall k$]		37.61***	38.62***	35.97***	36.99***
Over-all R^2		0.670	0.669	0.672	0.672
No of Instruments		13	13	13	13
No of Observations		922	922	922	922

Notes: [a] *White-Koenker* test of the presence of heteroskedasticity of unknown form (H0: disturbance is homoskedastic); [b] *Anderson* canonical correlation test of under identification /IV irrelevance (H0: instruments are irrelevant/under ID); [c] *Hansen* test of relevancy/ over-identification of all instruments (H0: all instruments are relevant/over ID); [d] *Anderson-Rubin* endogenity test of suspected regressors (H0: coefficient of endogenous variables are jointly insignificant); [e] Joint hypothesis of full consumption insurance where *k= 4* for first two models and *k=5* for the last two models; Cluster-robust standard errors are within parentheses; *, **, and *** refer to significant at 1%, 5% and 10% level, respectively. For all the shocks the test is one-tailed as predicted by the theory.

CHAPTER 5

SUMMARY, CONCLUSIONS AND FUTURE DIRECTIONS

5.1. Summary

This research revolves around the distributional issues such as inequality, polarization, and poverty, and their relationship with the violent conflict and its welfare consequences in Nepal's households. During 1995/96 – 2003/04 Nepal experienced the worst form of violent conflict that claimed over 13,000 lives and over 200,000 people were displaced internally. Given the intensity and effect of the violent conflict, we construct the poverty, inequality and polarization indices across the villages of Nepal, and analyze if the violent conflict is related to those distributional issues. We also analyze the effect of decade-old violent conflict on the households' welfare.

The main research is presented in three chapters. In chapter 2, we analyze the poverty and inequality situations among the villages of Nepal during 1995/96 and 2003/04. This poverty / inequality mapping is first of its kind using Nepal data. For poverty and inequality mapping, we basically use Nepal Living Standard Surveys I & II along with the Nepal Population Census 2001. With the use of micro-level estimation technique, we combine nationally representative but relatively smaller surveys information with the national census that enables us to estimate village level distributional measures which would be not possible without the use of such statistical methods.

The main contribution regarding the poverty and inequality mapping is that to our knowledge this is the first attempt to estimate village level poverty and inequality across Nepal. So far, all sorts of development policies are made based on aggregate analysis of

distributional issues in the lack of micro-level information. In a heterogeneous country like Nepal, such aggregate distributional measures do not provide relevant and essential information that can be used for designing village level public policies.

In chapter 3, we present the public choice theory of conflict and derive testable hypotheses about the role of distributional measures in escalating the violent conflict. Using poverty and inequality indices derived in chapter 2 along with the polarization indices that we also estimate, we test several hypotheses related to the violent conflict and inequality, polarization, poverty, social capital and government welfare programs. We find that inequality and polarization have significant positive association with the violent conflict, where as social capital and government welfare programs have significant negative relationship with the violent conflict that is measured in terms of people killed by the Maoist during the 1996 – 2004 period.

In chapter 4 we test the full consumption insurance hypothesis that is derived from the state dependent time separable household utility function in the presence of violent conflict. This hypothesis asserts that in a given community, households can maximize their welfare by pooling their resources and ensuring each other in the times of needs. For the analysis, we use the panel aspect of the household surveys from 1995/96 and 2003/04. We not only use traditional indirect measures of shocks, such as household non-transfer income, but also direct measures of shocks, such as the level of violence in the given village, remittances received by the households, and additional shocks due to natural disasters, such as flood. As the correlations between all these shocks are not high to raise concerns about multicollinearity, we use all shocks simultaneously. Due to the presence of error heterogeneity and endogenity of some of the key right hand side

variables we use the continuously updated GMM method for estimation that is robust to the weak instruments.

5.2. Conclusions

A recent household survey (NLSS-II) indicates that Nepal poverty has gone down (the aggregate head count index went down 0.42 to 0.32) but inequality went up (the Gini index increased from 0.34 to 0.42) significantly between 1995/96 and 2003/04 (CBS 2005). Despite such indication that the aggregate level of poverty went down by 10 percentage points during the past eight years (1995/96 – 2003/04), our findings indicate that the reduction is not uniform in the first place, and the level of poverty actually went up in the significant part of the country that comprises over 40% of the total population. Our findings suggest that the increased poverty among the significant portion of the population accompanied by the accelerating inequality and polarization throughout the country has compounded the divide between the haves and the have-nots and provided a suitable atmosphere for the conflict.

Combining rational choice theory with micro-level sub-national data from Nepal that facilitates controls for heterogeneous cross-country and international factors,[66] we

[66] The heterogeneity in cross-cultural norms, institutions and unique historical settings can produce different reference points or anchors, and a lack of common anchor within the sample can bias the perception of the threat and hence the measurement of such variables. Cultural and historical differences may influence the perception of the acceptable levels of violence in cross-country settings. Our micro level sub-national data

analyze the association between inequality and violent conflict in chapter 3. Along with the traditional measures of inequality, the *GINI* index, we also construct and use the recently developed polarization indices advanced by Esteban and Ray (1994, 1999) to explain the violent conflict. Using negative binomial count data models with test and correction for endogenity, results from multi-level analysis are robust and highly significant irrespective of the measure of inequality (*GINI* or *POLARIZATION*) used for the analysis, indicating that distributional outcomes do matter significantly when it comes to the violent conflict.

However, inequality or polarization is not the only source of the violent conflict. As indicated by the theory, weak rule of law, weak enforcement of property rights, and dearth of social capital can help to propagate the conflict. Our empirical results find support to the hypothesis that social capital generates valuable spillover effects in the form of shared value, norms, self-governance and understandings among the villagers that encourages the community members to cooperate among themselves that helps deterring the violent conflict.

Another important finding of our research is that transfer of resources from the central to the local governments can play vital role in lowering the violence as it may provide the sense of hope, connectedness and opportunity to the local people. In the backdrop of widespread poverty in the villages of Nepal, we also find a significant positive association between level of poverty and the intensity of the violence. The policy implications of these findings are that government policies towards balancing the

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avoids such cross-cultural heterogeneity and differential perceptions (Bohara, Mitchell and Nepal 2006).

unintended inequality combined with grants and targeted transfers for reducing poverty can potentially solve much of the problems for which the Maoists are blamed. Such policies can deliver expected outcomes provided that the transferred funds find their way to the intended beneficiaries. International agencies, local institutions, Non-Governmental Organizations (NGOs), and civil society can play meaningful roles by developing a productive partnership to achieve such objectives in the light of widespread perceptions that corruption is rampant in the government offices and such corruption also engenders poverty.[67] Motivating such partnership towards promoting social networks in the local communities would provide an added bonus for creating lasting peace as we find that social capital helps to inhibit the violence by promoting understandings among the community members.

Additional way of looking at the solution is that what factors are contributing to the increased inequality. As this research shows, the foremost contributors of rising inequality are enterprise income and remittances. On the other hand, agriculture income, high school and college level education help to reduce the inequality. Then the policy implication of these findings is that focusing on agricultural sector, high school and college education along with fiscal policy-mix (tax-transfer) could address the rising inequality and poverty.

[67] The Transparency International corruption perception index (CPI) for Nepal is 2.5 in 2006. The index value below 3 is considered as an indication of rampant corruption (TI 2006).

The results from Chapter 4 show that households are insured for the violence related shocks in the case of non-food expenditures, but those households are highly vulnerable in the case of food consumption. In our sample, food consumption absorbs majority of the household total expenditure (65% of the total household expenditure in an average), and it is not insured against the violence related shocks implying that the household are suffering from food insecurity due to the decade-old violent conflict. When analyzed the effect of household income growth on the food consumption growth, all types of households are vulnerable, but we find that households with low education and with low income are more vulnerable than the households with higher education level and with higher income level.

When we divide the households based on the caste/ethnicity, a variable that is considered as the root cause of several ills in the society, the socially disadvantaged low caste/ethnicity does not appeared to be more vulnerable than the reference caste/ethnicity. We further investigate if the low caste/ethnic households have separate kind of social networks that provide insurance during the difficult times. In the sub-sample of low caste/ethnic households, the full consumption insurance hypothesis is not rejected providing some support to the basic conjecture. In our sample, the households are using share-cropping, self-employment and borrowing for consumption as coping strategies of food consumption vulnerability. These coping strategies, however, are highly dependent on the types of shocks the household experience and the characteristics of household.

Our finding that low caste/ethnic households are not relatively more vulnerable than other households is a good news in the sense that public policies can always be devised to influence the variables like income and education, but the perception of

caste/ethnicity is hard to change in the short period of time. The policy implication is that public policies targeting the education and employment help to protect the households from being vulnerable towards food security.

5.3. Future Directions

Estimating poverty, inequality, and polarization across the villages of Nepal is one of the main contributions of this research. Still, Nepal population census data prior to 2001 has not been considered for this research due to its unavailability in a usable format. The village level poverty and inequality mapping aspect of this research could be improved if we could make use of the population census of 1991 along with Nepal population census of 2001. The use of this additional data will bring new dimensions to the poverty and inequality mapping across the villages of Nepal and the comparison of poverty and inequality between the 1990s and 2000s would be more natural.

A natural extension of this research is to analyze the effect of various macroeconomic policies to the village level poverty and inequality using computable general equilibrium modeling frameworks. Given the current states of affairs in Nepal where caste/ethnicity has been in the forefront of the public policy debate, impact of various policies on the poverty level of ethnic groups and resulting intra-ethnic income distribution would be another way of extending this research.

A question that this research brings up is why other countries with similar or even more unequal distribution of income and wealth have not witnessed the widespread violence seen in Nepal. A case in point is India, where violent conflict between the government and Maoist organizations has occurred, but only locally and sporadically.

There may be some bearing to the fact that India has a long history of democracy and stable institutions. A hypothesis is that effective redistribution by the central government from wealthier states to poorer ones has prevented inequality from growing worse and avoided conflict. Further research into this issue should be rewarding for a number of reasons. If this hypothesis is valid, it is not only consistent with our findings but would exemplify the kind of center-state institutions Nepal needs in its transition to democracy in order to solve this thorny problem. It would also indicate to emerging countries which have not seen this scale of violence that they should pay greater attention to widening inequality and deepening polarization in their societies that might threaten their growing prosperity.

Contrary to the general belief that low caste/ethnic households are socially and economically disadvantaged and may be more vulnerable to shocks that impacts their consumption. Our findings suggests that low caste/ethnic households are not relatively vulnerable than other households and sub-sample of low caste/ethnic households exhibit full consumption insurance. We suspect that these low caste/ethnic households may have stronger social networks among themselves that provide better insurance in times of needs. Our survey data lacks information regarding intra-caste/ethnic social networks. While conducting socio-economic surveys, such as NLSS, addition of few more survey components that helps to collect information regarding caste/ethnic-specific social networks. This additional information would be helpful to better understand why low caste/ethnic households are not more vulnerable than the other households given their low socio-social status.

Finally, the widespread poverty and growing inequality may have far- reaching environmental impacts in the face of a decade long violent conflict. Analyzing the environmental impacts of the conflict, inequality and poverty would be a logical extension of this research.

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APPENDIX A: SOFTWARE AND CODES

1. Example of SAS Codes for Data Preparation for Poverty Mapping Using SAS[68]

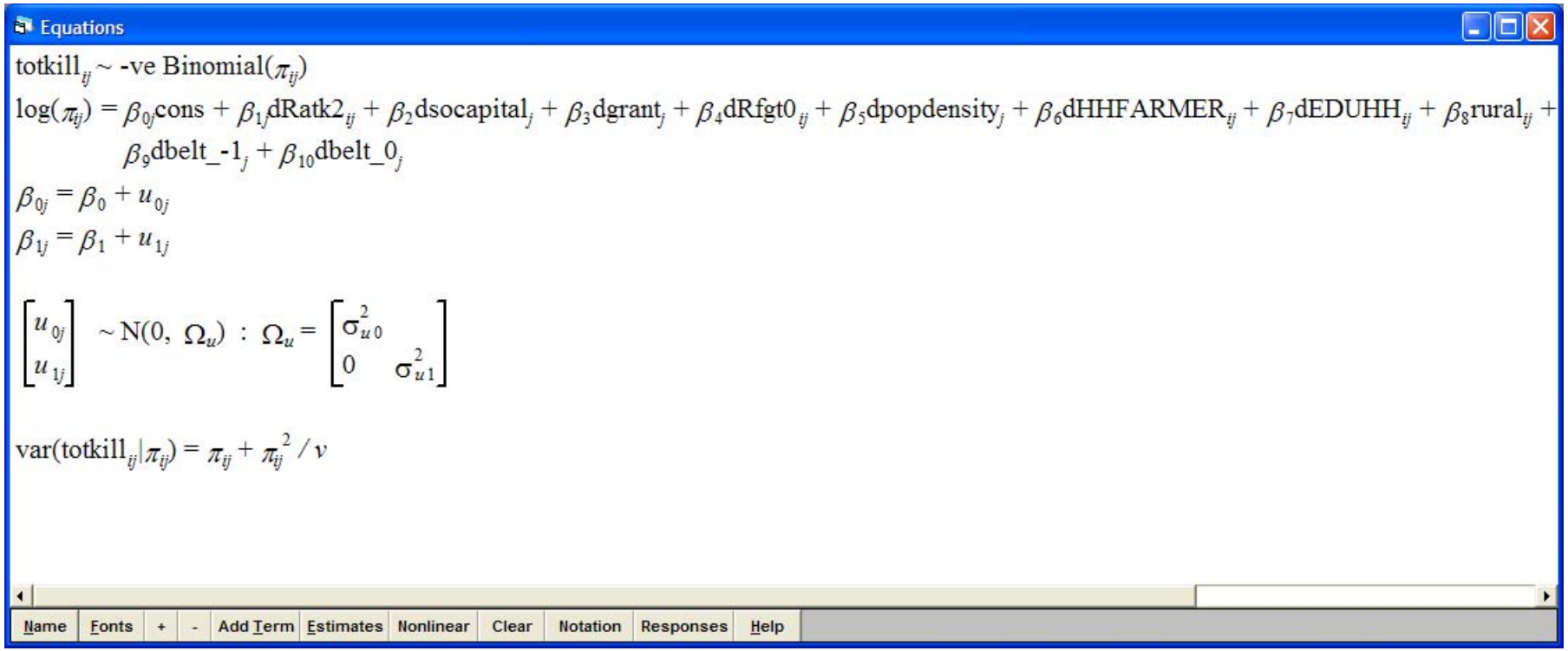
```
*============= Specify the Survey information ==================;
**** dir of survey data **;   %let sdir=;
**** input dataset name **;   %let srvdata=NLSSI;
**** clustering variable *;   %let Cluster=CLUSTER;
**** survey weight *******;   %let sWeight=FACTORES;
**** LHS variable ********;   %let lhs= LRPCEXP;
**** Beta RHS variables **;   %let rhs=
EDUCHD HEADAGE NOWIFE EDUCWF WIFEAGE PPD YGIENE1
TOPER2 TOPER3 PPD2 PPD3 CMEAN2 CMEAN3 CMEAN25 CMEAN40 SCMN22;
**** Alpha RHS vars ******;   %let arhs=VAR4 VAR11 XBETA4 S12 S112 S23
S45 S46;
**** Locational effect? **;   %let LOCERR=YES;

*================ Specify the census information ===============;
**** dir of Census data***;   %let cdir=;
**** input dataset name **;   %let cendata=smallcengabe;
**** census weight  ******;   %let cWeight=OPERSON;
**** ID Vars in census ***;   %let cKeyVar=Cluster;
**** Cluster only vars ***;   %let cOnlyVar=CMEAN2 CMEAN3 CMEAN25
CMEAN40 SCMN22;
**** Cluster only file ***;   *%let cOnlyDat=cclusterOnly;

*================= Output Directory ============================;
**** output directory ***;    %let outdir=;
%let LOCERR=Yes;
%let dataout=small;
%dataprep;
```

[68] The above program is written in SAS macro language, and adopted from Zhao (2004).

2. Example of Multilevel Estimation Using MLwiN



3. Example of STATA Codes for GMM Estimates

```
ivreg2 grpchfcon grvpcon dremit lowcast dHHsize dHHage dHHmale
(grpchinc ltotkill lowcastinc = electricity HHEDU foodinsuff sharecrop
selfemp HHMONTHWORK HHFARMER PerCapILLdays dfarm dwater dforest dwomen
vdcpop houseowned popdensity_2001 NLSTOCK PublicIndex ), cluster(WWW)
cue orthog(vdcpop houseowned popdensity_2001 NLSTOCK
PublicIndex)redundant (vdcpop houseowned popdensity_2001 NLSTOCK
PublicIndex) ffirst
ivhettest, nr2
test grvpcon=1
test lMtotkill=0, accumulate
test grpchinc=0, accumulate
test dremit=0, accumulate
```

APPENDIX B: FIRST AND SECOND STAGES REGRESSION RESULTS

Table B1 : First-Stage (Beta Regression[1]) GLS Estimates for Log Per-Capita Expenditure

	1995/96		2003/04	
Variable	Coefficient	Std. Error	Coefficient	Std. Error
INTERCEPT	8.20***	0.096	8.68***	0.081
HINDU	-0.04	0.028	0.02	0.023
NEWARI	0.01	0.068	0.09**	0.042
BAHUNCHHETRI	0.07**	0.027	0.07***	0.023
TAMAGURALI	0.01	0.031	-0.06**	0.027
DAKASA	-0.08**	0.036	-0.10***	0.031
TERAICASTE	0.08**	0.033	0.01	0.030
MALE	-0.01	0.025	-0.06***	0.020
MARRIED	-0.03	0.025	0.02	0.022
AGEHEAD	0.00*	0.001	0.00***	0.001
FARMERH	0.00	0.019	-0.04	0.033
PERMANENTHOUSE	0.34***	0.040	0.15***	0.030
SEMIPERMANENT	0.15***	0.030	-0.05**	0.024
OWNHOUSE	-0.02	0.036	0.21***	0.031
WATERPIPED	0.05**	0.025	0.10***	0.023
WATERWELL	0.05	0.033	0.03	0.030
TOILETFLUSH	0.22***	0.044	0.22***	0.025
LIGHTELECTY	0.24***	0.034	0.17***	0.021
TV	0.19***	0.040	0.57***	0.032
FULEWOOD	-0.03	0.027	-0.07***	0.021
CANWRITE	-0.02	0.022	-0.05**	0.022
EDUCATION	0.02**	0.009	0.01**	0.003
OWNLAND	0.13***	0.026	0.10***	0.022
HHAGE	0.01***	0.001	0.01***	0.001
HHFARMER	-0.14***	0.047	-0.28***	0.065
HHNOTWORK	-0.21***	0.057	-0.95***	0.134
HHMONTHWORK	0.02***	0.003	0.03***	0.004
HHWRITE	0.43***	0.043	0.43***	0.033
HHEDU	-0.01	0.009	0.01***	0.003
EASTERN	0.35***	0.053	-0.03	0.043
CENTRAL	0.30***	0.052	0.02	0.041
WESTERN	0.19***	0.055	0.06	0.044
FWESTERN	-0.04	0.065	0.01	0.057
MOUNTAIN	0.01	0.048	0.12***	0.042
TERAI	-0.09**	0.045	-0.02	0.033
RURAL	-0.10*	0.060	-0.14***	0.034
HHSIZE	-0.05***	0.004	-0.03***	0.003
[2]Adjusted R^2	0.502		0.642	
N	3373		3909	
Sample Clusters	274		326	

[1]Estimates for equation [2.1]

[2]The adjusted R^2 is reported from the OLS regression as GLS does not have such measure.

Table B2: Heteroscedastic Model (Alpha Regression[1]) Estimates in $(\hat{u}_{ch} - \hat{\eta}_c)^2$

Variable	1995/96		2003/04	
	Coefficient	Std. Error	Coefficient	Std. Error
Intercept	-4.59***	0.110	-5.16***	0.093
HHSIZE*EDUCATION	0.01**	0.003	0.00	0.003
OWNLAND*OWNHOUSE	-0.27***	0.096	-0.41***	0.077
AGEHEAD*AGEHEAD	0.00***	0.000	0.00	0.000
EDUCATION*AGEHEAD	0.00*	0.000	0.00	0.000
RURAL*LIGHTELECTRICITY	-0.10	0.162	0.00	0.091
PERMANENTHOUSE	0.32**	0.158	0.09	0.133
TV*RURAL	-0.14	0.329	-0.66**	0.345
RURAL*TOILETFLUSH	0.15	0.256	0.06	0.133
FULEWOOD*TV	-0.21	0.377	1.05***	0.366
TERAI*RURAL	-0.19**	0.081	-0.08	0.072
N	3373		3909	
Adjusted R^2	0.177		0.142	

[1] Estimates for equation [2.2].