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Risk and Vulnerability in Guatemala: A Quantitative and Qualitative Assessment

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Risk and Vulnerability in Guatemala: A Quantitative and Qualitative Assessment

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Abstract

This risk and vulnerability analysis conducted as a part of the Guatemala Poverty Assessment illustrates how a single cross-section survey, combined with a qualitative study, can provide a wealth of information on risks and coping mechanisms. This study combines quantitative data from the Living Standards Measurement Study and qualitative information from an in-depth qualitative study of poverty and exclusion conducted in 10 villages in Guatemala. Both data sources were designed to capture issues related to vulnerability, risks, and risk management. The quantitative survey included a risks and shocks module, in which households were asked to report if they had experienced a shock during the previous 12 months, using precoded questions for 28 economic, natural, social/political, and life-cycle shocks. These shocks were classified ex ante into covariant and idiosyncratic shocks. Households also reported: (1) whether these shocks triggered a reduction or loss of their income or wealth; (2) the main strategy that they used to cope with their welfare loss; (3) if they had succeeded in reversing the reduction or loss in their welfare by the time of the survey, and (4) the estimated time that had elapsed until successful resolution of the situation. Information on covariant shocks was also collected from the community questionnaire at the survey cluster level.

The vulnerability assessment includes several types of analysis of shocks and their impact, including (1) factor analysis to understand the correlation structure or “bunching” of shocks; (2) a multivariate logistic model to examine the association between a household’s characteristics and location and the probability that it reports a shock or incurs wealth and income losses due to the shock and the probability that it has recovered from the negative impact of the shock by the time of the interview; (3) nonparametric density estimation to estimate the counterfactual density of consumption or income; (4) multiple regression analysis to estimate the cost of shocks; (5) propensity score matching to estimate the cost of shocks; and (6) multiple regression analysis to estimate vulnerability to consumption poverty.

What are main findings of the study? **First**, the study suggests that interventions, whether designed to address poverty or protect against shocks, should concentrate on building the assets of the poor. Social protection can play an important role in this context. **Second**, the data suggest that a strategic emphasis on children – particularly child-focused interventions to reduce malnutrition and promote early childhood development – is crucial to avoid inter-generational transmission of poverty and vulnerability. **Third**, since exposure to some natural disasters seems largely determined by geography, maps of regional vulnerability to natural disaster could be useful for risk management planning. Since natural disaster often damage or destroy community infrastructure, in addition to reducing income and wealth at household level, social funds could be the institutional channel for relief and infrastructure rehabilitation. **Finally**, the study noted that while poverty is more severe in rural part of the country, social protection policy should not neglect urban areas, where the ratio of vulnerable people to currently poor people was 2.2 times higher than in the rest of the country.

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Introduction

In this paper, we present the results of an assessment of vulnerability in Guatemala in the context of the World Bank's on-going analysis of poverty and its determinants. The assessment draws primarily on quantitative data from the Living Standards Measurement Survey (ENCOVI, 2000) and on qualitative information from an in-depth qualitative study of poverty and exclusion carried out in 10 villages in Guatemala (QPES, 2000). Although neither provides panel data, both data sources were specifically designed to capture issues pertaining to vulnerability, risks, and risk management methods. This paper is a contribution to the poverty reduction strategy of the Government of Guatemala, the preparation of the Bank's proposed new social protection operation, and the Bank's Guatemala Poverty Assessment (GUAPA).

After a first section that gives background information on the current state of poverty and vulnerability in Guatemala, the paper has four subsequent sections. The second section outlines the sources of vulnerability in Guatemala and examines how households coped in 2000 when they were faced with or were anticipating welfare shocks. In section three, we estimate the welfare cost of the shocks that occurred in 2000. Thereafter, in section four, we attempt to identify those who are likely to have become poor in 2001/2002, in other words, those who were vulnerable to poverty in 2000, and to identify which household characteristics are a sign of being vulnerable to poverty. The last section of the paper presents our conclusions.¹

I: Background and Country Context

Guatemala suffers from high levels of poverty and vulnerability to poverty and inadequate social risk management. The country belongs to the group of lower-middle-income countries (GDP per capita of 3,630 USD at PPP in 2000), with a high incidence of poverty (56 percent in 2000). The vulnerable groups within the population are those that suffer from structural inequalities and from a pattern of exclusion and inequality that has characterized the country for decades. In addition, many Guatemalan households and communities have been hit by man-made or natural shocks, including a long-standing civil war, worsening terms of trade for coffee (the country's main export product), Hurricane Mitch, and various earthquakes and mudslides.

Overall, the country has little capacity to reduce or mitigate the social risks faced by these households due to both micro and macro factors. At the micro or household level, poverty is high, formal insurance and credit markets only reach a minority of the population, and social safety nets are inadequate. At the macro or national level, social risk management is hampered by high inequality and the government's low revenue generating capacity (central government tax revenue of 9.6 percent of GDP in 2000), and this situation is exacerbated by the relatively undiversified structure of the economy. A large share of export receipts is derived from primary commodities with volatile and decreasing prices, like coffee (18 percent of merchandise exports in 2000, down from 24 percent in 1997) and bananas. Recently, worsening terms of trade for coffee have triggered increasing trade deficits at the macro level and have reduced demand for people to work on the *fincas* (coffee plantations) at the micro level. Therefore, gaining a thorough

¹ A companion paper (Tesliuc and Lindert, 2002) analyzes the contribution of social protection and private transfers to reducing poverty and vulnerability.

understanding of the poor and vulnerable – their characteristics, constraints, and priorities – is crucial for formulating an effective strategy for reducing poverty and for designing social protection operations.

Despite these constraints, the Government of Guatemala has made progress in the area of social protection since the 1996 Peace Accords. This is reflected in the increase in the amount of public funds allocated to social protection and to the social sectors in general. By 2000, 3.5 percent of GDP was allocated to 31 social programs containing social protection activities, including such instruments as social assistance, social insurance, and social funds (Santiso, 2001). Public spending in health and education amounted to another 3.6 percent of GDP. However, there is still ample room for further improvements, in particular by streamlining existing programs, expanding the coverage of social protection programs, and fine-tuning their targeting (Santiso, 2001 and Tesliuc and Lindert, 2002). From a social risk management perspective, most social protection interventions simply provide risk coping mechanisms, while only the middle- and upper-classes seem to have access to risk mitigation instruments like pensions. The government also needs to explore synergies with other social policies, in particular education, health, and infrastructure, or other providers (either informal or market-based) of risk management instruments.

The government's effort to understand and fight poverty and vulnerability is high on its policy agenda. The analysis in this paper is designed to help the government in that effort. The importance of poverty on the government's list of policy priorities can be traced back to the 1996 Peace Accords, which ended a long period of civil war and redefined the country's economic and social agenda. It was decided that the recipe for fighting poverty should combine growth (cashing in on the "peace dividend") and redistribution (increasing the tax revenue ratio and using the proceeds from the privatization of state-owned utilities to finance and expand coverage in education, health, and basic services).

Although progress has been made, considerable challenges remain. Significant improvements have been achieved in the areas of education and access to basic services (World Bank, 1999a; Edwards, 2001; and Foster and Araujo, 2001). Other problem areas, such as child malnutrition and the insufficient targeting of public resources toward the poor, are beginning to find their way onto the policy agenda. Also, the Government of Guatemala needs time to fill the huge gap in basic and social services. Nevertheless, these strategic priorities proved to be right in 1996 and continue to be right today. , and Improved health, education, social protection, and access to basic services are the major pillars of the country's Poverty Reduction Strategy Paper, and important areas of investigation of the forthcoming Poverty Assessment (GUAPA).

Progress in implementing this strategy has been somewhat slower than originally anticipated as natural disasters (such as Hurricane Mitch in 1998) and economic shocks have taken their toll on Guatemala development. These shocks have brought vulnerability to the center of the policy debate in the country. While a recent regional World Bank study classifies Guatemala as facing low macroeconomic risk (World Bank, 2000), the recent drop in the terms of trade of major exportable crops such as coffee and sugar in 2001 may necessitate a reassessment. Also, vulnerability to natural disasters is high in Guatemala. The country is located at the confluence of three tectonic plates, with 30 volcanoes throughout its southwestern highlands. Nutritional, social, and environmental risks are other sources of vulnerability in Guatemala. With support from international agencies and donors, the government has taken stock of the multiple sources of vulnerability in the country and has taken steps to reduce and mitigate the major sources of shocks and to help households to cope with their adverse effects (Swedish AID Agency and UNICEF, 2001 and FAO, 2000).

Maintaining the same rate of progress in the future may prove harder than in the past. Growth rates, projected to be 6 percent per annum in the late 1990s, have been two to three percentage points lower in reality from 1996 to 2000 and were even lower in 2001. The government had difficulties in expanding the tax base and had to rely on capital revenues from privatizations to finance the expansion in social and

basic services. These revenues, however, are now drying up. Sustained progress depends on the ability of the government to improve its ability to target public money to the needy in order to reduce poverty and vulnerability.

Formulating an efficient poverty and vulnerability reduction policy in Guatemala requires a thorough understanding of the nature of poverty in that country. What share of the poverty that was observed in 2000 is transient, and how much is chronic in nature? The answer to this question will determine the ideal mix of poverty reduction policies, which aim to reduce chronic poverty, and poverty prevention policies, which aim to reduce vulnerability to future poverty (Chaudhuri, 2000). We find that most households that are vulnerable to consumption poverty are “chronically” vulnerable, which means that policymakers need to emphasize poverty reduction policies aimed at building and improving the assets of the poor. Thus, the strategic priorities set in 1996 in the Peace Accords (education, health, basic services, and infrastructure) are still relevant. The Guatemala Poverty Assessment (GUAPA) contains specific recommendations for increasing public sector efficiency in all these areas.

Some poverty prevention policies are also important. In this paper, we find that, in Guatemala, the poor are disproportionately exposed to natural disasters and agricultural-related shocks and are less exposed to economic shocks specific to formal economy (in which they do not participate) than the non-poor. Therefore, pro-poor disaster management and relief initiatives will be more effective in cushioning the welfare losses of the poor than social insurance schemes (such as pensions or, if instituted, unemployment benefit schemes). In terms of risk management strategies, policymakers should focus on more on measures to reduce or mitigate risks than on measures for coping.

Given the high emphasis on coping over risk reduction or risk mitigation strategies, the design of policies for reducing vulnerability should at least be counter-cyclical, i.e. targeted programs for the poor need to be better protected during downturns (de Ferranti et al, 2000). We find that most households have succeeded in managing idiosyncratic or localized shocks despite the lack of government support but that they are still scarred from catastrophic shocks of five or ten years ago. This finding is consistent with the conclusions of the literature on consumption smoothing (reviewed in Alderman and Paxson, 1995 and Morduch, 1999). . In years with only a moderate number and magnitude of shocks such as 2000, most households are able to smooth their consumption, using a wide range of risk management instruments and arrangements. The poor do so mainly through self-help and informal means (more labor, or borrowing and receiving help from friends, neighbors or relatives), while the non-poor through self-help and market-based mechanisms (drawing down savings, borrowing from banks or cashing insurance premia). Our qualitative data source revealed that catastrophic shocks (natural disasters such as Hurricane Mitch or the 1976 earthquake or armed violence in the period before the Peace Accords) have long-lasting negative effects on the welfare of the poor. Thus, the need for coping mechanisms is spread unevenly across time. Therefore, policymakers should take a long-term approach to devising vulnerability reduction policies, with institution building and preparatory efforts undertaken in years without major shocks and timely support provided after catastrophic shocks. A counter-cyclical social risk management policy is required (strengthening the current disaster management programs and expanding the role of social assistance and social funds).

Objectives

The overall objective of the present paper is to conduct an operational assessment of vulnerability and social protection interventions in Guatemala in the context of on-going analysis of poverty. More generally, the study makes the concept of vulnerability central to the traditionally static, asset-based poverty analysis, while expanding the scope of the poverty analysis into a dynamic, forward-looking dimension by identifying those who are in danger of becoming poor in the future. Thus, this shifts the

emphasis of our policy recommendations from the passive or reactive approach (what can be done to reduce current poverty rates?) to a dynamic or proactive approach (what can be done to help the current poor rise out of poverty and to reduce the likelihood of vulnerable people falling in poverty?). Taking this approach should also enable us to explore whether poverty in Guatemala is chronic or is mainly a transient problem.

Assessment of Sources of Vulnerability. In this analysis, we identify: (i) key vulnerable groups (their living conditions, the risks they face, and their incidence); (ii) key risks and shocks (both idiosyncratic and covariate, and their incidence and impact); and (iii) formal and informal coping mechanisms of households and communities. Our analysis distinguishes potential social protection beneficiaries (vulnerable groups). It also assesses the extent to which the government, through regulation, co-financing, or direct provision, can improve the outcomes of informal risk management methods.

Correlation between Household Characteristics and Vulnerability to Consumption Poverty. The fourth section of this paper looks into the future and attempts: (i) to quantify who is likely to become poor and (ii) to identify the household characteristics that are signals of this vulnerability. We limit the analysis to a particular dimension of welfare (consumption), and estimate each household's likelihood to fall below the poverty line in 2001. Households whose odds of becoming poor are greater than one are termed vulnerable. Given the cross-sectional nature of the data used in this exercise, we do not capture all the sources of vulnerability in our estimates. In particular, our measure of vulnerability does not capture nationally-covariant, macro shocks.

The Multidimensional Nature of Vulnerability. To present a complete picture of vulnerability, the last section expands in two directions. First, it complements the analysis of vulnerability with a brief review of the macroeconomic shocks and threats that have affected, or are likely to affect, Guatemala and their impact on future levels of poverty. Second, it summarizes other sources of vulnerability outside the triad of "material wealth, income, and consumption," such as vulnerability due to limited education, poor nutrition or health, or a lack of access to remunerative employment, housing, and basic services. The findings related to these issues are presented in the other background analyses undertaken as part of the Poverty Assessment exercise.

Value Added

This analysis of vulnerability contributes to the Bank's work on poverty in several important ways.

Relevance for Operational Work. A deeper understanding of the links between vulnerability and poverty in Guatemala will provide an empirical basis for social policy, thus strengthening both the analytical and operational content of the government's Poverty Reduction Strategy. It will also strengthen two Bank programs: (i) a proposed new Social Protection Operation² and (ii) the Guatemala Poverty Assessment (GUAPA).³ More specifically, our analysis of risk and vulnerability provides an empirical basis for : (i)

² With support from a Japanese PHRD Grant (TF026302), the World Bank is currently working with the Government of Guatemala to prepare a new Social Protection Operation. The project is currently under preparation and is expected to include three components: (i) a reform component aimed at increasing coordination among the many social funds in Guatemala; (ii) a component designed to provide crucial basic social and community infrastructure to the poor on a demand-driven basis; and (iii) a component that will provide basic social assistance and services to a pre-identified set of vulnerable groups and/or targeted to those vulnerable to a few key social risks through a *Partnership Fund* designed to attract support from NGOs and the private sector

³ The GUAPA supports a multi-year program of technical support using both quantitative and qualitative data to better understand poverty and vulnerability and the ways in which the government and the World Bank can help to reduce them. The GUAPA uses the same multi-faceted view of poverty as defined in the World Development Report, 2000. Under this approach,

rationalizing and increasing the efficiency of existing social protection instruments; (ii) taking advantage of the synergies that exist between social safety nets and informal safety nets and between social protection and other policy interventions; (iii) improving the arrangements and instruments for social risk management; and (iv) expanding the coverage of the safety net programs to include the chronic poor who are currently left out of the system.

Complementarities with other GUAPA Work. The GUAPA builds on the conceptual framework developed in the Bank's World Development Report 2001, which stressed the multi-dimensionality of poverty. Poverty is associated with a low level and low productivity of assets, a lack of voice in the social and political arena, and vulnerability to risks and shocks. Attacking poverty requires making concerted efforts on all of these fronts by widening the opportunities of the poor, ensuring that they have a say in the decisions that affect their life, and improving the security of their well-being. At the same time, there are synergies and complementarities between these fronts.

Within this framework, the analysis of vulnerability adds new perspectives to traditional poverty analyses, which have tended to focus only on increasing the opportunities of the poor. This aspect correctly emphasizes the role of assets – human, physical, financial, and social – in reducing poverty, and the role of the governments in helping the poor to build up their assets. The vulnerability analysis extends this view to embrace the larger pool of vulnerable households that face a high probability of becoming poor in the future. For these households, poverty prevention measures are highly relevant. In addition, the vulnerability perspective stresses the twin role of asset ownership. Not only is the level of and the returns to these assets an important determinant of current welfare, but also the ownership of assets helps households to reduce the variability of their future consumption (by enabling them to diversify their income-generating activities or to access insurance), thus lowering their vulnerability to poverty. Therefore, any poverty analysis should include not only the current situation with regard to a household's assets and poverty but also the effects of assets in reducing the probability of the household being poor in the future.

Vulnerability analysis also enriches and is enriched by the analysis of empowerment. Social capital can be an important risk mitigation instrument, consisting of intangible assets such as participation in informal groups (ROSCA's, burial societies) or practices (gift-giving by friends, neighbors and relatives to newly married couples) that may help the poor to mitigate the negative effects of idiosyncratic risks. This paper builds on the analysis of social capital and exclusion to analyze under what conditions bonding, linking, or bridging capital⁴ can reduce vulnerability, triggering thus a virtuous cycle.

Finally, looking at the challenge of reducing poverty through the perspective of vulnerability and social risk management extends the range of potential solutions beyond the traditional territory of social protection and human development policies. First, the scope for public actions to reduce vulnerability is much broader than specific social protection interventions. Reducing vulnerability and, hence, the extent of poverty in the future requires improving macroeconomic management, reducing or mitigating the risk of natural disasters through infrastructure policies, deepening financial markets to expand market-based instruments for mitigating risk, and broadening rural development and human development policies. Second, reducing vulnerability to poverty involves much more than public action. Social protection policies should exploit the synergies between informal and market-based arrangements to achieve an

poverty is defined as the interaction among a lack of opportunity (assets), exclusion (voicelessness), and vulnerability (insecurity).

⁴ Social capital refers to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. These norms can be classified into bonding, bridging and linking social capital. Bonding is a set of horizontal associations between people, consisting of social networks and associated norms that have an effect on community productivity and well-being. Bridging social capital transcend various social divides (e.g. religion, ethnicity, socio-economic status), and connects a community with other communities. Linking is a particular form of bridging, i.e. institutions and relationships between a community and authorities (e.g. Government).

efficient balance between a household's various strategies for reducing, mitigating, and coping with risk. This paper endorses this approach involving a multiplicity of actors and public interventions in the effort to reduce vulnerability and tries to assess their relative strengths and weaknesses in the Guatemalan context.

Application in Other Countries. This study is one of the first vulnerability assessments that combines quantitative and qualitative information. It can easily be replicated in other countries since it is based on only a single year of quantitative household survey data as the vast majority of countries that do not possess panel data at the household level. Finally, the simple vulnerability and risk modules that were included in the ENCOVI and QPES surveys are currently being tested to see if they can be improved and applied in other countries.

Integration of Quantitative and Qualitative Data

Until recently, Guatemala lacked comprehensive data on poverty and living conditions. However, through a multi-donor program⁵ that is supporting the development of an integrated system of household surveys, such information was collected in Guatemala under the Living Standards Measurement Survey in 2000 (ENCOVI, 2000). Because of the importance of vulnerability in Guatemala, the ENCOVI included questions to elicit a unique level of detail (for a representative sample) on themes related to vulnerability. The survey included modules on risks and shocks; conflict, crime, and violence; social capital; and migration (which has been used as a risk management strategy by many vulnerable groups in Guatemala). The ENCOVI also included a comprehensive section on the receipt of social insurance and safety net transfers, thus making it possible to analyze the incidence of such schemes. A Qualitative Poverty and Exclusion Field Study (QPES, 2000) was carried out in the same year in 10 rural ENCOVI villages, thus complementing the ENCOVI quantitative data with qualitative information on the communities' perceptions of key poverty and development issues, including data on poverty, risk, and vulnerability.

We also used complemented this survey data with administrative and statistical information. In particular, we used spatial data and geographic maps that identify specific regions, departments, or localities that appear to be particularly vulnerable to certain types of shocks, such as natural disaster, conflicts, or food insecurity. Our analysis of social protection interventions uses the available institutional information, such as the URL/IDIES inventory of social protection measures, and recent reviews of the social protection programs in both the public and non-profit sectors.⁶ An innovative aspect of this study is that it brings together these qualitative, quantitative, and institutional sources of information to paint a more complete picture of vulnerability in Guatemala.

Analytical Framework

The Concept of Vulnerability in a Poverty Context. Vulnerability comes from the notion that certain groups in society are more vulnerable than others to shocks that threaten their livelihood and/or survival. Other groups are so vulnerable that they live in a chronic state of impoverishment in which their

⁵ The "Program for the Improvement of Surveys and Measurement of Living Conditions in Latin America and the Caribbean" (MECOVI), sponsored by the Inter-American Development Bank (IDB), the World Bank (IBRD), and the Economic Committee for Latin America and the Caribbean (CEPAL). The MECOVI-Guatemala program is also supported by several other donors, including USAID, the Governments of Japan and Sweden, the Soros Foundation, UNDP, UNICEF, and the ILO.

⁶ URL/IDIES stands for Universidad Rafael Landívar. Recent reviews of social protection instruments were undertaken by URL/IDIES (2001) and Santiso (2001). Fuentes (2001) reviewed the social protection programs implemented by non-profit organizations.

livelihood is constantly at risk. The social risk management approach requires adopting policies aimed at reducing key risks and at breaking inter-generational cycles of poverty and vulnerability. The concept of vulnerability as used here has two elements: a person's resilience to a given shock (the higher their resilience, the lower their vulnerability) and the severity of the impact of the shock (the more severe the impact if the risk is not managed, the higher the vulnerability). By this definition, the very poor are extremely vulnerable because they have little opportunity to manage risk. Subsequently, even a small decline in welfare could be life-threatening or would at least have permanent consequences for human capital. The vulnerable include not only those who are already poor but also those currently above the poverty line who are potentially subject to severe shocks and have little ability to manage risk, in other words, those likely to find themselves in poverty after a shock has occurred (Holzmann and Jorgensen, 2000).

For the purposes of this study, vulnerability will be defined in the framework of poverty alleviation as the *ex-ante* risk that a household that is currently not poor will fall below the poverty line and that a household that is currently poor will remain poor (Holzmann, 2001). Thus, defined in this way, vulnerability can usefully be distinguished from the concept of poverty, which is the *ex-post* measure of a household's welfare (Chaudhuri, 2000). It is important to note that vulnerability is derived from (i) exposure to risks and shocks and (ii) an inability to manage these risks and shocks due to inadequate assets and social protection mechanisms (such as social insurance and assistance).

Like poverty, vulnerability is a multi-dimensional concept, based on both monetary (consumption and income) and non-monetary concepts (such as inadequate levels of nutrition, health, or education). A Quality Enhancement Review panel (QER, 2001) outlined a number of welfare indicators that could be used to measure "vulnerability" including an episode of consumption poverty, vulnerability to malnutrition, and a child's vulnerability to non-enrollment in school, absenteeism, or drop-out. Some of the outcome variables that are examined in this paper include: (i) consumption; (ii) health indicators such as malnutrition (with important inter-generational effects on poverty); and (iii) education indicators such as school attendance, repetition rates, and drop-out rates.

To guide policy, we wanted our vulnerability assessment to be as comprehensive as possible. Therefore, we combined quantitative and qualitative information: (i) to identify vulnerable groups; (ii) to identify and rank risks and shocks; (iii) to identify risk management instruments, including assets; (iv) to classify coping strategies; and (v) to assess the impact of risks and shocks on various dimensions of household welfare.

Given the multi-dimensionality of vulnerability, not all of the assessment can be encompassed in a single model. Instead, we used a number of analytical techniques to diagnose vulnerability. These include: (i) basic quantitative descriptive statistics; (ii) qualitative information, including people's perceptions of their own situations; (iii) qualitative identification of certain vulnerable groups (for example, those people, such as street children, who may not be captured in surveys but who fit our definition of vulnerability) and attempts to quantify their magnitudes; (iv) descriptive statistics from spatial and geographical mappings of indicators linked to vulnerability (which are compared with the statistical modeling analysis); and (v) multi-variate modeling of vulnerability with respect to outcome indicators such as consumption.

Sources of Vulnerability and Risk Management. For social protection policy, the distinction between poverty and vulnerability provides helpful policy insights since the causes and remedies of chronic poverty can be quite different from those of transient poverty (Jalan and Ravallion, 2000a). Most longitudinal studies have found that a lot of poverty is transient in nature (Baulch and Hoddinot, 2000). If this is the case in Guatemala, building a poverty reduction strategy based on those who were poor yesterday will be insufficient, leading to potentially large leaks of public resources to the non-poor and to the exclusion of today's poor if targeting methods other than self-targeting are used. Taking into account

the dynamic aspects of poverty and vulnerability, an efficient social protection strategy should include *ex-ante* poverty prevention and *ex-post* poverty alleviation interventions (Chaudhuri and Datt, 2001). How policymakers allocate funds to preventive interventions (between risk reduction and mitigation) should be guided by the incidence of vulnerability versus that of poverty. The incidence of poverty should determine the allocation of funds for *ex-post* poverty alleviation programs (risk coping). As discussed above, most existing social protection programs in Guatemala fall in the *ex-post* risk-coping category.

The World Bank's Social Protection Sector Strategy (World Bank, 2000a) defines social protection as the mix of public interventions that assists individuals, households, and communities to manage risk better and that provides support to the critically poor. In this strategy document, social protection is regarded as a springboard as well as a safety net for poor people, and social protection interventions are seen as investments rather than costs. The strategy focuses less on symptoms and more on the causes of poverty and takes into account the complementarities and synergies that exist between the risk management instruments provided by the informal, private, and state sectors.

This new perspective on social protection as part of a broader social risk management agenda stresses complementarities and synergies between human development policies, other public policies and market or informal interventions (World Bank, 2000a). First, the capacities of individuals, households, and communities to handle risks and their choice of risk management instruments depend on the characteristics of those risks (their sources, correlation, intensity, and frequency) and the portfolio of assets that the individuals, households, and communities control. Second, according to the theory of comprehensive insurance (De Ferranti et al, 2000), efficient risk management involves a combination of strategies for: (i) risk prevention; (ii) risk mitigation by pooling uncorrelated risks or sources of income or by making use of formal and informal insurance; and (iii) coping strategies designed to relieve the impact of the risk once it has occurred. Finally, risk management instruments fall into three main categories: (i) informal arrangements; (ii) market-based arrangements; and (iii) public arrangements within or outside the scope of social protection. These concepts are combined in a social risk management matrix (see Table 1), where social protection instruments can be seen in their broader context.

Building on existing concepts and methodologies and adapting these to the data that are available for Guatemala, we have attempted in this paper to construct an assessment of vulnerability by taking the following broad steps: (i) identifying risks and vulnerable groups; (ii) assessing the outcome and impact of shocks; and (iii) identifying those households that are at high risk of falling into poverty in the near future. We then build on this assessment to outline a more effective mix of risk management interventions.

By identifying the sources of vulnerability and – in a broad sense – the nature of poverty and vulnerability in Guatemala, this paper provides useful insights that should inform the formulation of an anti-poverty policy. First and foremost, the paper signals the importance of policies for reducing poverty over policies for preventing poverty in the case of Guatemala. A companion paper (Tesliuc and Lindert, 2002) analyses the availability and efficiency of the main risk mitigation and risk coping mechanisms, such as social protection, private transfers, and access to credit and insurance markets.

Table 1: Strategies and Arrangements of Social Risk Management

Arrangements/ Strategies	Informal	Market-based	Public
Risk Reduction			
	<ul style="list-style-type: none"> • Less risky production • Migration • Proper feeding and weaning practices • Engaging in hygiene and other disease preventing activities 	<ul style="list-style-type: none"> • In-service training • Financial market literacy • Company-based and market-driven labor standards 	<ul style="list-style-type: none"> • Labor standards • Pre-service training • Labor market policies • Child labor reduction interventions • Disability policies • Good macroeconomic policies • AIDS and other disease prevention
Risk Mitigation			
Portfolio	<ul style="list-style-type: none"> • Multiple jobs • Investment in human, physical and real assets • Investment in social capital (rituals, reciprocal gift-giving) 	<ul style="list-style-type: none"> • Investment in multiple financial assets • Microfinance 	<ul style="list-style-type: none"> • Multi-pillar pension systems • Asset transfers • Protection of property rights (especially for women) • Support for extending financial markets to the poor
Insurance	<ul style="list-style-type: none"> • Marriage/family • Community arrangements • Share tenancy • Tied Labor 	<ul style="list-style-type: none"> • Old-age annuities • Disability, accident and other personal insurance • Crop, fire and other damage insurance 	<ul style="list-style-type: none"> • Mandated/provided insurance for unemployment, old age, disability, survivorship, sickness, etc.
Risk Coping			
	<ul style="list-style-type: none"> • Selling of real assets • Reduced savings or investment • Borrowing from neighbors • Intra-community transfers/charity • Sending children to work • Dis-saving in human capital • Migration 	<ul style="list-style-type: none"> • Selling of financial assets • Borrowing from banks 	<ul style="list-style-type: none"> • Transfers/Social assistance • Subsidies • Public works

Source: Holzmann, 2001

II: Shocks as a Source of Vulnerability

The objective of this section is to describe the sources of vulnerability in Guatemala. We achieve this by: (i) estimating the frequency, correlation structure, and severity of the risk and shocks that affected the country in 2000 and (ii) identifying the mitigation and coping strategies used by households when faced with shocks. We use five sources of information: (i) administrative information or vulnerability maps; (ii) shocks that occurred during the previous 12 months as reported by household heads in the ENCOVI sample; (iii) covariate shocks that occurred during the previous 12 months as reported by the communities that participated in focus group interviews for the ENCOVI community questionnaire; (iv) qualitative information reported by the QPES focus groups that was not time bounded to a particular recall period; and (v) quantitative information reported in the Inter-American Development Bank's (IDB) survey of shocks in Latin America and the Caribbean in 1999.

Vulnerability is at the center of the policy debate in Guatemala. Macroeconomic vulnerability regained the attention of the government after the drop in the terms of trade of major exportable crops such as coffee and sugar in 2001.

In response, the Government of Guatemala and other administrative bodies decided to compile information on a variety of natural and man-made shocks. One such effort, undertaken with the support of the Swedish Aid Agency and UNICEF in 2001, mapped various sources of vulnerability, such as natural disasters, and social, economic, and environmental risks and highlighted the geographical areas most likely to suffer from these risks. The maps use administrative information on the various risk factors over time and depict the geographical pattern of various risks, such as drought, earthquakes, migration, or poor access to basic services. In this paper, we compare the reported incidence of shocks by region with the official administrative records to check the reliability of these sources of vulnerability over time.

This paper goes beyond mapping sources of vulnerability. It also exploits the rich information contained in the ENCOVI on the risks and shocks that affected households and communities in 2000 to identify the links between household characteristics and these shocks. The ENCOVI included a risks-and-shocks module, in which households were asked to report if they had experienced a shock during the previous 12 months, using pre-coded questions for 28 economic, natural, social/political, and lifecycle shocks (see Table A1a in the annex).⁷ These shocks were classified *ex-ante* into covariant and idiosyncratic shocks. Furthermore, households reported: (i) whether these shocks triggered a reduction or loss of their income or wealth; (ii) the main strategy that they used to cope with their welfare loss; (iii) if they had succeeded in reversing the reduction or loss in their welfare by the time of the survey; and (iv) the estimated time that had elapsed until successful resolution of the situation.

Information on the covariant shocks was also collected the ENCOVI community questionnaire at the survey cluster level. Groups of people (focus groups) reported whether a covariant shock had hit the locality since 1995. For the two most serious shocks that affected each locality, the respondents specified: (i) the main strategy that they used to cope with the effects of these shocks; (ii) whether the shock was successfully resolved; and (iii) what help they received from outside their locality to cope with the shock, if any.

⁷ The ENCOVI did not collect information on the impact of health-related shocks (which themselves were recorded in the health module) on household welfare, nor did it collect data on households' coping mechanisms to such shocks.

Such detailed information is, to our knowledge, unique among surveys of living standards, consumption, or family budgets. We used this information to profile the sources of vulnerability in Guatemala to try to answer the question of which types of household are most likely to suffer from various types of shock. Moreover, we used it to examine the coping mechanisms that households used when faced with a particular shock. It is possible to test if the same mechanisms are or are not used by many different households and especially if and how the methods used varied depending on the economic status of the household. Finally, we used the information to estimate, albeit imperfectly, the relative impact of different shocks on household welfare.

Despite these opportunities, the ENCOVI risk and shocks data have also serious limitations:

- The cross-sectional nature of the data means that it is not possible to analyze the impact of shocks over time. The information on shocks and on welfare was collected for the same time period (the 12 months prior to the survey interviews) for just one period in time (only one survey round), thus making it difficult to make any inferences about cause and effect. In addition, the recall period was too small to take into account any infrequent but severe shocks such as natural disasters. Respondents to the ENCOVI's companion qualitative study – the QPES – emphasized the importance of these shocks as having lasting negative effects on household welfare.
- Some important characteristics of shocks were not recorded in the survey. For example, no information was collected on when the shock hit and for how long it lasted. Nor do the data distinguish between shocks with respect to how long before the survey each shock had happened; all shocks experienced by a household in the previous 12 months are lumped together, regardless of whether they happened the day before or 12 months previously. Nor were survey respondents asked to quantify the impact of the shocks in monetary terms, for example, the percentage of their wealth, income, or consumption that they lost or the cost of any damage done by the shock.
- The incidence of shocks can be calculated from the ENCOVI data set on the basis of self-reported responses. Unlike consumption – which can be expressed in current monetary terms – shocks do not have their own measurement unit. Thus, the same qualitative answer (did you experienced a harvest shock? *Yes* or *No*) covers heterogeneous responses. Clearly, a shock such as a bad harvest may affect two households very differently (one can lose all harvest due to a severe drought, while another can experience a marginal loss if someone's herd destroyed some of the harvest at the periphery of the field), and yet they would both report experiencing the same number of shocks. Given these data limitations, we have modeled all shocks as if they were of the same magnitude, although we are aware of the extent of “noise” relative to signal in the data. Furthermore, what household members actually report about the shock may depend on their mood at the time of survey interview. Also, in the ENCOVI survey, the wealthier households tended to complain more than the poor about shocks, a pattern that was also observed in the health module, and this may skew the results.

In addition, the QPES gathered information on risks and shocks, coping mechanisms, and sources of support, which we used to formulate hypotheses to be tested by formal models to validate some of the results we reached using the quantitative data.

The Frequency and Correlation Structure of Shocks

The year 2000 was a normal year for Guatemala, in so far as the country was spared any major “macro” shock, either natural or man-made. Violence was at a historic low and there were no major natural disasters. The most recent major disasters had been Hurricane Mitch in 1998 and before that, the 1976 earthquake. Macroeconomic indicators for 2000 were stable, with modest growth (0.6 percent in GDP per capita) and with low inflation (6 percent per year), unemployment (1.8 percent), and current account deficit (4.8 percent of GDP).

Despite the absence of major shocks, the perceptions of QPES respondents were remarkably different. They recalled all types of shocks: natural, health, economic, social, lifecycle-related, political, and environmental. In the ENCOVI, 80 percent of the households reported that they had experienced at least one shock during the previous year: 7 percent reported experiencing natural shocks, 38 percent experienced man-made shocks and another 35 percent were hit by both natural and man-made shocks. Gaviria (2001) reports that in the first semester of 2000 36 percent of urban Guatemalans reported a loss of income and a 26 percent fall in consumption.

Among the shocks that Guatemalan households reported that they had experienced in the previous 12 months, inflation was mentioned by 68 percent, more often by the rich than the poor. This is puzzling. Inflation was low in 2000 (6 percent per annum) and falling (from 11 percent in 1996). Two types of assets are likely to suffer from inflation – financial deposits and wages. However, financial deposits were protected by relatively high real interest rates (10 percent per annum), and real wages maintained their purchasing power. In contrast, in the QPES, respondents from the 10 villages did not mention inflation among the risks that had affected their communities in the previous year. . A simple model that we used to capture the impact of the shock on household consumption found a positive impact on consumption, which we found implausible.⁸ Therefore, we decided to omit the responses on the risk of inflation from our analysis.

Despite a dearth of major shocks in the year 2000, there were a larger number of infrequent shocks (Figure 1). Overall, 53 percent of the surveyed households reported experiencing one or more shocks in 2000, of whom 23 percent reported experiencing only natural shocks, 17 percent only man-made shocks, and 13 percent both. Pest infestations and bad harvests ranked second and third after inflation, with 20 percent and 17 percent respectively. Other shocks, such as falls in income, the household breadwinner having an accident, a job loss, drought, poor terms of trade, storms, a criminal offense, or floods, were reported by 2 to 10 percent of the survey sample. Very infrequent shocks, reported by fewer than 2 percent of the survey households, included hurricanes, bankruptcy, landslides, the death of a household member, the death of the breadwinner, forest fires, land or family disputes, public protests, lost remittances, mass lay-offs or enterprise closures, abandonment by the breadwinner, an earthquake, or fire.

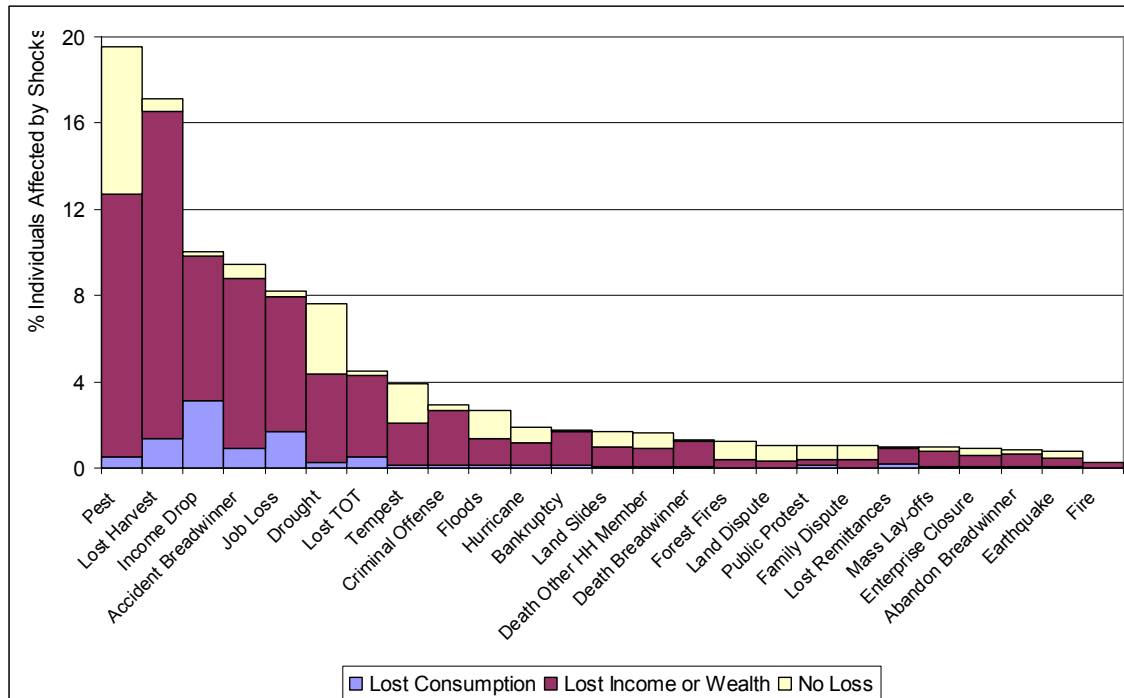
Some households reported experiencing shocks even though they did not result in material losses (of wealth or income). The largest numbers that were reported were for pest infestations, drought, storms, floods, landslides, and forest fires. The interpretation of these answers is ambiguous. They may have been “false” complaints or the household may have been somehow able to compensate for the entire impact of the shock. However, some of the shocks that had no serious material consequences did have an impact on other dimensions of households’ welfare (such as their social and psychological welfare) that were not captured by the survey. These shocks included the death of household members other than the breadwinner, land or family disputes, and public protests.

Despite the large number of reported shocks, most Guatemalan households were able to smooth their consumption in 2000. Few households were forced to cut their consumption as their main coping strategy following a shock. The highest share of shocks with a negative impact on consumption were a reduction in the income earned by a household member (32 percent of households reporting this shock were forced to cut their consumption); public protests (27 percent); a job loss (21 percent); and lost remittances (19 percent). This suggests that most households had the capacity to mitigate the effect of the shocks that they experienced in 2000. This is probably only the case in years of relative stability when there are no catastrophic shocks. Most households in the QPES sample that had suffered from Hurricane Mitch in 1998 reported reductions in their living standards even two years after the event. Recent macroeconomic shocks, such as the severe drop in the terms of trade of sugar and coffee or the recession in the U.S.

⁸ Attributed in part to noise in the data (people complaining routinely about inflation), and to omitted variables (households connected to the cash economy complained more often about inflation than autarchic poor households did).

(which is the main source of most households' remittances) have probably had a negative effect on the livelihoods of many Guatemalan households in 2001/2002.

Figure 1: Incidence of Reported Shocks during 2000 in Guatemala

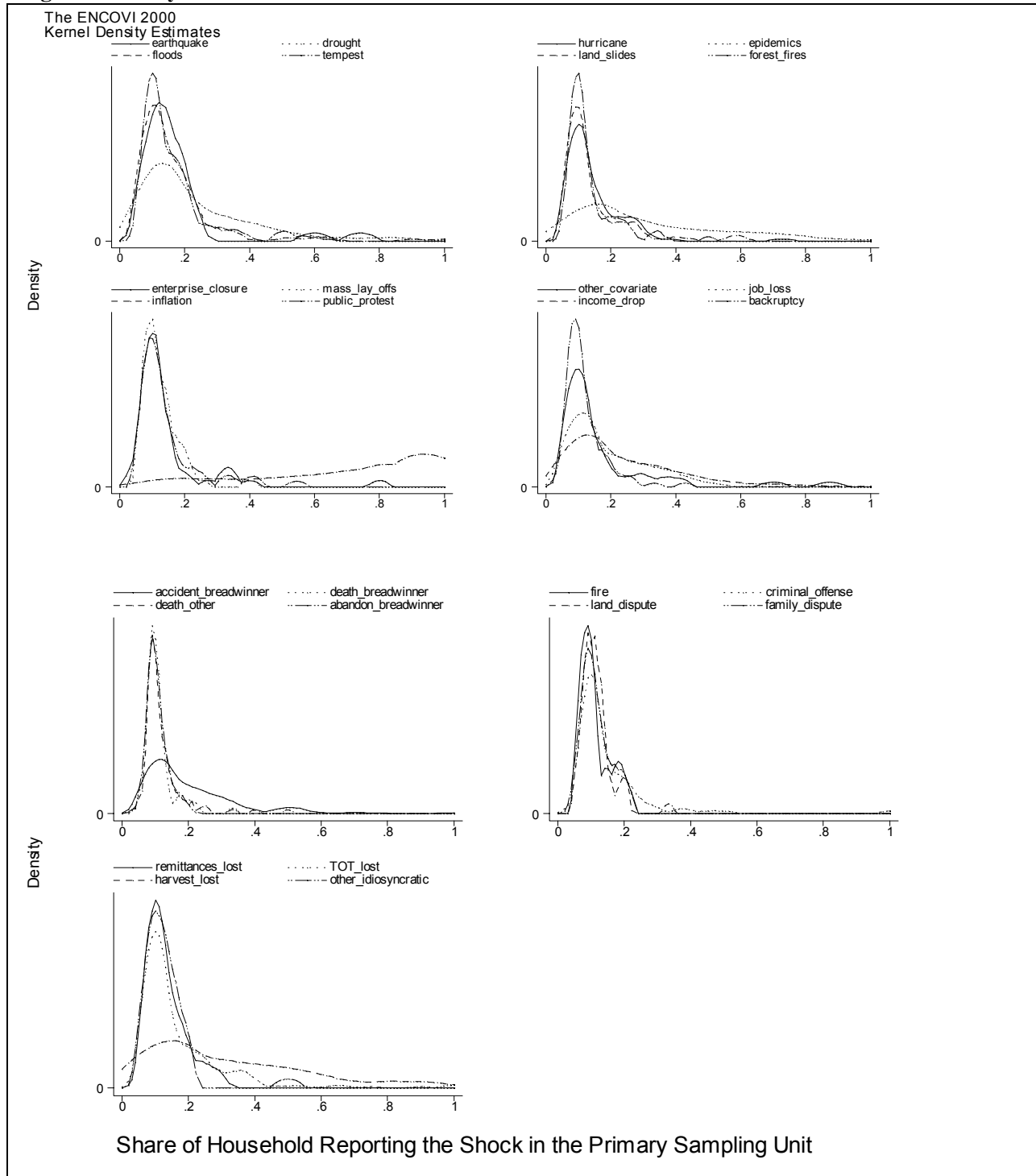


World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Most households experienced multiple shocks. The majority of households that reported experiencing shocks (53 percent of total) during the previous 12 months were hit by more than one shock. A quarter of those reported experiencing two shocks during that time, and another quarter reported experiencing three or more shocks. The incidence of multiple shocks is similar for both the (*ex-post*) poor and the non-poor. The large number of households who reported having experienced multiple shocks may be a sign that an accumulation of vulnerabilities is a cause of poverty.

Consistent with the absence of any major shock, we found that all reported shocks were localized (in other words, idiosyncratic rather than covariate). Covariate shocks tend to affect all – or a large proportion of – households in a particular location, especially when the location is a small area like the primary sampling unit (PSU) used in the ENCOVI survey. A large covariant shock is likely to be felt by everybody in the PSU, whereas an idiosyncratic shock is usually experienced only by a few or even just one household.

Figure 2: Idiosyncratic or Covariate Shocks? A Non-Parametric Answer



Note: For each shock, the estimation sample is restricted to the PSUs where at least one shock was reported. World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadísticas – Guatemala

Figure 2 looks at the degree of covariance of the occurrence of a shock at a particular location using nonparametric kernel density estimates. We excluded from this exercise all PSUs in which no one reported experiencing the shock. First, we aggregated the information on the incidence of the shocks at the level of the primary sampling unit, and then we estimated the proportion of households reporting the shock in each PSU. Then, we used an Epanechnikov kernel to estimate the proportion of PSUs with a

small, medium, or large share of households that reported experiencing the shock. . For most shocks, the center of the density of their distribution is at 0.1, meaning that only 10 percent of the households in a PSU reported experiencing the shocks. As the average PSU has 10 households, Figure A2 suggests that most households that reported experiencing a shock were the only household that did so in that location. The only exception was inflation, for which the center of the distribution lies around 0.8.

Most shocks are highly idiosyncratic. Almost all of their density is concentrated between 0.0-0.2, in other words, only one or two households per primary sampling unit reported experiencing the shocks. The rest of the residents in the primary sampling units were spared the shock. Droughts, epidemics, a drop in income, an accident to the breadwinner, and bad harvests were therefore, according to this test, idiosyncratic shocks. However, for these particular shocks, we detected a number of localities (PSUs) where a large share of the respondents had reported experiencing the shock. In these few instances, these shocks behaved as expected, i.e. like covariant shocks.

How to interpret the evidence about the idiosyncratic behavior of classical covariant shocks? Different interpretations may explain these findings. A small fraction of households from the same location that reported experiencing covariate shocks may denote: (i) that some respondents made a false complaint, reporting a shock when none occurred; (ii) the severity of the shock affected the households in the PSU to different extents, with only a few being hard hit; or (iii) the shock hit all the households in the PSU with the same severity but most were able to mitigate its effect, and, thus, did not mention it in the survey. Various combinations of these factors may also be possible. Irrespective of the cause, all of these interpretations point to the serious problem that affects the estimations, which is the problem of errors – in variables.

Shocks tend to hit in bunches. There is strong empirical evidence about the effect of bunched shocks on household welfare. The impact of a shock is greater if the affected household is simultaneously hit by other shocks. Reducing or mitigating one of the bunched risks reduces the household's overall vulnerability. Therefore, we used the data collected by the ENCOVI to determine which shocks affected the same households during the previous 12 months, and our findings can be used to guide social risk management policymakers. The ENCOVI records information on 26 specific shocks, plus two catch-all categories ("other idiosyncratic or covariate shocks"). The standard variance-covariance matrix can be used to find the pairs of shocks with the strongest association (for example, the "job loss – drop in income" pair.) Another option is to acknowledge that the classification of these shocks is somehow arbitrary, and some of them are simply different manifestations of a particular class of shocks. The subsets of shocks that are correlated among themselves (bunched) and uncorrelated (or more weakly correlated) with other shocks belong to a class of shocks or are manifestations of a latent, prototype shock. The standard technique used to find the latent shocks that account for patterns of variation among observed shocks is factor analysis. Factor analysis is a method used to reduce the number of variables to a smaller number of underlying dimensions, with highly covariant variables loading on the same factor (in other words, shocks that tend to hit the same households).

The results of our factor analysis, presented in Table 2, revealed the following five major types of bunched shocks: (i) agricultural (drought, pest infestations, a bad harvest, and terms of trade losses); (ii) idiosyncratic economic shocks (a job loss, bankruptcy, accident or death of the breadwinner, and lost remittances); (iii) social /violent (family or land disputes and criminal offenses); (iv) covariate economic shocks (enterprise closures and mass lay-offs); and (v) natural (an earthquake, flood, storm , hurricane, landslide, or forest fire).

Table 2: Bunched Shocks: Understanding the Correlation Structure using Factor Analysis

Reported statistic: Factor loadings after oblique rotation

Shocks \ Factor	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Earthquake	(0.109)	(0.034)	(0.061)	0.147	(0.605)
Drought	0.537	0.078	(0.080)	(0.078)	(0.075)
Floods	0.130	(0.065)	0.179	0.117	(0.239)
Tempest	0.206	0.041	0.143	0.045	(0.402)
Hurricane	0.057	0.021	(0.140)	(0.047)	(0.646)
Pest	0.592	(0.037)	0.030	(0.009)	(0.087)
Land Slides	0.229	(0.038)	0.140	(0.069)	(0.242)
Forest Fires	0.076	0.080	0.067	0.045	(0.256)
Enterprise Closure	(0.018)	0.064	0.038	0.724	(0.026)
Mass Lay-offs	(0.050)	0.185	(0.043)	0.670	(0.065)
Public Protest	(0.105)	0.113	0.142	0.173	(0.108)
Job Loss	(0.141)	0.681	(0.049)	0.200	(0.040)
Income Drop	(0.021)	0.728	(0.066)	0.085	0.024
Bankruptcy	0.226	0.291	(0.076)	0.156	0.155
Accident Breadwinner	0.095	0.423	0.049	(0.191)	(0.060)
Death Breadwinner	(0.085)	0.191	0.080	(0.187)	0.067
Death Other HH Member	(0.082)	0.091	0.225	(0.051)	(0.065)
Abandon Breadwinner	(0.054)	0.206	0.114	(0.196)	0.047
Fire	(0.030)	0.188	(0.154)	(0.138)	(0.171)
Criminal Offense	0.015	0.018	0.358	0.200	0.115
Land Dispute	(0.015)	(0.108)	0.692	0.033	0.093
Family Dispute	(0.055)	0.004	0.642	(0.063)	0.031
Lost Remittances	0.118	0.260	0.166	(0.054)	0.171
Lost TOT	0.497	0.029	(0.126)	0.189	0.225
Lost Harvest	0.692	(0.139)	(0.003)	(0.071)	0.004

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Shocks are difficult to predict. When we compared information on the incidence of various shocks from sources with different recall period (the ENCOVI, the QPES, and from administrative and secondary sources), we found that there is not much of a common story across time. There are good years with only mild shocks and bad years with severe, catastrophic shocks. Moreover, the reported incidence of shocks differs even across contemporaneous surveys with similar recall period. The incidence of shocks with a negative impact on income reported by urban Guatemalans in 2000 ranged from 43.3 percent in the ENCOVI data set (78.5 percent if inflation is taken into account) to 35.7 percent in Gaviria (2001).

For some shocks, there are sizeable differences in reported incidence when different reporting periods are used. These differences are illustrated in Table 3. The second column in the table presents estimates of the incidence of shocks during the 1995-2000 period as reported by focus group members in the ENCOVI community questionnaire.⁹ The third column presents the estimates from the ENCOVI data set for the same shocks but with a recall period of 12 months. The last column of the table presents estimates from the ENCOVI data set restricted to the same sample as the focus groups. Assuming that there was no overlap of shocks during 1995-2000 and that shocks were uniformly distributed across time, then shock incidence for 1995-2000 should be five times greater than the corresponding figure for 2000. As some overlap is expected, this ratio may be smaller than five. However, ratios in excess of five will be sufficient to discredit the hypothesis that shocks are uniformly distributed over time. This is the case, for instance, for hurricanes and forest fires; 2 percent of individuals were affected by a hurricane in 2000, but

⁹ Because of non-responses, the ENCOVI community questionnaire covers only 58 percent of the clusters in the survey sample.

44.3 percent were affected by one over the five-year period, while 1.3 percent of individuals experienced a forest fire in 2000 whereas 17.1 percent experienced one in the five-year period.

Table 3: Frequency of Reported Shocks by Different Recall Periods

	% of HHs Reporting Shocks over the last:		
	5 years	1 year	1 year
Level:	Focus Group	Household Level	Household Level
Sample:	Restricted Sample	Whole Sample	Restricted Sample
Earthquake	4.0 (1.3)	0.8 (0.2)	0.6 (0.2)
Hurricane	44.3 (3.0)	1.9 (0.3)	2.2 (0.4)
Drought	19.4 (2.2)	7.6 (0.7)	8.9 (0.9)
Floods	14.9 (2.3)	2.7 (0.4)	3.1 (0.5)
Tempest	17.1 (2.5)	3.9 (0.4)	4.0 (0.5)
Pests	31.1 (2.8)	19.6 (1.2)	20.7 (1.5)
Land Slides	12.1 (1.9)	1.7 (0.3)	1.8 (0.3)
Forest Fires	17.1 (2.1)	1.2 (0.2)	1.3 (0.2)

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Table A3a in the annex illustrates that, when different reporting periods are used, sometimes household characteristics are associated with significant differences in the incidence of shocks and sometimes they are not. For example, the incidence of hurricanes and forest fires was significantly higher in rural areas in the last previous years than in 2000. The reverse was true for storms and pest infestations.

Different recall periods also give conflicting messages about the incidence of shocks depending on the welfare position of the household. It is tricky to analyze the correlation between the probability of experiencing a shock and poverty (or income/consumption distribution) because those households who suffer an income or wealth loss are likely to appear in the lower end of the income distribution. Therefore, the probability of suffering a shock will be, by definition, higher for the poor than the non-poor. Thus, the observed correlation between shocks and poverty may be spurious.

One way to avoid this problem is to investigate the distributional impact of shocks relative to wealth variable constructed using information on households' possession of durables and the characteristics of their dwellings. This variable is less likely to be affected by short-term fluctuations in household income; thus, we interpret it as the long-term socioeconomic status of the household. In addition, the wealth variable is less likely to be affected by measurement error. As suggested by Filmer and Pritchett (1999), both durables and housing characteristics can be observed with much more precision than consumption and income. This variable correlates strongly with the (logarithm of) household consumption (Pearson correlation coefficient == 0.77).

In terms of wealth quintiles, forest fires affected relative more the poor than the rich since 1995, but not so in 2000. The non-indigenous population reported experiencing a higher incidence of earthquakes, hurricanes, storms, and pest infestations than the indigenous population between 1995 and 2000 but not in 2000. The reverse was true for forest fires.

There is a tendency for respondents to "complain" about covariate shocks, and be more "honest" with idiosyncratic shocks. In the ENCOVI data, the share of reports of covariate shocks that had no negative effects on household income or wealth – which are likely to be false complaints – is significantly larger than the share of reports of idiosyncratic shocks.

One implication of this finding is that the cross-sectional incidence of shocks in 2000 is a poor predictor of the future distribution of shocks. It does not allow us to predict how many shocks of specific types will hit the country in future years. Nonetheless, it does shed light on the likely impact of various types of shocks, as discussed below.

Natural shocks are an exception. Exposure to some natural shocks does seem to be largely determined by location and geographic factors. Administrative maps of vulnerability to drought, earthquakes, hurricanes, storms, frosts, and landslides are highly consistent with the results

Box 1: Disaster Management Programs in Guatemala

The *Coordinadora Nacional para la Reducción de Desastres* (CONRED) is a disaster management program (early-warning and early-response) employing about 1,300 people and providing training to communities exposed to natural risks and special housing arrangements to reduce vulnerability to earthquakes. The initiative relies primarily on foreign funding (90 percent). The budget for CONRED is quite small (about Q130 mn, or 0.09 percent of GDP). The Ministry of Health (MSPAS) also has a *Unidad Nacional de Prevención de Desastres*.

reported in the ENCOVI 2000. For example, both the flood maps prepared by the Ministry of Agriculture and the FAO and the data from the ENCOVI classify the Nor-Oriente Region as a high-risk area and the Nor-Occidente Region as a low-risk area. As such, vulnerability maps are useful instruments for risk management planning. They can be even more powerful in targeting assistance to those least able to cope with such shocks when combined with poverty maps. Guatemala has experience in collecting information on areas with high vulnerability to natural disasters and in implementing disaster-relief programs (Box 1). However, these mechanisms have implementation problems (for example, inadequate financing and staff to respond to disasters in a timely manner), and actual interventions have mainly focused on *ex-post* coping rather than on risk mitigation or prevention.

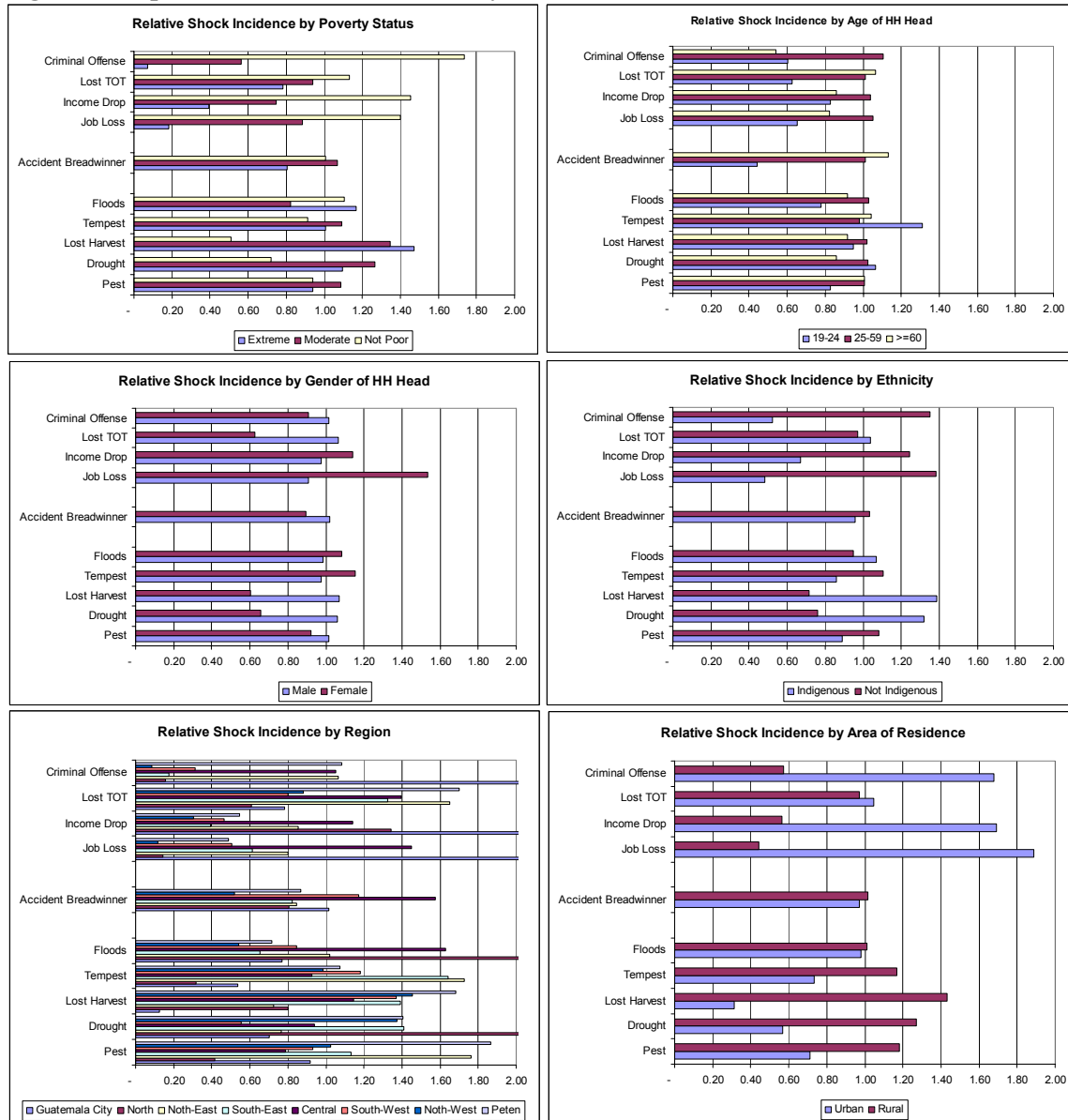
Who is Most Likely to be Affected by Shocks?

This section investigates the correlation between shock incidence and household characteristics for those shocks on which sufficient information was collected to allow for between-group comparisons. Some of these shocks were natural disasters or agricultural shocks, such as pest infestations, droughts, bad harvests, storms, or floods. Others were income shocks typically associated with participating in the formal economy, such as lost terms of trade, falling incomes, or lost jobs. Finally, we also look at household characteristics and shocks like accidents to the family breadwinner and criminal offenses.

Figure 3 illustrates the relative incidence these shocks (the ratio of the incidence of a shock on a particular population group relative to its countrywide incidence), by various household characteristics (the age, gender, or ethnicity of the household head and the household's poverty status) and location characteristics (the region and area – urban or rural – in which the household is located). For example, about 3 percent of Guatemalan households have been affected in 2000 by criminal offences. The corresponding figures for non-poor and extremely poor households were 5 percent and 0.2 percent respectively. In relative terms, the incidence of the shock was 75 percent higher for the non-poor and 93 percent lower for the extremely poor compared to the nation-wide average ($3\% = 1.00$). The incidence of the other shocks between population groups is transformed relative to the national average in a similar fashion.

The largest relative differences in the incidence of shocks occur across location characteristics, such as the region or area of residence (the lower panel in Figure 3). We had expected that agricultural shocks or natural disasters would have a large impact on rural livelihoods, while shocks like falling incomes, lost jobs, and criminal offenses would have more of an effect on urban livelihoods. However, regional characteristics were found to explain even more of the variation in the incidence of shocks.

Figure 3: Reported Incidence of Shocks by Household and Location Characteristics



World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

We found that household characteristics such as poverty status or the gender and ethnicity of the household head were also associated with relative shock incidence. Bad harvests, droughts and pest infestations were more frequently reported by the poor, indigenous, and male-headed households than by non-poor, non-indigenous and female-headed households. The reverse is true for lost terms of trade, falling incomes, and lost jobs. However, the associations revealed in Figure 3 are partly due to the association between poverty, rural location, and ethnicity. Next in Table 4 we investigate whether if these associations are significant if we control for the impact of other potential covariates.

Table 4: What Household Characteristics or Location Factors are Associated with the Probability of Reporting a Shock?

Reported statistics: odds' ratios

	Drought		Pest		Job Loss		Income Drop		Accident Breadwinner		Lost TOT		Lost Harvest		Tempest	
Wealth Factor Score	0.946*	0.951	0.974	0.969	1.030	1.034	1.071**	1.062**	0.983	0.972	1.121**	1.115**	0.988	0.982	1.048	0.954
	(0.023)	(0.031)	(0.015)	(0.020)	(0.021)	(0.021)	(0.020)	(0.020)	(0.019)	(0.020)	(0.031)	(0.031)	(0.021)	(0.021)	(0.031)	(0.042)
Illiterate HH Head	0.729**	0.685*	0.890	0.857	0.841	0.821	0.590**	0.593**	0.799*	0.821	0.845	0.820	1.133	1.119	1.086	0.777
	(0.084)	(0.103)	(0.074)	(0.086)	(0.130)	(0.130)	(0.084)	(0.084)	(0.090)	(0.094)	(0.132)	(0.130)	(0.100)	(0.099)	(0.177)	(0.171)
HH Size	1.040*	1.042	1.047**	1.050**	1.092**	1.083**	1.032	1.037	1.008	1.007	0.971	0.967	1.023	1.019	1.060*	1.071*
	(0.018)	(0.023)	(0.013)	(0.016)	(0.022)	(0.022)	(0.019)	(0.020)	(0.017)	(0.018)	(0.023)	(0.023)	(0.014)	(0.014)	(0.026)	(0.035)
Age HH Head	1.000	1.001	1.001	1.003	0.994	0.994	0.992**	0.993*	1.013**	1.014**	1.006	1.007	0.996	0.996	0.993	0.994
	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.006)
Gender HH Head	0.812	0.635*	0.946	0.879	0.948	0.953	1.066	1.083	0.981	1.009	0.705	0.698	0.674**	0.677**	1.430*	1.410
	(0.120)	(0.133)	(0.086)	(0.108)	(0.120)	(0.123)	(0.126)	(0.130)	(0.114)	(0.121)	(0.130)	(0.132)	(0.085)	(0.087)	(0.229)	(0.342)
Ethnicity HH Head	1.497**	1.207	0.785**	0.868	0.858	0.851	0.763*	0.776*	1.039	1.032	1.217	1.281	1.137	1.182	0.924	0.852
	(0.172)	(0.175)	(0.063)	(0.084)	(0.114)	(0.115)	(0.087)	(0.089)	(0.107)	(0.110)	(0.176)	(0.188)	(0.099)	(0.104)	(0.150)	(0.176)
Urban	0.673**	0.607**	0.800**	0.897	1.609**	1.599**	1.449**	1.439**	1.062	1.057	0.992	1.004	0.642**	0.666**	0.760	1.000
	(0.086)	(0.103)	(0.069)	(0.097)	(0.206)	(0.208)	(0.170)	(0.172)	(0.116)	(0.120)	(0.152)	(0.156)	(0.067)	(0.070)	(0.126)	(0.229)
North	1.827**	0.780	0.388**	0.179**	0.282**	0.257**	1.053	1.017	0.644*	0.616*	0.914	0.906	1.195	1.105	0.758	0.605
	(0.411)	(0.250)	(0.067)	(0.047)	(0.068)	(0.065)	(0.164)	(0.160)	(0.130)	(0.129)	(0.299)	(0.306)	(0.380)	(0.353)	(0.291)	(0.344)
North_East	1.057	0.608	2.256**	1.115	0.694*	0.702*	0.421**	0.412**	1.040	0.974	1.902*	2.061*	2.059*	2.070*	3.308**	2.020
	(0.277)	(0.236)	(0.302)	(0.214)	(0.122)	(0.124)	(0.079)	(0.078)	(0.195)	(0.190)	(0.561)	(0.621)	(0.696)	(0.701)	(0.964)	(0.989)
South_East	1.634*	1.448	0.947	0.678*	0.716	0.697*	0.384**	0.330**	0.780	0.689	2.210**	2.220**	3.054**	3.031**	3.086**	1.776
	(0.370)	(0.423)	(0.132)	(0.128)	(0.126)	(0.125)	(0.070)	(0.063)	(0.148)	(0.137)	(0.606)	(0.631)	(0.930)	(0.924)	(0.889)	(0.825)
Central	0.951	0.899	0.681**	0.549**	1.155	1.193	0.829	0.784	1.673**	1.536**	1.649	1.704	3.729**	3.527**	1.836*	1.811
	(0.209)	(0.255)	(0.091)	(0.098)	(0.170)	(0.177)	(0.116)	(0.111)	(0.261)	(0.248)	(0.435)	(0.464)	(1.097)	(1.039)	(0.530)	(0.803)
South_West	0.473**	0.554	0.705*	0.716	0.442**	0.437**	0.351**	0.334**	1.017	0.974	1.254	1.261	3.357**	3.154**	1.733	1.697
	(0.117)	(0.172)	(0.097)	(0.126)	(0.081)	(0.082)	(0.061)	(0.058)	(0.171)	(0.170)	(0.346)	(0.360)	(0.993)	(0.935)	(0.511)	(0.765)
North_West	0.996	1.367	0.774	0.843	0.175**	0.159**	0.314**	0.292**	0.482**	0.456**	1.316	1.291	2.408**	2.224**	1.139	0.991
	(0.225)	(0.390)	(0.109)	(0.149)	(0.048)	(0.046)	(0.060)	(0.057)	(0.095)	(0.093)	(0.370)	(0.375)	(0.716)	(0.663)	(0.367)	(0.472)
Peten	1.051	1.146	1.709**	1.294	0.523**	0.482**	0.324**	0.306**	0.635*	0.612*	3.219**	3.427**	4.393**	3.973**	1.611	1.444
	(0.269)	(0.373)	(0.248)	(0.246)	(0.116)	(0.112)	(0.073)	(0.070)	(0.141)	(0.140)	(0.927)	(1.012)	(1.369)	(1.242)	(0.560)	(0.738)
Agricultural Income	1.686**	2.016**	1.801**	3.613**	0.508**	0.530**	1.384**	1.391**	1.360**	1.358**	3.168**	3.233**	14.680**	15.037**	1.378*	3.226**
	(0.208)	(0.335)	(0.151)	(0.411)	(0.069)	(0.073)	(0.161)	(0.165)	(0.145)	(0.150)	(0.498)	(0.519)	(2.063)	(2.170)	(0.218)	(0.769)
Poor House	1.025	0.775	1.242	1.004	0.507	0.550	1.365	1.370	1.263	1.240	0.905	0.904	1.298	1.269	0.831	0.716
	(0.195)	(0.205)	(0.166)	(0.164)	(0.203)	(0.220)	(0.341)	(0.343)	(0.249)	(0.250)	(0.246)	(0.246)	(0.188)	(0.185)	(0.260)	(0.290)
Observations	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274	7,274
Pseudo-R2:	7%	7%	6%	9%	10%	10%	7%	6%	3%	3%	5%	5%	23%	23%	3%	5%

Standard errors in parentheses

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

Note: For each type of shock, two models are estimated: one for the probability of reporting a shock (first column), and the second for the probability of suffering (income or wealth) loss following a shock (second column). Wealth household score is an index of long-term socio-economic status of the household. Higher values of the index are associated with better-off households. "Agricultural income" is an indicator variable that stands for majority of HH income derived from agricultural activities. Poor house is an indicator variable that means living in a dwelling built from cheap materials.

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Table 4 investigates the association between a household's characteristics and location and the probability of it reporting a shock or the probability of it incurring wealth or income losses due to a shock using a multivariate logistic model. A linear model in logits is postulated. Compared to the unconditional estimates presented before, these models attempt to separate out the impact of each of the predictor variables while keeping the others "under control" (the *ceteris paribus* assumption). The predictors of the model are the economic status of the household (captured by its wealth, the literacy of the household head, and the quality of the dwelling), exogenous household characteristics of the household head (his or her age, gender, and ethnicity), and the location of the dwelling (area of residence – urban or rural – and region). Standard errors are reported in parentheses below the estimated odds ratios and are signaled as follows: * means significant at the 5 percent level, while ** means significant at the 1 percent level.

Ceteris paribus, wealthier households are more likely than poorer households to report or suffer income or term of trade losses and are less likely to report experiencing droughts (but not to actually *suffer* losses due to drought). Households that would be otherwise observationally equivalent but those with an illiterate head are less likely than those with a literate head to suffer losses due to droughts or drops in income and are less likely to be affected by an accident befalling the breadwinner. Large households are more likely than small households to suffer from pest infestations and job losses and to report experiencing episodes of drought, after controlling for the effect of the other predictors. If the household head is older, the household faces a higher risk of accident (of the breadwinner) and a lower risk of a fall in income, after controlling for other predictors. Similarly, households headed by indigenous heads are less likely than those with a non-indigenous head to suffer from falls in income *ceteris paribus*, and to over-report episodes of droughts and to under-report episodes of pest infestations.

Households located in urban areas, as expected, are less likely than those in rural areas to suffer from droughts and bad harvests but are more likely to suffer from falling incomes or lost jobs. There are significant differences in the probability of suffering income or wealth losses due to shocks across regions, except in the case of droughts. In particular, the odds of households suffering from economic shocks are higher in Guatemala City than in the rest of the country. The reverse is true for natural or agricultural-related shocks, although the model controls separately for those households that derive most of their income from agriculture. Deriving more than half of household income from agriculture, after controlling for other factors, is strongly associated with higher odds of experiencing bad harvests, terms of trade losses, droughts, pest infestations, falling incomes, and an accident to the breadwinner (in descending order of importance). These households than others have lower odds of suffering from job losses.

Who is Most Likely to Suffer Welfare Losses if Hit by a Shock?

The effects of shocks are multi-dimensional and affect a variety of aspects of household welfare. Focus group participants in the QPES reported experiencing a wide range of impacts of shocks (see Table 5). In addition to the triad of "economic" effects (wealth-income-consumption), they reported experiencing psychological effects (such as the demoralizing impact of job losses and the traumatic impact of violence), social effects (destroying trust and social capital within villages), damage or destruction of community assets (loss of road access or schools destroyed), health effects (illness or death), and education effects (parents cannot afford to send their children to school). In the ENCOVI, covariate shocks tended to be reported more often than idiosyncratic shocks, even if they did not trigger income or wealth losses. Idiosyncratic shocks are almost always associated with income or wealth losses. Social shocks (such as violence or civil unrest) are unlikely to result in income or wealth losses; their impact on other dimensions of welfare is not well spelled out in the ENCOVI data, though respondents to the QPES described many shock situations.

Some shocks, like earthquakes, fires, and hurricanes, mainly affect the wealth of the household. The remaining natural shocks and all economic shocks affect income. Social shocks are less damaging to income than other kinds of shocks. However, the qualitative information shows that they have a knock-on effect on other dimensions of welfare, as we have already discussed.

Table 5: Types and Impact of Shocks Reported in the QPES

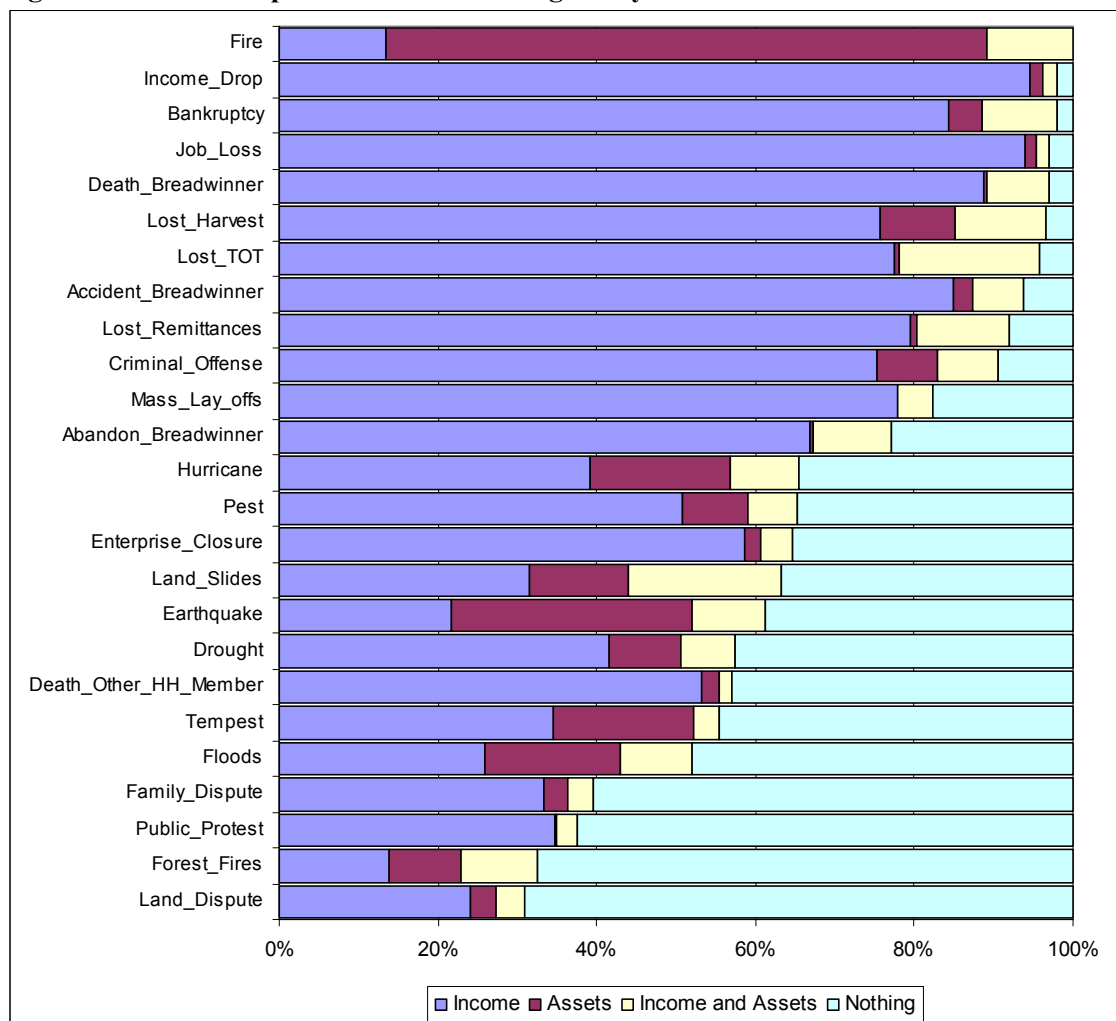
Types of Shocks	# of Villages Reporting Shock (out of 10)	Types of Impacts Cited					
		ECON WEALTH	ECON INCOME	PSYCH. SOCIAL	COMM. ASSETS	HEALTH	EDUC.
Natural							
Earthquakes (1976, 86)	7	X		X	X	X	
Tremors	1			X			
Hurricane (1998, 2000)	5	X	X		X	X	
Flooding	2	X	X		X		
Landslides	1				X		
Tornado	1				X		
Freezing/frost	2		X				
Forest Fire	1				X		
Drought	2		X				
Crop Loss	3		X				
Man-Made							
Violence of 1980s	3	X	X	X		X	X
Debt/Collective Debt	2	X					
Land conflict ^a	1	X		X	X		
Conflict in Community ^a	1			X	X		
Job loss	4		X	X			
Domestic Violence	3			X			
Crime and Violence	2			X			
Terms-of-Trade losses	1		X	X			
Abandonment from migration	1		X	X			
Health							
Cholera, dengue epidemic	2					X	
Birth (maternal mortality)	3					X	
Sickness	7		X			X	
Automobile accidents	1	X				X	
Death	5					X	

Source: QPES. PSYCH = psychological (fear, *susto*); COMM = community assets, such as damaged water tank, road blocked, etc. ECON = economic. EDUC = educational (kids couldn't attend school due to violence). a. Many other communities identified these conflicts as occurring in their villages (land, religious), but only a few identified them as shocks.

Economic shocks had the highest negative impact on welfare. Given the absence of information on the magnitude of income or consumption lost due to shocks, one way to assess the severity of their impact is to look at how often an economic shock resulted in such a loss or whether the household had compensated for the negative effects of the shock by the time of the survey (meaning within the previous 12 months). All of these measures are imperfect, in part due to limitations in the ENCOVI questionnaire.

The share of households that suffered welfare losses as a consequence of the reported shock varies from shock to shock (Figure 4). At one end, there were shocks that invariably resulted in material losses for the affected (reporting) households, including fire, falls in income, bankruptcy, job losses, the death of the breadwinner, bad harvests, and declining terms of trade. Some, like fire, mainly affected the assets of the household, while the rest eroded the household's income. At the other end of the spectrum, there were shocks that did not harm the income or wealth of a large proportion of the reporting households, such as land disputes, family disputes, forest fires, and public protests.

Figure 4: Share of Reported Shocks that Negatively Affected Household Income or Wealth



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The duration of the impact varies by the type of shock. In the QPES, which did not restrict respondents to a particular reference period, respondents in several villages noted the long-lasting effects of shocks. For example, many respondents reported that families still live in homes that were badly damaged by the earthquake of 1976 (some 25 years later). The shock simply caused these households to slip from an already poor level of living conditions into an even worse state with no way out. Hurricane Mitch also seemed to have had catastrophic consequences on some villages, completely wiping out their

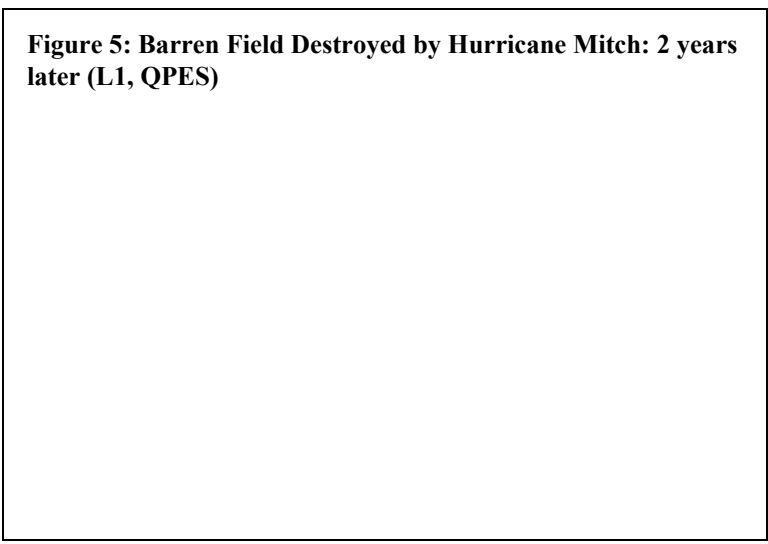
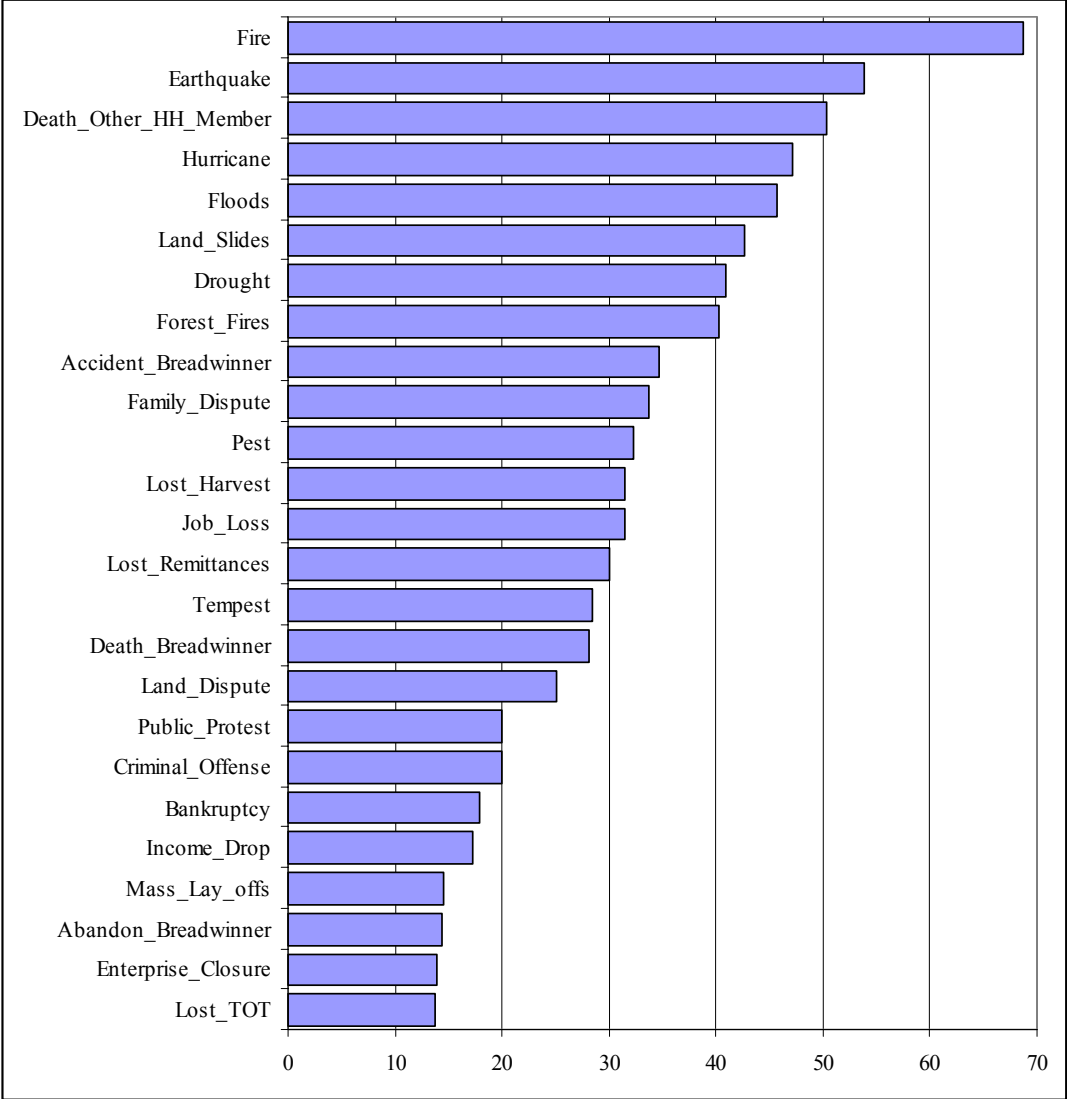


Figure 5: Barren Field Destroyed by Hurricane Mitch: 2 years later (L1, QPES)

main productive base (see Box 2). The conflict of the 1980s has also clearly had lasting social and psychological effects, according to respondents in the QPES. The ENCOVI 2000 suggests that most households were, in fact, able to mitigate the shock and restore their (economic) welfare within 12 months. For example, close to 70 percent of households that reported experiencing a fire were able to resolve their situation within a year. The impact of more frequent shocks lasted longer, however; fewer than 20 percent of households were able to restore their welfare within a year when faced with worsening terms –of trade, income (earnings) losses, enterprise closures, public protests, criminal offenses, or bankruptcy. Only a third of those reporting pest infestations, bad harvests, lost remittances, or job losses were able to overcome the shock within a year.

Figure 6: Share of Reported Shocks Whose Effects Were Mitigated at the Time of the Survey



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Box 2: The Catastrophic Consequences of Hurricane Mitch on One Village

In the Ladino village known in the QPES data as L1, is located in the Nororiente Region of the country, living conditions have drastically worsened since Hurricane Mitch struck in 1998. Prior to the hurricane, the main source of income for the village was agriculture, with a diverse range of production: lemons, papaya, tobacco, melons, eggplant, palms for raw material from artisan work, corn for subsistence, and livestock. Hurricane Mitch severely damaged the land, however, rendering it largely infertile (the flooding basically washed away the productive topsoil and dumped rocks all over the fields, see photo Figure 5). It also destroyed livestock animals and farm implements. Now, most individuals have to travel elsewhere to look for jobs, with some 400 (half of the village population) migrating to the capital or to the US and leaving their families behind.

Moreover, even though the village has certain community assets, such as electricity and water, the hurricane clearly exposed vulnerabilities in its asset base. The village lacks proper drainage and sewage and adequate health services. The villagers blame an ensuing dengue epidemic on stagnant waters left in the wake of Mitch, which generated an infestation of mosquitoes. The effects of this epidemic were exacerbated by the lack of health services in the village.

What household and location characteristics are associated with a swift resolution of the impact of some shocks? We used a multivariate logistic model to answer this question in the case of some frequent or moderate shocks. The results are presented in Table 6. While literacy (compared to illiteracy) does not seem to be a significant factor in increasing the odds of fast resolution, having more wealth helps those households that have experienced pest infestations or declining incomes to recover quickly. The odds of recovering from an accident to the household breadwinner get smaller as the age of the household head increases. Female-headed households have lower odds than male-headed households of recovering from job losses, *ceteris paribus*. Significant regional variations exist, especially with respect to the speed of recovery from pest infestations and from accidents to the household breadwinner.

Many households were able to smooth their consumption when confronted with shocks. Not all income or wealth losses resulted in reductions in consumption. In fact, only slightly more than a quarter of the shocks that resulted in income or asset losses forced households to cut their consumption to cope with the shock. In the majority of cases, households were able to mitigate the effects of shocks or to use coping strategies other than reducing their consumption.

The harshest impact on household consumption came from economic shocks, which reduced households' income streams. These include falls in income (32 percent), job losses (21 percent), lost remittances (19 percent), and lost terms of trade (12 percent). Surprisingly, public protests were also associated with reduced consumption; in 27 percent of the cases, households reporting such a shock were forced to reduce their consumption.

Table 6: The Probability of Recovering from the Negative Impact of the Shock by the Time of the Interview

Reported Statistic: Odds Ratios

	Probability of Solving the Shock by the time of the Interview						
	Drought	Pest	Job Loss	come Drop	readwinner	Lost TOT	arvest Loss
Wealth Factor Score	1.078 (0.076)	1.127** (0.047)	0.971 (0.041)	1.153** (0.052)	1.030 (0.045)	1.010 (0.071)	0.954 (0.040)
Illiterate HH Head	1.172 (0.367)	0.846 (0.164)	0.901 (0.300)	0.641 (0.289)	1.260 (0.290)	0.456 (0.228)	0.915 (0.151)
HH Size	0.998 (0.048)	0.973 (0.030)	0.996 (0.044)	1.000 (0.048)	0.985 (0.036)	0.921 (0.068)	0.993 (0.026)
Age HH Head	0.993 (0.009)	1.003 (0.006)	1.003 (0.007)	0.988 (0.008)	0.981** (0.006)	0.990 (0.012)	1.002 (0.005)
Female HH Head	0.493 (0.243)	1.023 (0.257)	0.556* (0.153)	1.010 (0.286)	0.609 (0.155)	1.447 (0.711)	1.339 (0.325)
Indigenous HH Head	0.960 (0.281)	1.129 (0.212)	1.853* (0.503)	1.094 (0.314)	1.115 (0.239)	0.787 (0.293)	0.926 (0.150)
Urban	0.416* (0.159)	0.811 (0.178)	1.030 (0.284)	0.965 (0.322)	1.123 (0.267)	1.382 (0.585)	0.855 (0.183)
North	0.415 (0.264)	5.061** (2.868)	0.719 (0.377)	1.166 (0.470)	2.974* (1.286)	1.942 (1.853)	2.123 (1.501)
North_East	0.455 (0.385)	1.956 (0.864)	1.024 (0.362)	0.748 (0.353)	2.023 (0.829)	1.248 (1.142)	1.765 (1.317)
South_East	0.312 (0.191)	3.710** (1.581)	1.208 (0.428)	1.277 (0.546)	2.709* (1.102)	1.217 (0.975)	1.003 (0.700)
Central	0.318 (0.186)	2.477* (1.086)	0.784 (0.238)	0.883 (0.305)	1.879 (0.657)	1.895 (1.455)	0.676 (0.461)
South_West	0.428 (0.273)	5.156** (2.156)	0.638 (0.268)	1.061 (0.419)	2.868** (1.041)	2.618 (1.969)	2.525 (1.695)
North_West	0.310* (0.174)	3.750** (1.563)	1.045 (0.609)	1.051 (0.461)	2.100 (0.859)	4.170 (3.117)	1.903 (1.277)
Peten	0.370 (0.245)	4.796** (2.033)	0.597 (0.295)	1.642 (0.887)	2.429 (1.147)	0.912 (0.861)	1.195 (0.831)
Agricultural Income	0.844 (0.287)	1.011 (0.253)	0.862 (0.239)	1.104 (0.347)	0.910 (0.206)	1.063 (0.428)	0.643 (0.185)
Poor House	0.633 (0.369)	1.667 (0.487)	0.303 (0.339)	0.373 (0.402)	0.549 (0.237)	1.345 (1.273)	1.036 (0.258)
Observations	320	779	487	599	599	312	1,062
Pseudo-R2:	4%	4%	2%	4%	4%	7%	4%

Standard errors in parentheses

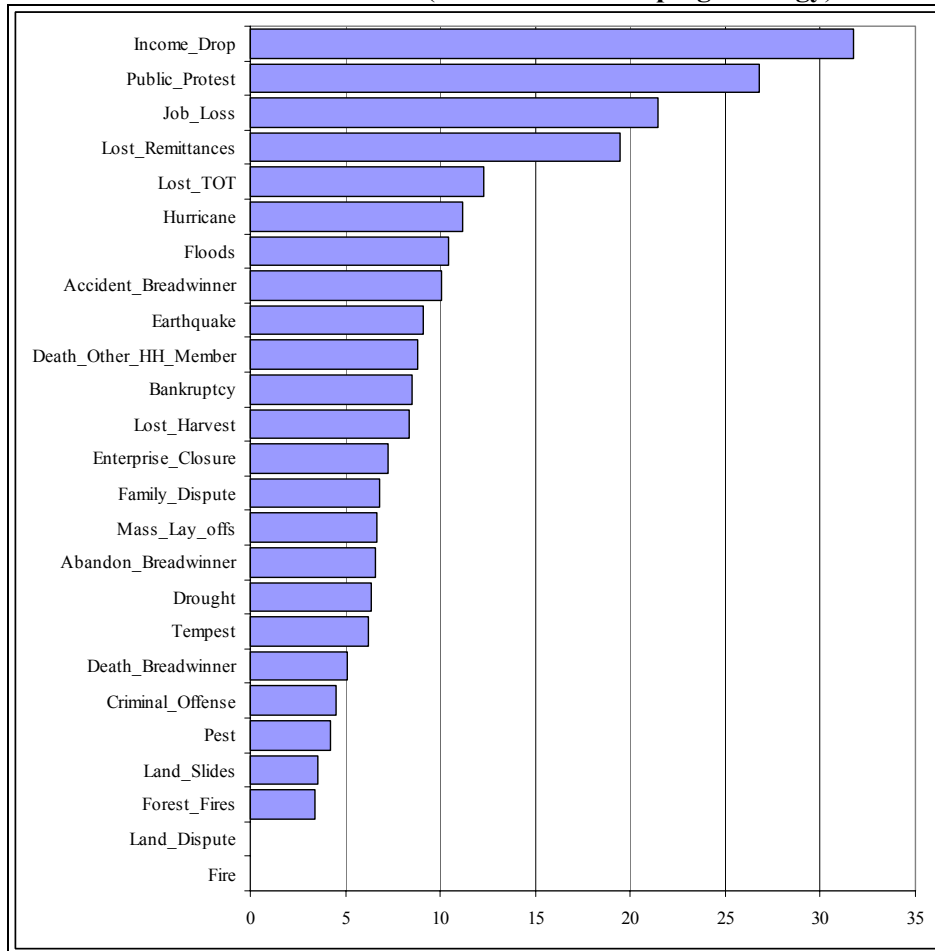
* significant at 5%; ** significant at 1%

* missing coefficient predict success perfectly

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

About 70 percent of the shocks forced fewer than one in ten affected households to cut their consumption as their main coping strategy. Again, it is possible that this result is specific to the particular shock profile (frequency, severity, and prevalence) that existed in Guatemala in 2000. Among the shocks to which almost all affected households responded by smoothing their consumption were fires, land disputes, landslides, forest fires, pest infestations, criminal offenses, and – surprisingly – the death of the breadwinner.

**Figure 7: Share of Reported Shocks that Forced Households to Cut Their Consumption
(as Their Main Coping Strategy)**



World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

The Severity of the Shocks

The ENCOVI survey did not collect quantitative information on the impact of shocks on household welfare, but these can be inferred, albeit imperfectly, by combining the available categorical information that we have previously presented. We estimated the severity of the impact of the shock on a household's wealth-income-consumption by creating an index equal to the mean (or median) of three variables: (i) the percentage of households that lost income or wealth as a result of the shock; (ii) the percentage of households that reported having to reduce consumption as their main coping strategy; and (iii) the percentage of households that had not compensated for the shock by the time of the interview.

Table 7: Assessing the Severity of Shocks

Shock Impact: / Shock	Share of Household Reporting the Shock Who:			Mean Rank	Median Rank
	Lost Income or Wealth	Reduced Consumption	Did Not Yet Resolved the Shock		
Low Impact					
Forest_Fires	33	3	60	4	3
Land_Dispute	31	0	75	7	1.5
Land_Slides	63	4	57	7	6
Drought	57	6	59	8	8
Family_Dispute	39	7	66	9	10
Death_Other_HH_Member	57	9	50	9	7
Moderate/Low Impact					
Pest	65	4	68	9	11
Earthquake	61	9	46	9	9
Fire	100	0	31	10	1.5
Tempest	55	6	72	10	8
Floods	52	10	54	10	5
Hurricane	66	11	53	12	13
Moderate/High Impact					
Criminal_Offense	90	5	80	14	16
Public_Protest	38	27	80	15	18
Death_Breadwinner	97	5	72	15	16
Accident_Breadwinner	94	10	65	15	18
Lost_Harvest	97	8	69	16	14
Abandon_Breadwinner	77	7	86	16	14
Enterprise_Closure	65	7	86	16	13
Mass_Lay_offs	82	7	85	16	15
High Impact					
Lost_Remittances	92	19	70	18	17
Job_Loss	97	21	69	20	23
Bankruptcy	98	9	82	20	20
Lost_TOT	96	12	86	22	21
Income_Drop	98	32	83	24	25
Inflation	96	46	88	24	26

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

In Table 7, shocks are classified by the severity of their impact on income or wealth. The low-impact category includes: forest fires, land or family disputes, droughts, the death of a family member, and landslides. The moderate- to low-impact category includes: pest infestations, earthquakes, fires, storms, floods and hurricanes. The moderate- to high-impact category includes: criminal offenses, public protests, death, abandonment by or an accident to the household breadwinner, bad harvests, enterprise closures, and mass lay-offs. Finally, the high impact category includes: lost remittances, job losses, bankruptcy, worsening terms of trade, falls in income, or inflation.

This classification, though, is only likely to hold for the current distribution of shocks. In particular, there were no severe hurricanes or earthquakes in 2000, and thus they were classified only as moderate shocks. In contrast, the QPES respondents recalled severe earthquakes or hurricanes, like the 1976 earthquake and Hurricane Mitch, as major shocks with particularly damaging effects that were still visible at the time of the survey. Similarly, the ENCOVI focus group participants reported these shocks as being particularly

severe when a five-year recall period was used. This is consistent with our earlier conclusion that the current distribution of shocks is a poor predictor of the future.

There is a positive correlation between a shock's frequency and its severity. Frequent shocks, such as bad harvests and income losses, tend to have a severe negative impact on household income or wealth.

Main Coping Strategies

What are the main coping strategies that households use when faced with a particular shock? The ENCOVI records such information for 26 different types of shocks. Respondents had 25 types of pre-coded answers from which to choose. In the interests of brevity and ease of interpretation, the responses were grouped into six categories, as suggested by the following social risk management matrix (Holzmann, 2001):

- *Self-help or self-insurance.* These strategies involve selling, pledging, or mortgaging their assets, using their assets to generate more income, or supplying more work or augmenting the labor supply of those already employed. The ENCOVI collected information on coping strategies in the following categories: augmented labor supply of those already employed; augmented labor supply of new household members; sold house or land; sold animals; sold durables; sold jewelry; sold harvest in advance; borrowed from a relative; borrowed from a friend; borrowed from a moneylender; borrowed from employer.
- *Informal insurance.* This consists of households borrowing from friends, relatives, or moneylenders, or from the workplace or receiving help from friends, relatives, or neighbors; or using other social capital networks;
- *Market insurance or use of credit.* This involves the household using market-based mechanisms, such as credit (borrowed from banks, sold harvest in advance) and private insurance (cashed in the insurance premium). The ENCOVI collected information on the following types of coping strategies: used savings or stocks; pawned/ pledged liquid assets; mortgaged house or land; used the insurance premium; borrowed from a private bank; borrowed from a state bank.
- *Government help.* Some households' main coping strategy was to rely on government help in the form of disaster relief, aid, or ad hoc social assistance services.
- *Help from NGOs or other private or international organizations.*
- *Did nothing.*

The last category "did nothing?" was a peculiar option that is difficult to interpret. When a shock affects the material welfare of households, some actions are necessary, either to adjust the standard of living downward or to use other arrangements (assets, informal, formal or social) to mitigate the fall. The 24 remaining options were comprehensive enough that it seemed unlikely that this answer would be chosen very often. Surprisingly, a large share of households reported that they "did nothing" as their main coping strategy, from 20 percent of households affected by the death of the breadwinner or by fire to 70-80 percent of households affected by criminal offenses, forest fires, or mass lay-offs (see Table 8). Half (49 percent) of the (un-weighted) answers of all households in the sample fell into this "did nothing" category.

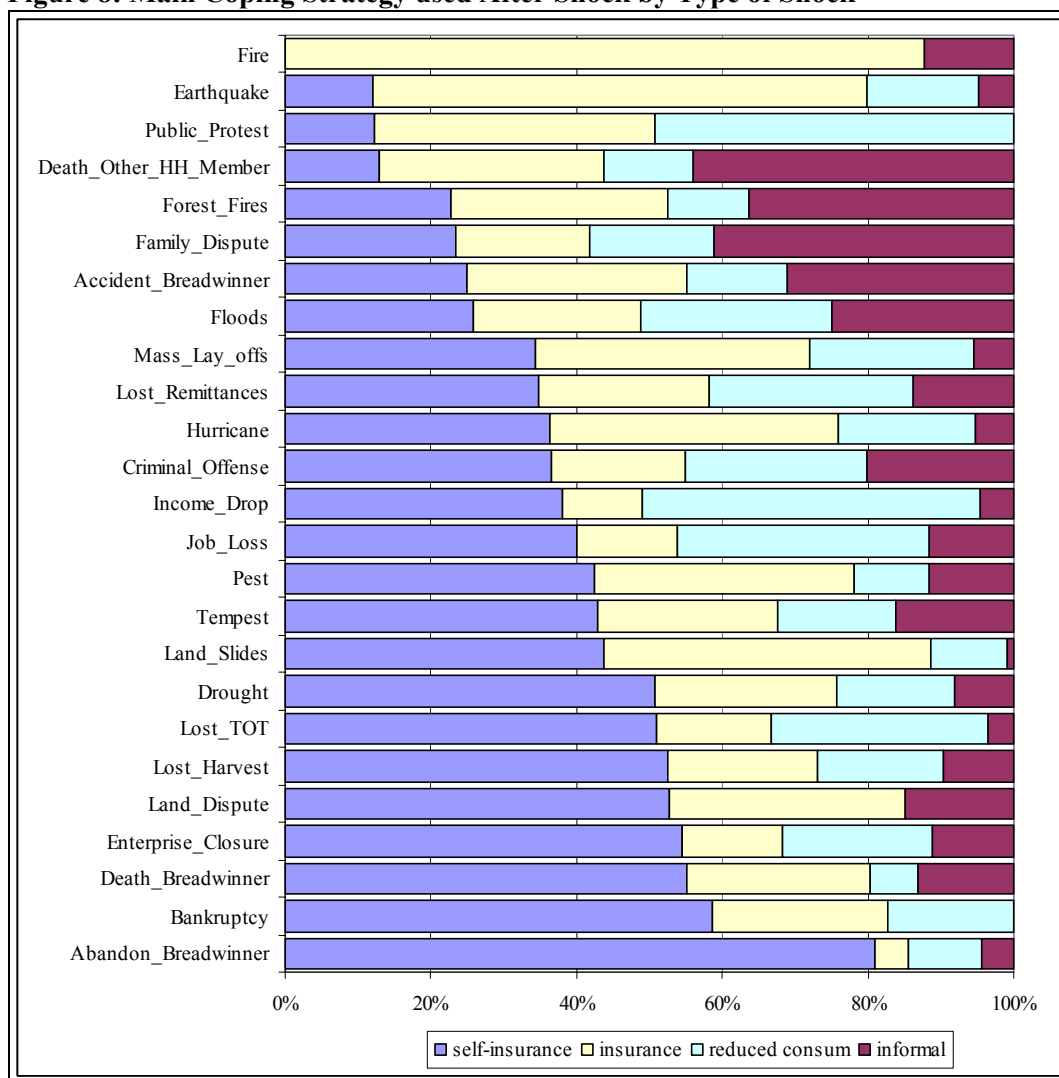
Table 8: Main Coping Mechanisms, by Type of Shock

Type of Shock	Did nothing	Self-insurance	Informal Insurance	Government	Reduced consum.	NGOs/Int'l	Total	
Earthquake	41	7	3	40	-	9	-	100
Drought	60	20	3	10	0.5	6	0.3	100
Floods	58	10	10	9	1.1	10	1.4	100
Tempest	61	16	6	10	-	6	0.7	100
Hurricane	41	21	3	23	-	11	0.3	100
Pest	58	18	5	15	0.3	4	0.5	100
Land_Slides	66	15	0	15	-	4	-	100
Forest_Fires	69	7	11	9	-	3	-	100
Enterprise_Closure	59	19	4	5	6.2	7	-	100
Mass_Lay_offs	70	10	2	11	-	7	-	100
Public_Protest	46	7	-	21	-	27	-	100
Job_Loss	37	25	7	9	0.2	21	0.2	100
Income_Drop	32	26	3	7	-	32	-	100
Bankruptcy	51	29	-	12	-	9	-	100
Accident_Breadwinner	26	18	23	22	0.1	10	0.6	100
Death_Breadwinner	21	44	10	20	-	5	-	100
Death_Other_HH_Mem	28	9	32	22	-	9	-	100
Abandon_Breadwinner	35	53	3	3	-	7	-	100
Fire	21	-	10	69	-	-	-	100
Criminal_Offense	79	7	4	3	-	5	3.0	100
Land_Dispute	57	23	6	14	-	-	-	100
Family_Dispute	60	9	16	7	-	7	-	100
Lost_Remittances	31	24	10	16	-	19	-	100
Lost_TOT	59	21	1	6	0.2	12	-	100
Lost_Harvest	50	26	5	10	0.1	8	1.0	100
Total	49	19	7	16	0.3	10	0.3	100

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Table 8 also highlights the main category of coping mechanism for each type of shock. For 12 out of 25 types of shocks, the main coping strategy was self-help or self-insurance, especially using extra labor or other physical and financial assets. Informal insurance was most often used in the case of the accident of the breadwinner, the death of another family member, or family disputes. Formal insurance or credit was used in the few risks covered by private insurance arrangements, such as fires, earthquakes, hurricanes, and landslides. When faced with falling income, public protests, or floods, most households reduced their consumption as their main coping strategy.

Figure 8: Main Coping Strategy used After Shock by Type of Shock



World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

With such a high rate of unclear responses, interpretation is difficult. Despite the limitations of the results, we present the shares of all the other main coping strategies in Figure 8.

When a shock hits, households' main strategy is to use their assets (by supplying more work, selling, pledging, or mortgaging their assets, or drawing down their savings), and the least common strategy is to receive help from the government or other forms of institutionalized help. Informal coping mechanisms dominate in the case of family disputes, accidents to the breadwinner, or the death of another member of the household. Formal coping mechanisms are the main coping strategies in the case of insurable risks, such as for losses triggered by earthquakes, hurricanes, landslides, or fires. Reducing consumption loss was reported as the most frequent main coping strategy in the case of falling household income, inflation, and public protests. Few households, if any, reported receiving any government help as their main coping strategy. For all shocks, fewer than 1 percent of the households reported using government help to cope with the shock, with the exception of those experiencing enterprise closures where this percentage goes up to 6 percent. These findings are very consistent with the findings of the QPES, where self-help and collective (community) actions were the prime coping strategies, with little evidence of government or formal assistance (Table 9).

Table 9: Main Coping Strategies and Formal Assistance in 10 Rural Villages

(for main collective shocks, QPES)				
Community	Shock Description	Main Coping Strategy/Response		Any Formal Assistance?
		Type	Description	
KA1	Earthquake 1976	SELF COLLECTIVE	Tried to rebuild homes, mill Using mill at neighboring finca	Received a few housing materials from unknown bilateral donors (“los gringos de francia o italia”)
	Massive labor dismissals by finca (labor dispute)	SELF	Tried to get union help (pending action) Sought temporary employment on nearby fincas	None
KA2	Earthquake 1976	COLLECTIVE	Organized development committee	Received housing materials, food, helicopter help for injured
	Violence of 1980s	SELF, COLLECTIVE	Villagers fled to nearby town, now have organized development committee to protect town	None during the violence Did receive a school, housing project after the conflict
KI1	Earthquake 1976	SELF (market-based)	Went into debt and then had to migrate to find work to pay back debt	UNEPAR provided some housing materials
	Cholera epidemic 1990	SELF	Went to hospital, received medicine, now treat water	Health education campaign at health center (promoting water treatment)
	Hurricane Mitch 1998	SELF	Went into debt, had to migrate to find work to pay back debt	None
L1	Hurricane Mitch Dengue epidemic	SELF SELF	Migration in search of work Illness, sought treatment	None None
L2	Earthquake 1976 Tornado 1998	SELF SELF	Each family rebuilt home Each family rebuilt home	None None
M1	Violence 1980s	SELF, COLLECTIVE	Villagers fled, helped each other repair homes, provide shelter and food	Some unknown external agency provided housing materials
	Forest Fire 1990s	COLLECTIVE	Village tried to fight fire	None
M2	Earthquake 1976	SELF	Family rebuilt home	Municipality provided some housing materials and food
	Rains, road washed out	COLLECTIVE	Village worked together to transport products and repair roads	None
QE1	Drought 1998	None	None	None
	Hurricane Mitch 1998	COLLECTIVE	Water committee, collective action	None
	Collective debt	COLLECTIVE	Collective action but little progress	Some advice from NGO/MAGA
QE2	Land conflict with neighboring community	COLLECTIVE	Contacted government officials	Yes, soldiers withdrawn (see Box 13.1 in Chapter 13).
	Drought 1998	SELF	Temporary migration in search of work	None
	Conflict within community	None	None (“voluntad de Dios”)	None

Does the probability of using one strategy over another vary depending on household welfare? To circumvent the circularity of poor households being those most likely to be affected by a shock, we ranked households from the poorest to the richest using a wealth score. We constructed this score by extracting the first factor out of a matrix of dummy variables recoding the household’s endowment in terms of their durables and of the characteristics of their dwelling instead of their observed consumption. We subscribe to the interpretation offered by Filmer and Pritchett (1999), that this first factor is a latent

variable that captures the long-term socioeconomic status of the household.¹⁰ The wealth factor score strongly correlates not only with household consumption,¹¹ but also with other indicators of well-being such as education and health status. We pooled together all information on shocks and on households' main coping strategies and tabulated them against the wealth factor score in Table 10.

Overall, there are no significant differences in the extent to which households used self-insurance, reduced their consumption, or received help from the government or NGOs by the economic status of the households. The very poor used informal mechanisms more frequently than the non-poor, while those in the second, third, and fourth quintiles used private insurance and credit more frequently than those in the first quintile (the very poor).

Table 10: Share of Households using a Particular Coping Strategy by Wealth Quintiles

Main Coping Strategy	Wealth Quintiles					Total
	Poorest	2	3	4	Richest	
Self-Insurance	39.4 (2.9)	39.2 (2.9)	31.8 (2.9)	33.6 (3.2)	33.1 (4.0)	35.3 (1.6)
Informal Insurance	11.0 (1.5)	8.1 (1.4)	7.4 (1.5)	5.8 (1.2)	5.1 (1.0)	7.4 (0.6)
Private Insurance/Credit	7.7 (1.4)	14.4 (2.6)	13.9 (1.8)	14.7 (2.0)	11.9 (1.6)	12.6 (1.1)
Government Help	0.4 (0.2)	0.0 (0.0)	0.2 (0.1)	0.0 (0.0)	0.3 (0.2)	0.2 (0.1)
Reduced Consumption	40.9 (3.1)	37.7 (3.2)	46.1 (2.8)	46.0 (3.0)	49.0 (3.4)	44.0 (1.6)
NGOs / Int'l Organizations	0.6 (0.4)	0.5 (0.4)	0.7 (0.4)	0.0 (0.0)	0.5 (0.3)	0.5 (0.2)
Total	100.0	100.0	100.0	100.0	100.0	100.0

Column percentages, (standard errors of column percentages)

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

However, this overall picture hides considerable variation among the different types of shocks in the relationship between which coping mechanism was used and the household's economic status (see Table A5a in the annex). As elsewhere in this paper, we confine ourselves to considering only those shocks with moderate or high frequency that can be estimated with sufficient confidence. For some shocks, such as income or job losses, poor households are more likely to resort to reducing their consumption than to try any other strategies. For pest infestations, worsening terms of trade, and bad harvests, the reverse is true; non-poor households cut their consumption more often than poor households when faced with such shocks. Shocks trigger reductions in consumption among poor and non-poor households alike, but, while the poor cut the consumption of their undiversified basket of basic staples, the non-poor reduce their consumption of elastic luxury goods. One way to interpret these findings is that poor households cannot smooth their consumption when they experience income or job losses.

The poor seem to be more successful in smoothing their consumption by using their assets (mainly labor) when faced with droughts, pest infestations, or bad harvests. The poor use self-help or self-insurance strategies more often than the non-poor. However, while the poor respond to such shocks by seeking jobs elsewhere (by augmenting either the labor of those household members who are already working or of other members of the family, including children), the non-poor tend to use their physical or financial

¹⁰ In addition, the information used to construct the factor score is easy to collect and is less prone to measurement error than alternative welfare measures such as consumption.

¹¹ The Pearson correlation coefficient between the natural logarithm of consumption and the wealth score was 0.77.

assets to cope with the effect of the shock. This pattern tends to hold for most of the shocks being studied.

Shocks for the Rich and Shocks for the Poor?

Consistent with international experience, it seems that the poor in Guatemala are more exposed to natural shocks, while the better-off (who are more able to protect themselves against natural shocks) are more often the victims of man-made shocks. This relationship holds when we control for the impact of shock on welfare. The probability of experiencing a material loss following bad harvests, droughts, pest infestations, or worsening terms of trade drops significantly as household wealth rises, after controlling for other potential determinants. The reverse is true for job losses, bankruptcy, and accidents to the household breadwinner. Figure 9 predicts the probability of reporting a shock as a probit function of the household's wealth score, keeping under control the household's size (set at mean), the gender and the age of the household head (set for a 45 years old male), the area (set for rural) and the region (set for Central Region) where the household resides.

The poor have lower resilience than the rich to the effects of shocks. The probability of restoring household income to level that prevailed before the occurrence of the shock rises with income. Some 88 percent of the extremely poor and 86 percent of the poor suffered losses after experiencing a shock compared with 83 percent of the non-poor. This difference is statistically significant. This is particularly noticeable in the case of natural shocks; while only half of those in the top quintile who experienced natural shocks suffered consequent welfare losses, two-thirds of those in the bottom quintile experienced welfare losses (Table 11).¹²

Table 11: Shocks for the Rich and Poor?

% of households	Total	Wealth Quintiles				
		Q1 poorest	Q2	Q3	Q4	Q5 richest
Reported Shocks						
Natural	28.7	35.4	28.2	32.0	26.7	21.2
Economic	32.8	32.8	31.5	34.7	33.0	31.8
Social	5.7	2.2	3.1	6.4	7.1	9.8
Lifecycle	12.4	10.8	12.4	11.8	14.2	12.7
Shocks that Reduced Welfare^a						
Natural	18.6	23.0	21.2	22.2	15.9	10.6
Economic	31.7	32.1	30.8	33.6	31.7	30.2
Social	3.7	1.0	1.8	5.5	4.6	5.8
Lifecycle	11.0	9.8	11.4	11.0	12.0	11.0

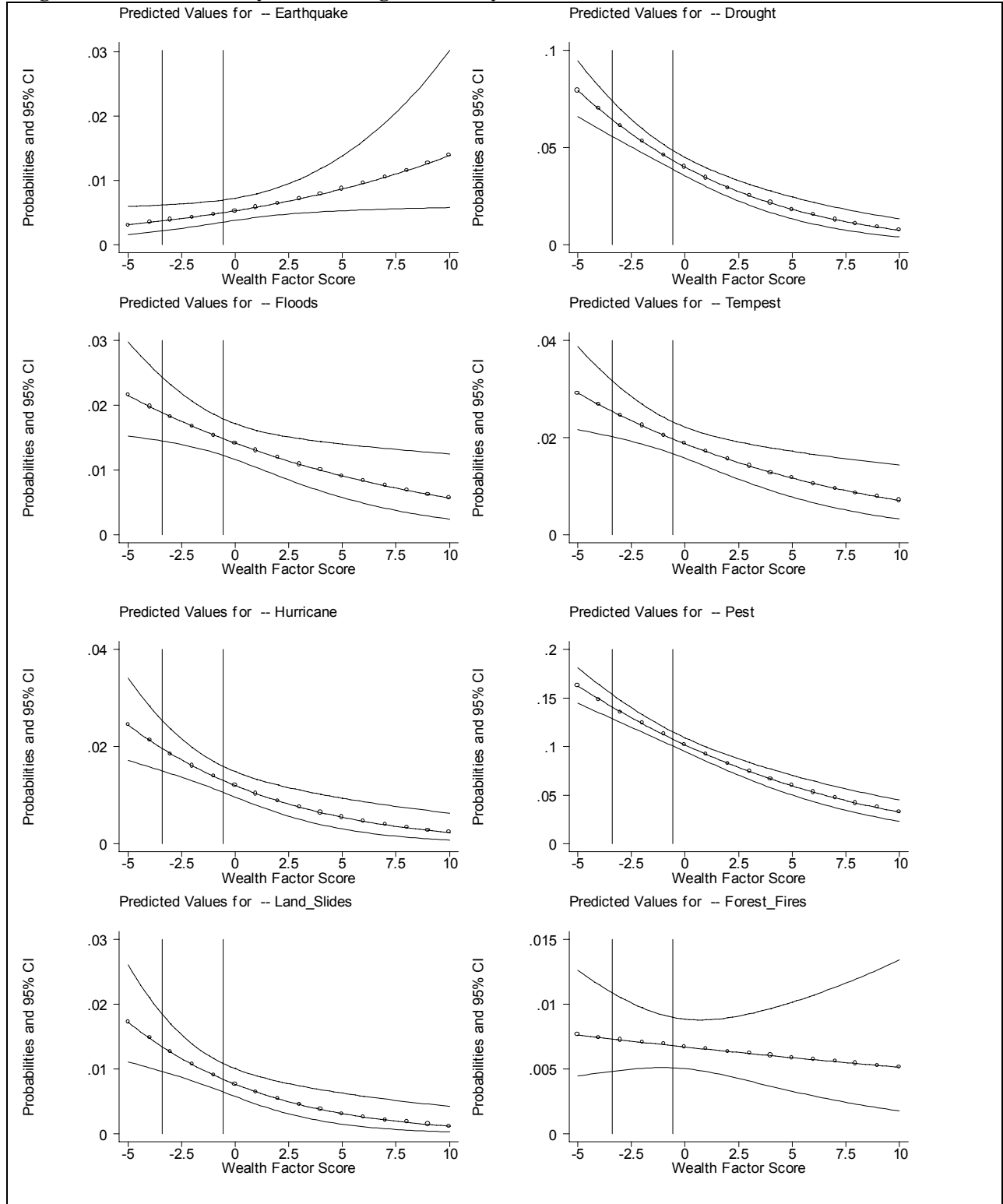
Source: World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadística – Guatemala*. Natural shocks include: earthquakes, droughts, floods, storms, hurricanes, pest infestations, landslides, fires, and forest fires. Economic shocks include: enterprise closures, mass lay-offs, job losses, income losses, bankruptcy, lost remittances, worsened terms-of-trade, and bad harvests. Social shocks include: public protests, criminal offenses, land disputes, family disputes. Lifecycle shocks include: accident to the breadwinner, the death of breadwinner or other household member, and abandonment by the breadwinner.

a. Income or wealth.

The coping strategies used by the poor damage their growth prospects. A multinomial model that contrasts three coping strategies (market-based coping mechanisms, informal coping mechanisms, and self-insurance) reveals that, for all shocks, the probability of choosing market-based strategies over self-insurance increases with household wealth and with the education of the household head. Female-headed households use informal coping mechanisms more often than male-headed households. The probability of using market-based coping mechanism is lower for indigenous people than for non-indigenous people, *ceteris paribus*.

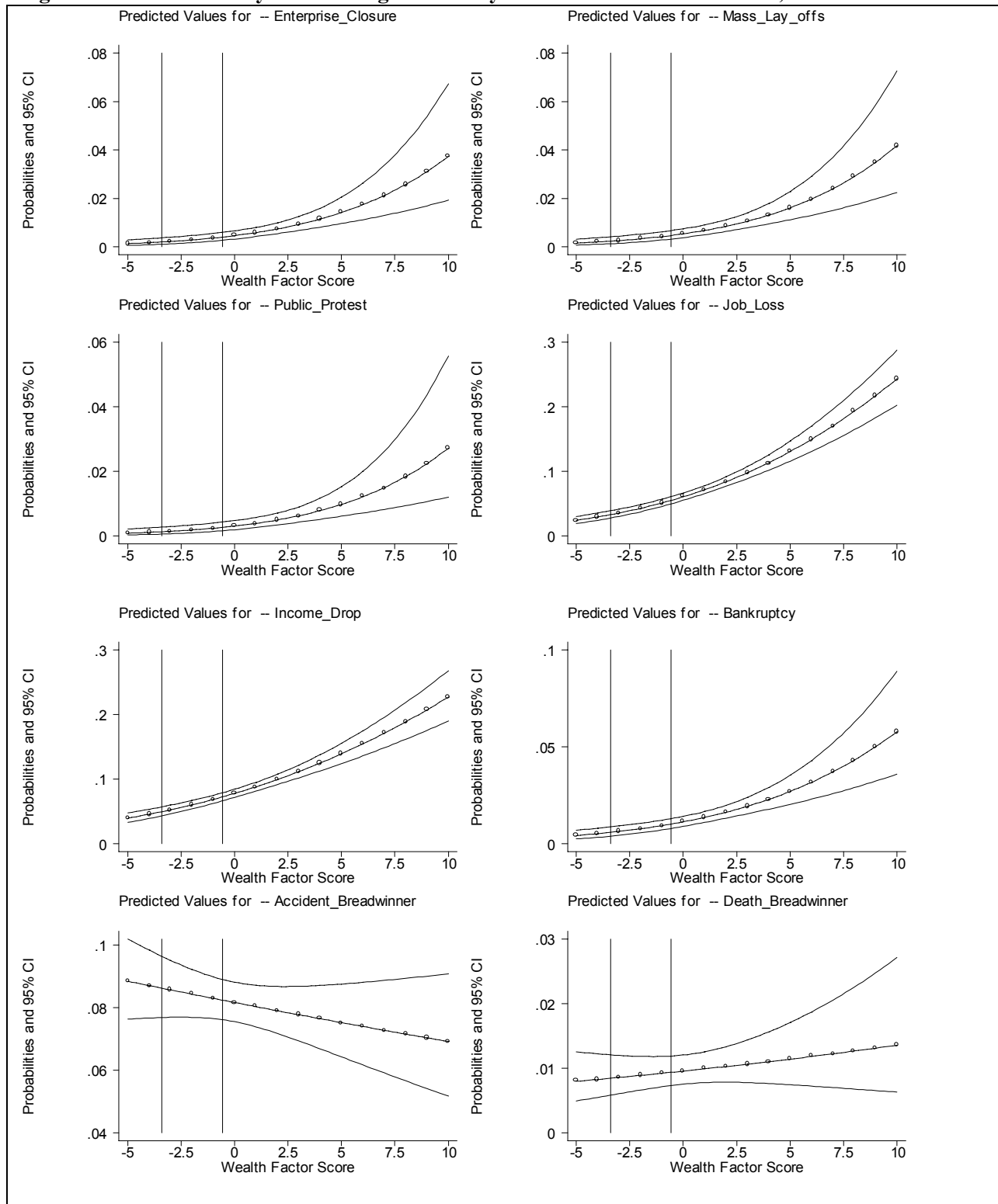
¹² We used wealth quintiles to circumvent the circularity of being poor and being affected by a shock. We ranked households from poorest to richest using a wealth index instead of observed consumption. As suggested by Filmer and Pritchett (1999) this factor is a latent variable that captures the long-term socioeconomic status of the household. This measure of wealth correlates strongly with (log) household consumption (Pearson coefficient = 0.77) as well as with other indicators of well-being such as education and health status.

Figure 9: The Probability of Suffering a Shock by Household Economic Status



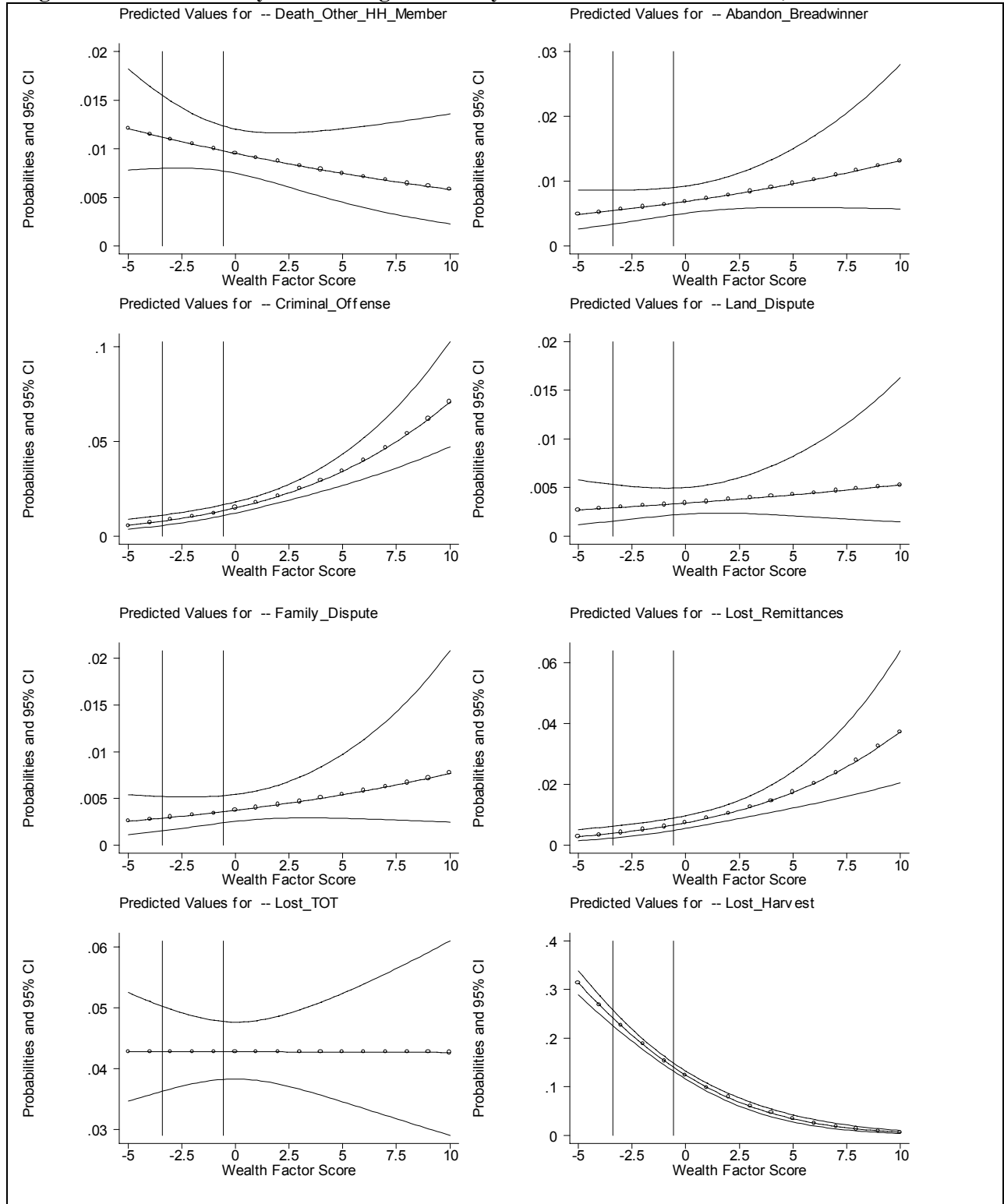
World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Figure 9: The Probability of Suffering a Shock by Household Economic Status, Cnt'd



World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Figure 9: The Probability of Suffering a Shock by Household Economic Status, Cnt'd



World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

III: Who Bears the Cost of Shocks?

Although the ENCOVI did not collect quantitative information on the magnitude or severity of shocks, this section attempts to use parametric and non-parametric models to estimate their costs, in other words, the amount and the share of household income/consumption lost due to shocks. Estimating the costs of the various shocks can provide answers to many questions relevant to the design of social policies. How is the shock burden distributed among households at different socioeconomic levels? Are the rich incurring higher costs than the poor in absolute or relative terms or vice-versa? How do these patterns vary among different types of shocks? Also, the answers to these questions help to extend what is known about the sources of vulnerability in Guatemala. Shocks with moderate costs among the *ex-ante* non-poor are not of as much concern to policymakers as those that affect the poor in particular. Also, this exercise will enable us to categorize those shocks with a higher incidence among the poor than among the non-poor as high-impact, medium-impact, and low-impact, thus making it possible to allocate more resources to mitigate the effects of the high-impact shocks.

Estimating the cost of the shocks involved a perilous endeavor, which was to estimate counterfactual consumption or income, in other words, the level of consumption or income that would have prevailed in the absence of these shocks. We are fully aware that, in doing this, we are making estimates based on assumptions rather than on hard data. However, collecting data on a counterfactual is intrinsically challenging because individuals cannot easily or accurately quantify the extent of the welfare cost loss of the shock in terms of the monetary value of assets lost, the duration and magnitude of lost income streams, and the duration and magnitude of reduced household consumption. As many empirical studies have shown, asking one member of the household to report total household consumption over any given period usually leads to serious over-estimations or under-estimations. Also, gathering these data would be expensive because the ideal solution would be to collect a panel of data, which would require several rounds of data collection. Thus, we have opted for indirect estimation methods that use plausible assumptions, as a cheaper and feasible alternative. As always, there is a trade-off between precision and cost.

Our estimate of counterfactual consumption will be reliable provided that all households affected by shocks and their controls have the same distributions of unobserved characteristics. When this condition fails to hold, this is often referred to as the problem of “selection bias” in econometrics or the “selection on unobservables” (Jalan and Ravallion, 2001). Further, parametric estimation requires that all relevant variables associated with the probability of suffering from a shock are measured and used in well-specified models. The ENCOVI is not an ideal candidate for this exercise. There is a large ratio of noise to signal in the data, as summarized in section II. To check the validity of our results, we estimated counterfactual consumption using three different methods. Given that our data are not of the highest quality, the results are only indicative.

The following subsection investigates what effect some of the shocks had on the distribution of income and consumption. In the last subsection, we estimate the cost of the shocks and their distributional impact using a multivariate regression model and propensity score matching techniques.

How do Shocks Affect the Distribution of Consumption and Income?

What would be the distribution of consumption in the absence of any shock? If selection issues are not a major problem (and the evidence presented in section II suggests that they are not), the simplest way to

proceed is to estimate separate consumption (or income) regressions for the sample of households with and without shocks and to use the Oaxaca decomposition (Oaxaca, 1973) to estimate the mean impact of the shock. The mean impact will be equal to the difference between the actual mean consumption for those households that experience shocks minus the mean consumption of those households that do not experience any shocks if the returns to their household characteristics have been the same as those for the households that experienced shocks. The expected impact is, of course, negative. A variant of this model is used later in this section. For now, note that this approach is useful if the object of interest is the mean, but it is not very helpful for understanding the distributional consequences of shocks.

An alternative approach is to use nonparametric density estimation to estimate the counterfactual density of consumption or income, following DiNardo et al (1998). For brevity, we present the consumption model below. Then we present estimates of the impact of shocks on both consumption and income densities in Figure 10. From the definition of conditional probability, the overall distribution of consumption will have the form:

$$g(y) = \int f(y | x)h(x)dx$$

where $f(y | x)$ is the conditional density of consumption. The observed density of household consumption for the sample without shocks is:

$$g(y | s = 0) = \int f^n(y | x)h(x = 0)dx$$

where $f^n(y | x) = f(y | x, s=0)$ is the conditional density of consumption for the households without shocks. Likewise, the observed density of consumption for the households with shocks is:

$$g(y | s = 1) = \int f^s(y | x)h(x = 1)dx$$

where $f^s(y | x) = f(y | x, s=1)$ is the conditional density of consumption for the households with shocks.

By analogy with Oaxaca decomposition, we ask what distribution of consumption would prevail if all households (not only those that did not experience shocks) were spared the negative impact of shocks, or, more formally:

$$g^n(y) = \int f^n(y | x)h(x)dx$$

As shown in DiNardo et al (1998), the estimation of this density is straightforward once one notes that according to Bayes' Law:

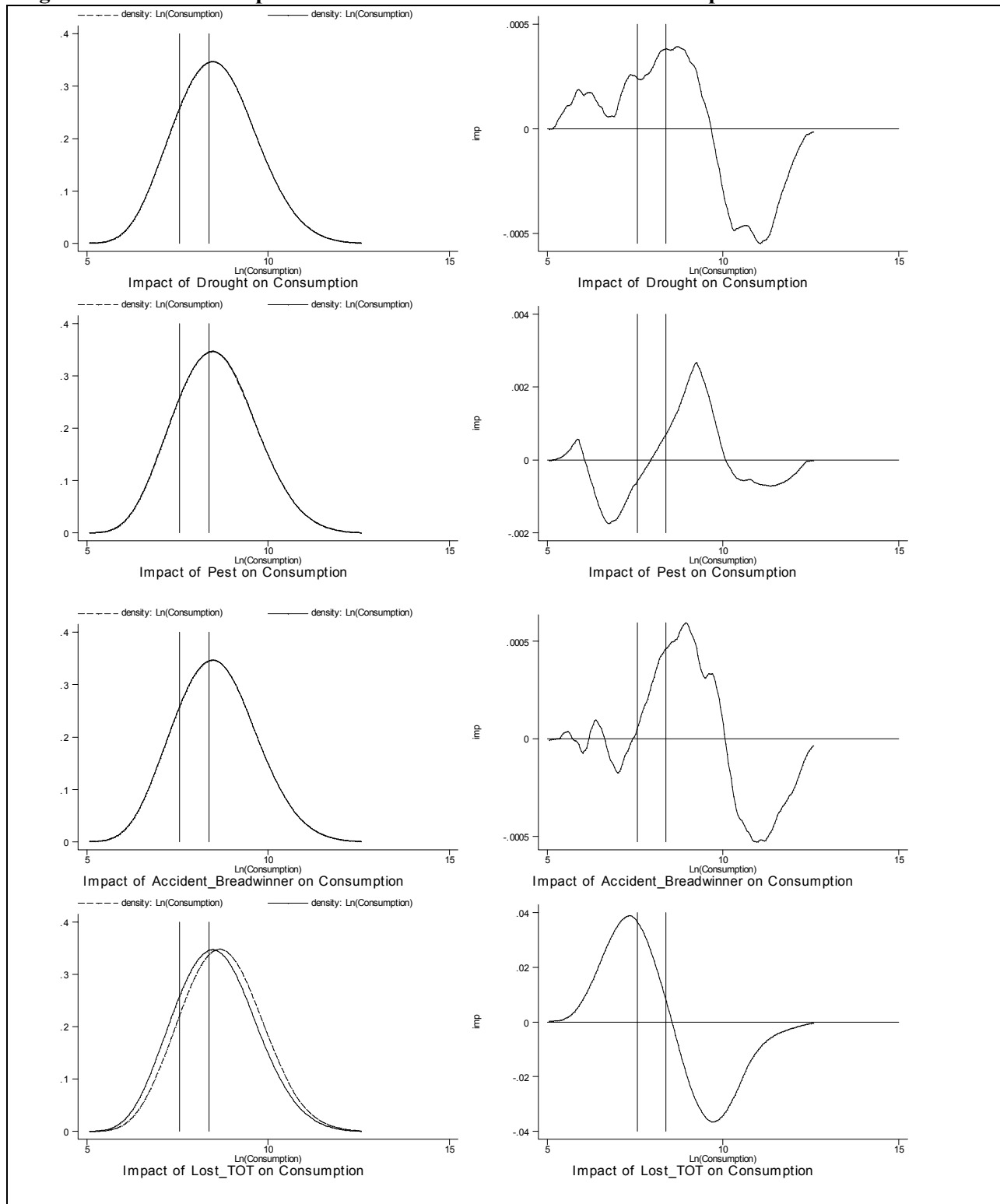
$$h(x) = \frac{h(x | s = 0)prob(s = 0)}{prob(s = 0 | x)}$$

where $prob(s=0)$ is the mean probability of experiencing a shock, while $prob(s=0|x)$ is the conditional probability of experiencing a shock. Thus, $g^n(y)$ can be written as:

$$g^n(y) = \int f^n(y | x) \frac{h(x | s = 0)prob(s = 0)}{prob(s = 0 | x)} dx = \int \theta \cdot f^n(y | x)h(x = 0)dx$$

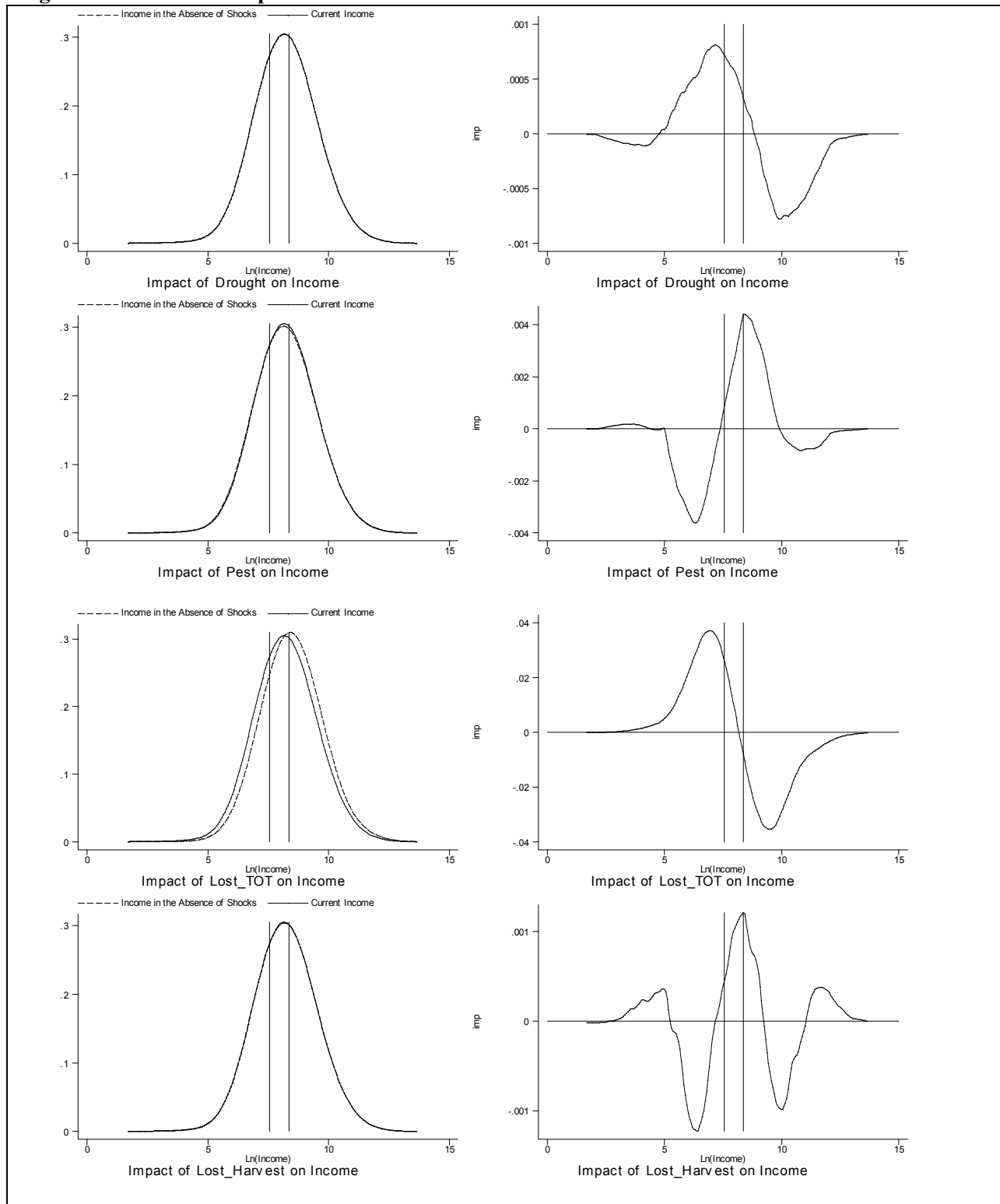
where $\theta = [prob(s=0)]/[prob(s=0|x)]$. The last equation is nothing more than the observed density of consumption for households without shocks reweighted by the factor θ . This procedure gives more weight to those households that did not experience shocks who are more likely to be underrepresented and vice versa.

Figure 10. Estimated Impact of Selected Shocks on Household Consumption



World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Figure 11: Estimated Impact of Selected Shocks on Household Income



World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

The conditional probability of experiencing a shock $\text{prob}(s=0|x)$ is estimated by a logit model,¹³ and θ is found to be the ratio between the overall probability of incurring the shock and the household-specific probability. Then, we estimated the density of household consumption in the absence of shocks using the Epanechnikov kernel applied to the sample of households without shocks. This yields the distribution of consumption that would prevail in the economy if all households were spared shocks. General equilibrium effects are ignored. This distribution is then compared with the actual distribution of consumption, and for each bin of the distribution, the impact of the shock is determined as the difference between the current density and the counterfactual density. We expect that the shock will move the distribution leftward by moving some of the density toward 0.

Figures 10 and 11 illustrate the estimated impact of selected shocks on household consumption (Figure 10) and income (Figure 11). Two vertical lines are drawn on each graph at the extreme poverty and total poverty line respectively. For each type of shock, two graphs are presented. The left graph illustrates the shift in the income or consumption distribution attributable to shocks. Shocks that have a low frequency and/or a moderate impact on income or consumption shift the density only imperceptibly. Most of the shocks presented in Figures 10 and 11 fit this description except “lost terms of trade”. The right graph illustrates the net impact of the shock on the distribution.

For instance, “lost terms of trade” hit a group of households with (a logarithm of) consumption around 10 and cause them to sink under the poverty line. The impact of the shock is particularly severe; the majority of the affected households will end up as extremely poor. Lost terms of trade have a similar impact on income too. In contrast, bad harvests seem to affect the income of two groups of households – non-poor households with (a logarithm of) income at around 10 and extremely poor households with (a logarithm of) income at around 7. From the first group, about half of the affected people end up poor, while the rest stay above the poverty line. Extremely poor households losing their harvest face even lower income levels. However, the model did not detect any negative impact on household consumption.

Households suffering from an accident to their breadwinner (Figure 10) seem also to fall in two groups. Most affected households are relatively well off, and the impact of the shock is, in general, not big enough to cause them to sink into poverty. One category of households that fits this description is those elderly people who have sufficient savings to protect them against such life-cycle shocks. Households in extreme poverty are also affected by an accident to their breadwinner. Following the shock, they fall into even deeper poverty.

Although a large number of households reported being affected by droughts, they do not seem to have had a large impact on the overall distribution of consumption, probably because they cause only slight falls in consumption (Figure 10) though larger falls in income (Figure 11). Thus, many of the affected households are able to smooth their consumption. The impact of droughts on the consumption of the affected households, illustrated on the right-side graph in Figure 10, is also mild. Most affected households have (a logarithm of) consumption from 10 to 12. After the shock, roughly one-third of them

¹³ Three logit models were fitted to the whole set of individual shocks. For most shocks, the predictors included regional dummies (for eight regions and urban/rural location), demographic characteristics (household size, number of children, gender, age, and the ethnicity of the household head), human capital characteristics (literacy and the education level of the household head), occupational characteristics (dummies for the industry of employment and the occupation of the household head, employment status, migration, and the contribution of informal and agricultural income to total income), the presence of social capital (participation in organizations), and the household’s endowment with assets (land ownership and its characteristics, dwelling ownership, and access to basic services like water, sanitation, electricity and phone. For employment-related shocks such as mass lay-offs, enterprise closures, job losses, or falls in income, the model was augmented with employment-specific variables (underemployment, the numbers of hours worked, and constraints in finding more work). For business-related shocks such as bankruptcies or lost terms of trade, the model was augmented with variables describing the size of the business (the number of employees, dummies for paying taxes, the age of the business, the place of the business, the sector of employment, and the number of businesses per household).

are still above the poverty line, while another third have fallen into moderate poverty and the last third into extreme poverty.

Although an attempt was made to condition the probability of suffering a shock by all relevant observables, some of the models had a poor fit, while for others, the large ratio of noise over signal in the dependent variable was fatal. Thus, the model produced implausible results for the following shocks: earthquakes, hurricanes, forest fires, enterprise closures, job loss, falling incomes, abandonment of the breadwinner, death of a member of the household, fire, land disputes, and lost remittances.

The Cost and Distributional Incidence of Shocks

In this subsection, we investigate the correlation between the probability of experiencing a shock and household welfare. As households that have lost their income or wealth are more likely to be in the lower end of the income distribution, this probability will be, by definition, higher for the poor than for the non-poor. Thus, the observed correlation between shocks and poverty may be spurious. We used two analytical approaches to circumvent this problem. We estimated counterfactual income and consumption in the absence of shocks as follows. First, we used an augmented specification of the typical consumption regression that includes dummy variables for the main shocks and interactions between shocks and wealth. The consumption or income in the absence of the shock was estimated by setting all the shock variables to zero. Second, we used propensity score matching techniques.

Both approaches were not easy to estimate. The estimated parameters were not resistant to alternative specifications of the functional form and were different between the two methods. Notably, simple specifications of the consumption or income regression with shock dummies produced a positive impact for some of the shocks (see Table A6a in the annex).

The Cost of the 2000 Shocks Estimated through a Multivariate Regression Model

We postulated a simple log-linear, multivariate additive model where, in a world without shocks, the expected level of household income or consumption is determined by observed, exogenous household characteristics.¹⁴ In a world with shocks, current income or consumption will be lower due to shocks,¹⁵ but the depth of the shortfall will be smaller, the more able the household is to reduce or mitigate its impact. Also, we assumed that the ability of the household to mitigate the effects of the shock is proportional to the wealth of the household and varies from region to region.¹⁶ More formally, the logarithm of consumption, C , is determined by the following model:

$$C_1 = \beta_1 \mathbf{X} + \beta_2 \mathbf{R} + \beta_3 \mathbf{S} \mathbf{W} + \beta_4 \mathbf{S} \mathbf{R} \mathbf{W}$$

where \mathbf{X} is the vector of household characteristics, \mathbf{R} is a vector of regional dummies, \mathbf{S} is the vector of the shock dummies, and \mathbf{W} is household wealth. If this specification is correct, then one can estimate the level of consumption in the absence of shocks simply by replacing all the indicator variables for shocks with zeroes. Thus, counterfactual consumption will be:

¹⁴ The model was suggested by Martin Ravallion and Lant Pritchett. A variant of this model was applied by Datt and Hoogeveen (2000) to estimate the cost and the distributional impact of macroeconomic and natural shocks in the Philippines.

¹⁵ For the same shock, the income or consumption shortfall will be larger if the severity of the shock is greater for some households than for others. Similar effects are expected from those shocks that hit some households for longer periods of time than others. Unfortunately, the ENCOVI data do not contain any details about the severity and the duration of the shocks.

¹⁶ The results presented in section II suggest that location is a powerful predictor of the frequency of reported shocks.

$$C_0 = \beta_1 X + \beta_1 R$$

which is the familiar consumption function found in most cross-sectional poverty studies. The impact of the shock will be the difference:

$$I = C_0 - C_1 = \beta_3 SW + \beta_4 SRW.$$

The vector of household characteristics includes regional dummies (for eight regions and urban/rural location), demographic characteristics (household size, number of children, and gender, age, and ethnicity of the household head), human capital characteristics (literacy and education level of the household head), occupational characteristics (dummies for the industry of employment and the occupation of the household head, employment status, migration, and contribution of informal and agricultural income to total income), the presence of social capital (participation in organizations), and the household's endowment with assets (land ownership and its characteristics, dwelling ownership, and access to such basic services as water, sanitation, electricity, and phone), employment-specific variables (underemployment, numbers of hours worked, and constraints to finding more work) and business-related variables (number of employees, dummies for paying taxes, age of the business, place of business, sector of employment, and the number of businesses per household).

There are many variables that can be thought of as plausible candidates to be proxy variables for the ability to mitigate shocks, such as financial savings, fungible physical assets, idle household assets that can be used for productive uses, a good credit record, formal or informal insurance, a higher than average level of human capital, and slack labor resources among others. However, such a long list of candidates for our vector \mathbf{W} would raise problems of estimability. For brevity, a scalar was used for \mathbf{W} , the wealth variable, based on households' possession of durables and on the characteristics of their dwellings using principal component analysis methods.

Four income and four consumption models have been estimated for separately for rural and urban areas with regional and district dummies respectively (Table 12). The logarithm of income or consumption was regressed on household characteristics, shocks, and shocks interacted with the wealth factor score. Only shocks with a moderate or high frequency were included in the regression: droughts, pest infestations, job losses, and bankruptcy, death of the breadwinner, worsening terms of trade, and bad harvests. Inflation was not included as the reported responses were implausible. All other shocks were included as a composite variable, equal to the number of residual shocks. As some shocks were not included for reasons of simplicity, the results of this model should be considered as a lower estimate of the impact of the shocks. Natural disasters, such as pest infestations or droughts, were further interacted with regional dummies to account for location-specific determinants.

Table 12: The Impact of Shocks and Shock Mitigation on Household Income and Consumption

Dependent: Log of	Income		Income		Consumption		Consumption		Consumption	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Household size	-0.123** (0.008)	-0.159** (0.009)	-0.124** (0.008)	-0.158** (0.009)	-0.118** (0.003)	-0.142** (0.004)	-0.120** (0.003)	-0.143** (0.004)	-0.120** (0.003)	-0.143** (0.004)
Primary School	0.124** (0.039)	0.137** (0.045)	0.123** (0.039)	0.137** (0.045)	0.087** (0.016)	0.111** (0.021)	0.088** (0.016)	0.113** (0.022)	0.088** (0.016)	0.113** (0.022)
Secondary School	0.350** (0.088)	0.416** (0.057)	0.355** (0.088)	0.420** (0.057)	0.242** (0.037)	0.322** (0.027)	0.251** (0.036)	0.325** (0.027)	0.251** (0.036)	0.325** (0.027)
Higher School	0.959** (0.183)	0.729** (0.074)	0.962** (0.183)	0.735** (0.074)	0.565** (0.076)	0.592** (0.036)	0.563** (0.076)	0.596** (0.035)	0.563** (0.076)	0.596** (0.035)
Female HH Head	-0.155** (0.052)	-0.087* (0.041)	-0.163** (0.052)	-0.070^ (0.041)	(0.006) (0.022)	0.052** (0.020)	(0.006) (0.021)	0.058** (0.020)	(0.006) (0.021)	0.058** (0.020)
Indigenous HH Head	-0.137** (0.042)	-0.093* (0.043)	-0.113* (0.046)	-0.086^ (0.041)	-0.176** (0.017)	-0.157** (0.021)	-0.124** (0.019)	-0.144** (0.022)	-0.124** (0.019)	-0.144** (0.022)
Age of the HH Head	0.005** (0.001)	0.006** (0.001)	0.005** (0.001)	0.006** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)
Drought*Metro	(0.136) (0.487)	0.032 (0.718)	(0.124) (0.487)	0.044 (0.716)	(0.327) (0.203)	(0.040) (0.343)	(0.368^) (0.201)	(0.037) (0.342)	(0.368^) (0.201)	(0.037) (0.342)
* Wealth*Metro	0.009 (0.194)	0.040 (0.181)	0.021 (0.194)	0.044 (0.180)	0.074 (0.081)	0.020 (0.087)	0.074 (0.080)	0.021 (0.086)	0.074 (0.080)	0.021 (0.086)
Drought*N	0.182 (0.561)	0.038 (0.338)	0.197 (0.560)	0.028 (0.339)	0.555* (0.233)	0.082 (0.162)	0.559* (0.231)	0.081 (0.162)	0.559* (0.231)	0.081 (0.162)
* Wealth*N	0.101 (0.176)	0.056 (0.130)	0.107 (0.176)	0.061 (0.130)	0.139^ (0.073)	-0.161** (0.062)	0.142^ (0.073)	-0.159* (0.062)	0.142^ (0.073)	-0.159* (0.062)
Drought*NE	0.313 (1.008)	0.746 (0.509)	0.556 (1.015)	0.736 (0.511)	0.078 (0.419)	0.246 (0.244)	0.201 (0.419)	0.178 (0.244)	0.201 (0.419)	0.178 (0.244)
* Wealth*NE	0.233 (0.522)	0.033 (0.092)	0.118 (0.522)	0.028 (0.092)	0.073 (0.217)	0.027 (0.044)	0.004 (0.217)	0.032 (0.044)	0.004 (0.217)	0.032 (0.044)
Drought*SE	(0.103) (0.259)	(0.399) (0.329)	(0.057) (0.259)	(0.243) (0.332)	0.038 (0.108)	0.103 (0.157)	0.017 (0.107)	0.103 (0.159)	0.017 (0.107)	0.103 (0.159)
* Wealth*SE	(0.027) (0.111)	0.192 (0.195)	(0.044) (0.111)	0.195 (0.195)	0.010 (0.046)	0.113 (0.093)	0.011 (0.046)	0.113 (0.093)	0.011 (0.046)	0.113 (0.093)
Drought*Central	-0.754** (0.258)	-0.908* (0.387)	-0.671** (0.259)	-0.868* (0.387)	(0.083) (0.107)	0.195 (0.185)	(0.014) (0.107)	0.219 (0.185)	(0.014) (0.107)	0.219 (0.185)
* Wealth*Central	(0.221) (0.135)	0.956* (0.386)	(0.204) (0.135)	0.957* (0.385)	- (0.056)	0.054 (0.185)	0.011 (0.056)	0.060 (0.184)	0.011 (0.056)	0.060 (0.184)
Drought*SW	0.179 (0.381)	0.224 (0.467)	0.142 (0.381)	0.225 (0.467)	0.132 (0.158)	0.120 (0.224)	0.105 (0.157)	0.081 (0.223)	0.105 (0.157)	0.081 (0.223)
* Wealth*SW	0.189 (0.151)	-0.279** (0.132)	0.193 (0.151)	-0.273* (0.132)	0.036 (0.063)	0.029 (0.063)	0.029 (0.062)	0.029 (0.063)	0.029 (0.062)	0.029 (0.063)
Drought*NW	0.077 (0.265)	0.199 (0.241)	0.078 (0.265)	0.194 (0.241)	0.114 (0.110)	0.018 (0.115)	0.108 (0.109)	0.017 (0.115)	0.108 (0.109)	0.017 (0.115)
* Wealth*NW	0.041 (0.093)	0.039 (0.071)	0.043 (0.093)	0.043 (0.071)	0.040 (0.039)	0.009 (0.034)	0.044 (0.038)	0.008 (0.034)	0.044 (0.038)	0.008 (0.034)
Drought*Petén	0.440 (0.662)	0.710 (0.634)	0.468 (0.660)	0.730 (0.633)	0.094 (0.275)	0.434 (0.303)	0.100 (0.273)	0.442 (0.302)	0.100 (0.273)	0.442 (0.302)
* Wealth*Petén	0.108 (0.204)	0.056 (0.310)	0.118 (0.203)	0.069 (0.309)	0.006 (0.085)	0.170 (0.148)	0.010 (0.084)	0.171 (0.148)	0.010 (0.084)	0.171 (0.148)
Pest*Metro	0.217 (0.280)	0.199 (0.211)	0.206 (0.279)	0.193 (0.210)	0.069 (0.116)	0.071 (0.101)	0.060 (0.115)	0.073 (0.100)	0.060 (0.115)	0.073 (0.100)
* Wealth*Metro	0.017 (0.129)	0.030 (0.049)	0.018 (0.129)	0.029 (0.049)	-0.114* (0.054)	0.023 (0.023)	-0.115* (0.053)	0.024 (0.023)	-0.115* (0.053)	0.024 (0.023)
Pest*N	0.714 (1.564)	0.281 (0.355)	0.658 (1.562)	0.277 (0.354)	0.330 (0.650)	0.302^ (0.170)	(0.352) (0.645)	0.297^ (0.169)	(0.352) (0.645)	0.297^ (0.169)
* Wealth*N	0.149 (0.439)	0.024 (0.084)	0.136 (0.438)	0.025 (0.084)	0.097 (0.182)	0.039 (0.040)	0.105 (0.181)	0.040 (0.181)	0.105 (0.181)	0.040 (0.181)
Pest*NE	(0.154) (0.315)	(0.126) (0.290)	(0.126) (0.319)	(0.264) (0.291)	(0.141) (0.131)	0.035 (0.139)	(0.137) (0.132)	0.001 (0.139)	(0.137) (0.132)	0.001 (0.139)
* Wealth*NE	0.019 (0.146)	0.026 (0.064)	0.031 (0.147)	0.022 (0.064)	0.013 (0.061)	0.001 (0.031)	0.026 (0.061)	0.009 (0.031)	0.026 (0.061)	0.009 (0.031)
Pest*SE	0.170 (0.232)	0.283 (0.257)	0.130 (0.233)	0.282 (0.257)	0.303** (0.096)	0.076 (0.123)	0.308** (0.096)	0.059 (0.123)	0.308** (0.096)	0.059 (0.123)
* Wealth*SE	0.123 (0.098)	0.004 (0.068)	0.096 (0.098)	0.002 (0.068)	0.125** (0.041)	0.034 (0.032)	0.127** (0.041)	0.037 (0.032)	0.127** (0.041)	0.037 (0.032)
Pest*Central	(0.004) (0.202)	0.027 (0.239)	0.060 (0.203)	0.038 (0.239)	0.006 (0.084)	0.044 (0.114)	0.045 (0.084)	0.040 (0.114)	0.045 (0.084)	0.040 (0.114)
* Wealth*Central	(0.006) (0.094)	0.129 (0.134)	0.004 (0.094)	0.126 (0.134)	0.019 (0.039)	0.005 (0.064)	0.017 (0.039)	0.009 (0.064)	0.017 (0.039)	0.009 (0.064)
Pest*SW	0.102 (0.147)	-0.450^ (0.230)	0.141 (0.149)	-0.450^ (0.244)	0.032 (0.061)	0.032 (0.110)	0.048 (0.062)	0.030 (0.116)	0.048 (0.062)	0.030 (0.116)
* Wealth*SW	0.037 (0.058)	-0.510** (0.073)	0.036 (0.058)	-0.531** (0.074)	(0.036) (0.024)	0.056 (0.035)	(0.035) (0.024)	0.051 (0.035)	(0.035) (0.024)	0.051 (0.035)
Pest*NW	0.162 (0.177)	0.038 (0.190)	0.150 (0.177)	0.038 (0.189)	0.101 (0.074)	-0.165^ (0.091)	0.104 (0.073)	-0.166^ (0.090)	0.104 (0.073)	-0.166^ (0.090)
* Wealth*NW	0.050 (0.065)	0.010 (0.068)	0.048 (0.065)	0.007 (0.068)	0.007 (0.027)	0.032 (0.032)	0.007 (0.027)	0.031 (0.032)	0.007 (0.027)	0.031 (0.032)
Pest*Petén	(0.004) (0.481)	0.093 (0.188)	(0.028) (0.480)	0.091 (0.188)	0.447* (0.200)	0.001 (0.090)	0.423* (0.198)	0.001 (0.090)	0.423* (0.198)	0.001 (0.090)
* Wealth*Petén	0.060 (0.139)	0.099 (0.060)	0.056 (0.139)	-0.101^ (0.060)	0.126* (0.058)	0.029 (0.029)	0.120* (0.057)	0.028 (0.029)	0.120* (0.057)	0.028 (0.029)
Job Loss	(0.087) (0.096)	-0.201* (0.079)	(0.097) (0.096)	-0.210** (0.079)	(0.029) (0.040)	(0.040) (0.038)	(0.037) (0.040)	(0.044) (0.038)	(0.037) (0.040)	(0.044) (0.038)
* Wealth	(0.003) (0.043)	0.034 (0.022)	(0.004) (0.043)	0.036^ (0.021)	0.006 (0.018)	0.006 (0.010)	0.005 (0.018)	0.002 (0.010)	0.005 (0.018)	0.002 (0.010)
Income Drop	(0.021) (0.096)	(0.031) (0.074)	(0.021) (0.096)	(0.035) (0.074)	(0.054) (0.040)	(0.049) (0.036)	(0.035) (0.040)	(0.049) (0.036)	(0.035) (0.040)	(0.049) (0.036)
* Wealth	-0.073* (0.036)	(0.007) (0.019)	-0.075* (0.036)	(0.007) (0.019)	0.004 (0.015)	0.034** (0.009)	0.006 (0.015)	0.033** (0.009)	0.006 (0.015)	0.033** (0.009)
Accident Breadwinner	-0.206* (0.083)	-0.127^ (0.075)	-0.169* (0.083)	(0.115) (0.076)	0.045 (0.034)	-0.095** (0.036)	0.065^ (0.034)	-0.088* (0.036)	0.065^ (0.034)	-0.088* (0.036)
* Wealth	(0.019) (0.032)	0.035 (0.022)	(0.013) (0.032)	0.034 (0.022)	0.011 (0.013)	0.029** (0.010)	0.012 (0.013)	0.027** (0.010)	0.012 (0.013)	0.027** (0.010)
Lost Terms of Trade	(0.109) (0.042)	(0.114) (0.012)	(0.109) (0.037)	(0.114) (0.011)	0.005 (0.025)	0.003 (0.016)	0.005 (0.015)	0.012 (0.015)	0.005 (0.015)	0.012 (0.015)
* Wealth	(0.040) (0.040)	(0.030) (0.015)	(0.030) (0.015)	(0.030) (0.015)	0.002 (0.002)	0.095** (0.031)	0.002 (0.041)	0.098** (0.031)	0.002 (0.041)	0.098** (0.031)
Lost Harvest	-0.210** (0.074)	0.015 (0.086)	-0.185** (0.075)	0.002 (0.086)	0.095** (0.031)	0.002 (0.041)	0.108** (0.031)	0.001 (0.041)	0.108** (0.031)	0.001 (0.041)
* Wealth	(0.030) (0.027)	0.082** (0.028)	(0.027) (0.028)	0.081** (0.028)	0.039** (0.011)	0.033* (0.013)	0.042** (0.011)	0.035** (0.013)	0.042** (0.011)	0.035** (0.013)
N	3852	3423	3852	3423	3852	3423	3852	3423	3852	3423
r2	0.29	0.48	0.30	0.49	0.58	0.71	0.59	0.71	0.59	0.71

** p<0.01; * p<0.05; ^ p<0.10 two tailed

Note: A selection of predictors (household characteristics and regional dummies) are presented.
World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadísticas – Guatemala

The model detected that five out of the six shocks had a negative impact on income (worsening terms of trade does not appear to cause such negative impact).

- *Droughts* negatively affected the income of households located in the Central region in both rural and urban areas and in the rural areas of the SW region. Wealthier households experienced smaller shocks thanks to their wealth in urban areas of the Central region.
- *Pest infestations* reduced the income of affected households in urban areas in the SW region proportionally to their wealth. In one specification (with departmental controls), pest infestations reduced the income of affected households in urban areas in the Peten region. The impact on consumption is rather puzzling; while reducing the consumption of affected households in the NW region, they increased consumption in the SE and Peten regions.
- *Job losses* are an urban-type shock. They have a negative impact on the income of affected urban residents (not significant in rural areas) but no impact on their consumption. In one specification, the negative impact of job losses on income is lower the higher the household's wealth.
- *Falls in income* are a rural-specific shock associated with bad harvests. They have the expected impact on rural incomes; the higher the wealth of the households, the higher the loss. On consumption, they seem to have a positive effect, raising household consumption in proportion to the household's wealth.
- Shocks like *an accident to the breadwinner* have a negative impact on income and consumption irrespective of the area of residence. The impact on consumption seems to be lower, the higher the household's wealth.
- The model detected a negative impact on the income of the rural residents who reported *bad harvests* and a (smaller) positive impact on urban residents.

The regression model was used to estimate the average impact of frequent shocks. The most severe impact is associated with economic shocks, in particular with job losses (28 percent), falling income (17 percent), and accidents to the breadwinner (19 percent). Natural agricultural-related shocks, such as droughts (9 percent), pest infestations (10 percent), lost terms of trade (9 percent), and bad harvests (11 percent) have less severe effects on household income. These estimates confirm our earlier results that economic shocks have a bigger negative impact than natural shocks.

The Cost of the 2000 Shocks Estimated through Propensity Score Matching

The counterfactual income and consumption was also estimated, for all shocks reported in the ENCOVI, using propensity score matching. For each group of shocks – agricultural, employment-related, business-related and natural, separate logistic models were estimated. The robustness of the results was checked using matching variants, such as the nearest or the five nearest neighbors. Matching within area of residence and region was used, whenever possible, to control for region-specific unobservables. The counterfactual income and consumption were used to estimate the impact of the shocks on income, consumption, inequality and poverty.

For each type of shock, the estimation proceeded in three steps.

- **First**, we estimated the probability of suffering from shock using a logistic model on a number of household characteristics. Next, we plotted the distributions of the probability of suffering a shock on the same graph for the samples of households that did and did not report experiencing the shock. We found a common support region, where the probability of suffering from shock was positive for both types of households, who experienced or not a shock. All the households that did not report experiencing the shock that fell outside the common support region were not included in the calculations.

- **Second**, for each recipient, we identified up to five of their nearest neighbors –, households not affected by the shock but whose likelihood of experiencing it is equal to that of the recipient plus or minus 1 percent (in the propensity score matching jargon, this is called the “caliper”) and are located in the same area of residence (urban or rural). Area of residence was used here as an additional filter to control for unobservable characteristics that may be specific to rural or urban areas. For each recipient, we estimated the consumption or income per capita in the absence of the shock as the mean consumption or income per capita of the household’s five nearest neighbors.
- The net impact of the shock is the difference between the current and counterfactual consumption and income. The sign of the impact is expected to be negative (consumption or income will decrease after the shock). Instead of estimating a mean impact, in the **third** step we used a non-parametric regression to detect the relationship between the net impact and the current (post-shock) consumption per capita. In case the net impact relates non-linearly to consumption per capita, a parametric estimation may under-state or over-state the impact for some groups of households. A non-parametric estimate would be more efficient in detecting differences in the mean impact by household welfare level. The non-parametric estimates can be perceived as expected values of the net impact purged from the measurement error that is so common in household surveys.

The resulting estimates by type of shock confirmed our earlier finding that economic shocks have a bigger negative impact than natural shocks. In general, the estimated impact of the shocks was higher than with the previous method (Table 13). The shocks that had the most damaging impact on household income were, in decreasing order of importance, lost remittances, the death of the breadwinner, mass lay-offs, family disputes or criminal offenses, and unemployment. Public protests, disputes over land, and the death of a household member other than the breadwinner had the lowest impact. Those shocks with the highest impact on income tend to have a higher impact on consumption too, as expected. For almost all shocks, the absolute impact is higher, the higher the income of the household (not shown in Table 13). The exceptions to this are earthquakes and fires, whose effects on the extreme poorly are more severe than their effects on the poor and even more so compared to their effects on the non-poor. In relative terms, the impact of shocks is greater for the poor than for the non-poor, in other words, it gets more severe as one moves down the income distribution from the richest to the poorest quintile. The relative effect of shocks on both income and consumption is particularly severe for those living at the bottom of the welfare distribution. As expected, these results confirm that the ability of extremely poor households to maintain their welfare in the face of natural shocks is much lower than the ability of non-poor or even moderately poor households.

Table 13: Impact of Shocks on Income and Consumption by the Economic Status of the Household
percent of Counterfactual Income or Consumption (In the Absence of Shocks) Lost due to Shock

	Impact on Income				Impact on Consumption			
	Extreme	Moderate		Total	Extreme	Moderate		Total
	Poor	Poor	Not Poor		Poor	Poor	Not Poor	
Earthquake	-15%	-3%	-1%	-3%	-16%	-11%	-4%	-6%
Drought	-4%	-4%	-2%	-2%	-2%	-2%	-1%	-1%
Floods	-2%	-4%	-2%	-2%	-3%	-4%	-2%	-2%
Tempest	na	-1%	-2%	-1%	-5%	-4%	-2%	-2%
Hurricane	-2%	-4%	-2%	-2%	2%	-1%	-1%	0%
Pest	-2%	-2%	-2%	-2%	-5%	-4%	-3%	-3%
Land Slides	-7%	-7%	-5%	-4%	-15%	-12%	-6%	-6%
Forest Fires	-8%	-4%	-2%	-3%	-17%	-8%	-5%	-5%
Enterprise Closure	na	na	na	na	na	1%	0%	0%
Mass Lay-offs	na	na	-5%	-6%	na	0%	0%	0%
Inflation	-4%	-5%	-4%	-4%	-5%	-5%	-4%	-4%
Public Protest	na	na	na	na	21%	17%	0%	1%
Job Loss	-6%	-6%	-5%	-5%	-7%	-6%	-4%	-4%
Income Drop	0%	-3%	-5%	-4%	-3%	-3%	-2%	-3%
Bankruptcy	na	na	na	na	na	5%	-3%	-2%
Accident Breadwinner	-6%	-6%	-4%	-4%	-5%	-4%	-3%	-3%
Death Breadwinner	-18%	-14%	-8%	-9%	-6%	-6%	-3%	-4%
Death Other HH Member	-2%	na	na	na	-4%	-5%	-2%	-3%
Abandon Breadwinner	-5%	-4%	-2%	-3%	-8%	-5%	-3%	-3%
Fire	-13%	-4%	na	-3%	1%	0%	na	0%
Criminal Offense	na	-3%	-5%	-6%	-1%	-4%	-5%	-6%
Land Dispute	na	na	0%	na	-7%	-8%	-3%	-4%
Family Dispute	-13%	-9%	-5%	-6%	-12%	-7%	-3%	-4%
Lost Remittances	na	-15%	-8%	-11%	na	3%	-2%	-3%
Lost TOT	na	-5%	-4%	-4%	-4%	-6%	-3%	-4%
Lost Harvest	-4%	-4%	-2%	-2%	-3%	-3%	-2%	-2%
Average Annual Income per HH	10,339	15,117	40,272	28,728	11,040	16,514	43,393	31,058

Note: Moderate poor are those poor not in extreme poverty

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

The Overall Impact of Shocks on Poverty and Inequality

According to our estimations, in 2000 shocks reduced nationwide mean consumption from 1 percent to 6 percent, following an aggregate loss of income estimated from 4 to 8 percent (Table 14). The lower bound estimate corresponds to the counterfactual consumption and income determined using the regression model. The upper bound was estimated by propensity score matching. The first method is likely to produce estimates that are biased downward, as it only captures the impact of a subset of shocks. The second method captures the impact of all reported shocks, but the estimates tend to be less precise. Thus, the magnitudes reported here should be interpreted only as indicative ranges.

Table 14: Overall Impact of Shocks on Aggregate Welfare
(In the absence of shocks, the indicator would be higher by x% for positive values and lower by x% for negative values)

Impact of Shocks on:	Propensity Score	
	Regression Model	Matching
	%	%
Mean Consumption	-1	-6
Mean Income	-4	-8
Income Inequality (Gini)	2	16
Consumption Inequality (Gini)	0	11
Total Poverty	-2	-20

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

As the relative impact of shocks was greater for the poor than for the non-poor, they contributed to an increase in income inequality (from 2 percent to 16 percent) and – according to the propensity score matching model – in consumption inequality. Without shocks, poverty in Guatemala in 2000 would have been from 2 to 20 percent lower.

IV: Looking Forward - The Would-be Poor

In the previous sections of this paper, we have looked at the past. Based on the available quantitative and qualitative information, we have described the main sources of vulnerability in Guatemala, as reported by the ENCOVI and QPES respondents or as mentioned in secondary sources, and we have provided rough estimates of the severity and costs of the shocks experienced by households in 2000.

By contrast, in this section, we look into the future and attempt: (i) to identify and quantify who is likely to become poor and (ii) to signal what household characteristics are proxy signals of these vulnerabilities. The cross-sectional nature of the data used for this exercise limits the extent to which our models can predict vulnerability to idiosyncratic shocks. To present a complete picture of vulnerability, we first briefly discuss the macroeconomic shocks and threats that are likely to affect Guatemala in the future and their likely impact on future levels of poverty. Second, from the findings of other background analyses of the Guatemala Poverty Assessment, we summarize other sources of vulnerability outside the triad of “material wealth–income–consumption” including vulnerability due to poor education, nutrition, or health or a lack of access to remunerative employment, housing, or basic services. .

The section is structured into five parts. First, we make some conceptual remarks about the meaning and measurement of vulnerability. In the second part, we survey the macroeconomic shocks that have threatened the livelihoods of the Guatemalans in recent years, with an emphasis on shocks from 2001. In the third part, we use the ENCOVI data to estimate the probability of experiencing future episodes of poverty and to investigate the relationship between poverty and vulnerability and the correlation between vulnerability and some household or location characteristics. Furthermore, we divide the sources of vulnerability into low-mean consumption and high-volatility consumption, and we highlight differences in urban/rural location, region, education, and ethnicity. In the fourth section, we describe the other sources of vulnerability from education and health to housing and basic services, and in the fifth and last section, we discuss the age profile approach.

Concepts and Definitions

Vulnerability is of growing concern for policymakers. The term is used to denote events that threaten or seriously damage one or more aspects of well being. The events associated with vulnerability operate at both the macro and the micro level. Alwang et al (2000) reviewed the different meanings attached to the notion of vulnerability in different fields such as economics, poverty dynamics, sustainable development, food security, sociology, anthropology, disaster management, and health/nutrition.

Macro Vulnerability. There are numerous examples of macroeconomic or worldwide threats to social welfare, in other words, macro vulnerability. Globalization and recent international financial crises have resuscitated the field of research into international financial contagion and macroeconomic vulnerability. An increased awareness of the human and material cost of natural disasters stimulated researchers to search for the best methods for households to mitigate and cope with these phenomena. This initiative was also given impetus by the heavy death toll and the large refugee problem created by conflict and violence. Despite the swift pace of material progress in the developing world in recent decades, hunger and famines are claiming hundreds of thousands of lives each year, pointing up the urgent need for ways to increase food security and thus reduce nutritional vulnerability. Vulnerability due to covariant health risks is now at the center of policy debates as the AIDS pandemic has changed the demographic map of

Africa in only one decade and is now threatening the rest of the globe. Probably nowhere is the North-South divide so great and growing as in the supply of health services. Medical researchers are following market signals, which means that technological and vaccine developments are aimed at the ills of the prosperous nations of the world, while the diseases that claim millions of young lives in developing countries are ignored. Growing inequality in access to health care services has resuscitated the debate on what is needed to reduce vulnerability to health risks in poor countries.

Micro Vulnerability. Policymakers are also becoming increasingly aware of vulnerability at the micro level, particularly since recent studies of the dynamics of poverty have found that most poverty is transient in nature (Baulch and Hoddinott, 2000). Household welfare is extremely volatile across time. The accumulation of all types of assets (natural, physical, financial, human, and social) and luck move some households up on the economic ladder. A wide range of shocks, whether covariant or idiosyncratic in nature, pulls others down the same ladder, sometimes into poverty and destitution. As was illustrated in section II, there are many different sources of micro vulnerability. Some households suffer from health risks, economic shocks, social shocks, natural disasters, and lifecycle-related shocks. Understanding the sources of vulnerability is a prerequisite for formulating a coherent social risk management strategy. The government and households themselves react to social risks using a wide range of arrangements (informal, formal, or social) and strategies (risk reduction, mitigation, or coping) (Holzmann, 2001). Each strategy-arrangement pair has its own cost, and most pairings will be used for some risks, up to the point where the marginal cost equals the private or social return (Erllich and Becker, 1976 and Gill and Ilahi, 2000). Understanding the costs of vulnerability (which we attempted to quantify in section III) and the costs of the available risk management instruments will help policymakers to formulate social risk management strategies that involve optimal roles for informal, private, and public arrangements.

Here we are analyzing only a narrow subset of this broad set of topics – households' vulnerability to poverty. For completeness, we first briefly summarize the sources of macro vulnerability in Guatemala and their effects and compared them to the situation in other LAC countries, using available information from secondary sources. We will just touch on the role of some recent macro sources of vulnerability as their impact is still not clear. We devote a larger share of the section to analyzing the factors that affect micro vulnerability, partly because of data availability. However, the same provisos concerning the quality of the data still apply, and therefore the results presented here should be regarded as indicative and the methodologies we use to estimate vulnerability should be viewed as illustrative rather than authoritative.

Conceptual Clarifications. What is vulnerability to poverty? In the most general terms, vulnerability is the forward-looking counterpart of poverty (which is an *ex-post* static concept), in other words, the probability of being poor in the future. Although apparently simple, the definition is in fact very complex.

First, vulnerability as defined above is a probability, a number between 0 and 1. If household X has a vulnerability to poverty of 0.2, this means that it faces a 20 percent chance of being poor in the future. The higher this index, the higher is the household's vulnerability. To simplify the dialogue, sometimes one would like to use an indicator variable, say vulnerable being households with a probability higher than 50 percent (somebody more likely than not to be poor).

Second, vulnerability is a one-dimensional welfare measure, derived from the underlying welfare distribution used to measure poverty. If poverty is defined as threshold consumption per adult equivalent, then vulnerability refers to the probability of falling below that threshold. If poverty is based on income, then vulnerability refers to the probability that the household's income during the next period of time will fall below the threshold. Other welfare vectors such as nutrition, education, health, or access to basic services, can also be used.

Third, there is a need to define “the future.” The choice of the period over which to measure vulnerability fundamentally affects the magnitude of vulnerability. The longer the period, the higher is the probability of a household falling under the threshold.

Policy Relevance. Vulnerability analysis complements static poverty analysis, thus making giving policymakers an additional tool for devising effective strategies to reduce current poverty *and* to prevent future poverty. Vulnerability has two elements, one due to a low level of and limited variance in consumption and a second due to a high level of and much variance of consumption. Vulnerability analysis is crucial for understanding poverty in two ways. First, it makes it possible to identify the characteristics of those impoverished households that lack the means to ascend the economic ladder and to tailor human development policies to their specific needs. Second, it quantifies not only the existing poor but also those in danger of becoming poor in the future and identifies a comprehensive set of sources of vulnerability for this group. This helps policymakers to formulate risk-management policies (including a mix of informal, market-based, and public risk management methods) to reduce the effect of these shocks in a cost-effective manner.

Sources of Vulnerability at the Macro Level

Given the limited extent of the public sector in Guatemala and the country’s under-developed financial institutions, Guatemala is unlikely to be affected by financial contagion or debt or currency crises. Within LAC, Guatemala can be classified as having a relatively low level of macroeconomic vulnerability. In the World Bank’s report on LAC “Securing our Future” (de Ferranti et al, 2000), Guatemala ranks among the most stable economies. During the last decade, it achieved stable inflation and exchange rates, low government deficits, and moderate trade deficits, partly due to the undersized public sector and the limited banking system. Deterioration in the country’s terms of trade and in its inflow of remittances may soon put pressure on the exchange rate, curbing a decade of stability. Imbalances on the foreign exchange market may be the cause of recent inflationary pressures, with inflation forecasts for 2002 switching from single to double digits. Following the Peace Accords of 1996, the government has been under pressure to increase spending on the social sectors and on basic infrastructure, but it faces severe revenue-generation constraints. Attempts by the Government to increase public spending have been resisted by civil organization and trade-unions. Recently, the same organizations expressed concerns about the government’s rising liabilities for the publicly mandated social insurance scheme operated by the IGSS.

The kind of macroeconomic crises that affect the livelihoods of Guatemalans are typical for low-developed countries: poor terms of trade and reductions in international remittances. A large share of production is derived from agriculture, with coffee and sugar being the main cash and export crops. Compared to the other low middle-income countries, Guatemala’s exports are relatively undiversified. The recent fall in the prices of coffee and sugar hit the domestic coffee and sugar sector hard and had negative effects on the livelihoods of a large number of self-employed and *finca* workers (see Vakis, 2002).

As discussed earlier, one in five Guatemalan households has its income enhanced by remittances. More than half of the total volume of remittances originates from abroad, especially from the U.S. Among recipient households, about 7 percent cover their consumption exclusively through foreign remittances. There is a danger that the recession in the U.S. might negatively affect remittances and increase poverty in 2002.

Guatemala is more prone to natural disasters, especially earthquakes and hurricanes than other Latin American countries. Although most recent massive earthquake was in 1976, a series of medium-scale earthquakes have hit Guatemala in recent years. Hurricane Mitch in 1998 damaged the coastal regions of the country, with long-lasting effects in terms of soil erosion and the destruction of livelihoods. One of the QPES villages was a victim of Hurricane Mitch. As indicated in sections II and III, natural disasters affect a disproportionate share of poor and extremely poor households, because they can only afford to live in cheap but insecure locations and/or because they have only a limited ability to manage (reduce or mitigate) these risks. Given their exposure to such nationwide covariate vulnerabilities, a counter-cyclical social assistance and disaster management policy is needed.

Current and Future Sources of Vulnerability

While the composition of shocks in the year 2000 should not be used to predict which shocks might occur in subsequent years, it can help to shed light on the potential impact of various types of shocks, especially when combined with information on the likelihood of various shocks. Given the small share of the public sector and its under-developed financial institutions, Guatemala is likely to be relatively cushioned from international financial contagion, debt or currency crises. Instead, the main “macro” and covariant shocks that are most likely to affect Guatemalans in the future include: (i) worsening terms –of trade; (ii) a reduction in international remittances; and (iii) natural disasters. The profile of shocks discussed above suggests that these shocks could all increase poverty.

- *Coffee shocks: severe and lasting impact likely.* The recent fall in the price of coffee (and to a lesser extent sugar) has been a substantial blow to a sector on which a large number of poor workers depend for seasonal and permanent livelihoods. As we have shown, this type of shock – job losses and worsening terms-of-trade – could have significant adverse effects. As we have shown above, both job losses (for coffee workers) and worsened terms-of-trade (for coffee producers) have already resulted in large average income and consumption losses (9-28 percent). Also, it is clear that only a small share of households (20-30 percent) have been able to overcome the impact of this type of shock within a year (see above).
- *Lost remittances: severe and lasting impact likely.* The global economic slowdown (particularly the recession in the U.S.) could significantly reduce international remittances, which constitute a significant share of income across the board in Guatemala – 4 percent overall and 2 percent for foreign remittances and 20 percent of total income for those who receive them. We have shown that this type of shock could be severe and long-lasting (only 30 percent of those who lost remittances in 2000 were able to compensate for the shock within a year).
- *Natural disasters: large and lasting impact, particularly on the poor.* Compared with many other countries, Guatemala is very prone to natural disasters, especially earthquakes and hurricanes. Our analysis has shown that those natural disasters affect a disproportionate share of poor households, because they can only afford to live in marginal areas and/or because of they have only a limited ability to manage these risks. Moreover, the QPES data suggest that such shocks have multiple effects – economic (by reducing wealth and income), communal (by damaging community assets), and psychological (by causing fear and post-traumatic stress syndrome or *susto*). Also, the QPES data suggest that the effects of catastrophic natural disasters are long-lasting and that they lower the standard of living of poor households for the long run.

Vulnerability – the Probability of Being Poor in the Future¹⁷

Modeling the Probability of Becoming Poor. We estimated vulnerability to consumption poverty using the models suggested in the economic literature¹⁸ based on a stochastic model of consumption and its variance. Following Chaudhuri, we assume that the stochastic process that generates the consumption of a household h is:

$$\ln(C_h) = \mathbf{X}_h\beta + e_h$$

where C_h is per capita consumption, \mathbf{X}_h represents a bundle of observable household characteristics, including assets and other risk management instruments, β is a vector of parameters, and e_h is a mean-zero disturbance term that captures idiosyncratic shocks and unobservable characteristics that contribute to different per capita consumption levels for households that are otherwise observationally equivalent.

Furthermore, we assume that the variance of the disturbance term e_h depends on:

$$\sigma^2_{e,h} = \mathbf{Z}_h\theta$$

in which \mathbf{Z}_h is the matrix \mathbf{X}_h augmented with vectors that quantify the occurrence of shocks, and θ is a vector of parameters. We augmented the model of consumption variance to include, in addition to the usual correlates of household consumption, estimates of the probability of suffering from a shock.¹⁹ The estimation of β and θ follows a three-step feasible generalized least squares (FGLS) procedure suggested by Amemiya (1977).

By assuming that consumption is log-normally distributed, the estimates can be used to form an estimate of the probability that a household with characteristics \mathbf{X}_h will be poor, or the *household's vulnerability level*:

$$v = \Pr(\ln Ch < LnC | Xh) = \Phi\left(\frac{\ln C - Xh\beta}{\sqrt{Xn\theta}}\right)$$

in which Φ is the cumulative density of the standard normal distribution.

As the available data for the estimation of vulnerability consist of a single cross-section, identifying the household characteristics that are associated with vulnerability necessitates making strong assumptions about the stochastic process that generates consumption (Chaudhuri, 2000). Probably the most important and strongest identifying assumption is that cross-sectional variance can be used to estimate inter-temporal variance. Most likely cross-sectional variance can explain a part of inter-temporal variance, mostly due to idiosyncratic components or cluster-specific shocks. However, the model will miss the impact of inter-temporal or aggregate (household-invariant but time-variant) shocks. In other words, the

¹⁷ The authors thank Shubham Chaudhuri at the School of International and Public Affairs, Columbia University for sharing with them two draft papers on the measurement of vulnerability, for explaining the methodology for measuring and decomposing vulnerability, and for providing an annotated program that implements the estimation of vulnerability.

¹⁸ Pritchett et al (1999), Chaudhuri (2000), and Chaudhuri and Datt (2001).

¹⁹ The model for the variance of consumption, presented in Table A7a, included the typical household characteristics and the likelihood of experiencing a loss following any of the seven most frequent shocks: drought, pest, job loss, a drop in income, an accident of the breadwinner, lost terms of trade, and a bad harvest.

model will probably produce good estimates of vulnerability for the situations where the distribution of risks and the risk-management instruments are similar in all periods of time.

As there is probably some error in the measurement of consumption, this may have resulted in significant overestimation of the variance of consumption, and thus of vulnerability. An advantage of the estimation strategy used in this paper – using a FGLS approach to estimate the variance of the idiosyncratic component of household consumption – is that it yields a consistent estimate of the true variance of consumption even when consumption is measured with error unless the measurement error varies systematically with some household characteristic(s). It may in fact be the case that measurement error is correlated with some observable characteristic of the household. For instance, rural households derive a larger share of their food consumption from their own production than urban households evaluated at imputed (not reported or observed) prices. If this is the case, it is possible to obtain unbiased estimators of consumption variance by estimating separate models for rural and urban areas. Concerns about systematic measurement error are another reason for estimating separate models at as disaggregated a level as possible. In this paper, we estimated separate models for the metropolitan region (Metro) and for the remaining rural and urban areas (see Table A7a in the annex).

Vulnerability to Poverty and Observed Consumption. The relationship between vulnerability and poverty is illustrated in the four graphs in Figure 12. The upper left-hand graph presents this relationship for the whole country, while the remaining graphs focus on the total poor, the extremely poor, and the non-poor. Each figure uses marginal boxplots to illustrate the density of the two distributions (consumption and poverty) for the sample being considered.

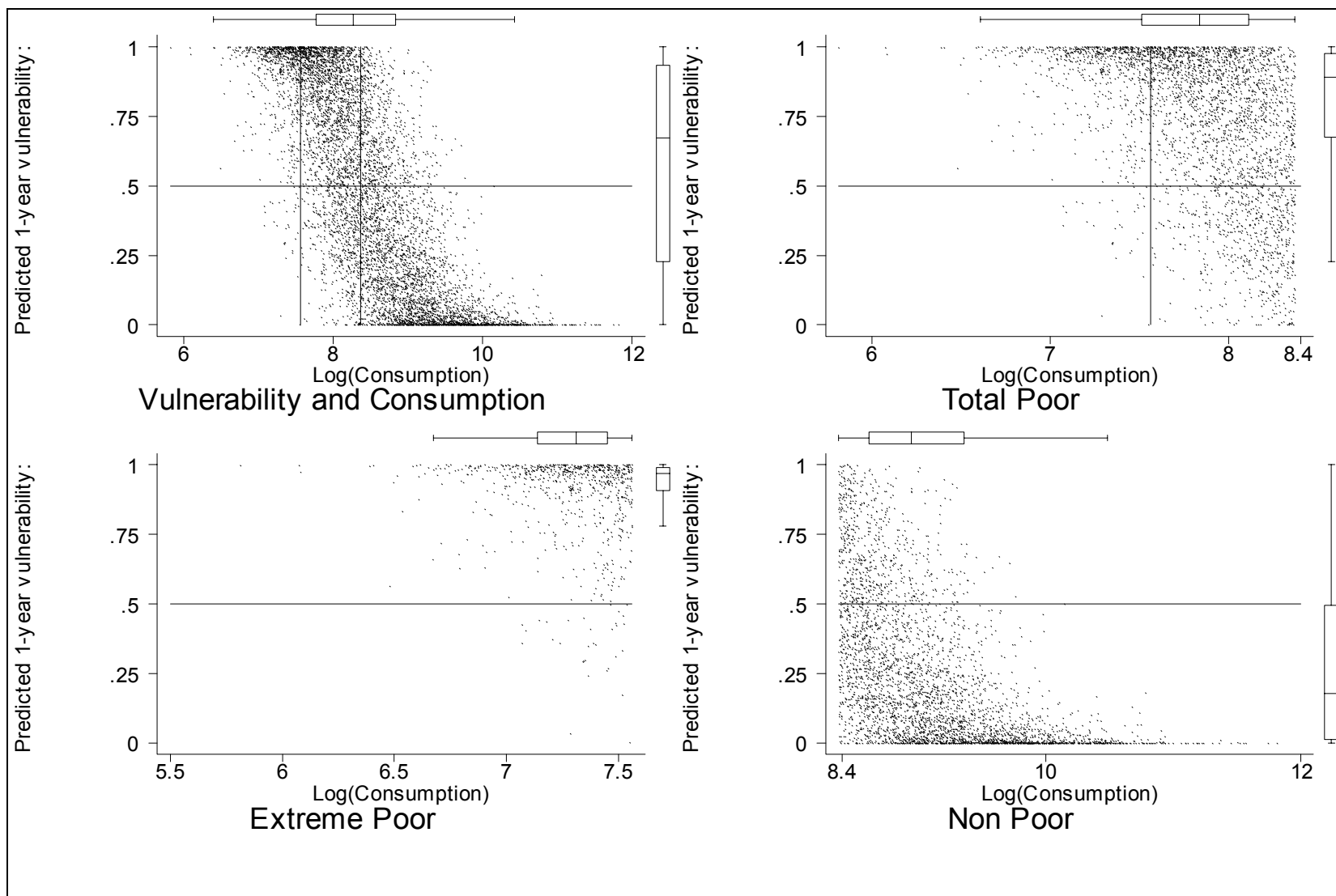
All of the graphs have a horizontal line at the 0.5 vulnerability level, separating those who are more likely to be poor – the vulnerable to be found in the upper part of the graph – from those less likely to be poor – the non-vulnerable to be found in the lower part of the graph. The upper graphs have vertical lines at the level of extreme and total poverty lines (the upper left-hand graph) and at the extreme poverty line (the upper right-hand graph). These lines separate the extremely poor from the moderately poor and the non-poor.

The upper left-hand graph illustrates the negative relationship between vulnerability and (the logarithm of) consumption. The relationship between vulnerability and current consumption is negative as expected but with a lot of variation along a hypothetical trend. The lower left-hand graph zooms in on the “extremely poor” part of the previous graph. As expected, almost all of the extremely poor are among the highly vulnerable. The marginal boxplot of the graph signals that almost all households have a vulnerability index in excess of 0.8, with three-quarters of them having a vulnerability index in excess of 90 percent. The rate of exit from the extreme poverty pool is extremely low. This means that the majority of the extremely poor in 2000 were also poor in 2001, providing that no major positive macroeconomic shock had occurred (such as pro-poor growth). This segment of the population is likely to benefit from social programs that increase their human capital and their other assets.

The upper right-hand graph presents the joint distribution of vulnerability and current consumption among the total poor. From the marginal boxplot, it can be seen that three-quarters of the total poor have a vulnerability index in excess of 0.67. This means that two out of three currently poor households will still be poor in the next period.

Finally, the lower right-hand graph presents the joint distribution of vulnerability and current consumption for the non-poor. Three-quarters of the non-poor are not vulnerable, and those who are vulnerable have consumption levels close to the poverty line.

Figure 12: A Closer Look at the Relationship between Vulnerability and Consumption



World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Differences between Poverty and Vulnerability Profiles. In 2000, 56 percent of the population was poor. By definition, the mean vulnerability level is close to this index, at 0.58. In the same year, two-thirds of the population had a probability greater than 50 percent of falling into poverty in 2001. This group was termed “vulnerable” to consumption poverty. Table 15 presents comparative estimates of poverty and vulnerability.

Table 15; Poverty and Vulnerability within Different Segments of the Population

	Population share	Share of poor	Share of vulnerable	Poverty Headcount	Mean vulnerability	Vulnerability Headcount	Vulnerability to poverty ratio
Total	100.0	100.0	100.0	56.2	0.58	64.1	1.14
Area of Residence							
Rural	61.4	81.4	78.3	74.5	0.75	81.8	1.10
Urban	38.6	18.6	21.7	27.1	0.27	36.1	1.33
Region							
Metro	21.7	6.9	13.6	18.0	0.10	40.21	2.24
N	8.1	12.1	10.7	84.0	0.79	84.58	1.01
NE	8.2	7.6	7.6	51.8	0.56	59.41	1.15
SE	8.8	10.7	9.2	68.6	0.64	67.25	0.98
Central	10.7	9.8	9.5	51.7	0.55	57.03	1.10
SW	26.5	30.1	28.6	64.0	0.65	69.16	1.08
NW	12.9	18.8	17.3	82.1	0.80	85.88	1.05
Peten	3.3	4.0	3.7	68.0	0.67	71.59	1.05
Ethnicity of the HH Head							
Ladino	57.5	42.4	46.1	41.4	0.44	51.5	1.24
Indigenous	42.6	57.6	53.9	76.1	0.75	81.2	1.07
Gender of the HH Head							
Male	85.3	87.5	88.8	57.6	0.60	66.7	1.16
Female	14.7	12.5	11.2	47.8	0.46	48.8	1.02
Age of the HH Head							
<25 years old	4.7	3.8	4.2	45.9	0.52	57.4	1.25
25-59 years old	81.3	82.8	82.9	57.2	0.59	65.3	1.14
60 years old and over	14.0	13.4	13.0	53.7	0.54	59.2	1.10
HH Head ST Migrant							
Non Migrant	92.7	90.3	90.8	54.8	0.57	62.8	1.15
Short Term Migrant	7.3	9.7	9.2	74.6	0.75	80.5	1.08
Education Status of the HH Head							
No_School	38.3	52.9	49.9	77.7	0.76	83.5	1.07
Primary	45.0	43.3	45.8	54.1	0.59	65.2	1.20
Secondary	11.4	3.3	1.9	16.4	0.12	10.4	0.64
Higher	5.3	0.4	2.5	4.2	0.03	30.5	7.32
HH Head Industry of Employment							
Agriculture	47.0	66.0	61.6	80.8	0.80	86.6	1.07
Mining	0.4	0.1	0.4	18.3	0.32	67.9	3.71
Manufacturing	10.1	6.2	6.8	35.5	0.38	44.3	1.25
Gas, Electricity, Water	0.5	0.3	0.5	31.7	0.45	65.7	2.07
Construction	8.3	7.2	8.0	50.2	0.54	64.1	1.28
Commerce	15.2	9.7	9.6	36.8	0.35	41.9	1.14
Transport	3.9	2.5	3.5	36.8	0.47	59.3	1.61
Financial	2.6	0.7	1.5	14.9	0.21	38.9	2.61
Community	12.0	7.3	8.0	35.1	0.33	44.4	1.26

Notes:

The fraction poor is the poverty headcount ratio. Similarly, the fraction vulnerable is the vulnerable headcount ratio, or the share of persons with a vulnerability index in excess of 50%. Mean vulnerability is the mean probability of being poor of a particular group (the mean of the vulnerability index for the persons in the group).

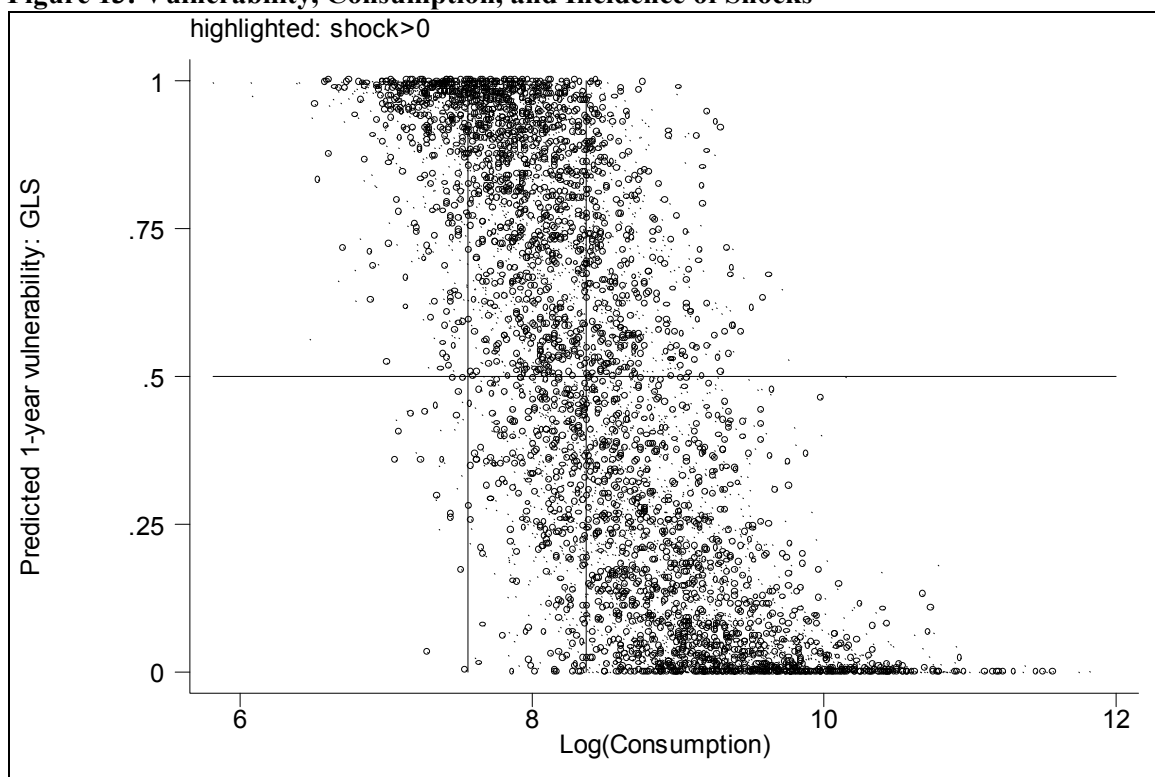
World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

There are differences between the poverty and the vulnerability rates. Overall, the number of vulnerable households is 14 percent higher than the number of poor households. Within some groups, this difference is even higher. Compared to the current poverty headcount, households with heads who have higher than a secondary education have a sevenfold vulnerability index. For some households in this category, the chances of a temporary fall in income and consumption are higher than 50 percent. In terms of differences between regions, households in the Metropolitan region had a vulnerability to poverty ratio 2.2 times higher than the headcount, while in urban areas in general, the ratio was 33 percent higher. In contrast, households with heads who have a secondary education have, in general, lower vulnerability than the corresponding poverty rate.

In terms of ethnicity, the non-indigenous have higher vulnerability to poverty ratios than the indigenous Mayan population. In terms of occupation, those engaged in mining, utilities, and financial services had higher ratios than the national average. Younger household heads also had higher vulnerability to poverty ratios than the average.

Are the Poor more often the Victims of Shocks? One may expect a spurious correlation between poverty and experiencing shocks. Shocks that cause income or asset losses are also likely to reduce consumption if credit constraints are binding or if the shock reduces expected life-time earnings by destroying the household's asset base. Figure 13 investigates this relationship. For each household, the vulnerability-consumption pair is illustrated by dots. The households that have suffered from at least one shock are highlighted by circles surrounding the respective dot. Figure 15 suggests that shocks occur everywhere in the distribution and hit poor and non-poor households alike. The non-catastrophic nature of the shocks that affected Guatemala in 2000 made consumption smoothing possible.

Figure 13: Vulnerability, Consumption, and Incidence of Shocks



Note: For each household, the vulnerability-consumption pair is illustrated by dots. The households who suffered from at least one shock are highlighted by circles surrounding the respective dot.

World Bank calculations using the ENCOVI 2000, *Instituto Nacional de Estadísticas – Guatemala*

Consistent with our analysis in section II, some shocks hit vulnerable households disproportionately while others do not. As is apparent in Figure 14, shocks like droughts, pest infestations, or bad harvests are mostly experienced by households that are vulnerable to poverty. Some shocks, like storms, worsening terms of trade, or an accident to the household breadwinner hit vulnerable and non-vulnerable households equally. Shocks associated with the formal labor market or entrepreneurship, such as job losses or falling incomes, are experienced primarily by non-vulnerable households. Therefore, from the perspective of vulnerability to poverty, the first category of shocks is of prime concern. Strengthening the ability of households to reduce, mitigate or cope with the effects of these shocks is likely to reduce their vulnerability to poverty.

Figure 14: Vulnerability, Consumption, and Incidence of Specific Shocks

