SHAKING UP ECONOMIC PROGRESS

Aggregate Shocks in Latin America and the Caribbean

Javier E. Báez
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SHAKING UP ECONOMIC PROGRESS
Aggregate Shocks in Latin America and the Caribbean
1. Executive Summary

The region has made impressive strides in the struggle against poverty and income inequality

The Latin America and Caribbean region has achieved remarkable economic and social progress over the last decade, gradually shifting toward middle-income status. Economic growth reached an average annual rate of 3.2 percent over 2000–14, noticeably higher than in previous decades. This favorable context contributed to significant poverty reduction and expansion of the middle class. The proportion of the region’s 600 million people living in extreme poverty, defined in the region as life on less than $2.50 a day, was cut in half between 2003 and 2012, to 12.3 percent. Similarly, the share of Latin Americans living in moderate poverty, corresponding to living on less than $4.00 a day, fell from 41.1 percent to 25.3 percent. Since 2011, there have been more Latin Americans in the middle class than in poverty, and the middle class is projected to become the largest group in the region (World Bank 2014a). The gains attained span other areas of human development such as increased access to basic services and lower child and maternal mortality.

But the gains are not assured partly because of substantial exposure and vulnerability to multiple shocks

While a significant share of households moved upward in socioeconomic class, the largest group of the population remained vulnerable to poverty. Many Latin Americans escaped poverty buoyed by more than a decade of strong economic growth and inequality reduction. However, most of the new nonpoor did not move directly to the middle class, but continued to be vulnerable, facing economic insecurity and likely to experience spells of poverty in the future.1 Nearly 4 households in 10 in the region belong to this group, making it the largest socioeconomic class. Owing to their substantial vulnerability, many of these households may be one shock away from sliding back into poverty.

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1 López-Calva and Ortiz-Juárez (2014) propose a 10 percent probability of falling into poverty as a dividing line between economic security and vulnerability and define the predicted income associated with that probability as the upper bound of vulnerability or the lower bound of the middle class. The lower bound is the $4.00-a-day poverty line. The resulting per capita incomes among nonpoor individuals facing a 10 percent probability of falling into poverty was $9.80 based on panel data for Chile and Mexico.
The substantial vulnerability is compounded by exposure to a numerous shocks that affect the region, particularly natural hazards. The incidence of these phenomena grew threefold regionally and globally between 1970 and 2014. Extreme rainfall and drought are a near-constant threat across the region. Of every 10 natural events recorded in the region, 7 arise because of storms and floods (Holt 2014). In the Caribbean, at least one country—and often more than one—is hit by a strong hurricane or cyclone every year. The dry corridor, a region of dry tropical forests in Central America spanning parts of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama, is regularly affected by recurrent droughts that endanger crops, livestock, and food security. The Andean and Central American countries are within the Ring of Fire, a string of volcanoes and sites of seismic activity in the Pacific Ocean that accounts for roughly 90 percent of the world’s earthquakes and more than 75 percent of the world’s active and dormant volcanoes. Over a quarter of all earthquakes of magnitude 8.0 or higher occur in western South America.

The region must also address major economic and social risks. A more restrictive macroprudential regulatory framework across most countries has made them more resilient to economic downturns. Yet, the region is edging toward a new equilibrium of lower growth, coupled with a rise in current account deficits and greater exposure to other external factors. Crime and violence continue to top the list of challenges in many countries; the incidence of crime is comparable with the rates recorded in war-torn countries. An individual born in Caracas, San Salvador, or Tegucigalpa—the three most violent large cities in the region—has about one chance in eight of being murdered during his lifetime. Parts of the region show a proliferation of violent youth gangs, drug trafficking, money laundering, and domestic violence, whereas other parts have endured civil conflict and unrest. Infectious disease and viruses thrive in warm and humid conditions such as those in the tropics, which span most countries in the region. Major epidemics such as Chikungunya and Zika are a serious risk to public health.

Aggregate shocks often signify income shocks

Large natural and man-made shocks undermine economic expansion and household incomes. The first manifestation of a major negative shock at the macro level is typically a drop in output. Gross domestic product (GDP) fell by 6 percent and 11 percent during the crises that hit Mexico (1994–95) and Argentina (2001–02), respectively. At the micro level, household incomes in the region are equally likely to experience hefty declines in the aftermath of major shocks. Hurricanes in Central America cut household incomes by 3 percent for each standard deviation in the intensity of the hurricane windstorm (Ishizawa and Miranda 2016). Similarly, two earthquakes that struck El Salvador in 2001 reduced a third of the preshock median per capita income of households in areas exposed to the strongest ground shaking (Báez and Santos 2009).
Income reductions caused by aggregate shocks may persist

Some households recover quickly following aggregate shocks, but recovery may take much longer among many other households, particularly the poor and vulnerable. Access to well-functioning credit and insurance markets, as well as savings, liquid assets, and informal risk-sharing mechanisms such as private transfers and community-based financial systems position households to withstand the negative income effects of major shocks. This is often not the case among the poor and vulnerable, who may be obliged to undertake a shift to a lower equilibrium of welfare and income growth. In Honduras, for example, two and half years after Hurricane Mitch (1998) had ravaged Central America, evidence shows that wealthier households were able to bounce back quickly, but less well off households went on a downward trajectory of sustained asset depletion and low income growth (Carter et al. 2005).

Income reductions translate into consumption shortfalls and greater vulnerability to poverty

Income risks help determine consumption, especially among vulnerable, low-income households. Incomplete insurance means vulnerable households manage to protect their consumption only partially from the negative income shocks caused by major hazards. Plentiful evidence shows that consumption (including basic expenditures) tends to fall in households and communities affected by natural disasters. Median per capita consumption fell by 7.7 percent in households affected by Agatha, a major tropical storm that hit Guatemala in 2010 (Báez et al. 2016). Man-made shocks potentially lead to similar outcomes. Households that were obliged to move from conflict zones in Colombia suffered a 22 percent decline in consumption, affecting their food and calorie intake (Ibáñez and Moya 2006). Moreover, transient impacts on consumption can become chronic. Panel data on rural families in El Salvador show lower consumption growth between 1995 and 2001 among less well off households that had dealt with substantial income shocks (Rodríguez-Meza and González-Vega 2004).

Because of consumption volatility, vulnerable households may be a disaster away from falling below the poverty line or sliding further back into poverty. If insurance and risk management are lacking or incomplete, income or consumption declines caused by major shocks push some households into poverty or deepen the levels of deprivation among the poor. Poverty rates rose by 5.5 percentage points in areas of Guatemala flooded by Agatha (2010), equivalent to nearly 80,000 more families falling below the poverty line (Báez et al. 2016). In 2003–04, the Dominican Republic experienced a bank collapse, rapid currency depreciation, and inflation, which hastened a domestic crisis that led to economic contraction. The poverty rate soared from 32 percent in 2002 to over 50 percent at the peak of the crisis (World Bank 2014b).
The significant vulnerability is influenced by the enduring negative effects of shocks on current asset stocks and future asset accumulation

**Major shocks reduce asset ownership.** Human capital is particularly sensitive. Natural disasters, civil conflict, and widespread epidemics result in human casualties, leaving negative human capital impacts in their wake. The 2010 earthquake that struck Haiti caused close to 250,000 fatalities. Colombia’s internal conflict, lasting for over 50 years, has claimed a similar number of lives. In addition to human casualties, these events often result in the destruction of the infrastructure required for the acquisition of human capital, such as schools, hospitals, and clinics. Likewise, shocks destroy private property (housing, machinery, crops and livestock), other critical public infrastructure (roads and bridges), and natural capital. Hurricane Mitch (1998) decimated over 80,000 hectares of agricultural land, the large majority of which was used by small farmholders for subsistence agriculture (Ishizawa and Miranda 2016).

**Shocks also undermine investments in assets.** Major shocks can pose a financial burden on households, often forcing them to cut back on food and health care expenditures, thereby raising the risk of malnutrition and other negative effects on health. For example, Nicaraguan children ages 0–5 in households located in the path of Hurricane Mitch (1998) were 30 percent less likely than children in unaffected parts of the country to be taken for medical consultation after the shock (Báez and Santos 2007). Households may also need to pull their children out of school to benefit from the extra labor, but at the cost of lower human capital. Once Mexican children are withdrawn from school in response to large shocks, they become nearly 30 percent less likely to reenroll relative to children who stay in school (Sadoulet et al. 2004).

**Not everyone’s assets are affected equally—the poor and the vulnerable often bear the greater burden**

**Aggregate shocks affect broad economic and social systems, but their impacts on assets, groups, and communities are not evenly distributed.** The earthquakes that struck Chile and Haiti in 2010 were of similar magnitude, but were associated with starkly contrasting outcomes: 525 people were killed in the former case compared with over 200,000 in the latter. The variations in impact are determined by the circumstances of the affected population, such as gender equality, geographical location, educational attainment, and type of job. In Mexico, the poor are almost three times more likely than the vulnerable or the middle class to be affected by a natural disaster that results in loss of dwellings, crops, and livestock (de la Fuente, Ortiz-Juárez, and Rodríguez-Castelán 2017).
Shocks undermine the incentive to use factors of production optimally

The supply of labor is sensitive to major shocks, at times increasing and at times declining. Aggregate shocks destroy household wealth and assets, reducing the income opportunities that can be generated from wealth and assets. They change prices and thus relative wages. In an effort to protect private expenditures or prevent expenditures from falling below subsistence needs, affected individuals may respond by supplying extra labor. Households in northern Colombia, for example, attempted to cope with extreme flooding that struck the country in 2010 by boosting their labor participation (Acevedo 2016). In contrast, unfavorable economic circumstances or major health setbacks can result in less labor supply in the market. Forced migration, a typical risk mitigation strategy, imposes high costs on populations by unsettling their engagement in labor and other markets. Over half the household heads internally displaced by the conflict in Colombia were unemployed three months after settlement at destination sites (Ibáñez and Moya 2006).

Households often rely on the labor of their children to cope with shocks, and this comes at a cost: lower human capital and productivity. Children represent a buffer, particularly among resource-constrained households. In tough times, households are often forced to resort to the labor of their children, who can contribute to income or free up time for adults. However, children’s work entails long-run costs as it often interferes with the human capital accumulation of the children and leads to reduced earnings potential. For instance, Brazilian children, particularly girls, were more likely to abandon school and enter the labor force during several of the economic slowdowns recorded in the 1980s and 1990s. Once out of school, they became 10 percentage points less likely to progress across grades later on, offsetting short-term smoothing gains with long-term losses in human capital (Duryea, Lam, and Levison 2007).

Major shocks disrupt job creation, reducing the demand for labor. Large natural disasters or civil conflicts do more than wipe out homes. They decimate local economies, thereby distressing businesses, supply chains, and markets. Close to 100,000 jobs were lost in Chile after the 2010 earthquake, pushing up the unemployment rate by 1 percentage point. Economic recessions lead to a slowdown in output, a slump in consumer spending, and a reduction in investments in capital and the expansion of credit. As this broad-spectrum aggregate supply slowdown unfolds, firms are likely to freeze hiring and lay off employees, which ultimately results in lower demand for labor, higher unemployment, and diminished job quality. The global financial crisis of 2008–09 raised unemployment rates in Mexico by more than 50 percent (Freije, López-Acevedo, and Rodríguez-Oreggia 2011).
Uninsured risk pushes households to use productive assets inefficiently and forgo significant returns. Credit- and insurance-constrained, risk-averse households are inclined to mitigate ex ante the effects of shocks by making conservative employment and production choices. Thus, fertilizers or enhanced seeds that boost crop productivity and raise expected profits are typically used less intensively by risk-prone households for fear of incurring investment losses if shocks result in poor harvests. Vulnerable households self-insure by diversifying toward portfolios with safer, but less profitable activities. Farmers in the Peruvian district of Cuyocuyo, for instance, diversify their crops spatially by working on smaller fields rather than on a more efficient, consolidated plot. However, this diminishes the overall yields by 7 percent (Goland 1993). Likewise, evidence shows that risk-reduction income diversification strategies among vulnerable households often translate into lack of specialization, small scale, informality, and even little income smoothing (the tactic of leveling expenditures across income highs and lows, that is, saving in good times to be able to spend normally in bad times).

Efficiency and equity losses linked to inadequate insurance, protection, and coping justify government intervention

Many of the negative impacts and development setbacks that arise from shocks are the result of inadequate risk management. Households follow multiple strategies to manage risk, but these are only partially effective. Inadequate risk management discourages households from taking on the risks that are encountered in pursuing economic gain, undermining income generation. Income- and asset-based strategies to self-insure smooth incomes, but also skew them, clustering households into low-return, low-risk activities. The poor functioning of asset markets constrains the access to alternative economic activities and depresses asset values if these are liquidated during a crisis. Informal risk-sharing mechanisms are prone to collapse if aggregate shocks occur. The welfare losses caused by these inefficiencies are not trivial. In addition, because the shocks tend to affect the poor and vulnerable disproportionally owing to a combination of greater exposure, weaker internal conditions, and unsatisfactory risk management, the resulting equity losses are equally large. The costs of inaction are substantial.

Risk management policy needs to address four objectives to help households effectively prepare for and cope with shocks. World Development Report 2014 argues that preparing for aggregate shocks involves three of the objectives: (1) gaining knowledge to understand the shocks, conditions, and potential outcomes, thereby reducing the uncertainties faced by people, societies, and countries; (2) building protection to reduce the probability and size of losses, while increasing the chances and size of positive outcomes; and (3) acquiring insurance to transfer resources. Successfully coping with aggregate shocks ex post is covered in the fourth objective: (4) applying proven coping mechanisms to recover from the losses inflicted by the shocks.
Strengthening the preparation and coping aspects of risk management requires policy actions on five main fronts, paying special attention to efficiency and equity considerations:

1 **Address market failures and the underprovision of public goods.** A major factor explaining suboptimal risk management is the lack of critical markets for credit, insurance, and jobs. These markets may exist, but fail to develop completely. Better financial inclusion contributes directly to faster recovery after a disaster, while also supporting asset diversification, which reduces vulnerability. Basic services and public goods that are essential in managing risks such as safe water and sanitation, education, key infrastructure, weather warning systems, economic and political stability, and the rule of law are often missing or substandard.

2 **Internalize social and economic externalities.** Economic activities adopted by some agents, including risk management strategies, can impose costs on others. Lack of land-use and building regulations can lead to infrastructure development in unsafe places under unsafe construction codes. Free-riding among agents who benefit from risk prevention or mitigation without contributing to the costs likely discourages risk management. Regulatory policies that enable collective action and help internalize relevant externalities need to be adopted.

3 **Reform weak government incentives.** Intertemporal political incentives are an impediment to adequate risk management. Risk preparation requires investment, often costly, that potentially yields discernible returns only in the medium and long term. Governments prefer to devote resources to policies and programs that produce gains in the short term even if the gains are smaller or to rely on international aid, which translates into a widespread inability to prepare for crises before they occur. Addressing these failures requires the development ex ante of coordinated plans for postdisaster action and agreements on standby financing.

4 **Deal with the lack of resources and information.** Investments in risk management infrastructure and technology usually involve large upfront costs. Households and governments on tight budgets may favor current expenditures over investments in risk reduction and mitigation. Lack of information on the relevant risks and on the benefits of risk management constrains the ability of public and private agents to price risks, undermining public and private efforts to insure against shocks and provide compensation at actuarially fair rates. An option is to leverage private resources and official development assistance for large, better investments in resilience.

5 **Develop and strengthen rapidly scalable social protection.** Households cannot be fully insured against every type of shock. Ex post mechanisms such as social transfers
are necessary to ensure a minimally acceptable standard of living, especially among the poor. Adaptive and scalable social protection can provide this type of insurance during a crisis by increasing the amount transferred to beneficiaries, relaxing eligibility rules and conditionalities, extending coverage to new beneficiaries, or creating a new program. Latin America and the Caribbean has succeeded in building safety nets to alleviate poverty. It is now time to use them to enhance the resilience of nonpoor households that face a substantial risk to slide back into poverty if struck by a shock.
2. Why Care about Aggregate Shocks in Latin America and the Caribbean?

The region has made impressive strides in the struggle against poverty and income inequality.

The Latin America and Caribbean region has achieved remarkable economic and social progress over the last decade, gradually shifting toward middle-income status. Economic growth reached an average annual rate of 3.2 percent over 2000–14, noticeably higher than the rates in previous decades. This favorable context contributed to significant poverty reduction and expansion among the middle class. The share of the region’s 600 million people living in extreme poverty, defined in the region as life on less than $2.50 a day, was cut by half between 2003 and 2012, to 12.3 percent. Similarly, the share of Latin Americans living in moderate poverty, corresponding to living on less than $4.00 a day, fell from 41.1 percent to 25.3 percent. The Gini coefficient has declined by over 10 points since 2003. Since 2011, there have been more Latin Americans in the middle class than in poverty (figure 2.1). The middle class has been growing rapidly and is projected to become the largest group in the region, exceeding the share of the vulnerable, namely, those who are not poor, but who face a higher risk of falling back into poverty (World Bank 2014a).

Figure 2.1. The Region Has Recorded Remarkable Poverty Reduction and Expansion of the Middle Class

The laudable gains also span other areas of human development. Access to basic services such as education, health care, electricity, water and sanitation not only increased, but also became more even across the population. Under-5 mortality declined by 28 percent during the first decade of the 21st century. Literacy rates are at an all-time high: 92 percent and 97 percent among adults and youth, respectively. Life expectancy, which was 67 years in 1990, has improved significantly, to 75 years today. Workers have become more skilled; the quality of jobs has risen; and more women have joined the labor force.

But the gains are not assured partly because of the substantial exposure to multiple shocks

While a large share of households moved up the socioeconomic ladder, a larger share risked falling back into poverty. Many Latin Americans escaped poverty buoyed by more than a decade of strong economic growth and inequality reduction. However, most of the new nonpoor did not move directly into the middle class, but joined the vulnerable, that is, individuals facing substantial economic insecurity and likely to experience spells of poverty. Nearly 4 households in 10 belong to this group and represent the largest socioeconomic class in the region. Owing to their exposure and vulnerability, many of these households may be one shock away from sliding back into poverty, a risk that is particularly great in in the region.

Large shocks continue to affect the region. Natural hazards may be the greatest risk. Across the world, natural disasters have become more frequent; the incidence of these phenomena grew threefold in the region and globally between 1970 and 2014 (figure 2.2). Environmental hazards, such as droughts, floods, landslides, hurricanes, earthquakes, and volcanic eruptions are a near-constant threat across the region. In the Caribbean, at least one country—and often more than one—is hit by a strong hurricane or cyclone every year. In most countries, poor households are more regularly exposed to floods (Hallegratte et al. 2016). The Andean and Central American countries are within the Ring of Fire, a string of volcanoes and seismic activity sites in the Pacific Ocean that accounts for roughly 90 percent of the world’s earthquakes and more than 75 percent of the world’s active and dormant volcanoes (map 2.1). Natural hazards are also converging into more intense, more severe phenomena. The 2014 report of the Intergovernmental Panel on Climate Change underlines that the intensity of extreme weather and climate in the region is expected to increase in coming years (Magrin et al. 2014).


3 López-Calva and Ortiz-Juárez (2014) propose a 10 percent probability of falling into poverty as a dividing line between economic security and vulnerability and define the predicted income associated with that probability as the upper bound of vulnerability or the lower bound of the middle class. The lower bound is the $4.00-a-day poverty line. Based on panel data for Chile and Mexico, the resulting daily per capita incomes among nonpoor individuals facing a 10 percent probability of falling into poverty was $9.80.
CHAPTER 2
Why Care about Aggregate Shocks in Latin America and the Caribbean?

Figure 2.2. The Incidence of Natural Disasters Has Been on the Rise Globally and Regionally

Note: Index 1970 = 100.

Map 2.1. Several Types of Natural Disasters Are Geographically Clustered in Latin America and the Caribbean

Extreme rainfall and drought are commonplace in the region. Of every 10 natural events recorded in the region, 7 arise because of storms and floods (Holt 2014). Most cyclones and storms begin in the eastern Atlantic, but develop into deadly hurricanes by the time they make landfall, often in the Caribbean or Central America. Extreme weather events can become manifest on both sides of the spectrum; thus, severe, prolonged water shortages are also common. The dry corridor, a region of dry tropical forests in Central America spanning parts of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama, is regularly affected by recurrent droughts that endanger the crops, livestock, and food security of over a million families engaged in subsistence farming. In the last couple of years, southeast Brazil has experienced long droughts, leading to water scarcity in São Paulo, the country’s most densely populated state (Seth, Fernandes, and Camargo 2015). Floods and droughts are aggravated by the warmer- and cooler-than-normal sea surface temperatures in the Pacific Ocean caused by the El Niño and La Niña phenomena.

The region is sensitive to earthquakes and other geological risks. Over a quarter of all earthquakes of magnitude 8.0 or higher occur in western South America. The strongest earthquake ever recorded (magnitude 9.5) struck Chile in 1960. Vulnerability to earthquake-related disasters is mostly confined to the active fault lines where the Cocos and Nazca plates converge with the South American plate on the western coasts of Central and South America. The 7.0 magnitude earthquake that ravaged Haiti in 2010 killed over 200,000 people, left 1.5 million homeless, and destroyed billions of dollars in infrastructure and the recent 7.8 magnitude earthquake that struck Ecuador and instantly generated damage that represented over 3 percent of the country’s GDP remind us of the destructive potential of these catastrophes.

The region is edging toward a new equilibrium of lower growth, coupled with a rise in current account deficits. The adoption of a more restrictive macroprudential regulatory framework across most countries has made the region more resilient to economic downturns. The region experienced a recession during over a third of the 1980s, but the frequency of recession fell to 10 percent in the 1990s and much lower in the 2000s (World Bank 2013a). However, the context has changed in the last few years, and the region seems to be edging toward a new equilibrium of greater exposure to external factors. Countries benefited in the late 1990s and 2000s from growing external demand for commodities, allowing for increases in consumption. Yet, the end of the commodity super cycle in recent years was not paired with restraint in consumption, leading to growing current account deficits across the region, mainly financed through debt. A sudden rise in interest rates could stop capital inflows and make debt untenable, thereby causing a potential balance of payments crisis and adding pressure to fiscal imbalances (figure 2.3) (World Bank 2015).

Commodity price fluctuations add to macroinstability, especially in countries in which growth is fueled by international commodity markets. Among world regions, the Latin
America and Caribbean region shows the strongest correlation between international commodity prices and terms of trade, which has a great influence on other macroeconomic variables. Indeed, over the last decade, the commodity boom boosted growth in the region. Recently, however, the sluggishness of the Chinese economy, coupled with weaker global growth, has put downward pressure on commodity prices. The price of oil, which fell by more than half between September 2014 and January 2015, as well as the subsequent strong appreciation of the U.S. dollar, squeezed fiscal and current accounts, suppressing growth in the region. Fluctuations in food prices disproportionally hurt households at the bottom of the income distribution, given that a larger share of their incomes are devoted to food consumption and that their ability to substitute cheaper sources of calories is often limited. The 2007–08 food price crisis and resulting food inflation were barriers along the region’s path toward reducing food insecurity (Robles and Torero 2010). In Ecuador, Haiti, Nicaragua, Panama, and Peru, calorie intake shifted below sufficiency in poor households, raising malnutrition rates.\(^4\)

**Crime and violence are among the top challenges.** Nearly a third of the population in the region ranks the lack of physical security as the main threat to basic rights.\(^5\) In stark contrast to the global decline in crime and homicide rates in the last two decades, the region has experienced a steady rise (figure 2.4). It is considered the most dangerous

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Table 2.1. Longest, Deadliest Internal Conflicts, Latin America and the Caribbean, 1964–present

<table>
<thead>
<tr>
<th>Country</th>
<th>Period</th>
<th>Insurgent Group</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colombia</td>
<td>1964–2016</td>
<td>FARC, ELN, M-19</td>
<td>Casualties: 220,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Displaced people: 4.7–5.7 million</td>
</tr>
<tr>
<td>Guatemala</td>
<td>1965–95</td>
<td>FAR I, FAR II, ORPA, EGP, URNG</td>
<td>Casualties: 140,000–200,000</td>
</tr>
<tr>
<td>Peru</td>
<td>1965, 1982</td>
<td>MIR, Sendero Luminoso</td>
<td>Casualties: 70,000+</td>
</tr>
<tr>
<td>El Salvador</td>
<td>1972, 1979–91</td>
<td>FMLN, ERP, FPL</td>
<td>Casualties: 70,000–80,000 Displaced people: 550,000</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>1978–89</td>
<td>Contras/FDN</td>
<td>Casualties: 20,000–50,000</td>
</tr>
</tbody>
</table>


part of the world and in the grips of a social pandemic. Violence is widespread, and crime rates are comparable with rates recorded in war-torn countries. With only 8 percent of the world’s population, the region accounts for one-third of global homicides. Since 2010, more than 10 percent of the population and over 30 percent of businesses have been direct victims of crime (Jaitman 2015). An individual born in Caracas, San Salvador, or Tegucigalpa—the three most violent large cities in the region—has about one chance in eight of being murdered during his lifetime. Parts of the region also show a proliferation of violent youth gangs, drug trafficking, money laundering, and domestic violence. The cost of violence is significant; by some estimates, it reaches the equivalent of 3.5 percent, close the total investments made by the region on infrastructure (IDB 2017). In addition to the direct human costs, the scale of crime and violence thwarts economic, social, and institutional development and undermines political stability. Domestic and foreign investors are often hesitant to do business in the most violent parts of the region.

The region has also endured long, violent, and destabilizing civil conflict. Since the end of World War II, the region has recorded 22 conflicts lasting an average of seven years. The civil conflict in El Salvador spanned more than a decade between the 1980s and 1992 (table 2.1). Although there are no official numbers, the United Nations estimates that more than 75,000 people were killed. The Peruvian civil conflict between Maoist terrorist groups and the government lasted two decades, from 1980 to 2000, and killed around 70,000 people. Colombia has been struggling with a 50-year domestic conflict, the longest armed conflict ever recorded in the region, which has internally displaced more than 5.7 million people, hindering growth and social development.

Major epidemics represent a serious risk to public health. Infectious diseases and viruses thrive in warm and humid conditions such as those in the tropics, which span most of the region. After a period of relative calm, recent years have seen an emergence of epidemic threats (map 2.2). The outbreak of the Zika virus, which was first reported in the Americas in 2014, has spread rapidly. As of June 2016, 39 countries and territories reported confirmed cases of the virus, which can lead to a surge in microcephaly among newborns.6 More than five million children are expected to be born in 2016 in areas prone to Zika transmission in the region (Messina 2016). Another vector-borne virus, Chikungunya, began spreading in the Americas in December 2013. More than 1.7 million suspected cases in 45 countries and territories have been reported. Other infectious diseases, such as dengue, dengue hemorrhagic fever, and equine encephalitis also present a latent risk of recurrence in several areas. Large health shocks likely result in human casualties, illness and disability, a rise health expenditures, lost labor income, and disruption in economic activity.

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Aggregate shocks can reverse economic and social development

**Natural and man-made shocks will continue to disrupt economic performance.** Large, sudden natural disasters such as earthquakes or hurricanes can cause great damage to physical and human capital and may push communities, cities, or nations into slower growth, even if only temporarily. The 2010 earthquake in Haiti is a striking example of the impact these events can have on people’s livelihoods and economic circumstances: over one-third of Haitians were severely affected; 2.5 percent of the population was killed; and 80 percent of the country’s schools were destroyed. Growth shrank in the aftermath of three major earthquakes that hit countries in the region: by 8.8 percentage points in Haiti (2010), 1.1 percentage points in Chile (2005), and 1.2 percentage points in Guatemala (2012) (figure 2.5). Similarly, in addition to the death toll and the destruction of infrastructure, conflict imposes a large cost on economic output. Regression analysis shows that relative to the historical performance, annual growth has been an average 2.8 percentage points less in countries in the region that have undergone a civil conflict in the last 50 years (third column, table 2.2). Disasters affect the wider economy. Price inflation skyrocketed in Peru (163 percent) and El Salvador (32 percent) during the bloodiest periods of civil conflict (figure 2.6). High levels of crime and violence make investments riskier and undermine the legitimacy of the state, weakening institutions and the rule of law. Large chunks of public and private capital and the labor force are idle as economic recession, disease outbreaks, conflict, or natural disasters unfold.
Human welfare losses are amplified in a riskier world. Natural disasters have been associated with substantial damage to human capital. Nicaraguan children affected by Hurricane Mitch in 1998, one of the most powerful hurricanes in the tropical Atlantic basin in the 20th century, were four times more likely to become undernourished in the aftermath of the disaster (Báez and Santos 2007). School attendance fell by almost 7 percent among children in households that were more heavily hit by two consecutive earthquakes that struck El Salvador in 2001 (Santos 2007). Per capita expenditures, including food consumption, fell by 8.2 percent in the urban areas that bore the burden, in 2010, of the strongest tropical storm ever to strike Guatemala (Báez et al. 2016). The droughts in 1997–98 and 2000 in Nicaragua increased by 10 percent the probability that households would remain trapped in poverty (Premand and Vakis 2010).
Figure 2.6. Civil Conflicts Also Disturb Other Economic Fundamentals Such as Inflation

Note: years in dark gray correspond to the periods with the largest number of casualties.

Figure 2.7. Living on the Edge: The Riskier Environment of the Poor
(households reporting impacts of large shocks during the 12 months preceding the survey)

The negative impacts on household well-being are not confined to natural hazards and can endure. Economic crisis inflicts a similar burden on affected populations. Evidence on a sample of 59 countries shows that negative shocks on per capita GDP increase infant mortality, especially among girls (Baird, Friedman, and Schady 2011). School-age cohorts directly exposed to the Salvadoran civil war (1980–92) exhibited lower school attainment (two fewer years of education) than slightly older or younger cohorts (Acosta et al. 2016). The consequences on human welfare are also likely to persist. Mexican children withdrawn from school because of aggregate and systemic shocks are about 30 percent less likely to continue studying compared with children who stay in school (Sadoulet et al. 2004). The civil conflict in Peru (1980–93), which caused about 70,000 deaths, reduced by 0.3 years the school attainment of children who were exposed to conflict (León 2012). Likewise, the cohorts that grew up during the civil war in El Salvador are today less likely to work than counterfactual cohorts (Acosta et al. 2016).

Not everyone is equally sensitive to shocks; the poor are the most vulnerable. Because of their physical scale, major shocks such as earthquakes, hurricanes, volcanic eruptions, or civil wars often affect large geographical areas and vast populations. Economic recessions are, by definition, national or global phenomena. Their impacts, however, are not evenly allocated across the population: poor people show the greatest vulnerability (figure 2.7). Calculations for this study indicate that, across the world, the higher the GDP per capita, the lower the relative number of people affected by natural disasters. Household surveys in four countries in Latin America and the Caribbean show that low-income households, such as those in the bottom two quintiles of the distribution, are more likely to report the occurrence of large shocks, including storms, floods, landslides, droughts, crop plagues, and animal diseases. Empirical analysis of the impact of a natural disaster on dwelling losses in Mexico between 2002 and 2005 was two times more likely among the poor than among the middle class (de la Fuente, Ortiz-Juárez, and Rodríguez-Castelán 2017).
3. Analytical Framework: The Link between Shocks and Household Welfare

A simple conceptual framework helps in understanding the multiple ways shocks affect household welfare. The framework conceptualizes in a simple manner the main channels through which aggregate shocks can undermine the income-generating capacity of households, hindering their ability to maximize welfare. The framework is comprised of three main elements: (1) the capacity of households to earn fair returns through the ownership and use of productive assets at certain points in time and dynamically; (2) the inability of credit-constrained households to separate their consumption and income generation decisions in a context of large, frequent uninsured risks; and (3) the implications of insured risks on household behavior and decision making.

The income and consumption possibilities of households are largely determined by the assets they possess, the intensity in which the assets are used, and the returns to the assets. The framework follows an asset-based approach that illustrates the dynamic decisions that households make in managing their resources to maximize income and achieve an optimal consumption pattern. Households own assets that are used to generate income, such as skills employed in the labor market, land utilized for agricultural production, or properties rented out. Assets can be used more or less intensively, namely, the rate of utilization (for instance, the employment rate for labor, or the depreciation of capital). In addition to asset ownership and utilization, the income generation capacity of households is affected by the returns to these productive assets: the real wages paid in the labor market, the real interest rate awarded on savings, or the rent charged for property. The income generation function of households is also influenced by transfers (public or private), the prices of goods and services, and the probability of being affected by positive or negative (idiosyncratic or aggregate) shocks. The ultimate welfare maximization among households will also depend on the specific preferences of households, particularly in consumption and leisure activities (figure 3.1).

7 On the asset-based approach, see Attanasio and Székely (2001); Bussolo and López-Calva (2014); Carter and Barrett (2006); Carter and Janzen (2015); Janzen, Carter, and Ikegami (2015); and López-Calva and Rodríguez-Castelán (2016).

8 Household assets can be grouped into five broad categories: human capital (educational attainment, health, nutrition, skills and professional experience), physical capital (machinery, property, housing, and equipment), financial capital (savings, stocks and bonds), natural capital (land, soil, forests, and water), and social capital (networks and social trust).
The accumulation of productive assets is a dynamic process that influences household well-being. Households seek to maximize their welfare by adjusting consumption based on the returns to the assets they own and the investments made or planned (López-Calva and Rodríguez-Castelán 2016). The future level of productive assets depends on today’s consumption decisions. Households can delay consumption through an increase in their current asset base by, for instance, raising the educational attainment of household members, strengthening nutrition, or acquiring physical capital. These investments are expected to produce benefits later through higher productivity and, therefore, higher incomes and better standards of living. Consequently, households will accumulate assets to the point where the marginal benefit of present consumption and the flow of consumption (in present value) derived from the stock of productive assets used in the future are equal.

Risks of shocks and shocks can aggravate poverty traps because households with lower asset endowments are structurally more highly exposed and vulnerable to the negative effects. Households with a high stock of productive assets are often more able to move into higher consumption paths by taking up more profitable economic opportunities. They are also more well endowed to withstand the effects of negative aggregate shocks by taking out loans, selling assets, or receiving insurance compensation. The prospects are different among vulnerable, credit-constrained households with traditionally lower asset holdings. Even a relatively small shock can hinder the accumulation capacity of these households, rendering them unable to accumulate the critical assets necessary to enjoy higher standards of living. In the absence of full and well-functioning credit and insurance markets, these households typically engage in economic activities and

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9 While the emphasis in this framework is to maximize utility based on consumption, which is a function of assets, other models link assets more directly to livelihoods. See Scoones (1998) for such a sustainable livelihoods framework.

10 Assets are fungible under this framework. It may thus be argued that poor people should spend their incomes on nutrients instead of savings, as this would provide higher potential assets in the future. This would still raise their productive assets in the future in terms of enhanced human capital.
Box 3.1. Putting Faces to the Framework

The background
The cases of Isabel in rural Honduras and Alejandro in urban Peru illustrate the capacity of households to generate income based on available assets and the potential impact of aggregate shocks on welfare. The illustration focuses on three types of assets: physical, human, and financial capital.

Isabel has a small plot of land, where she grows modest amounts of produce to sell in the local market. She holds traditional rights over her land, respected for generations, but no formal deed. She completed elementary school and works for a moderate salary, a few months a year, in a small grocery store. Isabel keeps her cash savings at home. She hopes to save enough to open her own grocery store one day.

Alejandro went to school in Arequipa and finished secondary school. He has a job in a local textile manufacturing plant. Using some savings and money he inherited from his father, he bought a small apartment, where he lives and where he also rents a room to a work colleague. Alejandro manages to save part of his salary regularly in the bank.

Both individuals generate income from a different combination of productive assets, the utilization of these assets, and the real market value they thereby obtain. Alejandro has accumulated a higher stock of human capital; he uses it more intensively; and earns a higher return than Isabel, who uses her lower human capital to farm her own land and work at the store. In terms of physical capital, Isabel exploits her land and obtains a return by selling the produce at the market. If the legal property deeds were available, however, she could use the land more intensively, as collateral to access credit and start a business, diversifying her sources of income. Alejandro also obtains an inflow of income through his physical capital, the rent of the second room in the apartment. In terms of financial capital, Isabel does not use her cash savings intensively, thereby forgoing potential returns, unlike Alejandro who saves in the formal banking sector.

Table B3.1.1. The Story of Isabel and Alejandro

<table>
<thead>
<tr>
<th>Capital</th>
<th>Stock</th>
<th>Intensity of use</th>
<th>Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Isabel’s household</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical capital</td>
<td>Plot of land</td>
<td>Medium: missing formal land titles; may not be used as collateral for credit</td>
<td>Moderate</td>
</tr>
<tr>
<td>Human capital</td>
<td>Primary schooling</td>
<td>Low: works a few months a year</td>
<td>Low</td>
</tr>
<tr>
<td>Financial capital</td>
<td>Cash savings at home</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Alejandro’s household</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical capital</td>
<td>Apartment</td>
<td>Medium: rents a room</td>
<td>Medium</td>
</tr>
<tr>
<td>Human capital</td>
<td>Secondary school</td>
<td>High: manufacturing plant; works each day</td>
<td>Medium</td>
</tr>
<tr>
<td>Financial capital</td>
<td>Savings in a bank</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>
The impact of aggregate shocks on Isabel and Alejandro’s welfare

Isabel and Alejandro are exposed to idiosyncratic and systemic risks. In terms of the former, both individuals are exposed to the risk of illness. Isabel’s household, with a less diversified asset-stock and lower intensity of use, is more vulnerable to aggregate shocks.

Consider the occurrence of a severe weather event, such as a hurricane, that strikes Honduras. The shock could take a direct toll on Isabel’s stock of physical assets, both immediate and long-lasting, by flooding her land and leaving it unfit for farming. It could also impact her ability to utilize these assets indirectly if the hurricane affected infrastructure, such as the roads to take the produce to the market or to go to the grocery shop to work. To compensate for the loss in income and to smooth consumption, the household could even be forced to take a child out of school, affecting the accumulation of human capital of the next generation. Furthermore, the latent risk of hurricanes affecting the region and her asset base could be making Isabel lose out on higher income-generating opportunities, such as choosing to grow low-risk (low-profit) subsistence crops over higher-risk (higher-profit) cash crops.

Now consider the effect of a global economic recession, including a steep drop in the external demand of Peruvian manufactures. While an economic crisis would not have a direct effect on Alejandro’s stock of physical assets, it could likely impact asset utilization. Demand for labor could drop, leading to lower salaries in the manufacturing industry, making Alejandro decide to work fewer hours and depressing the returns to his human capital. The crisis could also affect his tenant’s income-generating capacity, which could lead to a decrease (or a loss) in Alejandro’s returns from renting the room in his apartment. Economic activity could decline enough to trigger a decline in interest rates, which would lower returns to his financial capital.

While both individuals would be affected by the shocks, Alejandro appears to be better equipped to deal with the consequences than Isabel. Alejandro uses his assets more productively, which provides the opportunity to have more savings to cope with the effects of the crisis and thus smooth his consumption pattern. His link to the financial system—his current savings account—would make it easier for him, relative to Isabel, to take out a loan or access other forms of credit to smooth consumption. His formal job at a manufacturing plant may provide more job security, at least in the short run, than farming in the face of a natural disaster. By virtue of living in an urban setting, even if he is subjected to a weather-related shock, it is likely that Alejandro would encounter fewer difficulties in accessing infrastructure, because damage and service interruptions are likely to be addressed more quickly in urban areas than in rural areas.

This illustration sketches out some of the possible impacts of aggregate shocks on household welfare. To study the full impact on household income generation capacity and consumption would require a more sophisticated analysis of the effects of shocks on assets, intensity of use, and returns, as well as the interaction of these effects and their duration.
investments to reduce risk exposure rather than to maximize profits. However, ex ante risk mitigation through low-return, low-risk production and employment choices leads to large inefficiencies and contributes to the miring of households along low-income paths, which implies deepening inequities. For example, risk-prone, low-income farmers are often reluctant to invest in fertilizers, even though these would boost the expected returns, because they prefer to retain savings as a cushion to deal with bad weather or other shocks. Similarly, aggregate shocks can impact household welfare through the negative distorting effects on markets, prices, and the allocation of resources (box 3.1).

**Income uncertainty can reinforce poverty traps through a variety of behavioral mechanisms that affect household decision making.** In addition to undermining the capacity of households to generate income, uninsured risks also influence household preferences in consumption, leisure activities, and time use in ways that weaken asset accumulation and the ability of households to rise out of poverty. A behavioral explanation of poverty traps involves the issue of lack of self-control, namely, the inability of individuals to follow through on an envisioned plan such as saving and reinvestment. Recent theories show that a lack of self-control can lead to poverty traps and that market imperfections and lack of commitment devices (such as lockbox accounts designed to promote savings), both of which are aggravated during serious shocks, reinforce the preference for temptation goods (Banerjee and Mullainathan 2010). A related strand in the literature indicates that the burden of scarcity also influences how poor individuals allocate attention, pushing them to devote more mental effort to solving some problems, while neglecting others that may more directly lock them in poverty (Shah, Mullainathan, and Shafir 2012). Information biases can also shape behavior in ways that make poverty more persistent. Lacking accurate knowledge about risks and effective ways to deal with them may adversely encourage households to make decisions that increase their exposure and vulnerability to shocks (Dupas 2011). Finally, a high-risk context can accentuate behavior that leads to aspirational failures, defined as the failure to aspire to one’s own potential (Dalton, Ghosal, and Mani 2016). In sum, aggregate shocks and exposure to risks could also affect household welfare by affecting preferences and time discounting in an inefficient way (see figure 3.1).

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11 This is also known as the nonseparable household model. See de Janvry and Sadoulet (2006); López (1984, 1986); Singh, Squire, and Strauss (1986).
12 Bernheim, Debraj, and Yeltekin (2013) explore how the ability to exert self-control (such as to save more or borrow less) relates to economic circumstances. Using a model of intertemporal allocation with an imperfect credit market, they find that poverty in itself can be harmful to self-control. In a similar line, Banerjee and Mullainathan (2010) look at the link between the consumption of households and temptation goods in the context of shortsightedness and time-inconsistent preferences. Their framework explores whether the impact of temptation declines with income.
13 Recent empirical studies focus on behavioral effects in the presence of risk. Using data from Kenya, Lybbert and McPeak (2012) calculate the risk aversion and intertemporal preferences of herders in the northern region. Their results indicate that poorer households are more risk averse, but also more ready to disrupt consumption than wealthier households. This is in line with the notion that, at certain levels of wealth, asset smoothing (over consumption smoothing) is an equilibrium behavior. This is confirmed in Carter and Lybbert’s (2012) study, which uses data from Burkina Faso. Rural households below an estimated threshold (a critical herd size) do not insulate their consumption, while, for the most part, those above the threshold do insulate their consumption.
The conceptual framework outlined above provides an opportunity to organize the discussion that follows. The next chapters synthesize the available evidence that links aggregate shocks to household welfare, as well as the evidence on the two main channels of transmission through which shocks affect welfare: the accumulation of assets and decisions to utilize productive assets based on the returns observed in the market. Starting with the main outcomes of interest, chapter 4 examines the responsiveness of household income and consumption to the variety of effects arising from aggregate shocks, placing special interest on the likely increase in poverty vulnerability among affected households. Chapter 5 focuses on the disruption of household asset ownership and accumulation that is caused by large shocks. Chapter 6 pays attention to the other broad elements of the framework, namely, the influence of aggregate shocks on the ability of households to put their assets to good use and earn a fair return, as well as the effects of the nonseparability of production and consumption decisions in the context of pervasive market failures.
Household welfare—linked to the affordability of goods and services, the opportunities for human and physical capital investment, and sustainable economic expansion—has progressed in Latin America and the Caribbean. People require an adequate minimum level of income or consumption to meet basic needs in food, clothing, shelter, and health care. In addition to this monetary criterion, well-being is also associated with satisfactory levels of health and education, access to basic services such as clean water, sanitation, and electricity, and physical security and voice to enable the capabilities and opportunities of the individual to function in society (Sen 1997). Countries across the region have recorded remarkable progress in their command of resources and their enhanced capacities and economic choices. Income per capita grew an average of 2 percent a year between 2000 and 2014. Around 80 million people escaped poverty over the same period, and households—including those at the bottom of the distribution—are now endowed with sufficient human and physical capital to participate effectively in society and unleash their economic potential (World Bank 2015). Notwithstanding the greater prevalence of social assistance, labor income is the main driver of progress among most of the population in the region.\textsuperscript{14}

However, a large share of households continue to face substantial income and consumption risks, many of which are tied to large natural and man-made hazards. Despite substantial growth in living standards at the bottom end of the income distribution, the median household is barely nonpoor and hence still vulnerable to becoming poor. Aggregate shocks place a huge burden on the incomes of households, especially those that are poor and vulnerable. They may be unable to maintain a stable level of consumption once large negative shocks occur and incomes fall. Markets either do not exist or function imperfectly so that households may no longer be able to protect themselves against the risks by relying on insurance. Households may lack liquid assets or other formal strategies to cope. Some informal risk-sharing mechanisms such as private transfers and community-based financial systems are useful, but empirical evidence indicates that they shield consumption only partially. Local risk-pooling arrangements are prone to collapse in the face of spatially covariant risk. Despite all the formal and informal risk management and

\textsuperscript{14} According to household data on 17 countries in Latin America, labor income accounts for 60–80 percent of total income among households in the bottom 40 percent of the distribution, while the corresponding share is even higher among households in the top 60 (Cord, Genoni, and Rodríguez-Castelán 2015).
coping strategies available to households, income shocks still count in the determination of consumption, especially among vulnerable, low-income families, sometimes trapping them in persistent poverty.

**Aggregate shocks often signify income shocks**

The first manifestation of a major negative shock at the macroeconomic level is a drop in output. Financial crises, earthquakes, floods, droughts, and civil conflicts disrupt the routine functioning of economic systems and institutions. Macroeconomic crises are often characterized and even defined by the losses they generate in the main economic aggregates such as GDP growth, investment, and employment. The Latin America and Caribbean region has experienced steep declines in GDP. For instance, GDP fell by 6.0 percent in Mexico in 1995, while the drop was 11.0 percent in Argentina in 2002, and this also had a profound impact on the economy of Uruguay, where GDP shrank by 17.5 percent. Wars and civil conflict inflict a similar cost. In a global context, World War II has historically been considered the most serious economic shock: declines in GDP in the aftermath of the war averaged 34 percent in 22 countries on which reliable data are available (Barro and Ursúa 2008). The Latin America and Caribbean region has not been spared from this type of impact. The GDP of Nicaragua collapsed by 6 percent during the most violent period of the revolutionary war (1962–90). The potential economic effect of the H1N1 flu outbreak in Mexico in April 2009 is estimated at 2.2 percent of GDP (World Bank 2009). Sometimes, the effects of shocks become more manifest in local economies. Two major back-to-back earthquakes that struck Colombia’s coffee-producing departments in 1999 destroyed over 8,000 farms and heavily affected the coffee industry, a strategic economic sector of the area.

*Household incomes show hefty declines after major natural disasters, particularly in agriculture.* Weather shocks are the most important source of income volatility in developing countries, chiefly in rainfed agriculture, which is prevalent in almost three-quarters of the total area allocated to agriculture in the world.\(^{15}\) Income risk because of extreme weather is equally common in Latin America and the Caribbean. Data collected in Honduras shortly after Hurricane Mitch show that 1 household in 3 incurred a loss of crops that translated into a loss in income, mostly among poor households, and 1 household in 10 lost wages or business income (Morris et al. 2001). These examples are consistent with other evidence on the effects of shocks on income. Thus, hurricanes in Central America have cut household incomes by 3 percent for each standard deviation in the intensity of the hurricane windstorm (Ishizawa and Miranda 2016). Similarly, individuals in the region who were in utero when major floods occurred in the areas where their mothers were living eventually earned 12.6 percent less income as adults (Caruso 2017).

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Household incomes collapse in the aftermath of earthquakes, volcanic eruptions, tsunamis, and avalanches. The multiple effects of earthquakes translate into sizable declines in income. El Salvador was struck by two consecutive strong earthquakes (7.7 and 6.6 on the Richter scale) in 2001. Detailed data on the seismic parameters of the earthquakes (depth and energy released), the geographical coordinates of the dwellings damaged, and the soil types of the villages allow measurements of the intensity of the shocks among individual households. Empirical analysis of microdata reveals that the total effect of both events led to an average income reduction by almost a third relative to the median preshock per capita income of households in the upper half of the ground-shaking distribution (Báez and Santos 2009). An earthquake of like magnitude that hit the central coast of Peru in 2007 was found to have similar impacts (Lucchetti 2011).

Civil conflict jeopardizes short-term income. Civil conflict disrupts market transactions and economic activity immediately. Income among entrepreneurs and shop owners dropped by 47 percent and 59 percent, respectively, after the 2007–08 election crisis in Kenya and the ensuing massive killings (Dupas and Robinson 2012). The civil war in Peru led to an earnings decline of 5 percent for every standard deviation of early-life exposure (at the district level) to conflict-related violence (Galdo 2013). Municipalities with higher levels of drug-related crime in Mexico in 2007 observed a decline in annualized household income growth of 0.2 percentage points between 2005 and 2010 (Enamorado, López-Calva, and Rodríguez-Castelán 2014).

Other types of shocks such as economic crises also heavily affect household incomes and expenditures. Average household labor earnings fell by 37 percent and 30 percent, respectively, in the year following the economic crisis in Argentina (2001–02) and in the Dominican Republic (2003–04). Mostly because of the 2001–02 crisis, the share of people living below the poverty line doubled in Argentina in only two years, and it took almost 10 years for the country to rebound to the precrisis poverty rates (Barriga Cabanillas et al. 2015). Mean household expenditures in Mexico fell by Mex$15 between 1994 and 1996 during the peso crisis. Although households were unable to protect their consumption during the crisis, there is evidence that they altered the composition of consumption by reducing spending on nonessentials and durable goods to allocate a higher share of their budgets to basic food items (McKenzie 2006).

The effects of aggregate shocks on incomes can persist

Some households improve quickly following shocks, but recovery may take much longer among other households, particularly the poor and vulnerable. Access to well-functioning credit and insurance markets, savings, and other liquid assets position households to withstand the negative income effects of major shocks. This is often not the case among the poor and vulnerable, who may be obliged to undertake a shift to a lower
In Honduras, two and a half years after Hurricane Mitch (1998) had ravaged Central America, evidence shows that wealthier households were able to bounce back quickly, but less well-off households went on a downward trajectory of sustained asset-depletion and low income growth (Carter et al. 2005). An increase of about 10 homicides per 100,000 inhabitants doubles the probability that a municipality in Mexico remains chronically poor 5 to 10 years later (Martinez-Cruz and Rodríguez-Castelán 2016). In Colombia and Mexico (in 2010–13 and 2002–05, respectively), upward economic mobility was less prevalent among households affected by large shocks. Almost half the unaffected households were able to move out of the bottom 40 percent of the distribution, almost twice as large as the share of shock-affected households that showed upward mobility (figure 4.1).

The effect of major hazards such as natural disasters on short- and long-term economic growth is less straightforward. Growth theory does not offer a clear-cut answer on the question of whether natural disasters should affect economic growth. Traditional neoclassical growth models predict that the destruction of capital does not affect the rate of technological progress, and it might thus only enhance short-term growth prospects. Endogenous growth models based on Schumpeter’s creative

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16 A large body of evidence indicates that the effect of aggregate shocks on the incomes of the bottom of the income distribution is larger, but the potential influence on income inequality is depends mainly on the type of shock and the impact on particular sectors of the economy. Thus, part of the recent narrowing in income inequality in Latin America has been driven by a compression in earnings structure, especially in Mexico and Central America during the global financial crisis of 2008–09. The crisis had a significant negative effect on high-skilled workers through spells of unemployment and lower real earnings (Cord et al. 2017).
destruction process may even ascribe higher growth as a result of negative shocks because these shocks can be catalysts for reinvestment and the upgrading of capital goods. AK-type endogenous growth models in which technology exhibits constant returns to capital predict no change in the growth rate following a negative capital shock; meanwhile, endogenous growth models that exploit increasing returns to scale in production generally predict that a destruction of part of the physical or human capital stock results in a lower growth path. However, empirical analysis on 196 countries over 1970–2008 suggests that GDP growth in the short- and long-run is rarely affected by major floods, storms, or earthquakes (Cavallo et al. 2010).

Income shocks translate into consumption shortfalls and greater vulnerability to poverty

Vulnerable households manage to protect their consumption only partially from the negative income shocks caused by major hazards. Households are resourceful in handling the effects of negative shocks. If they lack full access to credit and insurance, they rely on informal mechanisms ranging from income smoothing to self-insurance and to social insurance arrangements such as borrowing from friends and family. Despite these strategies, a good deal of evidence shows that households, particularly the less well off, are unable to allocate risk optimally across space (for example, mutual insurance within villages) and income cycles. Several studies show a strong relationship between changes in household consumption and measures of aggregate risk in villages such as rainfall variability (Alderman and Paxson 1994; Báez, de la Fuente, and Santos 2010). Empirical analysis of consumption growth in rural villages in southern India, Mexico, and Thailand confirms the existence of a significant amount of risk-sharing, but rejects the hypothesis of full insurance (García-Verdú 2002; Paxson 1992; Townsend 1994).

Incomplete insurance means that consumption falls in the aftermath of aggregate shocks. Drought-affected households in Burkina Faso and other countries in Sub-Saharan Africa reduce their consumption relative to those not affected. The evidence points to little or no risk-sharing, as well as little consumption smoothing (Kazianga and Udry 2004). While households attempted to offset the fall in income by selling livestock, these sales covered only 20–30 percent of the shortfall in crop income (Fafchamps, Udry, and Czukas 1998). In Ethiopia, a 10 percent reduction in rainfall resulted in a 5 percent decline in food consumption (Dercon 2004). In addition, a 10 percent reduction in rainfall reduced future consumption growth by 1 percentage point. Households that were obliged to move

17 A recent study has also shown the potential trade-offs in aggregate welfare of positive trade shocks in Mexico. While increasing real earnings among the less highly skilled, a positive shock that fostered growth in export manufacturing in Mexico in 1986–2000 also raised the opportunity costs of schooling, which then raised drop-out rates at the margin (Atkin 2016).

18 Underlying the relationship between individual income and consumption is the high covariance between income sources and asset values that is distinctive of aggregate shocks (Báez, de la Fuente, and Santos 2010).
from conflict zones in Colombia suffered a 22 percent decline in total per adult equivalent consumption, reducing their food and calorie intake (Ibáñez and Moya 2006).19

**Urban households also have limited scope to smooth consumption.** It is often argued that individuals in urban areas are more effective at protecting their consumption against income risk. The literature suggests, however, that this is not always the case. In Guatemala, a range of risks are prevalent throughout the territory, affecting rural areas as well as the main cities. Empirical analysis of the effects of Agatha, a major tropical storm that hit the country in 2010 and dropped the largest amount of rainfall on the country since 1963, shows that per capita consumption fell in the affected areas by an average of 7.7 percent relative to the median consumption of the control group at baseline (figure 4.2). Yet, further inspection of the data indicates that the drop in consumption was concentrated in urban centers, where the storm happened to have dropped the largest amount of precipitation, and, consequently, the affected households were unable to offset the fall in income (Báez et al. 2016). Similarly, longitudinal data on urban households in Colombia reveal that households that experienced major adverse shocks were more likely to see their consumption fall, which pushed some of the affected households from the bottom half of the distribution into a poverty trap (Fergusson and Zambrano 2016).

**Transient impacts on consumption and growth can become chronic.** This implies that the welfare losses are well beyond the cost capacity of lower consumption in the short term. Most of the available evidence on this subject is derived from studies on Africa and South Asia. One of these studies investigates the determinants of food consumption growth in rural Ethiopia between 1989 and 1997, when most households were dependent on rainfed agriculture, and droughts were commonplace. The results show that a drop by 10 percent in historical rainfall reduces consumption growth by 1 percentage point four to five years later. Furthermore, the households most affected by the large-scale famine crisis of the 1980s endured 16 percent lower consumption growth in the following decade (Dercon 2004). In Tanzania, farmers who experienced crop failures induced by severe droughts between 1991 and 1995 suffered consumption growth losses ranging from 17 percent to 40 percent 10 years later (Beegle, Dehejia, and Gatti 2006). The evidence on Latin America and the Caribbean is thinner, but points in a similar direction. Rural Brazilian workers affected by strong rainfall shocks migrate permanently to urban areas where they earn lower wages and can probably afford only lower consumption following the depletion of their productive assets (Mueller and Osgood 2009). Panel data on rural families in El Salvador between 1995 and 2001 also show low income and consumption growth among less well off households that experienced substantial income shocks (Rodríguez-Meza and González-Vega 2004).

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19 This population was found to allocate 65 percent of their total consumption to food expenditures.
Consumption volatility means that vulnerable households may be a disaster away from falling below the poverty line or sliding further into poverty. Although households may adopt various risk management and coping strategies, the growth rate of household consumption is largely determined by the growth rate of household income. From a policy perspective, the lack of full insurance is particularly relevant among households that are below or slightly above the level of income or consumption deemed necessary to afford minimal standards of food, clothing, health care, and shelter. Translating this into numbers for Latin America and the Caribbean means that more than half the total population faces substantial consumption risk: as of 2014, around 24 percent of the people are poor, whereas 39 percent are vulnerable (a group located between the poor and the middle class that faces high levels of economic insecurity). The vulnerable encompass the modal (typical) household in the region, that is, the household with the income that occurs with the highest frequency in the distribution (World Bank 2013b).

The inability of households to insure their consumption effectively against large shocks increases their vulnerability to poverty. Some studies have investigated whether the fall in income or consumption caused by major shocks pushes some households into poverty or deepens the deprivation among households that were already poor. This was the case among a subset of the households affected by tropical storm Agatha in Guatemala (2010). The drop in consumption put these households below the poverty

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20 This refers to households with a 10 percent probability or higher of experiencing spells of poverty over a five-year interval (World Bank 2013b).
threshold, increasing the overall poverty rate among urban households in the sample by 5.5 percentage points, equivalent to roughly 80,000 more families in poverty (figure 4.3). Likewise, the 2007 earthquake in the Ica Region of Peru increased objective and subjective poverty by roughly 4 percent and 15 percent, respectively, among households within 80 kilometers of the epicenter (Lucchetti 2011). A series of droughts and floods in Mexico increased poverty by between 1.5 percent and 3.7 percent in the affected municipalities in 2000–05 (Rodríguez-Oreggia et al. 2013). The impact of economic stagnation on poverty is noticeable. In 2003–04, the Dominican Republic experienced a bank collapse, rapid currency depreciation, and inflation, which hastened a domestic crisis that caused the economy to contract. Poverty soared from 32 percent in 2002 to over 50 percent at the peak of the crisis (World Bank 2014b) (figure 4.4).

Despite the region’s notable progress on many fronts, the risk of large shocks threatens the recent income and consumption gains. The next two chapters expand on these notions, unpacking the channels of transmission from shocks to household welfare through three main drivers: asset ownership, asset utilization, and returns to assets. Natural shocks can damage or destroy physical and natural capital, posing another layer of disruption on households that are either already living in poverty or living on the edge of poverty. Labor, the main source of income across the region, may behave adversely in response to shocks. Households may lower their labor supply because of large disruptions that cause negative income effects or increase it if the shock causes consumption to fall (the substitution effect). In the absence of social insurance, children may join the labor
Figure 4.4. Substantial Reversals in Poverty Reduction Are Likely to Arise during an Economic Crisis

a. Colombia

b. Argentina

c. Dominican Republic

force because of aggregate shocks if more income is needed during tough times or if the opportunity cost of sending the children to school becomes too high during good times. Tough times caused by major crises often dampen the returns to household and firm assets, and risk distorts incentives in ways that may lead to a series of nonoptimal decisions, thereby ultimately dampening household welfare.
5. The Vulnerability of Assets and Livelihoods to Aggregate Shocks

Progress in the region has translated into remarkable welfare-enhancing asset accumulation.

Recent progress in inclusive growth in Latin America and the Caribbean has been paired with the accumulation of physical, human, and financial capital. A wider fiscal space has allowed an expansion of public investment in infrastructure, basic services, and social programs. The share of adults with more than six years of schooling rose from 56 percent to 66 percent between 2003 and 2013. Life expectancy increased from 67.0 years in 1990 to 74.6 years in 2014, and the under-5 mortality rate fell by nearly half between 2000 and 2013. Investments in physical infrastructure enhanced access to critical services such as electricity. In 2014, 86.1 percent of rural households were connected to the grid, up from nearly two-thirds in 2000. By 2010, 18 countries in the region had been able to implement conditional cash transfer schemes, which represented the equivalent of an average 0.4 percent of GDP and benefited almost a quarter of the population in the region, while also contributing to objectives in poverty reduction and asset building (Paes-Sousa, Regalia, and Stampini 2013).

This progress was particularly beneficial for poor households and low-skilled workers. The economic advances helped poorer households. Access to basic services expanded significantly among households at the bottom of the distribution. These households were able to purchase a wide range of durable goods, including refrigerators, stoves, televisions, bicycles, and motorcycles. Mobile phone ownership also increased, averaging 80 percent throughout the region and reaching almost 100 percent in some countries (figure 5.1). Although access to the Internet is much lower across the region, data suggest that coverage rates among the bottom 40 in Brazil and Chile rose from almost zero in 2000 to 21 percent and 25 percent in 2012, respectively (Cord, Genoni, and Rodríguez-Castelán 2015). Asset accumulation brought about improvements in the quality of life, but also enhanced the opportunities available to low-income individuals.

Thus, access to electricity can help improve educational attainment; air conditioning
can lower heat-related mortality; refrigeration can improve child health outcomes;
stoves (gas or electric) can reduce indoor air pollution; durables can strengthen the
financial position of households that are able to use the durables as collateral; and
mobile phones and the Internet can facilitate access to crucial information, from pricing
on crop markets to weather alerts.

Yet, progress in asset accumulation is at risk because of the
effects of aggregate shocks

Recurring shocks or shocks that are more severe interrupt positive trends and may
reduce the stock of accumulated assets. Natural disasters, widespread violence, civil
conflict, or economic crises have a negative effect on the stock of assets owned by
individuals and households. These phenomena disrupt human lives and destroy human
capital (by weakening nutrition, health, and school participation), private property
(housing, machinery, crops and livestock), critical public infrastructure (roads,
bridges, schools, and health facilities), and natural capital (through environmental
degradation). Similarly, droughts, floods, storms, and plant diseases wipe out crops,
while civil conflict erodes social cohesion, trust, and stability. In addition to the
rather obvious negative effects on aggregate output, economic crises disrupt financial
markets (thus reducing the availability of capital), discourage labor supply, and thwart
productive skills.

Human capital is sensitive to the direct effects of major shocks. Natural disasters,
civil conflict, and widespread epidemics result in human casualties, leaving a wake

Figure 5.1. A Remarkable Increase in Asset Ownership among the Bottom 40

![Figure 5.1. A Remarkable Increase in Asset Ownership among the Bottom 40](image-url)

Source: Tabulations of Equity Lab, Team for Statistical Development, World Bank, Washington, DC, based on data in SEDLAC (Socio-Economic Database for Latin America and the Caribbean).
of negative human capital impacts. The 2010 earthquake that struck Port-au-Prince, Haiti’s densely populated capital, caused between 200,000 and 250,000 fatalities. Colombia’s internal conflict, lasting for over 50 years, has claimed a similar number of lives, most of them civilian noncombatants. Hurricane Mitch accounted for over 14,000 deaths across four countries in Central America. In addition to human casualties, these events often result in the destruction of the infrastructure required for the acquisition of human capital, such as schools, hospitals, and clinics. Major shocks may pose a financial burden on households, often forcing them to cut back their expenditures on food and health care, thereby raising the risk of malnutrition and other negative health impacts. Economic crisis also erodes human capital through the sharp rise in the rate and duration of unemployment and the subsequent depreciation of the human capital of workers.22

Shocks destroy other forms of capital such as productive agricultural assets, durable goods, and basic public infrastructure. Droughts and floods typically destroy key farming inputs, leading to declines in crop production that compromise food security and other productive and consumption goals. Hurricane Mitch (1998) decimated over 80,000 hectares of agricultural land, the large majority of which was used by small-scale farmers for subsistence agriculture (Ishizawa and Miranda 2016). As the severity of extreme weather or other comparable shocks increases, households are more likely to deplete livestock, including livestock that contributes to farm production, such as transport, draft, and breeding animals. After Hurricane Mitch hit Honduras, poorer households lost close to 20 percent of their productive assets (land, livestock, and plantations), thereby compromising their capacity to generate earnings and livelihoods; in contrast, higher-income households lost a lower share of assets (7.5 percent) and recovered more quickly (Carter et al. 2005).23 The effects are also evident in other types of assets. Peruvian households affected by large shocks are less likely to own durables such as refrigerators or cars (figure 5.2). Physical infrastructure that is central to the provision of basic services is habitually destroyed or damaged. Data on Haiti in 2012 show that households hit by major shocks are less likely to have access to electricity. Because assets and infrastructure are destroyed, the negative effects tend to linger well into the medium and long term.

22 Evidence based on Swedish data shows that a full year of unemployment led to a 5 percentile downward shift in the distribution of skills, including in the ability of adults to read and make practical use of printed information (Edin and Gustavsson 2008).

23 The long-run effect of weather shocks on household productive assets depends on the household’s sensitivity to and resilience in the face of the shocks. Sensitivity and resilience are likely to depend on the household’s wealth prior to the shock and on the household’s access to employment and capital, as mediated by either market or social mechanisms.
Social capital is a risk-sharing mechanism commonly used by households. Mutual interactions through norms and networks (for instance, kinship or friendship) that support each other based on principles of trust, cooperation, and reciprocity are a key instrument in risk-sharing and mitigate the effects of aggregate shocks. Indeed, private transfers of food, clothing, and cash are common in the aftermath of a shock in developing countries. Recovery after Hurricane Mitch was less challenging among poor rural household in

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24 Social capital is thus a set of customary principles that enable collective action. Putnam (1995, 67) defines it as the “features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit.”
Honduras that relied upon the support of their communities for financial aid (Carter and Castillo 2004). In the same way, interhousehold transfers among Nicaraguan households that were affected by the same hurricane acted as an informal insurance mechanism, benefitting mostly those who had experienced the largest economic losses (Santos 2006). Aware of the mutual benefits of private transfers, households in Peru that are more prone to being affected by a shock engage more actively in community activities focusing on the application of social capital (figure 5.3).

Yet, social capital can evaporate during major shocks, especially among the poor. Shocks may affect the entire social fabric, disrupting links that might have helped households endure in the aftermath. Civil wars, other forms of widespread violence and destruction, and the subsequent involuntary displacement of large groups of people alter networks and tear apart ties developed through mutually supportive community relations. Over three million people have been displaced internally in Colombia in the last 50 years because of incursions by armed groups. The social capital of the poor tends to be weaker. Detailed analysis of networks for mutual support in rural Tanzania show that wealth is a strong determinant of network formation. Consequently, the poor have less dense networks relative to the more well off (De Weerdt 2004).

**Aggregate shocks disrupt and constrain asset accumulation**

Human capital formation, a process that takes place over years, is deeply disrupted by large shocks. The impacts of shocks may extend beyond the direct damage to the stock of assets; they also undermine future investment in assets. Extreme weather, civil strife, price spikes, and even economic crisis often lead to reduced investment in food, health care, and other critical family inputs among children. Evidence from rural Colombia in 1999–2008 shows that fetal exposure to temperature shocks during the first trimester of pregnancy reduces the average birthweight of infants by about 4.1 grams and has negative effects on Apgar tests (Andalón et al. 2016). These two indicators are strong predictors of socioeconomic outcomes during adult life, such as labor earnings (Behrman and Rosenzweig 2004). If they showed signs of illness, Nicaraguan children ages 0–5 in households located in the path of Hurricane Mitch (1998) were 30 percent less likely than sick children in unaffected parts of the country to be taken for medical consultation after the shock. Likewise, malnutrition rates among affected children almost quadrupled (Báez and Santos 2007). Similarly, the food price spike in 2007–08 led to a deterioration in food expenditures and, possibly, nutrition. A 1.0 percent increase in the price of wheat flour was associated with a 0.2 percent decline in real monthly per capita food consumption (D’Souza and Jolliffe 2014).
The negative effects on human capital accumulation are particularly evident among school-age children. If they face tight budgets, households sometimes need to pull their children out of school to benefit from the extra labor. This was the case among households in the areas most affected by the 1999 earthquake that struck the western-central part of Colombia’s coffee belt. These households were less likely to send their children ages 6–11 and 11–15 to primary and secondary school, respectively, chiefly because of the massive destruction of housing and infrastructure (Bustelo, Arends-Kuenning, and Lucchetti 2012). Similarly, school attendance fell by almost 7 percent among households more heavily affected by the two serious earthquakes that struck El Salvador in 2001 (Santos 2007). Because schools play a central role in the creation of human capital, the destruction of school facilities and other complementary resources, such as roads and other transport infrastructure, hamper learning and reduce instruction time, thereby lowering school quality.25

The detrimental effects on human capital are typically long-lasting. Once Mexican children are withdrawn from school in response to large shocks, they become nearly 30 percent less likely to reenroll relative to children who stay in school (Sadoulet et al. 2004). Similarly, resource-constrained households in Venezuela resorted to the labor of their children to cope with the 2002–03 economic crisis. Many of these children never went back to school after the economy recovered (Blanco and Valdivia 2006). Interruptions in school participation associated with aggregate shocks translate into lower educational attainment among young adults. Individuals born and raised in the areas most affected by the 1979–92 armed conflict in El Salvador showed a reduction in educational attainment later in life equivalent to 0.4 to 1.7 years of education, which also weakened the engagement of these people in the labor market (Acosta et al. 2016). In this way, aggregate shocks may also affect future generations.

The persistence of the negative effects are manifest in other, economically meaningful ways, particularly among the poor. The Ecuadorian children affected by the 1997–98 El Niño floods while in utero were found to be 0.09 standard deviations shorter in stature seven years later and 0.13 standard deviations lower on cognitive tests (Rosales 2014). Infants and school-age children affected by the 7.5 magnitude earthquake that struck Guatemala in February 1976 accumulated an average of 0.2 to 0.4 fewer years of schooling in adulthood for each additional standard deviation in the intensity of the shock. Moreover, they averaged around 0.4 centimeters shorter in height than others (Hermida 2011). Analysis of prenatal stress caused by large shocks finds a negative impact on children’s cognitive outcomes. This effect is acutely stratified by income levels: it is large among

25 However, these types of shocks do not always slow human capital accumulation. An analysis of the effects of the 1988–92 economic crisis in Peru finds no evidence that school attendance fell during the crisis. Instead, there was a significant decline in the share of children who were both in school and employed, implying that unemployment lowered the opportunity costs of schooling (Schady 2004).
poor families, but disappears among high-income families. The cognitive ability of poor children in places affected by the 2005 Tarapacá earthquake in Chile turned out to be significantly lower seven years later than that of poor children in places that were not affected by the shock or children in high-income households (Torche 2016).

**Not everyone’s assets are affected equally**

Aggregate shocks affect broad economic and social systems, but their effects on assets, groups, and communities are not evenly distributed. Although the incidence of major disasters in some developed countries is comparable with the incidence in developing countries, developed countries tend to report substantially fewer human casualties and much less material damage because economic development typically provides implicit insurance against shocks (Kahn 2005; World Bank 2013b). The earthquakes that struck Chile and Haiti in 2010 were of similar magnitude, but were associated with starkly contrasting effects: 525 were killed in the former case compared with over 200,000 in the latter. As of 2010, GDP per capita was around 17 times larger in Chile than in Haiti. Cross-country analysis shows that the death toll of natural disasters falls as the GDP per capita of countries rises (figure 5.4). There is likewise variation in the impacts within countries and communities across different socioeconomic and demographic groups (box 5.1). The poor, women, geographically isolated households, and unskilled workers are frequently affected the most. The differences in exposure and vulnerability are equally evident in developed countries. Less availability of economic resources and mobility in the neighborhoods of New Orleans prior to Hurricane Katrina were strong predictors of the negative effects that unfolded during and after the catastrophic event (Masozera, Bailey, and Kerchner 2007).

**Figure 5.4. Natural Disasters Kill More People in Poor Countries Than in Rich Countries**

![Figure 5.4](image-url)

Box 5.1. The Multifaceted Vulnerability of Haiti to Natural Disasters

Haiti exhibits one of the highest levels of exposure to natural hazards in the world. It is located in the path of frequent tropical storms, which are becoming more frequent and more intense. As this box was being drafted, Hurricane Matthew (October 4, 2016) ravaged Haiti’s remote southwestern peninsula, killing more than 1,000 people, leaving 15 percent of the population in need of humanitarian assistance, and destroying infrastructure and the livelihoods of a large share of Haitians.

Measured as the ratio of economic losses to GDP, Haiti’s economic vulnerability to natural disasters is significant. Household surveys reveal geographical variations in the exposure and vulnerability to natural disasters. The Sud-Est (southeast) Department is the most vulnerable given that 78 percent of the population reported effects of a natural shock in 2012 (figure B5.1.1). In contrast, the Ouest (west) Department reported the lowest share of people affected by natural hazards (43 percent).

Figure B5.1.1. The Close Relationship between Poverty and Vulnerability to Natural Disasters, Haiti (affected people and poverty headcount, by department)

Historically, the deadliest hazard in Haiti has been seismic activity, the consequences of which are related to human decisions on where and how to build. Institutional weaknesses such as deficient urban planning and unenforced building codes aggravate the impact of disasters. With a magnitude of 7.0 on the Richter scale, the 2010 earthquake killed over 200,000 Haitians and injured many more. Thousands of people were left homeless. Water and electricity infrastructure, roads, and port systems in the capital, Port-au-Prince, and surrounding areas were destroyed. Haiti was subsequently struck by a cholera epidemic that led to more deaths. Although 75 percent of households throughout the country reported their living standards were degraded after the earthquake, there were stark differences in the impact of shocks on vulnerable and more resilient households.
The poor and other vulnerable groups often bear the largest burden. The interactions of shocks and individual and community vulnerabilities lead to large heterogeneity in the impacts. Economic crises, for example, do not affect all groups equally; inequalities in exposure and sensitivity to risk as well as inequalities in access to resources, capabilities, and opportunities disproportionately affect certain groups or communities, rendering them more vulnerable to the impact of major shocks. Natural disasters exhibit a similar pattern: deeper effects on the most vulnerable (figure 5.5). Women are remarkably less well protected from weather shocks in Ethiopia and Zimbabwe, whereas under-5 mortality is worse among landless households in India (Dercon and Hoddinott 2004; Rose 1999). Globally, the life expectancy of women has been found to fall more than that of men in the context of natural disasters in a sample of up to 141 countries in 1981–2002 (Neumayer and Plümper 2007). Wars and political oppression tend to affect particular demographic groups more than others. In Peru, the civil war systematically affected certain political groups, and, in Guatemala, the death toll from the country’s civil war was relatively larger among the indigenous population (Malasquez 2016). Major shocks are generally rather regressive: the monetary and nonmonetary poor are the most affected in most cases.
Exposure to shocks and the size of the impacts are determined largely by the characteristics of the population. The physical deprivations that characterize most vulnerable groups, such as their location, the low-quality of their housing, and their restricted access to hazard buffer mechanisms also raise the importance of the impact of major hazards on these groups. Data on Colombia and Mexico show a high correlation between lower incomes and location in areas that are more likely to be affected by natural disasters. For instance, households among the bottom 40 in Mexico are nearly four times as likely to report they have been affected by a systemic shock relative to households in the top 20. A similar relationship between income level and the incidence of a shock is observed among households in Colombia. In both countries, major hazards are systematically more common in rural areas than in urban areas (table 5.2). Additional data from panel surveys in Mexico show that, in 2002–05, the poor were almost three times more likely than the vulnerable or the middle class to be affected by a natural disaster resulting in loss of dwelling, crops, and livestock (de la Fuente, Ortiz-Juárez, and Rodríguez-Castelán 2017).

The size of the effects of aggregate shocks on assets can increase more than proportionally as the intensity of the shocks increases. Empirical studies document a host of nonlinear relationships between aggregate shocks (particularly extreme weather events), physical and human capital damage, and reductions in household well-being. This was the case of tropical storm Agatha in Central America in 2010. Spatially disaggregated
rainfall records suggest that consumption fell more than proportionally among Guatemalan households exposed to rainfall 6 standard deviations (extremely high intensity) above the historical mean relative to households in areas that recorded rainfall anomalies between 2 and 3 standard deviations (relatively lower intensity) (Báez et al. 2016). Accounting for different threshold effects is crucial for policy purposes. Under different global warming forecasts, global distributions of temperatures are projected to shift, and the frequency and severity of extreme shocks are expected to increase. Several analyses reveal similar tipping points in the relationships between temperature and agricultural yields, health status, or mortality (for instance, Deschênes and Greenstone 2011; Deschênes, Greenstone, and Guryan 2009; Schlenker and Roberts 2008). Therefore, assuming linearities in extrapolating from existing evidence to project and plan against future damage will likely misinform policy.

Table 5.2. Income and Location Are Strong Predictors of the Exposure to Shocks

<table>
<thead>
<tr>
<th></th>
<th>Mexico 2009–12</th>
<th>Colombia 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>5.6</td>
<td>13.4</td>
</tr>
<tr>
<td>Quintile 1</td>
<td>9.0</td>
<td>19.2</td>
</tr>
<tr>
<td>Quintile 2</td>
<td>7.1</td>
<td>18.9</td>
</tr>
<tr>
<td>Quintile 3</td>
<td>6.3</td>
<td>13.1</td>
</tr>
<tr>
<td>Quintile 4</td>
<td>2.8</td>
<td>9.2</td>
</tr>
<tr>
<td>Quintile 5</td>
<td>2.5</td>
<td>7.1</td>
</tr>
<tr>
<td>Rural</td>
<td>13.7</td>
<td>17.8</td>
</tr>
<tr>
<td>Urban</td>
<td>3.0</td>
<td>9.5</td>
</tr>
</tbody>
</table>

Notes: The relevant survey questions were “Over the last two years, has this house been affected by floods, landslides, earthquakes, or similar events?” (Colombia) and “Did the household lose the home, businesses, crops, or agricultural production animals due to a natural disaster?” (Mexico).
6. Aggregate Shocks Undermine Incentives to Use Factors of Production and Invest

The supply of labor is sensitive to major shocks, increasing at times and at times falling

Aggregate shocks are expected to influence the supply of labor. Among most households, labor is the main asset. Labor income in the region accounts for 60 percent to 80 percent of the total income for a typical household in the bottom two quintiles (Cord, Genoni, and Rodríguez-Castelán 2015). Simple neoclassical theory predicts that the labor supplied by individuals is the result of a utility maximization process that reflects trade-offs in preferences between income (consumption) and leisure time. Given that large shocks often have a sizable effect on factors such as wealth, consumption, and relative wages, as well as the demand for workers, it is likely that they influence household decisions on the amount of time to allocate to working and to leisure activities. Yet, as the evidence summarized below suggests, whereas a change in the amount of labor supplied—or even a shift in the aggregate supply curve—is expected in the context of a major shock, it is difficult to forecast the direction of the net effect, particularly because aggregate shocks often also disrupt labor demand. Thus, potential impacts vary with the type of shock, the country context, and local markets and institutions.

A typical coping response of households involves labor supply adjustments as an attempt to earn extra income. Aggregate shocks can destroy household wealth and assets, reducing the income opportunities that can be generated from wealth and assets. They are also expected to change prices and thus relative wages. In an effort to protect private expenditures or to avoid a fall in expenditures below subsistence, affected individuals may respond by supplying extra labor. Some individuals who were not participating in the labor market before the shock may decide to seek employment, while those already employed may attempt to work longer hours. Mexican households attempted to cope with the 1994–95 crisis driven by the sharp devaluation of the peso and high inflation by increasing the labor force participation of adult women, including the wives of household heads who had been transitioning from employment to unemployment (Skoufias and Parker 2006). Extreme floods in the Caribbean areas of Colombia encouraged a similar coping response in
urban areas (Acevedo 2016). Reconstruction efforts in the aftermath of major catastrophes can create new job opportunities, partly offsetting job cuts in some economic sectors.

**Unfavorable economic circumstances or major health setbacks can result in lower labor supply in the market.** Labor market conditions frequently deteriorate at the peak of an economic crisis. Firms cut jobs; wages fall; and unemployment rises, denting employment growth. Individuals may boost their labor supply to compensate for job losses or to respond to changes in relative wages. However, the lack of suitable employment options and the depreciation of skills because of long spells of unemployment may discourage workers from looking for jobs even if they are eligible and able to work. Serious systemic health shocks can result in lower labor supply and productivity. For instance, individuals exposed to the Dutch Famine (1944) before birth were less likely to be employed in adulthood partly as a result of reduced cognitive ability (figure 6.1). Crop diseases exert similar pressure on economic activity and employment. The 2012–13 coffee season in Central America was ravaged by the rust fungus disease, erasing over 20 percent of the production and almost 15 percent of the employment in the sector, equivalent to 250,000 jobs (Piñeiro, Morley, and Elverdin 2015).

**Migration is a common risk mitigation strategy**

The relocation of labor through migration is a household strategy for dealing with shocks. Families may decide to diversify by supplying their labor in markets and economic activities less exposed to risk as a sort of insurance. Analysis of internal migration in Nicaragua shows that the level of insurance increases if migrants and households of
origin are exposed to less correlated rainfall shocks or are engaged in different economic sectors (Molina 2014). Similar insurance motives encourage other forms of migration. Marital arrangements among households in south Indian villages function as implicit interhousehold contracts to mitigate income risks in the face of spatially covariant shocks. Households exposed to higher income risks are more likely to invest in longer-distance migration-marriage arrangements (Rosenzweig and Stark 1989).

Migration decisions are also shaped by the effects that unfold after the occurrence of major shocks. Internal and external migration is often substantial in difficult times as households try to cope with the effects of negative shocks. Migration flows between Mexico and the United States slowed after the global financial crisis of 2008–09. Indeed, for the first time in recent history, more Mexican immigrants returned to Mexico from the United States than left Mexico for the United States (Gonzalez-Barrera 2015). An analysis of eight countries in Central America, which is characterized by exceptionally high internal and international migration rates and substantial exposure to natural hazards, finds that individuals, particularly youth, are more likely to migrate in response to these disasters, especially if confronted with droughts (Báez et al. 2016). In the absence of agricultural shocks, Salvadoran households are 24 percent less likely to send at least one member to the United States (Halliday 2006). Research on Mexico shows that a 10 percent reduction in crop yields driven by variations in climate is associated with an increase of 2 percent in the rate of migration to the United States (Feng, Krueger, and Oppenheimer 2010).

Natural disasters, civil conflict, and repression frequently lead to forced population displacements. People often have to migrate as a survival strategy in the aftermath of major earthquakes, floods, or droughts. Similarly, entire families are forced to flee their homes to seek refuge in their own countries or across international borders because of civil conflict, violence, or systematic human rights violations. As of 2014, close to 60 million people worldwide were living under forced displacement, the highest levels since World War II (UNHCR 2015). An additional 20 million are estimated to have been displaced because of natural disasters (IFRC 2012). While at a lower scale relative to other regions, forced migration has also been prevalent in Latin America and the Caribbean. More than six million people have been forcibly displaced during 50 years of internal conflict in Colombia. Similarly, over a million Guatemalans and Salvadorans abandoned their homes to flee from civil war, most of whom represented indigenous groups (Gammage and Fernandez 2000; IDMC 2011). One-sixth of the population of Port-au-Prince (close to a half million people) left the capital immediately after the 2010 earthquake to seek refuge in other provinces.

Forced migration imposes high costs on civilian populations, unsettling their engagement in labor and other markets. Households are left without access to basic

26 Internal migration rates are also strongly procyclical (Monras 2015; Saks and Wozniak 2011).
health care, education, and welfare services. Incomes are weakened, while assets, such as housing and land, are destroyed or illegally seized, and social capital is fractured. Approximately half the households internally displaced by the conflict in Colombia lost their homes. The aggregate land loss was over 2 million hectares, 3.5 times the amount of land granted in agrarian reform programs in 1993–2002. Because most households were active in agriculture prior to displacement, they struggled to integrate into urban labor markets. As a result, over half the household heads were unemployed three months after settlement at destination sites. Moreover, upon return, few households can recover or use their previously occupied land because of weak systems of property rights (Ibáñez and Moya 2006).

Households tend to rely on the labor of their children to cope with aggregate shocks

Children represent a buffer mechanism, particularly among resource-constrained households. In tough times, households are often forced to resort to the labor of their children, who can thus contribute to income or free up time for adults. However, children’s work entails long-run costs if it interferes with the human capital accumulation of the children and leads to reduced earnings potential. Brazilian children, particularly girls, were more likely to abandon school and enter the labor force during several of the economic slowdowns recorded in the 1980s and 1990s. Once out of school, they became 10 percentage points less likely to progress across grades later on, offsetting short-term smoothing gains with long-term losses in human capital (Duryea, Lam, and Levison 2007). Salvadoran children were more likely to be taken out of school to look for work following the 2008–09 global crisis (Duryea and Morales 2011). Unemployment among household heads driven by the 1994–95 Mexican peso crisis was significantly associated with a higher probability that teenage girls were not attending school (Skoufias and Parker 2006). Natural disasters prompt similar responses. Children’s labor participation swelled in Colombian municipalities hit by record flooding in 2010 because of La Niña (Acevedo 2016).

Children and teenagers may be pushed to work if favorable economic circumstances raise the opportunity costs of sending them to school. Households send their children to work out of necessity, but they also do so in relatively better economic times to take advantage of good opportunities. If the substitution effect of unexpected temporary changes in income exceeds the income effect, transitory improvements in economic conditions and household incomes can increase children’s labor participation and deter schooling. Aggregate events such as economic booms in specific sectors or sharp increases in commodity prices can raise the value of children’s time. Coffee production, an important sector in many countries in the region, provides a good example of the effects of local economic conditions on the value of children’s time. Increases in the coffee harvest and prices in Brazil led to more work among low- and middle-income boys and girls, but only poor children were withdrawn
from school as a result of this time reallocation (Kruger 2007). The sharp increase in gold prices in 2002–11 led to a similar response. Child labor rose by 12 percent in Colombian villages close to gold mines. This happened in tandem with a drop in school attendance of 28 percent, mostly among children attending public schools (Santos 2015). Similarly, the engagement of children in labor markets increased following the strong earthquakes in Haiti and Peru in 2010 and 2007, respectively (figure 6.2).

**Figure 6.2. More Children Join the Labor Market after a Major Earthquake**

<table>
<thead>
<tr>
<th></th>
<th>Before Earthquake</th>
<th>After Earthquake</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Peru earthquake</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>2010 Haiti earthquake</td>
<td>30%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Notes: Children ages 7–14 years in employment refer to children involved in economic activity for at least one hour in the reference week of the corresponding household survey. Values shown correspond to the indicators available closely before and after each earthquake.

The demand for labor is responsive to aggregate shocks

**Major shocks disrupt job creation, reducing the demand for labor.** Large natural disasters or civil conflicts do more than wipe out homes. They decimate local economies, thereby distressing businesses, supply chains, and markets. Simulations of the economic impacts of electricity disruptions caused by catastrophic earthquakes show that the potential output loss could amount to as much as 7 percent of the gross regional product in areas near Memphis in the United States (Rose et al. 1997). Economic recessions lead to a slowdown in aggregate output, a slump in consumer spending, and a fall in stocks, and they put the brakes on investments in capital, marketing, research and development, and the expansion of credit. As this broad-spectrum aggregate supply slowdown unfolds, firms are likely to freeze hiring and lay off employees, which ultimately results in lower demand for labor and higher unemployment. Aggregate shocks can leave long-lasting scars among those workers who are more prone to bear the brunt of major crises. For instance, jobs remain relatively more difficult to find among young workers even as economies recover. This is especially relevant in the region, where one individual in five ages 15–24—totaling...
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More than 20 million people—is neither working nor in school (de Hoyos et al. 2016). More broadly, major crises may lower the output potential of a country whenever they structurally undermine labor and productivity growth.

More jobs are destroyed than created as a consequence of major shocks, particularly economic crisis. The global financial crisis of 2008–09 is probably the most recent illustration of the weakening effects of crisis on net job creation across developed and emerging economies. Globally, it is estimated that firms cut nearly 67 million jobs (ILO 2015). The unemployment rate in the United States rose sharply, from 4.5 percent in 2007 to over 10.0 percent in 2010, whereas it reached levels on the order of 25.0 percent in Greece and Spain. The same crisis destroyed a large number of formal and informal jobs in Mexico, lifting unemployment rates by more than 50 percent and depressing real wages across almost all economic sectors (Freije, López-Acevedo, and Rodríguez-Oreggia 2011). Unemployment rates also surged dramatically following previous macroeconomic crises in Argentina (1995) and the Dominican Republic (2003–04) (Fallon and Lucas 2002; World Bank 2015).

Natural disasters lead directly to job losses. The 2010 earthquake in Haiti and the devastating tropical storms that hit the country in 2012 crippled the agricultural sector, the main employer, leaving thousands jobless and causing unemployment to skyrocket. Close to 100,000 jobs were lost in Chile after the 2010 earthquake, pushing up the unemployment rate by 1 percentage point (Elsahai et al. 2010). Women in Colombia became 7 percentage points more likely to lose their jobs in municipalities flooded by extreme rainfall in 2010 (Acevedo 2016). The impacts are not always instantaneous. Empirical analysis on a large number of countries in the region shows that the probability of unemployment rises by up to 10 percent among individuals exposed to a major natural disaster at some point during their first 15 years of life (Caruso 2017).

A related concern is the increase in the duration of unemployment. In some cases, long-term unemployment results from a combination of higher labor participation and lower demand for labor. In other cases, however, even if labor force participation has tumbled, longer spells of unemployment are likely driven by a high rate of job loss because of real wage adjustments or lower labor demand. This was the case during the global financial crisis, which was associated with an unprecedented increase in the mean and median time of unemployment across most advanced and developing countries. The duration of unemployment almost doubled during the Argentine crisis, from 6.6 months in 2001 to 11.7 months in 2003. Spells of unemployment may become structurally longer if firms decide to shift jobs away from areas prone to natural disasters, which are typically inhabited by vulnerable populations.

27 In the United States, the average duration of unemployment reached 39 weeks, up from less than 20 weeks in previous recessions between the early 1980s and early 2000s.
Many of the jobs that remain or are created after a major shock are lower in quality. Underemployment, a manifestation of the underutilization of workers and skills, tends to rise during economic recessions, natural disasters, and civil conflict. The global financial crisis led to a sharp rise in the incidence of precarious employment in many countries despite the desire of workers to remain on the job for more hours and have more stable contracts. Of 35 advanced economies tracked by the International Labour Organization, 29 recorded an intensification in involuntary part-time and temporary employment between 2007 and 2010. Informal employment, a common feature of labor markets in the region, also increased in some countries during the global crisis. In Honduras, the ratio of informal jobs to total nonagricultural jobs rose from 52 percent (precrisis) to 58 percent (2010). Increases in informality—although of smaller magnitude—were also seen in Colombia, the Dominican Republic, El Salvador, Mexico, and Venezuela over the same period (ILO 2012). Individuals exposed during childhood to the direct effects of internal conflicts in El Salvador and Peru show a larger probability of working at an informal job later in life (Acosta et al. 2016; Malasquez 2016). Moreover, after crises, newly created jobs are more likely to be provided on a short- rather than long-term basis.

Shocks and perceptions of risk distort the allocation of financial capital

Capital often becomes scarcer in the wake of major financial crises. Negative macroeconomic and financial shocks trigger vast losses, dislocating capital markets. Precautionary liquidity and risk-aversion on the supply side following a crisis distort the optimal allocation of capital across an economy. Banks and investors respond by reallocating their investments or even reducing their portfolios, which often results in a credit crunch. As a result, private firms face greater financial constraints because of a lack of accessibility to debt and equity capital, which limits their ability to invest. In Mexico, the debt crisis of 1982 and the peso crisis of 1994–95 eroded trust in financial institutions among savers who lost large portions of their deposits and among borrowers who lost assets and other collateral (IMF 2015). These effects are usually not equally distributed. Credit tends to dry up more rapidly among small and medium enterprises, a sector that contributes substantially to employment and income. Likewise, foreign investment weakened in the region following the Argentine crisis in 2001 and the most recent global crisis: it dropped by 38 percent and 23 percent, respectively (figure 6.3).

Risk-averse, shock-prone households are less likely to use financial and insurance instruments. Standard neoclassic theory predicts the opposite, namely, that this type of household should show a stronger demand for insurance instruments to cope with shocks. The evidence speaks to the opposite view. In Ethiopia, the demand for weather index insurance is markedly lower among smallholder farmers who are characterized
by their higher degree of risk aversion and vulnerability to shocks (McIntosh, Sarris, and Papadopoulos 2013). Another possible explanation for the low take-up is ambiguity aversion, namely, that households do not perfectly understand the distribution from which the relevant risk probabilities are drawn (Bryan 2010). Another contributory factor may be the presence of basis risk, which means households may end up not receiving indemnities even if they are hit by a serious shock (Clarke 2016). Ambiguity aversion and basis risk are likely to be aggravated in a context of stronger hazards at greater frequency.

Risk pushes households to use productive assets inefficiently and forgo some returns

Aversion to latent risk distorts the productive choices of households at the cost of forgoing returns. Credit- and insurance-constrained, risk-averse households are inclined to mitigate ex ante the effects of major shocks by making conservative employment and production choices. These strategies reflect the desire of households to choose income-generating activities and use their assets to reduce risks rather than to maximize profits. Shock-prone farmers in south India use labor relatively more intensively than profit maximization behavior alone would dictate (Antle 1987). Inputs such as fertilizers or enhanced seeds that boost crop productivity and raise expected profits in low-income agricultural environments are used less intensively by risk-prone households in Ethiopia and India for fear of incurring investment losses if shocks result in poor harvests (Bliss and Stern 1982; Dercon and Christiaensen 2011; Lamb 2003).

The nature of aggregate shocks and market imperfections forces households to own assets that help them reduce risk rather than maximize profits. An essential feature of
communities characterized by incomplete markets and high exposure to large risks is asset portfolios that contribute directly to production and indirectly to smoothing consumption. The covariate nature of aggregate shocks that simultaneously affect geographical clusters of households and villages tend to exacerbate borrowing, insurance, and rental market constraints. Indian farmers own bullocks to till the land in the short time window between the onset of the monsoon rains and the optimal sowing date. However, while it would be more efficient for farmers to rely on a bullock rental market, accumulating and using other profit-enhancing assets instead, the systemic uncertainty of the monsoon onset date and the positive covariance of rainfall within villages force farmers to own bullocks to meet their demand for animal traction. Simulations in this context reveal large welfare gains arising from policies such as credit, subsidized weather insurance, and cash transfers that would help stabilize income flows among farmers (Rosenzweig and Wolpin 1993).

Households prone to weather variability have a greater propensity to change the timing of their investments, undermining the returns. A consequence of climate change or phenomena such as El Niño and La Niña is to shift global precipitation patterns dramatically, delaying the onset of rains, broadening or shortening rainfall seasons, making the path of storms and hurricanes less predictable, and increasing the intensity of the storms and hurricanes. In the face of rising uncertainty about the timing of rainfall, poor households may resort to postponing investments (for instance, sowing seeds) until they have better information on expected weather conditions. If rains are poor, farmers may cut back production to reduce possible losses (Morduch 1995). Evidence shows that low-income households do not plant crops if the soil lacks sufficient water. As a result, the variability of areas cultivated in low-income settings is larger than the variability in agricultural yields. This explains why consecutive drought years may result in larger reductions in cultivated area than shortfalls in yields (Walker and Ryan 1990). Delaying the use of assets can involve high costs.

In dealing with shocks, vulnerable households opt to diversify toward portfolios with safer, but less profitable activities. Vulnerable rural households devote larger shares of their land to more conservative crops rather than to riskier, higher-yielding crops. Poor Indian farmers in villages of the International Crops Research Institute for the Semi-Arid Tropics are more likely to plant safer, but less lucrative varieties of rice (Morduch 1990). Likewise, households in the lowest wealth quintile in western Tanzania allocate close to 10 percent of their land to sweet potatoes (compared with less than 2 percent among the well off), a low-risk yield that is difficult to market and is thus characterized by low economic returns (Dercon 1996). Vulnerable households also diversify their crops spatially to work on a number of small fields rather than on a more efficient consolidated plot. This is the traditional risk management strategy among shock-prone Peruvian farmers in the district of Cuyocuyo who disperse their agricultural fields over the landscape (Goland 1993). The riskiness of agricultural incomes, intensified in a context of aggregate shocks,
also influences tenancy contracts (such as sharecropping) and long-term labor contracts (for example, permanent arrangements at stable, but low wages) in ways that favor risk management over expected returns.

**Engagement in often less profitable nonfarm jobs provide another typical form of diversification among vulnerable households.** A large share of farm households across the developing world earn a significant share of their incomes from nonfarm sources, often motivated by the need to manage risk and cope with shocks. In Guatemala, 86 percent of the rural households living in extreme poverty report engagement in activities outside agriculture. A similar share also report that they participate in two or more activities to earn a living. Even if the levels are lower, a comparable pattern is observed in other countries in the region, such as Mexico, Nicaragua, and Panama (Banerjee and Duflo 2007). Rural households in areas highly affected by the Colombian conflict reduced the amount of time spent on onfarm work and increased their supply of labor to off-farm activities. While evidence shows that the poor are more likely to engage in off-farm activities where earnings have a low positive covariance with the returns they obtain in agriculture, their overall earnings outside agriculture are lower more often than not (Reardon et al. 2006).

**Because of shocks or risk management strategies, production factor returns are often lower**

**Workers in areas affected by major shocks often experience substantial earnings losses, which can extend into the medium and long run.** Individuals often increase their labor supply in times of aggregate shocks, whereas firms and businesses are likely to shed more jobs than they create. Taken together, both changes in labor supply and labor demand lead to a drop in real wages. This seems to be the rationale behind the wage income losses suffered by urban households located in the path of Agatha (2010), the strongest tropical storm to strike Guatemala since rainfall records have been kept. While the decision whether to work remained unchanged among adults in the affected households, they were found to work an average of 2.2 more hours per week in the aftermath of the event. Possibly signaling a general equilibrium effect, workers commanded wages 5.4 percent lower relative to the median hourly wage at baseline (Báez et al. 2016). Similarly, a careful analysis of the nature of the jobs created during the global financial crisis (2008–09) shows that the majority of new jobs in Argentina and Mexico were remunerated at a rate below average wages. In fact, the number of jobs paying below two times the minimum wage rose during the 2008–09 crisis in Mexico and now make up the largest share of jobs (ILO 2012; World Bank 2012a).

**Forced migrants are among those people who bear the largest costs imposed by large, negative shocks.** The returns to human and physical capital usually drop after the
occurrence of aggregate shocks because the skills of most displaced people tend to be concentrated in agricultural activities, which are noticeably less in demand in urban labor markets. Income among household heads affected by the Colombian conflict is less than half among the people who are employed following displacement. The net present value of forgone agricultural revenue over a lifetime is estimated at $15,787 per household, nearly twice Colombia’s GDP per capita (Ibáñez and Moya 2006). More broadly, labor market conditions can deteriorate because of forced migration flows, usually expanding the informal economy (Calderón and Ibáñez 2009). Empirical research has shown that children born and raised in areas affected by conflict and natural shocks typically grow up to be shorter in stature, possibly implying negative effects on labor productivity in adulthood, particularly if they are engaged in physically demanding activities such as agriculture (Akresh, Caruso, and Thirumurthy 2014; Báez 2011; Báez and Santos 2007).

The latent risks of potential shocks undermine economic returns, particularly among the poor. Households accumulate and use their assets to balance two objectives: maximize profits and reduce risks. This link between production and consumption decisions entails sizable efficiency losses because expected profits are sacrificed for lower risk. The excessive use of labor by farmers in south India implies a risk premium of 14 percent of the expected net returns (Morduch 1995). Low-income Indian farmers forgo up to 35 percent of the expected profits if the impact of risk aversion on the use of a broad set of inputs is considered (Rosenzweig and Binswanger 1993). The crop portfolio of Tanzanian farmers in the wealthiest quintile yields 25 percent more per adult than that of the poorest quintile (Dercon 1996). In Palanpur, India, delaying the onset of production by two weeks to gain extra information on expected weather is found to decrease yields by 20 percent (Bliss and Stern 1982). Field-scattering among farmers in the Peruvian district of Cuyocuyo is estimated to diminish yields by 7 percent (Goland 1993). Conservative estimates in several surveys suggest that the median return from the use of fertilizers is above 75 percent; yet, few risk-averse and shock-prone households use fertilizers (Banerjee and Duflo 2007). Overall, the lower returns do not follow from differences in risk preferences, but from the limited options available to insured households.

Income diversification among vulnerable households often translates into lack of specialization, small scale, informality, and little income smoothing. Households tend to have multiple jobs, partly as a result of risk-spreading strategies. Short-term migration is widespread. This multiplicity of occupations and the substantial amount of time spent commuting often mean less specialization as households trade off opportunities to master tasks or jobs that fit their skills. Businesses created by these households operate at remarkably small scale. The average number of paid employees of a business created by someone who lives on less than $2.00 a day range from 0.14 in rural Nicaragua

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28 In contrast, farmers in the top wealth quartile take on more risk without sacrificing expected returns.
to 0.53 in urban Panama (Banerjee and Duflo 2007). Available evidence contradicts the conventional wisdom that earnings from labor migration—another common income diversification strategy—exceed the earnings obtained from local nonfarm activities. Empirical studies in five countries in the region (Brazil, Colombia, Ecuador, Mexico, and Nicaragua) show that local nonfarm earnings surpassed the earnings of migrant family members by a ratio of over 10 to 1 (figure 6.4). Diversification does not always lead to income smoothing when most needed. Whereas incomes from jobs across different sectors are uncorrelated in normal times, they are likely to collapse in tandem during major crises. Droughts in West Africa reduce crop incomes, but also nonfarm incomes (Fafchamps, Udry, and Czukas 1998).

Figure 6.4. The Share of Earnings from Labor Migration in the Region Is Low

![Composition of nonfarm earnings: Local and Migration](image)

Source: Calculations based on Reardon et al. 2006.
7. Risk Management Policy: Preparing for and Coping with Aggregate Shocks

The rationale for public action

Many of the negative impacts and development setbacks that arise from aggregate shocks are the result of risk management systems unable to shield household well-being. Aggregate shocks can lead to sizable losses in human lives, lower standards of living, destruction of physical and human capital, disruptions of markets, and sacrifices in economic opportunities. Many of these effects even last for a long time. Yet, the losses associated with shocks do not arise primarily from the actions of nature, but from the choices of people. In spite of notable recent economic and social progress, risk management among individuals, households, communities, villages, and countries in the Latin America and Caribbean region remains inadequate. Because of the large scale of aggregate shocks, households alone are unable to handle the impacts and need support systems to withstand them without forgoing present and future well-being.

Efficiency losses linked to weak insurance, protection, and coping against aggregate shocks justify public intervention. Households follow multiple strategies to manage risks, but these are only partially effective. Inadequate risk management discourages households from taking on the risks that are encountered in pursuing economic gain, undermining income generation. Income- and asset-based strategies to self-insure smooth incomes, but they also skew incomes, clustering households into low-return, low-risk activities. The poor functioning of asset markets constrains the access to alternative economic activities and depresses asset values if these are liquidated during a crisis. Informal risk-sharing mechanisms are prone to collapse when aggregate shocks occur. The welfare losses caused by these inefficiencies are not trivial. The median return from the use of fertilizers is above 75 percent, but poor, shock-prone households rarely use fertilizers. Aggregate shocks also tend to affect the poor and vulnerable disproportionately owing to a combination of greater exposure, weaker internal conditions, and unsatisfactory risk management. The resulting equity losses are equally large. The poor typically earn lower returns on their portfolios than more well off households at similar levels of risk exposure.
The benefits of adequate risk management are substantial. The risks of economic stagnation can be reduced if countries follow sound fiscal and monetary policies. Seismic building codes can protect vital infrastructure against the destructive power of earthquakes. Spending on flood defenses and warning systems can help households and businesses withstand floods. Farmers can boost agricultural productivity through increased use of irrigation and fertilizers. Immunization among children provides protection against certain diseases and contributes to healthier and more productive lives. Each dollar spent on improving water and sanitation systems yields around 4 dollars in economic benefits (figure 7.1).

Successfully addressing aggregate shocks requires an enabling environment for collective coordination, action, and responsibility. World Development Report 2014 argues that effective risk management can be a powerful instrument for development by building people’s resilience and allowing them to seize opportunities for improvement. It calls for a “shift from unplanned and ad hoc responses when crises occur to proactive, systematic, and integrated risk management” (World Bank 2013b, 4). Aggregate shocks require coordination ex ante to prepare for the risks and shared action and responsibility ex post to cope with the impacts. Public policy plays a central role in promoting the environment needed for this sort of collective action to occur across society, from households and firms to local communities, nongovernmental organizations, the financial system, countries, and the international community.

**Figure 7.1. The Benefits of Formal Risk Management Often Offset the Costs**

![Figure 7.1](image)

Source: World Bank 2013b. Note: The figure shows the median benefit-cost ratios across a range of studies in each category (with a minimum of at least four estimates in each category). Above the dotted line, expected benefits exceed expected costs. The range of estimates within each category can be substantial, reflecting a diversity of intervention types and locations and the sensitivity of estimates to variations in underlying assumptions. However, in almost all cases, even the 25th percentile of the ranges are above the break-even point.
A key message of this report is that aggregate shocks vary considerably in nature, scale, and intensity, calling for careful identification of the risks and predetermined action plans. Equally diverse is the spectrum of impacts the shocks produce. An exhaustive policy strategy to confront the impacts requires careful identification of the risks and the environment in which they arise, the resilience of various groups (such as families, communities, and countries), the interactions with internal and external factors, and the obstacles to successful risk management. This chapter draws extensively from World Development Report 2014 (World Bank 2013b) to outline a simple framework and derive a set of guiding principles and insights to strengthen risk management policy in Latin America and the Caribbean, paying special attention to efficiency and equity considerations and focusing on household resilience and coping ability. Because of the variety of risks and local conditions, holistic risk management strategies will necessarily include a range of instruments targeted on specific shocks and social groups.

A policy framework to prepare for and cope with aggregate shocks

Risk management policy needs to address four objectives to help households effectively prepare for and cope with aggregate shocks. Preparing for aggregate shocks involves three of the objectives: (1) gaining knowledge to understand the shocks, conditions, and potential outcomes to reduce the uncertainties faced by people, societies, and countries; (2) building protection to reduce the probability and size of losses, while increasing the chances and size of positive outcomes; and (3) acquiring insurance to transfer resources. Successfully coping with aggregate shocks ex post is covered in the fourth objective: (4) applying proven coping mechanisms to recover from the losses inflicted by shocks. Box 7.1 explains the advantages of considering both ex ante and ex post objectives.

Strengthening the preparation and coping aspects of risk management to confront aggregate shocks requires policy actions on five main fronts. They include addressing (1) market failures and the underprovision of key public goods, (2) social and economic externalities, (3) weak government incentives, (4) limited resources and information, and (5) underdeveloped and inflexible social protection (figure 7.2).

(1) Addressing market failures and the underprovision of public goods. One of the major factors explaining suboptimal risk management is the lack of critical markets for credit, insurance, and jobs. In some cases, these markets may exist, but fail to develop completely. Household surveys across the developing world often show that the demand for credit from farmers is rarely met by financial institutions. In other contexts, the opposite is also true. Experiments in Ghana and India show that the demand for weather index insurance is low (around 6–18 percent) at market prices (Karlan et al. 2014). Better financial inclusion contributes directly to faster recovery
Box 7.1. Ex Ante or Ex Post Risk Management

Each shock is unique, and the impacts may be diverse. Nonetheless, most components of the response to shocks should be planned before a shock strikes. Even a clear and structured ex post decision-making process can be established beforehand. This will promote a sense of confidence and commitment, increasing the effectiveness of the ex post intervention. Plans and any decision making they entail are kept as clear and simple as possible (Clarke and Dercon 2016).

Several ex ante decisions influence ex post policy responses. The participation of strong and dynamic institutions requires policy agreements and negotiations that take time. First, it is necessary to undertake a rigorous assessment of the potential risks that a country is facing and establish the institution that is to be responsible for each risk response.

Three main dimensions of the ex post response to aggregate shocks can be planned ex ante to avoid negative impacts (Clarke and Dercon 2016). First, a synchronized plan for ex post action that is established previously reduces coordination costs. Typically, a lack of coordination among the government, international organizations, and the population after a shock strikes generates inefficiencies in the delivery of assistance to those who are most affected by the shock. Without adequate planning, the interactions among these three sets of actors may become unnecessarily difficult. Detailed planning ex ante also represents an opportunity to coordinate shock risk reduction.

Second, identification of a dynamic, evidence-based decision-making procedure assures the efficacy of response policies. The efficiency of the response depends on the implementation of policies that truly ameliorate the impact of the shock. The inclusion of scientists in the planning stage may increase the efficacy of the reaction to the shock. There is a particular need to invest in science-based risk information and clearly communicate this information to ensure that the stakeholders and actors are well aware of the contingencies. Moreover, if decisions are to be made based on rules that rely on data, the reliability of the data and statistical systems is crucial to identifying the potential at-risk populations and the responsibilities of those who will be delivering the assistance.

Financing the response and the assistance should also be planned ex ante. Identifying the necessary contingency resources guarantees that the plan can be financially implemented. To have financial and budgetary instruments on standby requires ex ante planning as well as financial discipline given that governments may have incentives to use contingency funds. To avoid these incentives, triggers to enable the use of funds can be established within the financial strategy and matched with initiatives set out in the shock response plan. Traditional reinsurance can be particularly useful in locking in plans for reconstruction, and indexed reinsurance can play the same role in financing indexed early actions. The support of international humanitarian agencies can be sought and agreed on as a backup if plans fail.
after a disaster while also supporting asset diversification, which reduces vulnerability in turn. In Guatemala, for instance, universal access to financial institutions would reduce welfare losses associated with natural disasters by 7.6 percent (Hallegatte et al. 2017). Similarly, basic services and public goods that are essential in managing risks, such as safe water and sanitation, education, key infrastructure, weather warning systems, economic and political stability, and the rule of law, are often missing or of substandard quality. Healthier and more well educated people are better at adopting behaviors and investing in technologies that contribute to building resilience. Early warning systems enable preparation against natural hazards, reducing death tolls and assets losses. Macroeconomic stability acts as a buffer against interest and currency fluctuations and provides a framework for the improved performance of markets and for steady growth.

(2) Helping internalize social and economic externalities. Economic activities adopted by some agents, including risk management strategies, can impose costs on others. In the absence of banking regulations, excessive risk taking by the banking system can increase the risks of systemic shocks to the overall economy. Lack of land use and building regulations can lead to the development of infrastructure in unsafe places and under unsafe construction codes. The depletion of forests, mangroves, and other natural assets exacerbate the effects of floods, landslides, storms, and droughts. Contractionary monetary policy in one country can reduce the local inflation rate, but disrupt capital flows in other parts of the world. Overuse of antibiotics is causing some bacteria to become drug-resistant. Free riding among agents who benefit from risk prevention or mitigation without contributing to the costs likely discourages risk management. Flood defenses can provide significant protection to infrastructure in vast areas; yet, they are less likely to be installed and maintained if areas close to the coastline have to bear most of the burden of the costs. Governments have to establish regulatory policies and enable collective action that contribute to internalizing the relevant externalities.

(3) Reforming weak government incentives. Intertemporal political incentives are a major impediment to adequate risk management. Risk preparation requires a number of investments, often costly, that potentially yield discernible returns only in the medium and long term. Governments prefer to devote resources to policies and programs that produce gains in the short term, even if the gains are smaller. International aid, while beneficial from a humanitarian perspective, leads to moral hazard, creating incentives for governments to underinvest in risk preparation and coping. Disaster aid is often associated with few conditions, and efforts to provide debt forgiveness in times of distress are unlikely to benefit the poor. Corruption, elite capture, and distortionary
policies undermine risk management. Government failures across the world and the lack of a regulatory and institutional framework for risk management translate into a widespread inability to prepare for crises before they occur. Addressing these failures requires the development ex ante of coordinated plans for postdisaster action and agreements on standby financing to ensure that the plans can be implemented (Clarke and Dercon 2016) (see box 7.1).

(4) Addressing the lack of resources and the lack of information. Investments in risk management infrastructure and technology usually involve large upfront costs. The costs of the new protection systems in New Orleans are on the order of $15 billion (Hallegate et al. 2017). Meeting these costs may be difficult in low-income contexts where asset ownership is limited, access to credit is lacking, and other market failures and externalities exist. Whereas the benefits are likely to surpass the costs, the former are usually realized only in the long term, complicating the decision-making process. Protection infrastructure rarely attracts sufficient capital largely because

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Figure 7.2. A Framework to Switch from Fighting Crises to Managing Risks Effectively

Source: Adapted from World Bank 2013b.
the benefits mostly take the form of avoided losses. Households and governments on tight budgets may favor current expenditures over investments in risk reduction and mitigation. Information on the relevant risks and on the benefits and costs of various actions to prepare and cope with the risks may not exist or, if it does, may not be available, accurate, or understood. Data from the United States shows that less than a third of homeowners in flood-prone areas are cognizant of the risk (World Bank 2013b). Lack of information constrains the ability of public and private agents to price risks, undermining public and private efforts to insure against shocks and provide compensation at actuarially fair rates. An option for countries is to leverage private resources and official development assistance for large and better investments in resilience.

(5) Developing and strengthening rapidly scalable social protection. Ex ante measures to increase knowledge, protection, and insurance raise resilience to aggregate shocks, but, ultimately, households cannot be fully insured. Ex post mechanisms such as social transfers are necessary to ensure a minimally acceptable standard of living, especially among the poor. Adaptive and scalable social protection can provide this type of insurance. Flexible public safety nets can be scaled up during a crisis by increasing the amount transferred to beneficiaries, relaxing eligibility rules and conditionalities, extending coverage to new beneficiaries, or creating a new program. These changes are scaled down after economic and social systems recover. Recent experiences in the region offer valuable lessons (box 7.2). Mexico’s Ministry of Social Development, for instance, designed a rapidly scalable national program of temporary employment through public works. Familias en Acción, a standard conditional cash transfer program launched in Colombia after the economic crisis of the late 1990s, relaxed program rules and conditionalities in 2008 after a series of natural events destroyed critical infrastructure, including schools and health facilities. Expansion of social safety nets, coupled with prudent macroeconomic management, increased the resilience to external shocks in Uruguay. Mexico’s Prospera conditional cash transfer program expanded coverage to one million families to alleviate the effects of the food price surge. Chile and Guatemala introduced new or redesigned programs to respond to the 2008–09 global financial crisis. The Latin America and Caribbean region has succeeded in building safety nets to alleviate poverty. However, many of the nonpoor are not covered, while remaining vulnerable to sliding back into poverty if they are hit by a major shock. In the face of this challenge, the many conditional cash transfer programs in place in the region offer an opportunity to enhance the resilience of shock-prone and vulnerable households.
Box 7.2. Mexico’s Fund for Natural Disasters

Mexico’s Fund for Natural Disasters (FONDEN) is a good example of a successful risk management and risk coping policy. Aggregate shocks require ex ante coordination to prepare for the risks and ex post action and responsibility to cope with the impacts. FONDEN strikes a good balance between these objectives by committing contingent resources ex ante and setting clear rules to disburse them for reconstruction efficiently and transparently. Designed in the 1990s, FONDEN’s main objective is to support the rapid rehabilitation and reconstruction of infrastructure affected by adverse natural disasters and also act as the contracting authority for market-based risk transfer mechanisms, including insurance and catastrophe bonds. It is funded through the Federal Expenditure Budget and can be used for the rehabilitation and reconstruction of public infrastructure, low-income housing, and certain components of the natural environment. These efforts include the reconstruction of state and federal roads, the provision of funds to rebuild hydraulic, health, and educational infrastructure. Furthermore, FONDEN attempts to avoid recreating vulnerabilities, meaning that funding can be used to rebuild infrastructure at higher standards and to relocate public buildings or communities to safer zones. These actions allow FONDEN to address market failures, the lack of critical public goods, and limited resources and information, as well as formal institutional needs in risk management.

Another critical factor that successful risk management policies must address is related to government incentives. FONDEN tackles this issue by setting clear preestablished rules on execution to balance the need for time-efficient disbursement and the need for accountability and transparency. Whenever a shock or natural disaster occurs, the Federal Ministry of the Interior first issues a declaration of a natural disaster so FONDEN resources become accessible to affected federal agencies or state governments. Once this declaration is made, federal agencies and state governments can apply for funding, and a damage assessment process begins. The damage assessments make use of innovative information technology, such as geocoding and digital imagery, to ensure efficiency and accuracy, but also entail complementary physical site visits by state and federal officials to assess damage. Based on the findings, the Ministry of the Interior determines the appropriate allocations and requests the Ministry of Finance and Public Credit to authorize the transfer of funds to the service providers implementing the reconstruction works. Moreover, FONDEN may also provide a double gain in economic development, first, by coping with the losses created by natural disasters and, second, by enabling local governments and households to reallocate resources from safer but inefficient low-risk, low-return productive activities to more risky higher-yielding activities, thereby enhancing risk management decisions.

Sources: de Janvry, del Valle, and Sadoulet 2016; World Bank 2012b.
Three other elements should be considered in risk management policy: careful design, the identification of risk vulnerabilities, and innovation in market-based products.

First, badly designed policies may make matters worse. Public programs may dislocate informal risk-sharing institutions by crowding out private transfers across households within an insurance network. Evidence on Mexico shows that private transfers to households covered by the Prospera conditional cash transfer program fell after the households joined the program (Albarran and Attanasio 2004). While the provision of subsidized weather insurance may provide incentives for households to embrace more risk-taking (a desirable objective), the extra risk can undermine the access of the households to credit markets and other financial instruments. Cautious assessment of the trade-offs arising from different policy options is critical. Second, the effectiveness of public interventions hinges on the ability to target them on those most in need of insurance and protection against major shocks. While challenging, emerging evidence (including panel data studies) suggest that vulnerability to shocks is largely determined by access to and ownership of human and physical capital as well as by the functioning of and opportunities in labor, product, and asset markets (Dercon 2004). Most household surveys collect this type of information to varying degrees. Third, like most policy areas, risk management calls for innovation in the design of market-based mechanisms to increase knowledge and insurance against major crises. While instruments have emerged, such as derivative financial instruments, catastrophe bonds, weather index insurance, and interlinked credit and insurance contracts, substantial untapped opportunities exist to increase the protection available to households in Latin America and the Caribbean, especially to the two-thirds of households that are either poor or experience a relatively high probability of falling back into poverty.


Bryan, Gharad. 2010. “Ambiguity and Insurance.” Job market paper (November 14), Department of Economics, Yale University, New Haven, CT.


Magrin, Graciela O., José A. Marengo, Jean-Phillipe Boulanger, Marcos S. Buckeridge, Edwin Castellanos, Germán Poveda, Fabio R. Scarano, and Sebastián Vicuña. 2014. “Central


———. 2012b. “FONDEN, Mexico’s Natural Disaster Fund, a Review.” World Bank, Washington, DC.


# Annex 1. Summary of the Findings of the Background Papers

## Human welfare impacts of aggregate shocks

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Country</th>
<th>Sources</th>
<th>Main findings</th>
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<tr>
<td><strong>Consumption, income and poverty</strong></td>
<td>Central America</td>
<td>Ishizawa and Miranda (2016)</td>
<td>One standard deviation in the intensity of a hurricane windstorm leads to a contraction in the growth of total per capita GDP of between 0.9 and 1.6 percent and a decline in total income and in labor income by 3 percent, which raises the moderate and extreme poverty rates by 1.5 percentage points</td>
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<td></td>
<td>Colombia</td>
<td>Fergusson and Zambrano (2016)</td>
<td>Shocks are persistent: experiencing an adverse shock increases future vulnerability by about 9 to 11 percentage points, making households in the middle of the wealth distribution significantly decrease their consumption when they are hit by an adverse shock; this generates a poverty trap among households in the first two quartiles and implies large welfare losses among the first quartile when it is hit by an adverse shock</td>
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<tr>
<td><strong>Asset accumulation</strong></td>
<td>Latin America and the Caribbean</td>
<td>Caruso (2015)</td>
<td>In utero and young children are the most vulnerable to natural disasters and suffer the most long-lasting negative effects, including less human capital accumulation, worse health, lower income, and fewer assets when they are adults; furthermore, the results provide evidence of the intergenerational transmission of the impacts of the shocks, indicating that children born to mothers who were exposed to natural disasters achieve less education and run a greater risk of performing child labor</td>
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<tr>
<td></td>
<td>Colombia</td>
<td>Duque (2016)</td>
<td>Children exposed to violence in utero and in childhood experience significant developmental declines in health and cognitive abilities</td>
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<td></td>
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<td>Santos (2016a)</td>
<td>In utero shocks on birthweight translate into lower weight and height among children in middle-income families</td>
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<td></td>
<td></td>
<td>Santos (2016b)</td>
<td>After commodity price increases: unskilled employment expands; more children begin working and fewer children attend school; educational attainment shrinks; public-school enrollment declines</td>
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### Human welfare impacts of aggregate shocks

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<tbody>
<tr>
<td>Asset utilization and returns</td>
<td>El Salvador</td>
<td>Acosta et al. (2016)</td>
<td>Exposure to war at birth reduces the likelihood of employment, the skill level of available jobs, and long-term human capital accumulation</td>
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<tr>
<td></td>
<td>Colombia</td>
<td>Acevedo (2016)</td>
<td>After exposure to shocks: intrahousehold reallocation of resources; conditional on generating positive income, more teenagers take up work (rather than adults) in the presence of extreme weather than in its absence</td>
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<td></td>
<td>Peru</td>
<td>Malásquez (2016)</td>
<td>Exposure to violence during the first year of life reduces average height; the body mass index rises if exposure occurs during the first year of life; educational attainment declines if the exposure to violence occurs at 3–5 years of age; exposure to violence in utero reduces the probability of completing primary or secondary education; the effect of exposure to violence on labor market outcomes is negligible</td>
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### The effectiveness of ex ante risk management

<table>
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<tr>
<th>Outcomes</th>
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<th>Main findings</th>
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<tbody>
<tr>
<td>Income diversification, occupational choice, and migration</td>
<td>Central America and the Caribbean</td>
<td>Báez et al. (2017)</td>
<td>Extreme events, such as hurricanes, affecting infrastructure tend to discourage people from migration; longer-term events, such as drought, affect agricultural labor markets, have an insignificant or a positive impact on migration decisions in Central America</td>
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<td></td>
<td>Peru</td>
<td>Toro (2016)</td>
<td>Disasters do not incentivize people living to emigrate across provinces</td>
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<td>Social protection and labor market programs</td>
<td>Colombia</td>
<td>Duque and Rosales (2016)</td>
<td>Although conditional cash transfers have an overall positive impact on children’s educational outcomes, they do not have a differential effect on children exposed to early-life shocks; however, the overall effect of such transfers is large enough to mitigate the negative impact of weather shocks</td>
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<td></td>
<td>Jamaica</td>
<td>Bronfman and Reyes (2016)</td>
<td>Labor market programs attenuate the effects of employment shocks; while a simulated employment shock would increase the prevalence of vulnerability to 31 percent in urban areas and 47 percent in rural areas in the absence of Program of Advancement through Health and Education cash transfers, the impact of the employment shock on vulnerability is reduced to 20 percent and 15 percent, respectively, with the transfers; this impact is stronger (ex ante) among the vulnerable than among the poor</td>
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