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TRANSITORY SHOCKS, PERMANENT EFFECTS: IMPACT OF THE ECONOMIC CRISIS ON THE  
WELL-BEING OF HOUSEHOLDS IN LATIN AMERICA AND THE CARIBBEAN

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**TRANSITORY SHOCKS, PERMANENT EFFECTS:  
IMPACT OF THE ECONOMIC CRISIS ON THE  
WELL-BEING OF HOUSEHOLDS IN LATIN  
AMERICA AND THE CARIBBEAN\***

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*United Nations Development Programme*

*Resumen:* Se busca medir el impacto de la crisis global de 2009 en la pobreza, mortalidad infantil y materna, desnutrición y educación en varios países de América Latina. Los resultados sugieren que la desaceleración económica tiene impactos adversos en la salud, mortalidad infantil y pobreza. Los resultados en educación son ambiguos. Los resultados confirman la relevancia de establecer programas integrados de protección social que eviten que choques transitorios tengan efectos de largo plazo en el bienestar de los hogares.

*Abstract:* This paper aims to measure the impact of the global crisis on social indicators child health, mortality, education and poverty in five Latin American countries. The results suggest that economic downturns have a negative impact on child mortality, child health, and both overall and child poverty. Child poverty increases at higher rates than overall poverty. Results on education indicators are ambiguous. The paper concludes that an integrated social protection policy that protects the income of poor households and that maintains or expands basic health services during economic downturns are of critical importance to prevent transitory shock from having permanent effects on the well-being of households.

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*Palabras clave/keywords:* desarrollo humano, crisis económica, bienestar de los hogares, América Latina, pobreza, human development, economic crisis, household well-being, poverty

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## 1. Introduction

In the absence of insurance and social protection schemes, aggregate and idiosyncratic shocks may have permanent effects on the well-being of households. The evidence in the literature shows that this may be especially the case for the most vulnerable within the household, including children, elderly and people with disabilities. In this paper the focus is on aggregate shocks due to macroeconomic downturns.<sup>1</sup>

The effects on children are of particular interest. Several studies on early childhood development indicate that adverse events during the first years of a child's life translate directly into less than optimal adult outcomes in terms of well-being. According to Schady (2006), a poor early childhood development can have long lasting effects in school attainment, employment, wages, and incidence of criminality. Thus, economic crises, or short-term economic downturns, can have lasting consequences on human development and perpetuate the intergenerational transmission of poverty.

In the past few decades the Latin American and Caribbean, LAC, region has made important strides in poverty reduction and social protection. Countries in the region have implemented large-scale social programs, mainly through conditional cash transfers, CCT that covered about 95 million beneficiaries in 2009. These programs, accompanied by sustained economic growth, have contributed to significant reductions in poverty levels and inequality, improvements in child health and education and sustained progress toward the achievement of the Millennium Development Goals, MDGs.

However, in spite of the decreasing trend, inequality and poverty remain very high in the region and are likely to show reversals due to the current economic crisis. Moreover, improvements in social indicators are recent and not consolidated. Many households, and the children within them, remain vulnerable to the long-term effects on their well-being of this transitory macroeconomic shock.

The main objective of the project *The Effects of the Economic Crisis on the Well-being of Households in Latin America and the Caribbean* is to understand, through empirical analysis the ways in which crises affect households in the long-term, identifying the main sources of their vulnerability in the economic crisis. We conclude that an integrated social protection policy that moves beyond the programmatic approach prevalent in the region is critical to prevent transitory poverty from evolving into structural deprivation.

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<sup>1</sup> For a similar discussion looking at the effects of extreme natural events see López and Ortíz (2008).

## 2. Conceptual Framework

Using an asset-based approach to poverty, the main concern about the effects of transitory shocks on long-term household's well-being is the extent to which they result in reductions in the stock and reversals on the accumulation of income-generating assets. As described by Attanasio, and Szekely (1999), household income is a function of the stock of income-generating assets owned by each individual in the household, the rate at which these are used, their market value and transfers such as benefits from CCTs or remittances. Household income, thus, can be expressed in the following terms:

$$y = \sum_i^n \sum_j^k A_{ij} R_{ij} W_j + \sum_i^n T_i \quad (1)$$

where  $y$  is household income for a household with  $n$  individuals  $i$ ,  $A$  is the stock of assets of type  $j$ ,  $R$  is the rate at which the assets are used,  $W$  is the market value of the assets and  $T$  is transfers. Income-generating assets  $A$  include human capital, such as education and skills, physical capital, such as property or financial assets, or social capital, referring to norms and networks that enable collective action.

The extent to which crises have effects on households' well-being, thus, depends on the extent to which they have negative impacts on any of the components of household income. Economic crises tend to decrease the stock of income-generating assets held by individuals in the household because these individuals make decisions to forgo assets in order to smooth consumption, especially in the absence of credit or insurance markets. For example, individuals might use savings or sell physical capital for immediate consumption, relinquishing the income these could generate in the future and reducing their future consumption. Crises can also have an effect on the rate at which assets are used; unemployment, for example, results in a sub utilization of human capital, or lower demand for certain goods results in the sub utilization of physical productive assets such as machinery or land. Finally, aggregate shocks can affect the market value of assets, for instance decreasing wages or prices of goods. In any case, economic downturns, even when transitory, affect the long-term income-earning capacity of individuals.

Moreover, recessions can have an impact on the stock of income-generating assets of future generations. As households forgo part of their stock of assets, they tend to also forgo the accrual of income-generating assets, such as education or health. For instance, a temporary shock could induce a household to reduce the dietary intake

of a child, to withdraw their kids from school to provide additional income or to forgo prenatal care. These short-term decisions have long-lasting impacts on the cognitive development of children and are proven to result in less productive future outcomes for them. Early childhood malnutrition decreases later cognitive ability, students who leave school are unlikely to return and never catch up in economic terms with their peers, and the absence of prenatal care increase chances of maternal mortality and birth complications. Decisions taken during a transitory shock, thus, can perpetuate asset-poverty in future generations.

When individuals make decisions about reducing their stock of income-generating assets in the face of an economic downturn, the literature suggests that several effects come into play (Ferreira and Schady, 2008). Income and substitution effects are of particular importance when exploring decisions to forgo assets or asset-accumulation. For example, although the cost of the services such as education and health might increase relatively to the household's income during recessions, the opportunity cost of sending a child to school or of dedicating more time to health inducing behaviors, decreases if the crisis affects the labor market. Which of these two effects dominates determines the extent to which households forgo future consumption *vis-à-vis* current consumption. The impacts are likely to be heterogeneous across households, and specific household characteristics will determine which effect is stronger: poorer households with a higher marginal utility of current consumption and fewer options for consumption smoothing, are likely to be driven to a greater extent by income effects than substitution effects.

Policy responses to crises often focus on preventing or compensating a reduction in income-generating assets by increasing transfers ( $T$ ). Conditional transfers increase  $T$  while encouraging the accumulation of assets. Ideally, the presence of additional income deters asset reduction decisions and protects the household's future consumption.

This paper aims, through the use of empirical evidence, to shed light on the coping mechanisms used by households during crises episodes in Latin America and the Caribbean

### 3. The Methodology

The empirical analysis for the project on *The Effects of the Economic Crisis on the Well-being of Households in Latin America and the Caribbean* was conducted using data from past crises, and various methodologies including a difference-in-difference approach, fixed

effects models, and an instrumental variables, depending on the availability of data at the country level and the peculiarities of each country's past crises episodes. Economic crises are defined as events of aggregate negative economic shock on the economy, characterized by a sharp decline of the GDP per capita of a country. The dimensions of households' well-being examined are those related to health, education, and poverty and which of these dimensions is studied in each country depends on the availability of data at the country level.

### 3.1. *Difference-in-Difference*

One of the methodologies used in the country case studies, particularly the case of Brazil and Peru, is a differences-in-difference approach that captures overall impacts of economic crises on the variables of interest using the following regression:

$$Y_{it} = \alpha + \beta T_i + \gamma D_t + \delta T_i^* D_t + \theta' X_{it} + \varepsilon_{it} \quad (2)$$

where  $Y_{it}$  is the outcome of interest,  $T_i$  is a group indicator variable that equals one if individual  $i$  was affected by the crisis (ie. if the individual was in the treatment group),  $D_t$  is an indicator variable that equals one for all time periods after the crises episode,  $X_{it}$  is a vector of control variables and  $\varepsilon_{it}$  is a vector of unobserved random variables associated with household outcomes. The parameter of interest is  $\delta$ , which captures the effect of the crisis on the household well-being outcomes of the treatment group. The "treated group" is defined as a group that is believed to be differently affected by the period of crisis (i.e. attended school during crises, was born during crisis, etc.). The counterfactual is defined as the outcome of interest for cohorts born immediately before and after the treatment cohort.

In the case of Brazil, to separate the age and cohort effects, an extension of equation (2) was used as in McKenzie (2003). The model takes the differences in an outcome of interest between two time periods to eliminate the cohort effects. Defining  $c_j$  as a birth cohort  $j$ ,  $a_j$  as the  $j$  age group and  $Y(c_j, a_j, t)$  as the outcome  $Y$  of cohort  $c$ , age group  $a$  and time  $t$ , we know that:

$$Y(c_j, a_j, t) = \alpha_{c_j} + \beta_{a_j} + \gamma_t + \varepsilon_{c_j, a_j, t} \quad (3)$$

where  $\alpha_{c_j}$  is the cohort effect,  $\beta_{a_j}$  the age effect,  $\gamma_t$  a time effect and  $\varepsilon_{c_j, a_j, t}$  an error term. If the crisis happens in time  $t = 1$ ,  $c_0$  is the cohort that we observed in  $t = 0$  (before the crisis) and  $t = 1$  (during

the crisis) and  $c_1$  is the cohort observed in  $t = 1$  and  $t = 2$ .  $c_0$  has the same age in  $t = 0$  than  $c_1$  in  $t = 1$ . To eliminate the cohort effect of  $c_0$  between years  $t = 0$  and  $t = 1$  then, we would differentiate equation (3) such that:

$$\Delta Y(c_0, a_j, t) = (\beta_{a_1} - \beta_{a_0}) + (\gamma_1 - \gamma_0) + \Delta \varepsilon_{c_0, a_j, t} \quad (4)$$

We do the same for  $c_1$  between  $t - 1$  and  $t = 2$ , and then differentiate both results to eliminate the age effect such that:

$$\Delta \Delta Y(c_j, a_j, t) = (\gamma_2 - \gamma_1) - (\gamma_1 - \gamma_0) + \Delta \Delta \varepsilon_{c_1, a_j, t} \quad (5)$$

The crisis effect is then given by the component  $(\gamma_2 - \gamma_1) - (\gamma_1 - \gamma_0)$ . It is the difference-in-difference of the time effects, once the cohort and age effects are netted out. The underlying assumption is that the changes in the age effects are constant across the years.

### 3.2. Fixed Effect Models

Another methodology used by a few of the country case studies, namely Argentina, Brazil, Jamaica and Mexico, is a fixed effect model to measure effects of changes in GDP (or its growth rate) on the outcome of interest exploring GDP variation across states or regions within a given country and over time. The specification is as follows:

$$Y_{ijt} = \beta_0 + \beta_1 GDP_{jt} + \theta' X_{ijt} + \eta_j + \phi_t + \varepsilon_{ijt} \quad (6)$$

where  $Y_{ijt}$  is the outcome of interest of individual  $i$ , region  $j$ , year  $t$ .  $X$  is a vector of control variables,  $\eta_j$  is the regional fixed effect,  $\phi_t$  is the year fixed effect, and  $\varepsilon_{ijt}$  is the error term. The parameter of interest is  $\beta_1$ , which captures the effect GDP on  $Y$ .

### 3.3. Instrumental Variables

In the fixed effect models, however, there is a potential identification problem if the outcome of interest and GDP are jointly determined. To avoid endogeneity, an instrumental variable approach was used when good instruments were available such that exogenous variation in GDP is introduced with no direct effect on  $Y$ . This approach is

particularly relevant in more specialized economies, such as Mexico and Jamaica as is specified later in the paper.

## 4. The Evidence

### 4.1. Argentina

A high level of debt has put Argentina in a particularly vulnerable situation in the current global economic downturn. Official statistics portray only a mild economic contraction for 2009. However, there is growing skepticism over the reliability of official data, and private surveys point towards an economic contraction of close to 3% of GDP.

Argentina has a long history of sharp macroeconomic crisis followed by periods of strong growth. The 2001-2002 crisis, the country's deepest recession in recent years, was characterized by a fall of 17% of per capita GDP and an increase in unemployment in the levels of 19 percent. This resulted in an increase of the official poverty rate from 38.3% in October 2001 to 53% in 2002 and it took the country over four years to return to pre-crisis poverty levels (Gasparini and Cruces, 2008).

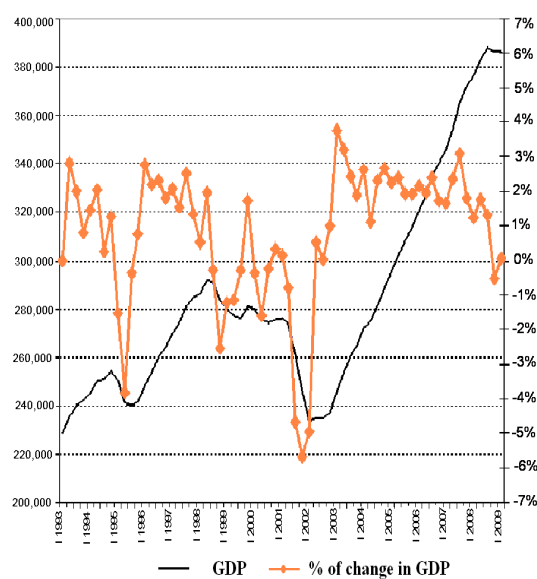
In order to forecast the effects of the current global economic crisis on outcomes related to the well-being of households in Argentina the analysis focuses on data from the 1999-2001 slump after the devaluation of the Brazilian Peso and the aforementioned 2001-2002 economic downturn. The following graph shows the evolution of GDP in Argentina since 1993 and the downturns and recoveries it has experienced.

The data for the analysis was gathered from various sources. For poverty and educational outcomes, the estimates come from the *Encuesta permanente de hogares* (EPH), a periodic household survey conducted by the *Instituto Nacional de Estadísticas y Censos* (INDEC) in Argentina. Health indicators come from the *Dirección de Estadísticas e Información de Salud* (DEIS) and INDEC. Per capita GDP is constructed using regional GDP time-series from provincial statistic offices and compiled by the Argentine office of the Economic Commission for Latin America and the Caribbean (ECLAC). Mortality data came from the INDEC. An important limitation is the lack of reliable updated data. There are no household surveys since mid-2007, and GDP growth figures are suspected to be unreliable since 2006.

A fixed effects model using provincial level data and weighted by provincial population for each outcome of interest is used to exploit

time and regional variability from a panel of GDP and outcomes. The model is also calculated differentiating between growth periods and recession periods in order to observe the asymmetry of the impacts on outcomes of interests during times of growth and of contraction.

**Figure 1**  
*Evolution of GDP in Argentina*



Source: Cruces, Glüzmann, and Lopez, 2009.

The results of the empirical analysis suggest that there is a strong relationship between the evolution of GDP in Argentina and poverty and health indicators. The results for education outcomes, however, are ambiguous.

A strongly significant negative relationship between the evolution of per capita GDP and both overall and child poverty is suggested by the results of the analysis. A one percent change in per capita GDP is associated with a change in child poverty of about -0.67 percentage

points and with a change in overall poverty of -0.48 percentage points, using a 2.50 USD poverty line. When differentiation between times of growth and contraction is introduced, the effects of changes in GDP on child poverty are lower in times of growth (-0.56) and larger in times of recession (-0.77). The same is true for overall poverty; growth decreases overall poverty by 0.38 percentage points, while recession increases overall poverty by 0.57 percentage points.

Results also show a significant and negative relationship between the evolution of per capita GDP and health outcomes. A decrease of one percent in per capita GDP is negatively associated with an increase in maternal mortality of 0.04 deaths per ten thousand live births and with an increase in child mortality of 0.04 deaths per thousand live births. When differentiation between growth and contraction periods is introduced, results show that while growth significantly reduces maternal mortality by 0.9 per ten thousand live births, recession does not significantly increase maternal mortality. The opposite is true for child mortality; growth does not significantly reduce child mortality, but recession can increase it by 0.12 deaths per thousand live births. The results for education indicators, however, are not significant at any of the education levels explored.

In order to provide an estimate of the effects of the current economic recession on household well-being indicators, the results from the above regression are extrapolated. Various alternative scenarios are considered for this exercise including an extrapolation of the official growth rate between the second quarter of 2008 and the second quarter in 2009 of -1.7% as the lower bound and an extreme scenario of -10% as an upper bound. Given these scenarios poverty could increase by between 1 and 5.7 percentage points respectively. The effect on child poverty could vary from 1.3 to 7.6 percentage points. Infant mortality and low weight at birth could increase by 0.2 and 0.5 percentage points in the most optimistic scenario, and by 1.2 and 25 percentage points respectively in the extreme scenario.

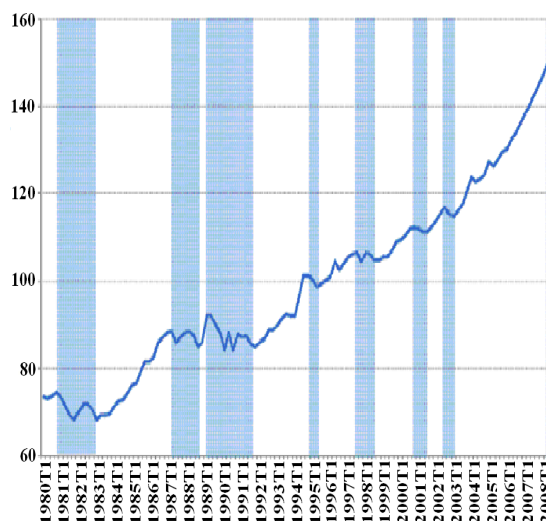
Results from empirical analysis in Argentina strongly suggest that the current economic crisis will have important long-term effects on the well-being of households, mainly on poverty and mortality. Of particular importance is the fact that results suggest that poverty increases at higher rates during recessions than those at which it falls in time of growth. Similarly, while child mortality increases during recessions, it does not decrease significantly in times of growth. This implies that even if Argentina's economic downturn plateaus in 2009 and GDP grows in 2010, it will take many years of sustained growth for the country to return to pre-crisis levels of household well-being.

4.2. *Brazil*

Brazil, the largest economy in Latin America, was strongly hit by the economic crises in the first quarter of 2009 but seemed to be staging a recovery by the second quarter. Overall the country has resisted the crisis better than other countries in the region, but prospects are still dim and GDP is expected to be flat in 2009.

Brazil has exhibited strong economic growth in the past ten years, but not without a number of crises episodes. Figure 2 shows the evolution of GDP in Brazil. The empirical analysis explores the 1987-1991 crises only. The main reason for this is that there is enough data from before and after the crisis to compare cohorts that attended school and were born during the crisis with those that attended school and were born before or after the crisis.

**Figure 2**  
*Evolution of GDP in Brazil*



Source: Firpo and Portela, 2009.

The empirical analysis focuses on estimating the impact of the crisis on school attendance, school delay, poverty and mortality; there is little existing literature about these topics in Brazil. Duryea and Arends-Kuenning (2003) study the effects of macroeconomic crises (namely that of 1981-1983 and that of 1990-1992) on education indicators in urban Brazil. They find no evidence that school enrollment changes significantly during crises periods. However, when they exploit variation across states, by exploring state level labor market conditions, they find that an increase in unskilled wages during crises was associated with decreases in the probability that a child was enrolled in school.

The data sets used for the empirical analysis come from the Brazilian Household Survey conducted annually by the Brazilian Bureau of Statistics (PNAD), and from the Demographic and Health Survey (DHS). A combination of methodologies was used in this analysis, including a difference-in-difference approach with cohort regressions to measure impacts on education and health, and a fixed-effects regression to measure impacts on poverty.

Results for education outcomes in Brazil indicate that economic downturns are associated with a decrease in school attendance, particularly for younger children, and an increase in the likeliness of school delays.

The results for school attendance show that children that were 7 years old during the crisis period had a 12.7 percentage point lower probability of attending school compared to children that were 7 years of age before the crisis. This effect is weaker for older children. Children that were 8 years old during a crisis period had a 1.8 percentage point lower probability of attending school compared to children that were 8 years of age before the crisis. For children that were eleven at the onset of the crisis, the effects on school attendance are not significant. Given that 7 is the official mandatory age for school enrollment in Brazil, the results suggest that the strongest impact of economic crises on education are for children that are about to enter the educational system and once the child is enrolled in school they are less likely to be withdrawn.

When looking at school delays, results suggest that children who were 7 years old during the crisis have an 18.4 percentage point higher probability of being delayed in school compared to 7 year olds who attended school before/after the crisis. For children over 11 ewho were affected by the crisis at age seven, the effect is much smaller, with a 1.1 percentage-point higher probability of being delayed in school compared to children that were 11-years-old who were 7 before or

after the crisis. The effect seems to be larger for boys than girls at all age groups.

The effects of economic downturns on child mortality are also significant. Results suggest that a child born during a crisis has a 0.9 percentage-point higher probability of dying during the first six months of life than a child not affected by the crisis. In Brazil the mortality rate of six month old children is 5%, thus the results suggest an 18% increase in the mortality rate of children in this age group. A child born during a crisis period has 1.6 percentage points higher probability of dying during the first month of life than a child born before or after the recession.

When exploring the effects of economic downturns on poverty, results suggest that a one percent decrease in per capita GDP is associated with a 0.113 percentage point increase in poverty and a 0.161 increase in poverty of children less than 7 years of age.

#### 4.3. *Jamaica*

Jamaica, like most of the Caribbean countries, is feeling the brunt of the global economic crisis mostly through downturns in tourism, remittances and weakened access to credit markets. However, a decrease in oil and food prices has countered some of the negative effects by improving the country's terms of trade. Already in 2008 Jamaica exhibited a contraction of its economy and according to ECLAC the contraction in 2009 will be of the magnitude of 3% of GDP.

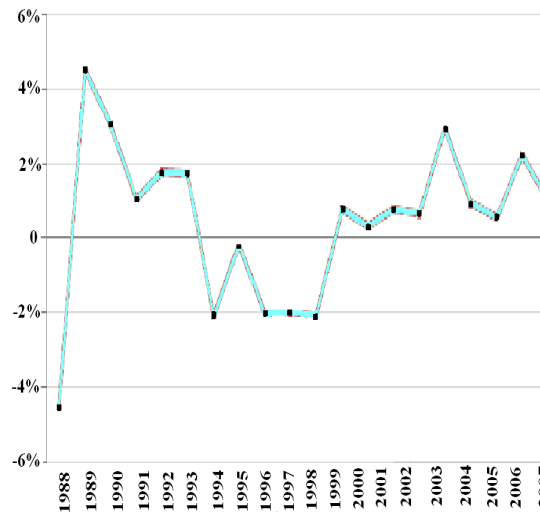
Jamaica has experienced weak economic growth since the beginning of the 1990s, interrupted by an inflation crisis in 1991-1992, when inflation reached levels of around 50 percent, and later by a deep financial crisis in 1995-1997, which resulted in government debt of about 150 percent of GDP by 2002. Figure 3 shows the evolution of GDP in Jamaica in the past few decades

The empirical analysis in Jamaica focuses on the effect of business cycles on enrollment and attendance at the primary and secondary school levels, and on immunization rates (for measles and tuberculosis), child diarrhea and Body Mass Index. The data comes from the Statistical Institute of Jamaica (STATIN) from 1988 to 2007.

The analysis uses a fixed effects model and introduces instrumental variables to overcome potential endogeneity of income and the outcomes of interest. The analysis uses the price variation of four main export commodities (sugar, banana, bauxite and alumina) as an exogenous instrument for GDP growth. The analysis conducts the

Hansen  $J$ -test and the Stock and Yogo (2002) weak instruments test, both of which indicate that the instruments are valid. The regression is also performed using lagged growth rates (growth rate of previous period) in order to measure if the crisis has delayed effects on household well-being.

**Figure 3**  
*Evolution of GDP in Jamaica*



Source: Kim and Serra, 2009.

When looking at the results for education indicators, it is important to take into account that Jamaica achieved full enrollment in primary school in 2007. Enrollment in secondary school is also high, particularly for the first three years, grades 7-9, where it reached levels of 98% in 2007. Enrollment in higher secondary school, grades 10-11, is around 93.5 percent. Enrollment at every level has been consistently high for the past ten years.

The results suggest mixed effects of economic downturns on schooling, depending on the grade levels. Results for primary school enrollment are significant only when lagged growth rates are used. A one percent decrease in GDP is associated with a 0.26 percentage points decrease in primary school enrollment in subsequent periods. However, secondary school enrollment seems to be inversely and significantly affected by economic downturns. When the growth rate change in the previous period is negative, then secondary school enrollment increases. A one percent decrease in GDP growth is associated with a 0.42 percentage point increase in secondary school enrollment. When GDP is instrumented this effect is no longer significant. The effect of GDP growth on enrollment at higher secondary levels (grades 10-11) is not significantly different from zero.

Although results suggest that GDP growth has mixed effects on enrollment depending on the school grades, lower growth rates are strongly associated with higher school attendance in Jamaica. Results suggest attendance in primary school increases when growth rates decrease in previous period. In short, the regression analysis reveals heterogeneous impacts of growth fluctuations on education indicators. Slow growth seems to lower primary enrollment rate with time lag but at the same time increase secondary school enrollment rates. Attendance is strongly and negatively affected by economic growth.

When looking at health indicators we see that the impact of growth on immunization is mixed. Measles immunization and body mass index do not seem to be affected by growth rates. Counter intuitively, positive growth rates seem to have a negative impact on the share of children that receive the BG Immunization and on child diarrhea. Illness rates seem to be weakly affected by growth. When instrumented, a one percent decrease in per capita GDP growth rates is associated with a 1.51 percentage point increase in illness rates. The effect of growth on immunization and health indicators in Jamaica is thus mixed.

#### 4.4. *Mexico*

Mexico's downturn due to the global economic crisis seems to be the deepest among the economies in the region. A number of factors have contributed to this steep economic decline including, among others, Mexico's strong commercial relations with the US, a deterioration of its terms of trade particularly due to a decline in oil prices, and a steep decline in incoming tourism and remittances.

Mexico, like most of the region, has been hit by a number of crises, both internal and external, in the past couple of decades. These crises have had important social impacts in the Mexican population which our empirical analysis will explore. However, over the last decade there has been significant growth in social protection programs, particularly conditional cash transfer programs which are now the centerpiece of the country's poverty reduction strategy. The presence of these programs is likely to mitigate the effects of the current crisis on social outcomes, although the extent is uncertain.

The empirical analysis focuses on the impact of economic crises on mortality in Mexico. The existing literature on the effects of economic downturns on mortality presents contradicting hypothesis. Cutler *et al.* (2002) conclude that mortality rates follow counter-cyclical patterns in Mexico, especially among infants and the elderly. Gonzalez and Quast (2009), inversely conclude that mortality rates in Mexico are procyclical.

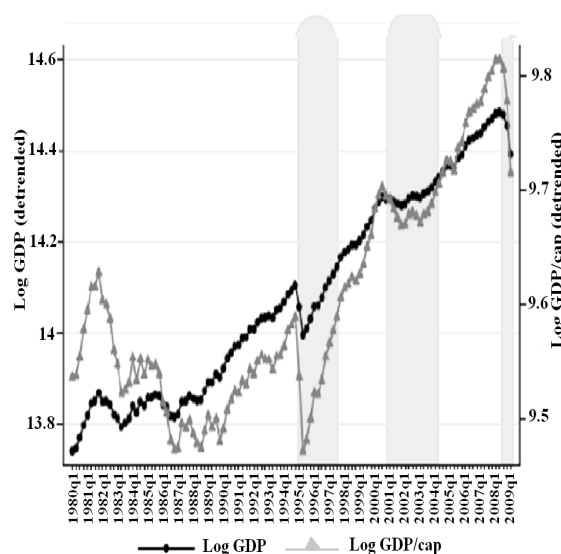
The data used for the empirical analysis comes from administrative death records from vital statistics, which contains information about deaths that occurred from 1985 to 2007 in the following age groups by gender: neonatal (one month or less), infants (a year or less), children (5 years or less) and total deaths. It also includes information about child deaths due to nutritional deficiencies, and maternal deaths. Due to data availability the analysis focuses on two crises: the 1995 Peso Crisis triggered by the devaluation of the Mexican Peso; and the financial crisis of 2000. Figure 4 shows the evolution of GDP in Mexico.

The analysis uses a fixed effects model as the one described in the methodology section. To overcome the potential endogeneity of GDP with respect to the outcomes of interest, two sets of instrumental variables, related to the fact that manufacturing was the most affected sector in both crises, are used. One is the share of manufacturing on the state's GDP in 1985 and the second is the distance of the state's capital to the closest US port of entry. These instruments exploit the variations in the impacts of the crises across states. Both of the instruments are interacted with period dummies defined as pre-crisis, 1995 crisis, inter-crisis and 2000 crisis to introduce time variation. A first stage regression shows that those states farther away from the US and those with lower shares of manufacturing experienced a smaller decrease in economic activity during the 1995 and 2000 crisis as compared to the states closer to the border.

However, a first set of regressions revealed that the coefficients from the two different sets of instrumental variables are quantita-

tively different, though they always have the same sign. The share of manufacturing in 85 almost consistently produces higher coefficients than the distance to closest US port. To overcome this, the model introduced the following additional controls: the share of population with education, health expenditure per capita and interstate and international migration rates.

**Figure 4**  
*Evolution of GDP in Mexico*



Source: Arceo, 2009.

The results of the analysis strongly suggest that mortality at every age group of interest has a countercyclical behavior. For neonatal mortality, a one percent decrease in GDP is significantly associated with an increase of 0.011 female neonatal deaths and 0.015 male neonatal deaths per thousand live births per month. Results are stronger for infant mortality (up to one year of age), where a one percent decrease in GDP is significantly associated with an increase

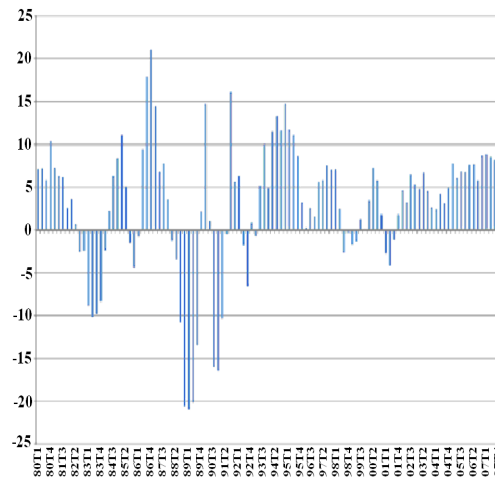
of between 0.021 female deaths and 0.028 male deaths per thousand live births per month.

#### 4.5. *Peru*

Peru is one of the few countries in the region where GDP is expected to continue growing in 2009, although at much lower rates than in the past few years. For the past 3 years, Peru grew at rates around 9%, reaching almost 10% growth in 2008. Forecast for 2009 are around 1% GDP growth.

Like other countries in the region, Peru has suffered deep crises in the past few decades. Since 1980 there have been four clear crises episodes on which this analysis will focus: 1982-1983 caused by a combination of domestic, external and climatic shocks; 1988-1992 characterized by hyperinflation that reached levels of 2 000 percent for the year in 1988; 1998-1999 a less dramatic crisis cause mainly by external factors; and 2001 an external and short crisis. Figure 5 summarizes the evolution of GDP in Peru.

**Figure 5**  
*Annualized per capita GDP growth rate (%) in Peru*



Source: Agüero and Valdivia, 2009.

A few studies have focused on the impact of the 1988-1992 crisis in Peru. Most notably, Paxson and Schady (2004) analyze the impact of this profound crisis on child mortality. They find an increase of about 2.5 percentage points in infant mortality rates for children born during the crisis, which implies around 17 000 additional deaths induced by the crisis. The analysis conducted for our project builds on these results, introducing a variable we call mothers fixed effects to distinguish between deaths associated with the crises themselves, and those due to the potential self-selection of mothers who have children during crises.

Our case study for Peru focuses on the effects of the above mentioned crises on infant mortality, child nutrition and prenatal care. The empirical analysis uses data from five Peruvian Demographic and Health Surveys (DHS) carried-out between 1988 and 2004 by the Peruvian National Institute of Statistics (INEI for its initials in Spanish), and a continuous survey thereafter. The DHS contains information about birth history as well as health of mother and child and other socioeconomic variables.

However, the data does not allow for the introduction of regional fixed effects because the survey does not ask the mother to identify the child's birthplace, it just indicates the location of the mother at the time of the survey. Thus, the analysis uses a difference-in-difference approach, comparing mortality rates of siblings born before/after a crisis with those born during crisis years to capture mothers' observed and unobserved characteristics. The specified model is as follows:

$$y_{imt} = \alpha + \beta \ln(GDP_t) + g(t) + \theta' x_{imt} + \mu_m + v_{imt} \quad (7)$$

Where  $y_{imt}$  is the health outcome of child  $i$  born to mother  $m$  at time  $t$ ,  $x_{imt}$  is a vector of child and mother characteristics, and  $g(t)$  captures several functional forms (namely linear, quadratic and cubic) that were explored,  $\mu_m$  captures unobserved characteristics of the mother and  $v_{imt}$  is the error term. The parameter of interest is  $\beta$ . For  $\beta$  to be unbiased the analysis assumes that mother's unobserved characteristics are time invariant and that the sample of population studied (mothers with children born during and before/after a crisis) is not different from the population at large.

Results suggest that economic crises are strongly related with increases in child mortality in Peru. A one percent decrease in GDP per capita is associated with an increase in child mortality of 0.27 per thousand live births. This implies an elasticity of child mortality of -0.39 for children 0 to 12 months old. Interestingly, the effects vary

by the level of the mother's education. Children born to uneducated mothers during crises have mortality rates 0.67 deaths per thousand live births higher than those born to the same mother in times of growth. This is much higher than children born during crises to mothers with secondary education or higher who exhibit child mortality rates only 0.08 per thousand live births higher than their siblings born outside of crises episodes. This implies that the effect of the crises have distributional implications, affecting households with mothers with less education more strongly than those with educated mothers.

When calculating the effects of crises on mother prenatal care, three measures are considered: proportion of women with access to prenatal care, number of prenatal visits during a pregnancy, and the proportion of women who had four or more prenatal visits (four being considered the standard number of visits). Results suggest that economic growth is not significantly associated with the probability of a mother attending a prenatal visit, but it is positively related to the number of visits and the probability of having four or more visits. A one percent decline in GDP per capita reduces the number of prenatal visits by 0.008 which implies an elasticity of 0.28 of prenatal visits for a one percent change in GDP, given that the average number of visits for the sample is 2.8. A one percent decrease in GDP reduces the probability of a mother having four or more prenatal visits by 0.31 percent.

When looking at the effects of the economic contraction on height-for-age z-scores of children up to six years of age, results suggest significant effects. A one percent decrease in GDP per capita is associated with a decline in child's z-scores by 0.21 percent. However, the effects for stunting (z-score of -2 or more) are not significant.

A key issue to consider when using these results to predict the effects of the current economic downturn is that women today have more access to education in Peru. Additionally, women overall have access to more "knowledge" about good health practices. Thus, past measures might be an upper bound for forecasting the impacts of the global economic crises on child health indicators.

The results show that previous crises in Peru had negative effects on child health, child height-for-age and prenatal care.

## 5. Conclusions

The empirical evidence explored in this paper indicates that economic downturns have significant impacts on the long-term well-being of

households. In all of the five countries studied, economic downturns have a negative impact on child mortality or child health. For those countries in which the effects of the crises on poverty are examined, there is also strong evidence that recessions are associated with increases in child and overall poverty. Results on education however, are ambiguous. Some evidence suggests that greater school delays are associated with recession, but attendance in some cases seems to increase in times of crisis. This evidence suggest that households cope with decreasing income by substituting health services and, although less clearly, delaying education, for immediate consumption.

To prevent temporary household coping mechanisms from affecting future consumption, we propose integrated social policies that prevent reversals in the stock and the accumulation of income-generating household assets. These should protect the income of poor households while maintaining or expanding basic health and education services during economic downturns and providing incentives for the accumulation of income-generating assets for future generations. Pro-poor crises management needs to make sure that episodes of transitory poverty, prompted by economic downturns such as the one we are currently experiencing, do not evolve into structural deprivation due to the absence of well designed policy instruments.

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**Table A1**  
*Summary of empirical analysis from country case studies*

| <i>Argentina, 1990–2001, 2001–2002 (crisis years)</i> |             |                     |                   |                                                                              |                                                                         |
|-------------------------------------------------------|-------------|---------------------|-------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| <i>Outcome of interest</i>                            | <i>Data</i> | <i>Indicator</i>    | <i>Age groups</i> | <i>Definition</i>                                                            | <i>Method</i>                                                           |
| Education                                             | EPH         | School attendance   | 6–12; 13–17       | Attendance rate for individuals in age group                                 | Fixed effects model differentiated between growth and recession periods |
|                                                       |             | School delay        | 6–12; 13–17       | Years of school delay for individuals in age group                           |                                                                         |
|                                                       |             | Years of schooling  | 6–12; 13–17       | Years of school completed by individuals in age group                        |                                                                         |
| Health                                                | INDEC, DEIS | Maternal mortality  | NA                | Maternal deaths for each 10 000 live births                                  | Fixed effects model differentiated between growth and recession periods |
|                                                       |             | Infant mortality    | 0–12 months       | Child deaths for each 1 000 live births                                      |                                                                         |
|                                                       |             | Low weight at birth |                   | Children weighing less than 2 500 grams at birth, for each 1 000 live births |                                                                         |
| Poverty                                               | EPH         | Child poverty       | 0–12              | Poverty headcount using 2.5 PPP poverty line                                 | Fixed effects model differentiated between growth and recession periods |
|                                                       |             | Total poverty       | NA                | Poverty headcount using 2.5 PPP poverty line                                 |                                                                         |

Table A1  
(continued)

| Brazil, 1987-1991 (crisis years)             |                                                |                    |                                  |                                                                   |                                                |
|----------------------------------------------|------------------------------------------------|--------------------|----------------------------------|-------------------------------------------------------------------|------------------------------------------------|
| Outcome of interest                          | Data                                           | Indicator          | Age groups                       | Definition                                                        | Method                                         |
| Education                                    | PNAD                                           | School delay       | 7-11                             | Child is at least one year delayed                                | Difference-in-Difference and Cohort regression |
| Health                                       | DHS                                            | School attendance  | 7-11                             | Child is enrolled in school                                       |                                                |
|                                              |                                                | Child mortality    | 0-12 months                      | Proportion of children who died within first year                 |                                                |
|                                              |                                                | Infant mortality   | 0-6 months                       | Proportion of children who died within first six months           |                                                |
| Poverty                                      | PNAD                                           | Neonatal mortality | 0-1 month                        | Proportion of children who died within first month                | Fixed effects regression                       |
|                                              |                                                | Child poverty      | 0-7                              | Household per capita wealth is less than R\$100                   |                                                |
|                                              |                                                | Total poverty      | Total population                 | Household per capita wealth is less than R\$100                   |                                                |
| Jamaica, 1991-1992, 1995-1997 (crisis years) |                                                |                    |                                  |                                                                   |                                                |
| Education                                    | Jamaican survey of living conditions 1989-2007 | School enrollment  | Primary, secondary 7-9 and 10-11 | Whether child was enrolled in school during current academic year | Panel regression and instrumental variables    |

Table A1  
(continued)

| <i>Outcome of interest</i>               | <i>Data</i>                                        | <i>Indicator</i>                      | <i>Age groups</i>                | <i>Definition</i>                                                            | <i>Method</i>                              |
|------------------------------------------|----------------------------------------------------|---------------------------------------|----------------------------------|------------------------------------------------------------------------------|--------------------------------------------|
| Health                                   |                                                    | School attendance                     | Primary, secondary 7-9 and 10-11 | Number of days the child was sent to school in the last week divided by five |                                            |
|                                          |                                                    | Immunization rates                    |                                  | Immunization rates for measles and tuberculosis                              |                                            |
|                                          |                                                    | BMI                                   |                                  | Body mass index                                                              |                                            |
|                                          |                                                    | Child diarrhea illness rate           |                                  | Child diarrhea rate illness rate                                             |                                            |
| <i>Mexico, 1995, 2000 (crisis years)</i> |                                                    |                                       |                                  |                                                                              |                                            |
| Health                                   | Administrative death records from vital statistics | Child mortality                       | 0-1, 0-12 month, 0-5 years       | Deaths per thousand live births per month                                    | Fixed effects using instrumental variables |
|                                          |                                                    | Maternal mortality<br>Total mortality |                                  | Deaths per thousand live births<br>Deaths per hundred thousand in population |                                            |

Table A1  
(continued)

| <i>Outcome of interest</i>                                        | <i>Data</i>                                 | <i>Indicator</i>                                                            | <i>Age groups</i>                                         | <i>Definition</i>                                                                                                                                                                                                                                                         | <i>Method</i>            |
|-------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <i>Peru, 1982-1983, 1988-1992, 1998-1999, 2001 (crisis years)</i> |                                             |                                                                             |                                                           |                                                                                                                                                                                                                                                                           |                          |
| Health                                                            | DHS 1992, 1996, 2000 and ongoing since 2004 | Infant mortality<br><br>Height-for-age z-score<br><br><br><br>Prenatal care | 0-12 month<br><br><br><br><br><br><br><br><br><br>Under 5 | Deaths per thousand live births<br><br><br>Height-for-age (HAZ) measures for children under the age of 6<br><br>Proportion of women with access to prenatal care, number of prenatal visits during a pregnancy, and proportion of women who had 4 or more prenatal visits | Difference-in Difference |

**Table A2**  
*Findings from empirical analysis from the country case studies*

| <i>Indicators</i>       | <i>Findings</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         | <i>Argentina</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| School attendance 6-12  | Results are not significantly different from zero                                                                                                                                                                                                                                                                                                                                                                                                                 |
| School attendance 13-17 | Results are not significantly different from zero                                                                                                                                                                                                                                                                                                                                                                                                                 |
| School delay 6-12       | Results are not significantly different from zero                                                                                                                                                                                                                                                                                                                                                                                                                 |
| School delay 13-17      | Results are not significantly different from zero                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Years of schooling      | Results are not significantly different from zero                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Maternal mortality      | Without differentiation between periods of growth and recession, a one percent decrease in per capita GDP is associated with an increase of 0.04 deaths per 10 000 live births. When differentiated, a one percent increase in per capita GDP is significantly associated with a reduction in maternal mortality by 0.9 deaths per 10 000 live births, while a one percent decrease in GDP is not significantly associated with an increase in maternal mortality |
| Children mortality      | Without differentiation between periods of growth and recession, a one percent decrease in per capita GDP is associated with an increase of 0.04 deaths per 1 000 live births. When differentiated, a one percent decrease in GDP is significantly associated with an increase in child mortality by 0.12 deaths per 1 000 live births while a one percent increase in per capita GDP is not significantly associated with a reduction in child mortality         |
| Low weight at birth     | Without differentiation between periods of growth and recession, a one percent decrease in per capita GDP is associated with an increase of 0.21 of low weight at birth cases 1 000 live births. When differentiated, a one percent decrease in GDP is significantly associated with an increase                                                                                                                                                                  |

**Table A2**  
(continued)

| <i>Indicators</i>                | <i>Findings</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Child poverty                    | in low weight at birth case by 0.25 cases per 1 000 live births while a one percent increase in per capita GDP is not significantly associated with a reduction in low weight at birth<br>Without differentiation between periods of growth and recession, a one percent change in per capita GDP is associated with a change in child poverty of -0.67 percentage points. When differentiated, a one percent decrease in GDP is significantly associated with an increase in child poverty by 0.77 percentage points while a one percent increase in per capita GDP is significantly associated with a reduction in child poverty by 0.56 percentage points |
| Total poverty                    | Without differentiation between periods of growth and recession, a one percent decrease in per capita GDP is associated with an increase in poverty of 0.48 percentage points. When differentiated, a one percent decrease in GDP is significantly associated with an increase in poverty by 0.57 percentage points while a one percent increase in per capita GDP is significantly associated with a reduction in poverty by 0.38 percentage points                                                                                                                                                                                                         |
| <i>Brazil</i>                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| School attendance 7 years of age | Children who were 7 years old during a crisis period had 12.7 percentage point lower probability of attending school compared to children that were 7 years of age before/after the crisis.<br>When examined separately, boys that were 7 years old during the crisis had 12.6 percentage point lower probability of attending school than boys of the same age before the crisis, while girls had a 12.8 percentage point lower probability of attending school                                                                                                                                                                                             |

**Table A2**  
(continued)

| <i>Indicators</i>                 | <i>Findings</i>                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| School attendance 8 years of age  | Children who were 8 years old during a crisis period had a 1.8 percentage point lower probability of attending school compared to children that were 8 years of age before/after the crisis. When examined separately, boys who were 8 years old during the crisis had 2.2 percentage point lower probability of attending school than boys of the same age before the crisis, while girls had a 1.4 percentage point lower probability of attending school |
| School attendance 9 years of age  | No significant effect of the crisis on school attendance of 9 year olds was observed                                                                                                                                                                                                                                                                                                                                                                        |
| School attendance 10 years of age | No significant effect of the crisis on school attendance of 10 year olds was observed                                                                                                                                                                                                                                                                                                                                                                       |
| School attendance 11 years of age | Children that were 11 years old during a crisis period had a 1.5 percentage point lower probability of attending school compared to children that were 11 years of age before/after the crisis. When examined separately, the effect on boys was not significant, while girls had a 1.6 percentage point lower probability of attending school than girls who were the same age before or after the crisis                                                  |
| School delay 7 years of age       | Children who were 7 years old during a crisis period had an 18.4 percentage point higher probability of being held back in school compared to children who were 7 years of age before/after the crisis                                                                                                                                                                                                                                                      |
| School delay 8 years of age       | Children over 8 who were affected by the crisis at age 7 have a 4.4 percentage point higher probability of being delayed in school compared to children over 8 who were not affected by the crisis when they were 7 years old                                                                                                                                                                                                                               |

**Table A2**  
(continued)

| <i>Indicators</i>                     | <i>Findings</i>                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| School delay 9 years of age           | Children over 9 who were affected by the crisis at age 7 have a 5.1 percentage points higher probability of being delayed in school compared to children over 9 who were not affected by the crisis                                                                                                                                                                              |
| School delay 10 years of age          | Children over 10 who were affected by the crisis at age 7 have a 3.8 percentage point higher probability of being delayed in school compared to children over 10 not affected by the crisis                                                                                                                                                                                      |
| School delay 11 years of age          | Children who were 11 during a crisis period had a 1.1 percentage point higher probability of being delayed in school compared to children who were 11 before/after the crisis. Children older than 11 who were affected by the crisis at age 7 have a 1.1 percentage point higher probability of being delayed in school compared to children over 11 not affected by the crisis |
| Child mortality (up to 1 year)        | No significant results were observed                                                                                                                                                                                                                                                                                                                                             |
| Child mortality (up to 6 months)      | A child born during a crisis period has 0.9 percentage point higher probability of dying during the first six months of life than a child born before the recession                                                                                                                                                                                                              |
| Child mortality (up to 1 month)       | A child born during a crisis period has 1.6 percentage point higher probability of dying during the first month of life than a child born before the recession                                                                                                                                                                                                                   |
| Total poverty                         | A one percent decrease in GDP is associated with an increase in poverty by 0.113 percentage points                                                                                                                                                                                                                                                                               |
| Poverty in children below 7 years old | A one percent decrease in GDP is associated with an increase in poverty for children under 7 years of age by 0.161 percentage points                                                                                                                                                                                                                                             |

**Table A2**  
(continued)

| <i>Indicators</i>                   | <i>Findings</i>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | <i>Jamaica</i>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| School enrollment primary           | A one percentage point decrease in per capita growth rate in previous period is associated with a 0.17 percentage point decrease in primary enrollment in the current period. When using commodity prices as instruments for growth, the change in school enrollment is 0.26 percentage points                                                                                                                                                          |
| School enrollment secondary (7-9)   | The results for the effect of economic growth on secondary enrollment (7-9) are ambiguous and not significant. Lagged growth rates seem to have a negative effect on secondary school enrollment. A one percentage point decrease in GDP growth per capita is associated with a 0.42 percentage point increase in secondary enrollment. Results for the IV estimations are not significant                                                              |
| School enrollment secondary (10-11) | Results for secondary enrollment (10-11) are not statistically significant and ambiguous                                                                                                                                                                                                                                                                                                                                                                |
| School attendance primary           | A one percentage point decrease in GDP per capita growth rate is strongly associated with a 1.45 percentage point increase in primary school attendance, although results are not significant when growth rates are instrumented. A one percentage point decrease in GDP per capita growth rate in previous period, is significantly associated with a 1.4 (panel regression) or a 1.66 (IV) decrease in primary school attendance in subsequent period |
| School attendance (7-9)             | A one percentage point decrease in GDP per capita growth rate is strongly associated with a 1.48 percentage point increase in primary school attendance, although results are not significant when growth rates are instrumented. A one percentage point decrease in GDP per capita                                                                                                                                                                     |

**Table A2**  
(continued)

| <i>Indicators</i>                        | <i>Findings</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| School attendance<br>(10-11)             | <p>growth rate in previous period, is significantly associated with a 1.44 (panel regression) or a 1.83 (IV) decrease in primary school attendance in subsequent period</p> <p>The effects of economic downturns are higher for higher grades. A one percentage point decrease in GDP per capita growth rate is strongly associated with a 1.93 percentage point increase in primary school attendance, although results are not significant when growth rates are instrumented. A one percentage point decrease in GDP per capita growth rate in previous period, is significantly associated with a 1.77 (panel regression) or a 2.32 (IV) decrease in primary school attendance in subsequent period</p> |
| Measles immunization<br>BCG immunization | <p>Results suggest that measles immunization is not affected by growth rates</p> <p>Growth rate in current period has negative impact on the share of children that receive the BMI immunization. A one percent increase in per capita GDP growth rate is associated with a decrease of 0.98 percentage points in the share of children immunized. The lagged growth rate, however, has a positive impact on the immunization. A one percentage point increase in previous period GDP per capita growth, increases immunization by .55 percentage points</p>                                                                                                                                                |
| BMI<br>Child diarrhea                    | <p>No evidence was found that BMI was affected by growth rates</p> <p>Child diarrhea is likely to be affected only by lagged growth rates when growth is instrumented by commodity prices. A one percentage point decrease of GDP per capita growth in previous period is associated with a 1.24 percentage point decrease in child diarrhea</p>                                                                                                                                                                                                                                                                                                                                                            |
| Illness rate                             | <p>Illness rates are weakly affected by growth. A one percentage point change in per capita GDP growth rates is negatively associated with a 1.51 change in illness rates. This is only significant</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

**Table A2**  
(continued)

| <i>Indicators</i>               | <i>Findings</i>                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | when growth rates are instrumented. Lagged growth rates are positively associated with illness rates                                                                                                                                                                                                                                                                |
|                                 | <i>Mexico</i>                                                                                                                                                                                                                                                                                                                                                       |
| Neonatal mortality 0 to 1 month | A one percent decrease in GDP is significantly associated with an increase, on average, of 0.011 female neonatal deaths and 0.015 male neonatal deaths per thousand live births per month                                                                                                                                                                           |
| Infant mortality 0 to 12 months | For children up to one year of age, a one percent decrease in GDP is significantly associated with an increase, on average, of 0.021 female deaths and 0.028 male deaths per thousand live births per month. This results imply an increase of 1.73 and 1.84 percent in the mortality rate of females and males respectively, for every one percent decrease in GDP |
| Child mortality 0 to 5 years    | For children up to five years of age, a one percent decrease in GDP is not significantly associated with an increase of in female deaths, however it is significantly associated with an increase of 0.003 male death per thousand live births per month                                                                                                            |
| Malnutrition 0 to 5 years       | For children up to 5 years of age, a one percent decrease in GDP is associated with a 2 to 4 percent increase in mortality due to deficient nutrition                                                                                                                                                                                                               |
| Maternal mortality              | Results for effects of the business cycle on maternal mortality suggest that a one percent decrease in GDP is associated with an increase of between 0.0005 maternal deaths per thousand live births per month                                                                                                                                                      |
| Total mortality                 | A one percent decrease in GDP is significantly associated with an increase of 0.11 female deaths and 0.15 male deaths for every hundred thousand in the population per month                                                                                                                                                                                        |

**Table A2**  
(continued)

| <i>Indicators</i>            | <i>Findings</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | <i>Peru</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Infant mortality 0-12 months | <p>A one percent decrease in GDP per capita is associated with an increase in child mortality of 0.27 deaths per thousand live births. This implies an elasticity of infant mortality of -0.39. These effects vary significantly according to mother education levels. For children born to uneducated mothers during a recession, a one percent decrease in GDP per capita is associated with an increase in child mortality of 0.67 deaths per thousand live births, compared to a sibling not born during a recession. For children born to mothers with primary education, a one percent decrease in GDP per capita is associated with a 0.17 additional deaths per thousand live births. For children born to mothers with secondary school the effect is even smaller, a one percent decrease in GDP per capita is associated with an increase in child mortality of 0.08 deaths per thousand live births. The results do not vary significantly when distinguished by gender</p> |
| Height-for-age z-score       | <p>A one percent decrease in GDP per capita is associated with an increase the z-score of a child, born during a crisis, by 0.0033 percent, relative that of a sibling not born during a recession</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Prenatal care                | <p>A one percent decrease in GDP reduces the number of visits by 0.008, or 0.28 percent, and the probability of having 4 visits or more by 0.31 percent</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |