Aggregate Economic Shocks and Infant Mortality: New Evidence for Middle-Income Countries[1]

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Abstract

We provide country-specific estimates of the effect of macroeconomic shocks on infant mortality for a sample of mainly middle-income countries. In most countries, infant mortality appears to be procyclical or acyclical. Only when shocks to GDP are very deep, 15 percent or larger, are they consistently associated with higher mortality.

[1] We thank Francisco Ferreira, Deon Filmer and Jed Friedman for their comments. All remaining errors are our own.

1. Introduction

How do negative shocks to GDP affect child health? The empirical literature from low-income countries suggests that child health worsens when there are negative income or weather shocks—see, for example, Bhalotra (2008) on India. This stands in sharp contrast with the literature for the United States, where child health has been found to improve during recessions (Chay and Greenstone 2004; Dehejia and Lleras-Muney 2005). There is less consensus about what happens in middle-income countries: Paxson and Schady (2005) show that infant mortality spiked sharply during a deep recession in Peru in the late 1980s. On the other hand, Miller and Urdinola (2007) use arguably exogenous variation in the price of coffee to show that infant mortality rises when prices (and incomes) increase in coffee-growing areas in Colombia.

In this paper, we use Demographic and Health Surveys (DHS) to revisit the relationship between income shocks and infant mortality in a sample of developing countries. Our focus is outside Sub-Saharan Africa, where the harmful effects of negative shocks have been well documented (Hoddinott and Kinsey 2001; Jensen 2000; Friedman and Schady 2009). The analysis is limited to countries which meet the following criteria: (1) they allow us to construct an infant mortality series of at least 10 years; and (2) they have experienced at least two years of negative growth over the relevant period. This gives us 17 countries to work with, 12 of which fit the World Bank category of "middle-income" at the beginning of the period we analyze (Bolivia, Brazil, Colombia, Dominican Republic, Guatemala, Jordan, Morocco, Paraguay, Peru, Philippines, and Turkey) while another 6 are "low-income" (Armenia, Haiti, Indonesia, Nepal, Nicaragua, and Pakistan).

2. Data and estimation

The DHS ask women a set of questions about the date of birth, current vital statistics, and date of death (if deceased) of all children ever born. We use the responses to these questions to construct retrospective birth and death histories for every woman in the surveys. Our measure of infant mortality is

the fraction of children born in a given country and year who die in their first year of life. We discard information for children born within 12 months of the survey to avoid complications with censored data.

Although the DHS are a rich source of data, they have some limitations for our analysis because of the use of *retrospective* information. First, recall bias may be a concern if women are less likely to accurately remember more distant births and deaths. To minimize recall errors, we do not use information on births that occurred more than 11 years prior to the date of the survey. Second, any given survey is representative of women ages 15-49 at the time of the survey, but is not representative of all births and child deaths in earlier years. To avoid this problem, we discard from the sample births to women age 40 or older. Our analysis therefore provides meaningful estimates of the relationship between income fluctuations and infant mortality for women aged 15 to 39.

Table 1 gives the list of countries, surveys, and years we use for our analysis. The data on per capita GDP are taken from World Bank (2009), and correspond to real per capita GDP in 2000 US dollars, adjusted for differences across countries in purchasing power parity (PPP).

3. Results

To begin, we graph the association between infant mortality and per capita GDP for three fairly "representative" countries in Figure 1. In Peru, infant mortality appears to be above trend during two deep recessions—in the early and late 1980s, respectively. In Turkey, by contrast, infant mortality seems to be below trend during recessions in 1989, 1994, 1999, and 2001, suggesting a pro-cyclical relationship in mortality. Finally, in the Philippines it is hard to discern any clear relationship between infant mortality and GDP.

We summarize country-specific changes in mortality during periods of economic growth and contraction in Table 2. The table shows that in 5 countries in our sample, the average year-on-year decline in infant mortality was larger when growth was positive than when it was negative. This is not the case, however, for the other 12 countries, where declines in infant mortality were larger in recessions than

during expansions. (Results are very similar when we consider proportional rather than absolute changes in mortality.)

Our main set of results is presented in Table 3. We account for underlying trends in infant mortality and GDP in two distinct ways. In one approach, we separately remove country-specific quadratic trends from the infant mortality and log GDP series, and then regress the infant mortality residuals on log GDP residuals. In our second approach, we regress the change in the infant mortality rate on the change in log GDP. In both cases, we present results with and without adjusting for possible compositional changes in the sample of women giving birth.[2]

Table 3 shows that there is only one country, Armenia, in which the relationship between infant mortality and GDP is consistently counter-cyclical and significant at conventional levels: A 1 percent decline in GDP is associated with an increase in infant mortality of between 0.17 and 0.25 per thousand children born. In two other countries, Peru and Indonesia, infant mortality also appears to be counter-cyclical, although the coefficients are not generally significant at conventional levels. In three countries, Colombia, Pakistan, and Turkey, there is clear evidence of a procyclical relationship between aggregate income and infant mortality. In Turkey, for example, a 1 percent increase in GDP is associated with an increase in infant mortality of between 0.57 and 0.79 per thousand children born. In other countries in the sample, it is hard to draw firm conclusions about the sign or magnitude of the association between GDP and mortality—either because the coefficients are nowhere near conventional levels of significance (as is the case, for example, for Brazil), or because they change considerably in magnitude and significance depending on the specification (as is the case, for example, for the Dominican Republic and Nicaragua). Table 3 also shows that adjustments for changes in the observable characteristics of women giving birth have negligible effects on our estimates.

[2] The estimations that adjust for compositional changes calculate the proportion of births that take place to women in 5 age groups, two educational categories, and by urban-rural location over the entire period for which data on births are available. We then reweight the data for each year so the fractions correspond to the averages for the entire period for that country.

What distinguishes Armenia, Peru, and Indonesia from the other countries in our sample? We conjecture that the magnitude of the negative shocks to GDP may account for the patterns we observe. The largest four year-on-year contractions in GDP in our data took place in these countries. Between 1991 and 1992, per capita GDP in Armenia contracted by 52.4 percent, and by a further 6.9 percent in the following year; infant mortality increased from 51 to 62 per thousand between 1991 and 1993, and declined steadily thereafter. In Peru, GDP contracted by 16.5 percent between 1981 and 1983; during this period, infant mortality increased from 74 to 97 per thousand. Peru faced a second severe crisis in the late 1980s, with GDP contracting by 19.7 percent between 1988 and 1990; infant mortality increased from 61 to 70 per thousand. In Indonesia, finally, per capita GDP fell by 15.4 percent in 1998, and infant mortality increased from 45 to 49 per thousand.

4. Conclusion

Aggregate economic shocks have income and substitution effects on child health. If households are credit-constrained, the income effect may lead households to spend less on health-augmenting goods, including nutritious foods and health care. However, there is also a substitution effect: as wages fall, the opportunity cost faced by caregivers in carrying out time-intensive activities that benefit children, such as preventive health care visits, breastfeeding, cooking healthy meals, or collecting clean water, also falls. The total effect of an aggregate income shock on infant mortality will depend on whether the income or substitution effects dominate (Ferreira and Schady 2009). In this paper, we focus on the relationship between income shocks and infant mortality in a sample of developing, mainly middle-income countries. Our estimates show that it is hard to draw definitive conclusions about the sign or magnitude of the effect. On balance, however, infant mortality appears to be pro-cyclical or acyclical in all but a small number of countries that faced very deep economic shocks.

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Figure 1: Infant mortality and log per capita GDP, Peru, Turkey, and the Philippines

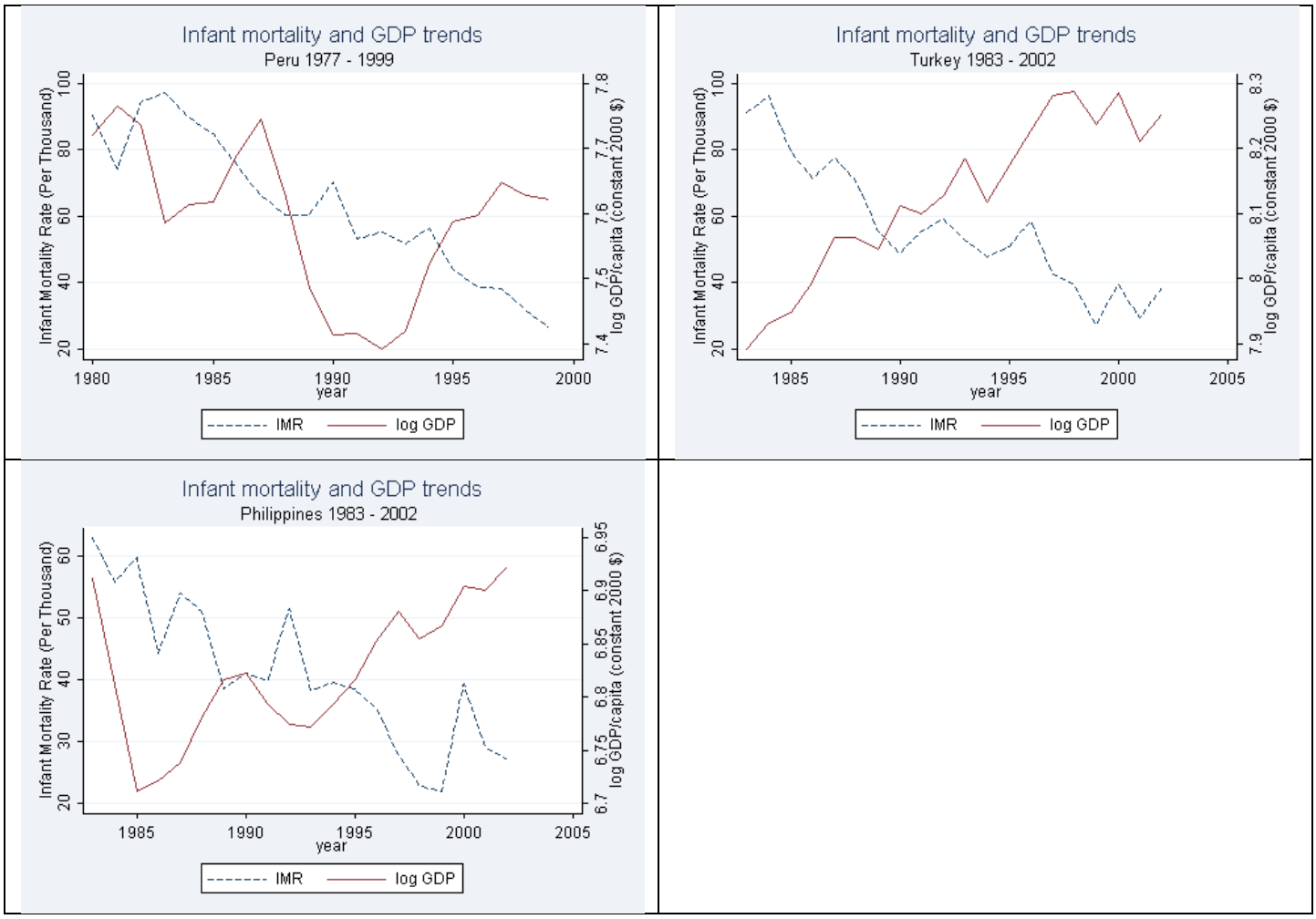

Table 1: Counties, surveys and years

Country	Survey Years	N: live births	N: mothers
Armenia	2000, 2005	6040	4033
Bolivia	1989, 1994, 1998, 2004	51655	25295
Brazil	1986, 1992, 1996	19616	11505
Colombia	1986, 1990, 1995, 2000, 2005	52898	34009
DomRep	1986, 1991, 1996, 1999, 2002	62539	35513
Guatemala	1987, 1995, 1999	30670	13908
Haiti	1995, 2000, 2006	27051	13148
Indonesia	1987, 1991, 1994, 1997, 2003, 2007	168572	102535
Jordan	1990, 1997, 2002, 2007	28531	22315
Morocco	1987, 1992, 2004	27703	15081
Nepal	1996, 2001, 2006	35960	17501
Nicaragua	1998, 2001	28339	14547
Pakistan	1991, 2007	29503	12095
Paraguay	1990	7187	3261
Peru	1986, 1992, 1996, 2000	76106	40807
Philippines	1993, 1998, 2003	42427	20445
Turkey	1993, 1998, 2004	21851	12439

Table 2: Annual average changes in infant mortality during periods of positive and negative economic growth, per 1,000 children born

	Positive growth		Negative growth	
	N	Change	N	Change
Armenia	10	-4.34	2	5.30
Bolivia	14	-1.54	9	-5.28
Brazil	12	-0.48	7	-9.26
Colombia	23	-0.14	4	-4.57
DomRep	23	-1.66	6	-0.56
Guatemala	13	-2.53	6	-5.63
Haiti	5	3.32	14	-5.00
Indonesia	26	-1.10	3	-2.27
Jordan	11	-1.35	3	2.54
Morocco	16	-2.67	6	-5.65
Nepal	17	-4.65	2	1.97
Nicaragua	7	-2.37	5	-4.23
Pakistan	17	0.58	2	-15.71
Paraguay	6	0.13	3	-6.01
Peru	14	-6.97	8	2.20
Philippines	12	-1.20	7	-3.06
Turkey	14	-1.20	5	-7.12

Table 3: The effect of economic shocks on infant mortality

	Removing quadratic trends				Change on change			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
Armenia	-0.25	0.07**	-0.29	0.12**	-0.17	0.07**	-0.23	0.08**
Bolivia	0.36	0.38	0.30	0.39	-0.44	0.81	-0.58	0.77
Brazil	-0.08	0.44	0.06	0.48	0.46	1.26	0.60	1.23
Colombia	0.70	0.18**	0.76	0.13**	0.77	0.33**	0.80	0.29**
Dominican Republic	-0.78	0.19**	-0.85	0.20**	-0.23	0.48	-0.11	0.53
Guatemala	-0.26	0.63	-0.26	0.62	1.09	1.23	1.12	1.11
Haiti	-0.11	0.56	-0.13	0.53	0.34	0.86	0.24	0.80
Indonesia	-0.21	0.15	-0.18	0.13	-0.22	0.14	-0.16	0.11
Jordan	2.12	0.48**	2.46	0.69**	0.05	0.55	0.11	0.77
Morocco	0.08	0.62	0.17	0.62	0.64	0.63	0.86	0.63
Nepal	-1.47	1.94	-1.65	1.95	-2.20	2.66	-2.44	2.69
Nicaragua	2.12	0.60**	2.20	0.53**	0.48	0.47	0.51	0.49
Pakistan	0.28	1.16	0.71	1.22	4.03	0.51**	5.02	0.68**
Paraguay	0.79	0.91	0.32	1.01	0.65	1.28	0.39	1.27
Peru	-0.23	0.15	-0.21	0.18	-0.44	0.23*	-0.50	0.23**
Philippines	-0.10	0.30	-0.10	0.30	0.02	0.42	-0.02	0.40
Turkey	0.57	0.30*	0.62	0.29**	0.79	0.34**	0.87	0.39**

Note: Coefficients and standard errors divided by 100, to correspond with effect of 1 percent change in per capita GDP.