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Exogenous Shocks and Growth Crises in Low-Income Countries: A Vulnerability Index

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Summary. — This paper develops a new index which provides early warning signals of a growth crisis in the event of large external shocks in low-income countries (LICs). Multivariate regression analysis and a univariate signaling approach are used to map information from a parsimonious set of underlying policy, structural, and institutional indicators into a composite vulnerability index. Both the in-sample and out-of-sample predictive power of the index are high. In particular, it explains well the growth crises observed in LICs during the global financial crisis.

Key words — vulnerability index, growth crises, low-income countries, external shocks

1. INTRODUCTION

Low-income countries are subject to a wide variety of exogenous shocks—sharp swings in the terms-of trade, export demand, natural disasters, and volatile financial flows. The amplitude and frequency of such shocks tend to be higher than in advanced and emerging market countries (International Monetary Fund (IMF), 2011). In principle, negative shocks in a standard neoclassical growth model would imply a quick reversion to the steady state level of income, implying a growth "bounce-back" and benign transitory effects. However, the resources, instruments, and policy buffers needed to absorb or mitigate shocks are often unavailable in low-income countries or difficult to implement in weak institutional and policy environments. Consequently, large adverse external shocks tend to induce breaks in trend growth rather than cycle fluctuations around a trend, imposing steep output and welfare losses, both directly and often through ensuing prolonged growth slowdowns.

Studies have found that the negative impact of exogenous shocks on growth and consumption volatility is especially pronounced in low-income countries (Becker & Mauro, 2007; Perry, 2009), and that such impact results mostly from crises or severe recessions rather than normal cyclical fluctuations (Hnatkovska & Loayza, 2005). Declines in consumption are more precipitous in LICs than in other countries because of low savings, liquidity constraints, limited risk diversification opportunities, and the greater dependence of the poor on public services, especially health and education, which exposes them to fiscal cuts in real terms, including through inflation.

Macroeconomic volatility additionally imposes indirect welfare costs through its negative impact on output growth, and thus future consumption. Research suggests that adverse shocks in LICs on average translate into substantial persistent output losses over the medium-term (Papageorgiou, Pattillo, Spatafora & Berg, 2010). Volatility impacts long-run growth through reductions in investment, a worsening of economic policy and, in extreme cases, by increasing the risk of conflict. In particular, higher volatility tends to depress investment in both physical and human capital, particularly in countries that are credit constrained. There is also evidence pointing to a higher risk of civil war and internal conflict and protracted growth downturns due to greater economic volatility, which is exacerbated by the structure of income in LICs (Bruckner & Ciccone, 2010).

Furthermore, studies point to an asymmetric effect of shocks on poverty levels: poverty levels increase sharply during deep downturns and do not recover to previous levels as output recovers (Agenor, 2004). Given nascent formal safety net mechanisms in many LICs, the poor rely to a large degree on self-protection and informal networks to protect themselves against risk. However, these coping strategies usually provide inadequate protection, and frequently lead to adjustments with detrimental long-term negative effects on their productivity and ability to climb out of poverty (Carter & Barrett, 2006; Clarke & Dercon, 2009).

A growing integration with the global economy and the pernicious effects of macroeconomic volatility in LICs thus call attention to the need for identifying emerging risks from changes in the external environment. This paper develops a vulnerability index that can help quantify low-income country risks to growth crises arising from external shocks. While predicting the timing of such events is likely to be an elusive endeavor, flagging the underlying vulnerabilities that predispose countries to growth declines in the event of external shocks can provide a first indication of a possible problem and signal the potential for pre-emptive policy action.

The index provides a systematic and forward-looking cross-country analysis of emerging risks and vulnerabilities across LICs and their mapping with existing structural and policy weaknesses that make a country more prone to economic distress in the event of an external shock before they materialize. Results from the index can help complement in depth country-specific and judgment-based analysis.

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Growth crises episodes in this paper capture the combined effects of growth declines (negative growth) and level drops in the event of shocks, which can endanger the sustainability of a country's growth path. It is well documented that macroeconomic vulnerabilities–large fiscal and external imbalances, unsustainable debt ratios, and inadequate reserve buffers, weakly diversified economic structures, narrow and concentrated tax bases, and institutional weaknesses serve to reduce resilience to exogenous shocks in low-income countries. The importance of these factors in reducing resilience to shocks is well established in the empirical literature (see Acemoglu, Johnson, Robinson, & Thaicharoen, 2003; Collier, Goderis, & Hoeffler, 2006; Loayza & Raddatz, 2007; Rodrik, 1999). In line with this literature, a range of economic, structural, and institutional indicators that capture the flow and stock vulnerabilities in the external and fiscal sectors and the real economy are used to gauge whether a country hit by a large external shock is also likely to experience a growth crisis.

Two complementary approaches are used to map information from the underlying indicators into a composite vulnerability index: multivariate regression analysis, and a univariate "signaling" approach. The multivariate regression approach uses a correlated panel probit model to estimate the probability of a growth crisis. This approach allows us to take account of correlations among different variables, to test for the statistical significance of individual variables, and to assess the constancy of coefficients across country groups.

The univariate approach entails using each indicator of crisis events separately, identifying critical thresholds that signal such events with the lowest prediction error, and then averaging the indicators into a summary index. In particular, the composite vulnerability index measures the number of indicators exceeding these thresholds, weighted by their relative signaling power. This approach can accommodate differences in data availability across countries and allows for the inclusion of a potentially larger number of vulnerability indicators than the multivariate regression method. At the same time, the results from the probit analysis provide guidance on the conditional statistical significance of the variables used in the univariate approach.

The index can be used to assess vulnerabilities to growth declines in low-income countries over time. The analysis shows that the overall vulnerability index has declined significantly from its peak in the early 1990s. Better policy and economic management, coupled with a favorable external environment, especially terms of trade improvements, and official debt relief contributed to stronger macroeconomic positions and lower vulnerabilities till the onset of the global crisis. More recently, growth crises risks in low-income countries remain elevated and well above pre-crisis years as fiscal buffers have increasingly been used up.

The rest of the paper is organized as follows. Section 2 provides a brief review of the literature. Section 3 describes the methodology for identifying crisis episodes. Section 4 presents the empirical analyses and main results using the multivariate regression analysis. Section 5 describes the statistical methodology underlying the univariate approach and presents results, and Section 6 concludes.

2. LITERATURE REVIEW

This paper is related to several strands of research. A large body of evidence finds that adverse external shocks have a significant negative impact on short- and medium-run growth through their effect on aggregate demand, external balances, and the government's fiscal position (Papageorgiou *et al.*, 2010; Collier & Goderis, 2009). Studies find that shocks impact long-run growth through reductions in investment (Aghion, Angeletos, Banerjee, & Manova, 2005), a worsening of economic policy (World Bank., 2006) and, in extreme cases, by increasing the risk of conflict (Bruckner & Ciccone, 2010). Moreover, these effects are asymmetric: while negative shocks impede growth, positive shocks do not necessarily contribute to long-run growth, particularly in resource-rich countries with weak institutions (Collier, Goderis, & Hoeffler, 2007). Our paper builds on these studies by analyzing a broad range of macroeconomic, institutional, and structural correlates of growth declines in the event of shocks, although we focus on the negative tail of the distribution.

This paper also complements previous studies that examine determinants of growth down-breaks, broadly defined as extended periods of markedly slow growth (see for e.g., Berg, Ostry, & Zettelmeyer, 2012; Hausman, Pritchett, & Rodrik, 2006; Pritchett, 2000; Rodrik, 1999). Our study focuses on sharp declines in growth over a shorter timeframe–events that, in our view, are related to, but distinct from, permanent changes in output and possibly of greater concern to policy makers.[1] If economic agents were liquidity-constrained or short-sighted, they may be more concerned about an immediately apparent sharp decline in growth than a slowdown in the long-run economic growth that has a similar impact in net present value terms (Becker, 2007). Further, our approach allows for differentiating local recoveries from severe downturns within a longer growth downbreak.

Finally, our paper is related to a large literature on early warning system models focused on a range of crises facing emerging market and advanced economies (see Kaminsky, Lizondo, & Reinhart, 1998, for currency crises; IMF, 2007 for sudden stops; Baldacci, Petrova, Belhocine, Dobrescu, & Mazraani, 2011, for fiscal crises; International Monetary Fund, 2010 for financial crises). In low-income countries, volatility in the real economy stemming from large terms of trade declines, contractions in external demand, and natural disasters can manifest in different sorts of severe economic distress–declines in consumption, balance of payments crises, and fiscal stress. An overarching focus on growth is thus an efficient way to capture most of these manifestations.

This paper is also related to Easterly, Islam, and Stiglitz (2001) who estimate a panel probit regression relating growth downturns (negative growth rates) to a large set of structural variables in developing and advanced economies. Our analysis focuses on growth decline episodes conditional on external shocks and captures relevant macroeconomic and structural vulnerabilities that predispose low-income countries to growth crises. In this respect, our paper is most closely related to Dabla-Norris *et al.* (2011) who empirically examine the benefits of international reserves in smoothing domestic absorption and consumption in response to exogenous shocks in low-income countries. Our paper draws on their methodology of shock and crisis identification to examine the determinants of growth declines.

3. METHODOLOGY

(a) *Identification of large exogenous shocks*

Large negative external shock events in countries are identified if the annual percentage change of the relevant shock variable falls below the 10th percentile in the left-tail of the country-specific distribution. In particular, shock episodes