Causes and Consequences of Macroeconomic Challenges Facing Low-Income Countries as a Complex Economic System

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Selected Paper prepared for presentation at the Agricultural and Applied Economics Association's 2014 AAEA Annual Meetings, Minneapolis, MN, July 27-29, 2014

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Background

According to World Bank country classifications (Gross National Income per capita), there are thirty six low income countries (LIC) in the world today (World Bank, 2013). It is also noteworthy that many LICs have made great improvements toward gaining macroeconomic stability during last decade (ICTSD & FAO, 2012). Also, many of these LICs have become more integrated into the global economy through participation in international capital markets and attracting foreign investments due to newly achieved economic and social stabilities. Furthermore, they have been actively participating in international trade and entering markets for new goods and services as well as greater development in private financial sectors (ICTSD & FAO, 2012). The flip side of this internationalization is the vulnerability and susceptibility of these LIC economies to vagaries in the global economy. This new dimension and dynamics of behavior of LICs to changes in global economy triggered need for a new generation of facilities from international financial entities like World Bank (WB) and International Monetary Fund (IMF).

Looking at recent past, LICs were affected back-to-back, first by sudden jumps in world food and fuel prices (in 2007 and 2008), and then by spillover effects of worst global financial crisis (2008 through 2011) in four decades which pushed additional 64 million people into extreme poverty by end of 2010 (IMFa, 2010). However, two-thirds of LICs have been more resilient during this global economic crisis than past downturns (IMFa, 2010), in contrast to richer countries. This has been attributed to robust pre-crisis countercyclical domestic policies of LICs, especially materialized during past decade through development of tighter macroeconomic policy buffers. These policy buffers are lower fiscal and current account deficits, reduced debt levels, lower inflation and strengthening of reserves (IMF Factsheet, 2013). Furthermore, most LICs with IMF-supported programs were able to maintain healthy levels of real primary spending and expenditure on priority sectors such as health, education and infrastructure (IMFa, 2010). Although, LICs were more resilient during recent global macroeconomic shocks, they are not immune to another sizable shock triggered by slow economic recovery of the United States, the United Kingdom and other European Union members. Therefore, it is indispensible to governments of LICs to rebuild macroeconomic policy buffers, restoration of fiscal and debt sustainability while maintaining growth prospects (IMFa, 2010; IMFb, 2010).

Given this complex nature of internationalization of LICs into global economy, it is indispensible for international financial and development entities such as IMF, WB, United Kingdom Aid for International Development (UKaid), and United States Agency for International Development (USAID), who work closely with LIC governments to know how such macroeconomic challenges of LICs operate in practice and more importantly how they interact with each other, especially in terms of their effect on growth, macroeconomic stability and resilience to shocks. This information will be useful in designing appropriate macroeconomic policy interventions tailored to different macroeconomic challenges faced by LICs.

We propose to study causes and effects of macroeconomic challenges facing LICs as a complex economic system. It focuses on an inductive, rather than an *a priori*, model of causation. A list of measured variables is specified without prejudice that each is a cause of, an effect of or unrelated to other included variables in our list. Specification of our list is based on various recent writings by IMF on macroeconomic challenges facing LICs.

Objectives

The specific objectives of our study are

(1) to provide a graphical structure of macroeconomic challenges facing LICs highlighting complex interaction between exogenous and endogenous players, and

(2) to offer policy prescriptions based on the graphical structure.

Data

Broadly defined macroeconomic variables pertaining to 36 LICs such as, measures of growth, macroeconomic stability, and measures of resilience to shocks will be gathered for various LICs for periods before and after recent global recession. More specifically they are, IMF lending, exchange rates, GDP growth, inflation, unemployment, flow of foreign direct investments (FDIs), external debt, interest rates, money supply, remittances, exchange market pressure index, and Buffer Index. Data with respect to pre and post global recession will be gathered from IMF and WB databases (World Development Indicators (WDI)). We gather time-series data for 36 countries for 30-year period from 1980 through 2010 for aforementioned macroeconomic measures.

Methodology

Causal relationships come from recent efforts in computer science (Pearl, 1995; Pearl, 2000; Spirtes, *et al.*, 2000). One reason for studying causal models, represented here as $X \rightarrow Y$, is to predict the consequences of changing the effect variable (Y) by changing the cause variable (X). The possibility of manipulating Y by way of manipulating X is at the heart of causation. Here we follow work of Spirtes *et al.*, (2000) and Pearl (2000), in representing causal structures in graphical form and using separation notions to help identify causal flows with observational data.

Research workers at Carnegie Mellon University have developed computer software for carrying-out causal inference using the correlation matrix associated with a set of variables. This software is labeled PC algorithm and exists as one of several offerings under the umbrella TETRAD IV. Briefly, one begins with a complete undirected graph, where every variable in a set of variables is connected to every other variable by an edge (line). Correlation and partial correlations are used to remove edges (lines) between variables if such correlations are not significantly different from zero, given a pre-determined level of significance. Edges (lines) surviving all correlation and partial correlation tests are then directed (assigned arrows "$X \rightarrow Y$ or $X \leftarrow Y$") by applying the notion of d-separation, which is a graphical characterization of conditional independence (Pearl, 1995).

Empirical Estimation

Heretofore applications of the algorithms of inductive causation have been applied with either cross section data or to innovations from dynamic data (time-series data), pre-filtered in vector autoregressive structures (Bessler and Akleman 1998). What we propose here is to investigate PC algorithm for pooled time series of cross sections. That is we will observe data on macroeconomic indicators from 36 LICs over five year intervals from 1980 – 2010. So we will explore alternative pooling structures (no time effects, with time effects, no country effects, with country effects) for uncovering the structure of macroeconomic factors affecting LIC performance in global economy. Standard pooling set-ups (Wooldridge, 2002) will be investigated as part of the research effort.

The distinction of "seeing" relationships between or among variables in an uncontrolled setting and taking a policy action and "doing" or "forcing" certain settings on variables is discussed in Pearl (2000) and Spirtes *et al.*, (2000). Such considerations and differences in predicting the effects of policy are fundamental when governments attempt to set values of one variable in order to affect values of (changes in) other variables. In this study, evidence provided by PC algorithm, will be directly relevant for suggested policy manipulations. This fundamental notion of differences between seeing (associational inference) and doing (structural inference) is at the heart of policy with complex economic systems.

Results and Discussion

Graphical directed acyclic structures will be derived connecting all macroeconomic variables affecting LICs performance global context. As a result, we are in position to identify exogeneous, weakly exogeneous and endogeneous macroeconomic variables that can be used to generate appropriate financial and development policy prescriptions dealing with growth, macroeconomic stability and resilience to shocks of LICs.

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