ENERGY PRICE SHOCKS IN DYNAMIC STOCHASTIC GENERAL EQUILIBRIUM MODEL: THE CASE OF BANGLADESH

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Overview

Energy price is a crucial driver of the world economy and changes in the price of energy can have significant effect on macroeconomic condition and welfare in any developing country like Bangladesh. The measure of growth in Bangladesh is synonymous with the level of energy use as it is considered to be one of the key elements in the socio-economic development of the countries. The transmission mechanisms through which energy prices have an impact on economic activity include both supply and demand side channels. There is the classic supply side effect according to which rising energy prices are indicative of the reduced availability of a basic input to production, leading to a reduction of potential output. From demand side perspective, when energy prices rise, consumers are unable or unwilling to reduce energy consumption and may reduce expenditures on other goods and services, potentially upsetting the macroeconomic condition. Naturally, the bigger the energy price increase and the longer higher prices are sustained, the bigger the macroeconomic impact. Therefore, the energy related constraints like energy price shocks needs to be considered in the context of business cycle fluctuations to examine the importance of energy for development process and advocate policy suggestions.

Methods

Since Dynamic Stochastic General Equilibrium (DSGE) model has become a standard research instrument in investigating economic fluctuations, we construct a DSGE model with energy to examine how the fluctuations of key economic variables such as consumption and output are explained by the exogenous shocks like energy price shocks. We also aim to explore the extent to which aggregate energy price shocks can help explain business cycle fluctuations in Bangladesh. To the best of our knowledge, there is yet no record of an energy augmented DSGE model which has been calibrated for developing economy to investigate the interactions between energy and the overall economy.

Energy is explicitly modelled in the household's utility function where the representative household derives utility from the consumption of energy oriented goods, non-energy oriented goods and from their leisure. The model also considers energy as an additional productive input along with labour and capital. That means, all economic agents in the economy rely on energy either for household's consumption or for production of various goods. Aggregate energy price is modelled as an exogenous random process in addition to productivity shocks. The model is calibrated based on microeconomic evidence and also on long run considerations and try to examine the strength of the model to replicate the quantitative business cycle properties. Before the statistics were calculated, all the data were log-differenced and detrended using the HP filter so that the actual growth rates are displayed (Prescott and Hodrick, 1997; Uhlig and Morten, 2002).

Results

The main conclusion from our paper is that energy price shocks are not a major factor for macroeconomic fluctuation in the Bangladesh economy and therefore, output fluctuations in Bangladesh are mainly driven by technology shock. This might be the case of the substitution possibility of energy with labour and capital in the production process as described by Dhawan and Jeske (2007). Besides, different measures of the underground economy of Bangladesh has pointed out that the informal economy had the size of 35% of the total official GDP, which is a large value and sufficient enough to distort any macroeconomic outcomes (Schneider, 2004).

Conclusions

McCallum (1989) suggests that DSGE theory should explicitly model exogenous energy price changes. We made an attempt to implement this suggestion in the simplest possible way where energy is included both in the utility and production functions which constitute a novelty with respect to previous literature. Energy price shock is explicitly introduced in our model in addition to the technology shocks. In addition we contribute to the existing literature by modelling energy price shocks in a DSGE framework for a developing country, Bangladesh.