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Exploring the depth of energy penetration in economic advancement: Perspective of Bangladesh

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ABSTRACT

Developing countries consume a tiny share of world commercial energy. This tempts policymakers in developing countries to sort out ways to increase commercial energy demand so that their invaluable resources are best utilized. Country like Bangladesh may fall in trap if quickly declining and immensely valuable energy is wasted in unsustainable growth. This urges for better use of its scarce resources for sustainable growth. In this paper, we aim to identify how energy consumption in Bangladesh is related to various growth indicators like national income, financial development, industrialization and urbanization in the long-run in search of a right path for sustainable development. In this study we try to assess the relationship among energy consumption, financial development, economic growth, industrialization and urbanization from 1980 to 2010. A number of cointegration techniques are employed to examine whether there is a long-run relationship. Besides these, we also employed augmented Granger causality test to examine the causality if presents. This study finds that financial development, economic growth, industrialization and urbanization have positive impact on energy consumption in short-run but industrialization has no impact in the long run. Our causality test ensures that the above mentioned variables Granger cause energy consumption. For sustainable growth, industrialization should be given priority as future consumption of energy in industrial sector will be greater than any other sector. This future demand can only be fulfilled by injecting more and more renewable energy through solar, wind and other technology as nonrenewable energy are declining quickly.

Contents

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1. Introduction

Empirical studies are not yet conclusive about whether high energy consumption is a precondition for growth [52] or simply a sign of a growing economy [7]. In addition, some studies [38,45,67] posit a bi-directional relationship between energy consumption and economic growth. New frontiers in, for example, efficient energy usage, sustainable energy use, and energy conservation are gaining momentum as we increasingly realize the true value of energy, as greater portions of populations are under threat of becoming energy poor, and as more than 80% of our total commercial energy consumption depends on non-renewable sources, which poses threats to our growth, prosperity, and quality of life [5,23]. Under these circumstances, clarity is greatly needed about the bi-directional nature of the relationship between energy consumption and growth, especially for developing countries that usually face high energy supply constraints and demand failures from productive sectors. However, straightforward causality between economic growth and energy consumption may be misleading [54]. Currently, complex interdependence among macroeconomic variables results in a long list of determinants with direct or indirect impact on economic growth [18]. For instance, the relationship between financial development and economic growth is multifarious in both the empirical and theoretical literature [20,34,64]. It is said that if flexibility is produced through competition, then this enhances the relationship between growth and financial development [53,63].

While business and financial economists focus on the role of energy prices in economic activity, the mainstream theory of economic growth pays little or no attention to the role of energy or other natural resources in promoting or enabling economic growth. Mainstream theories of production and economic growth consider that some inputs are reproducible and others are not. According to mainstream economists, growth theories consider the direct impacts of primary and intermediate inputs and treat energy as an indirect input. Land, labor, capital, and even natural resources are considered as reproducible factors in which energy is a non-reproducible factor of production. Therefore, natural scientists and ecological economists place very heavy emphasis on the role of energy in both production processes and growth theories. However, growth models of natural resources face problems of finiteness and exhaustibility: natural resource stocks are finite and some non-renewable resources are potentially exhaustible. This makes indefinite economic growth and even sustainable development problematic. There are numerous factors that affect the linkages between energy and growth. The relationship between energy and an aggregate of output, such as gross domestic product (GDP), can be affected by substitution between energy and other inputs, technological change, shifts in the composition of energy input, and shifts in the composition of output. Again, orthodox economists argue that energy consumption and economic growth are decoupling from each other whereas natural scientists and ecological economists cast doubt on this [23]. The latter group places importance on the use of fuel efficient technology, which would create a “rebound effect” and increase energy consumption. Up to now, a number of studies have been devoted to exploring the link between energy consumption and economic growth [47,77,81,92]. Again, the quality of the environment should be linked to the energy–growth relationship. Although clean technology is costly, decoupling of energy and growth would prevail until cheap and efficient technology is no longer available. Higher quality of fuels, green technology, and technological change would underpin a strong relationship between energy consumption and economic growth. Karanfil [53] suggests suggest simultaneous causality between economic growth, financial variables, and energy consumption. Bartlett and Gounder [19] find that economic growth, energy consumption, and employment have a cointegrating relationship. Kapusuzoglu and Karan [52] establish causal relationships among energy consumption and other macroeconomic and demographic factors, like GDP, consumer price index, population, and carbon dioxide emissions, in developing countries. In addition, there are studies relating energy consumption to other macroeconomic variables, like financial development and urbanization [46,47,66,77,82,92].

Developing countries consume a tiny share of world commercial energy. Specifically, Organisation for Economic Cooperation and Development (OECD) countries consumed about 43% of total energy consumption in 2009 while Asian countries, excluding

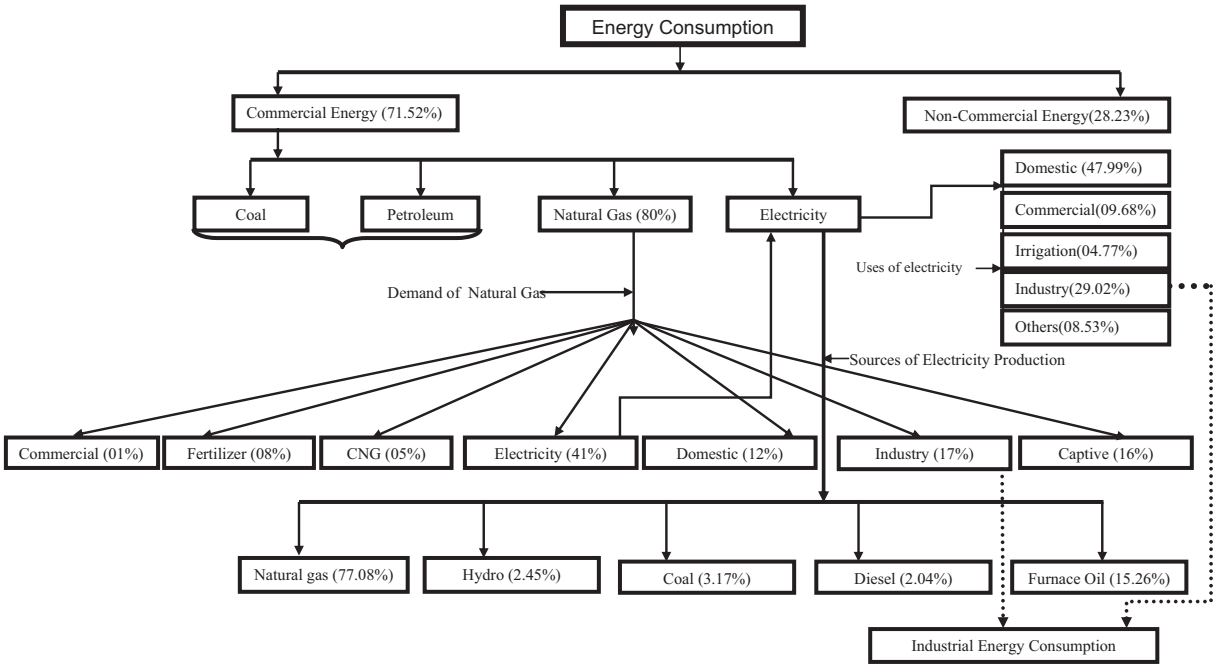

Fig. 1. Energy consumption and production in Bangladesh.
Source: Joarder et al. [48], BBS and Author's calculation.