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# Electricity consumption and economic growth nexus in Bangladesh: Revisited evidences

Mazbahul Golam Ahamad\*, A.K.M. Nazrul Islam

Research Division, Centre for Policy Dialogue (CPD), House: 40C, Road: 11, Dhanmondi, Dhaka 1209, Bangladesh

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## ABSTRACT

In this paper, an attempt is being made to examine the causal relationship between per capita electricity consumption and per capita GDP of Bangladesh using the vector error correction specified Granger causality test to search their short-run, long-run and joint causal relationships for the period of 1971–2008. Empirical findings reveal that there is a short-run unidirectional causal flow running from per capita electricity consumption to per capita GDP without feedback. The presence of a positive short-run causality explains that an increase in electricity consumption directly affects economic activity in Bangladesh. Likewise, results from joint causality exhibit the same as in short-run. By contrast, long-run results show a bi-directional causality running from electricity consumption to economic growth with feedback. These findings can provide essential policy insights to design immediate and long-term growth prospect for Bangladesh keeping in mind its present planned growth strategy and dismal power and energy sector.

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## 1. Introduction

Over the past three decades, studying the interrelation between electricity consumption and economic growth has been a major issue across the developing economies. Several studies have been conducted to examine the causal relationship between electricity consumption and economic growth to understand their nature of relationship for policy purposes (Table 1). Most of these studies reveal some unidirectional causality running from economic growth to electricity consumption, especially in the context of developing countries (Aqeel and Butt, 2001; Mozumder and Marathe, 2007; Narayan, 2005), whereas some studies also support that there can be changes in the direction of electricity consumption and economic growth depending upon their long-run and short-run relationships (Lee and Chang, 2008).

It is not that no such attempt has yet been made to assess the linkage between per capita GDP and per capita electricity consumption in the context of Bangladesh. Mozumder and Marathe (2007) conducted a short-run causality test using the data for the period of 1971–1999, whereas the study by Assaduzzaman and Billah (2006) estimated a long-run income elasticity of energy demand for Bangladesh using data for 1994–2004. Both the studies are found to be important on many grounds, yet no study to date has been conducted to assess their

short-run, long-run and joint relationship to facilitate immediate, medium and long-term power policies for the country to attain its desired economic performance. It also needs to be mentioned here that both of the studies have not employed recent data set. Given many changes that have taken place in the recent years in electricity sector in Bangladesh and the continued power crisis, there is a need to re-evaluate the possible causal relationship between electricity and economic performance from a fresh perspective in the context of Bangladesh.

Against this backdrop, this paper is designed to explore possible sources and directions of relationship between electricity consumption and economic growth in the country to understand their immediate, long-run and joint causalities using annual data covering the period of 1971–2008.<sup>1</sup> A vector error correction model specified Granger causality test was used to analyze the relationships. It is assumed that such an exercise would add more robustness in the findings meant for short, medium and long-term policy implications for electricity as well as for economic growth in the context of Bangladesh.

## 2. Recent update on electricity generation in Bangladesh

Bangladesh remained one of the least per capita electricity consuming economies in the world, even after 40 years of its independence (CPD, 2011). Despite that in the recent years

\* Corresponding author. Tel.: +88 01717 258612; fax: +88 02 8130951.

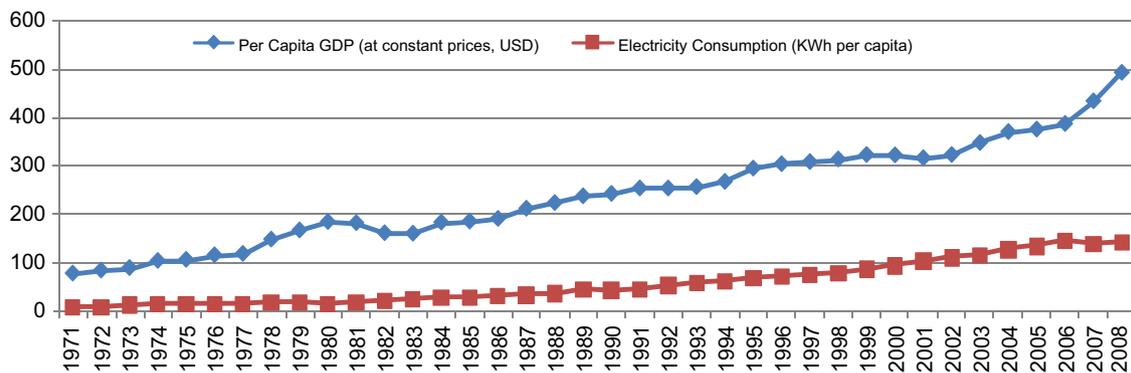
E-mail addresses: [mg.ahamad@gmail.com](mailto:mg.ahamad@gmail.com), [mazbahul@cpd.org.bd](mailto:mazbahul@cpd.org.bd) (M. Golam Ahamad), [nazrul2002@yahoo.com](mailto:nazrul2002@yahoo.com) (A.K.M. Nazrul Islam).

<sup>1</sup> This is the most comprehensive data set used for any such studies in the context of Bangladesh, including the data for the recent years (up to 2008).

**Table 1**  
Summary findings of selected literature.

Country	Period	Author(s)	Series	Method	Relation
China	1971–2000	Shiu and Lam (2004)	GDP & ELC	ECM	ELC → GDP
Australia	1969–1999	Narayan and Smyth	ELC, Employment and Real income	GC	Real income → ELC
Malaysia	1970–2005	Tang (2009)	GDI, ELC, FDI & POP	ARDL & GC	Bilateral causality between series
Pakistan	1955–1996	Aqeel and Butt (2001)	GDP & ENC	C & GC	GDP → ENC
Singapore	1975–1995	Chang and Wong (2001)	GDP & ENC	C & GC	GDP → ENC
South Korea (ZA), Singapore (SG)	1961–1990	Glasure and Lee (1997)	GDP & ENC	C & GC	ZA: GDP × ENC, SG: GDP → ENC
Sri Lanka	1960–1998	Morimoto and Hope (2004)	GDP & ELP	GC	ELP → GDP
Taiwan	1954–1993	Cheng and Lai (1997)	GDP & ENC	GC	GDP → ENC
Taiwan	1961–1990	Hwang and Gum (1991)	GNP & ENC	C & GC	GDP ↔ ENC
USA	1947–1987	Abosedra and Baghestani (1989)	GNP & ENC	C & GC	GNP → ENC

Notes: in 'Series' column GDP, ENC, ELC and ELP represent gross domestic product, energy consumption, electricity consumption and electricity production, respectively. In 'Method' column C, GC and ECM denote Cointegration, Granger causality and error correction model, respectively. The signs → and ← indicate unidirectional causal relationship between the series, whilst ↔ and × denote bi-directional causality and no causality, respectively.



**Fig. 1.** Per capita GDP (PCGDP) and per capita electricity consumption (PCEPC) for 1971–2008.  
Source: Statistical Yearbook of Bangladesh, BBS (2009) and World Development Indicator (WDI, 2010).

electricity demand in the country is fast increasing, mainly due to expansion of economic activities with changes in her trade and investment policies (Asaduzzaman and Billah, 2006). At present the estimated daily demand for electricity in Bangladesh is found to be around 5500 MW, whereas the gross generation capacity till May 2011 was 6350 MW. Despite having such a higher generation capacity, the actual average generation was about 4500 MW in the month of May 2011 (BPDB, 2011). The reasons behind this gap are attributed to shortage in fuel supply for power generation, decrease in generation capacity by some of the aged power plants, lack of timely maintenance and overhauling works for old plants and lesser production capacity (than agreed amount) by so-called 'quick rental' power plants.<sup>2</sup> There is, thus, a need to re-evaluate the power generation strategy of the country and suggest a policy mix that can suitably be used to address short-run and long-run as well as medium term policy issues concerning electricity generation for accelerating economic growth and development in Bangladesh. Fig. 1 shows the trend (yearly actual value) of the series of Bangladesh for the period 1971–2008.

Poor power and energy situation in the recent months has affected the economic activities and growth prospects in Bangladesh, mainly in the form of lesser investment and lack of employment opportunities. Government of Bangladesh unveiled a 'Power and Energy' mega-plan in the recent budget of FY2011–2012 to

generate additional 11,698 MW of electricity by 2015.<sup>3</sup> In this plan, a 5 year power generation and investment road map is designed to stimulate both public and private investments for power generation to accelerate the GDP growth in the country. But achieving higher GDP growth envisaged in her Sixth Five Year Plan (SFYP), Perspective Plan or in Vision 2021 would critically depend on the government's ability to deliver required inputs such as electricity in time. For example, average electricity generation needs to be increased at the rate of 12.5–14.5% per annum to commensurate with the projected GDP growth target of 8.1% under the sixth five year plan period of 2011–2015 (CPD, 2010). Though the government has come up with the revised mega-plan to generate additional 11,698 MW of electricity over the next five years (until FY2015–2016), the very indication from some of the 'quick rental' and 'rental' power plants<sup>4</sup> would certainly raise the doubt of its proper implementation. The present paper is designed to find out some way out for effectively implementing short-run, mid-term and long-run electricity policies in the context of Bangladesh.

The structure of the paper is organized as follows: in addition to the introductory section (Section 1), a separate section (Section 2) is designed to give an update on current electricity generation and related policy issues concerning Bangladesh. It is followed by a brief review of literature on the relationship between electricity

<sup>2</sup> Many of the quick rental power plants that are currently under operation are facing technical difficulties. Because of this problem they frequently fail to produce their maximum capacity.

<sup>3</sup> In the revised plan, unveiled with the budget of FY2011–2012.

<sup>4</sup> Which are permitted under the 'mega-plan' unveiled in FY2010–2011. The plan can then be revised in FY 2011–2012.

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