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Linking financial development, economic growth and energy consumption in Pakistan



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ABSTRACT

This paper aims at exploring the finance–growth–energy nexus for Pakistan over the 1972–2012 period. By employing the system GMM estimation technique, the study tries to capture the impact of financial development over energy consumption through economic growth channel and includes energy prices and urbanization in the structural model. The study finds positive and significant impact of economic growth and urbanization on energy consumption, while the effect of energy prices over energy consumption is significant but negative. Financial development positively and significantly affects energy consumption through the economic growth channel. Our analysis is important for policy makers for effective energy demand planning and conservation policies that would ensure sustainable economic development as well as serve as motivation to search alternative energy sources to meet the burgeoning energy demand in Pakistan.

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1. Introduction

Literature reveals that energy is crucial for enhancing economic productivity [27,35,49]. Furthermore, growth in production activities stimulates energy demand due to increase in consumption

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[52]. EIA [18] estimated increase in the global energy consumption by about 56 percent during the period 2010–2040. Most of this increase will take place in non-OECD countries, where energy consumption is stimulated by strong growth in the economy [23,29]. Industrial expansion and population growth has led to increased energy consumption in Asian economies in general, and in Pakistan in particular [61]. Pakistan, falls in low middle income group country, has been facing the worst energy crisis for the past few years and its energy demand has continuously increased with economic and population growth. Furthermore, as a result of financial reforms, Pakistan's financial sector has shown exceptional and notable growth, particularly with respect to the banking sector [30].¹ This would also have implication for both economic growth and energy consumption [26].

Economy's long run growth potential is about 6.5 percent per annum but power outages have reduced it to 2 percent [21]. This indicates that growth of the economy is largely suppressed due to energy shortages. Kessides [28] has pointed out that electricity shortage has a negative impact on international competitiveness and exports, employment, and poverty alleviation in Pakistan. Recent energy literature includes financial variables when modeling energy consumption for an economy, asserting that financial variables can impact energy demand. It is, therefore, essential to consider financial variables in such a study to exclude the possibility of underestimation of energy demand.²

Moreover, studies on finance–energy nexus highlight the direct impact of financial development on energy consumption [23,52]. Financial development affects energy consumption indirectly via economic growth. This effect may be either positive or negative depending whether economic growth occurs in an efficient manner or not. For instance, growth in financial sector improves funds availability for investment projects that results in industrial growth leading to expansion in production activities. This in turn enhances economic growth, and increases the demand for new infrastructure and more energy, thereby positively influencing energy consumption [23,52]. However, the ability to adopt technological innovations in industrial sector development varies across countries that affect the intensity of energy consumption [52]. Thus, this study intends to explore the finance–growth–energy nexus in Pakistan i.e. how financial development affects energy consumption (i.e., positively or negatively) using economic growth channel?

Empirical literature on finance–energy nexus follows one of the two approaches. The first approach estimates the model in terms of elasticity in the variables by including energy consumption and financial development jointly in a single equation without much theoretical base. The second approach estimates the model using conventional unit root, cointegration and causality tests. The present study is different from these approaches in that it uses system GMM technique to separately capture the impact of financial development over energy consumption through economic growth. It, therefore, prepares a strong theoretical ground for empirical analysis. It explores the channel variable (economic growth) through which financial development may likely affect energy consumption. This channel variable is used to capture the effect of change in financial development on energy consumption, and to infer if increased financial development is linked to more energy consumption in Pakistan or vice versa. To the best of our knowledge, there is no published study that captured the indirect relation of financial development and energy consumption.

¹ Financial reforms are introduced in several areas relevant to financial markets and institutions with the core purpose to encourage competition, improve supervision and governance and adopt monetary, credit and exchange mechanism that ensure efficient allocation of financial resources [32].

² Present study uses energy consumption and energy demand interchangeably.

This paper is organized as follows: Section 2 discusses energy scenario of Pakistan. Section 3 provides an overview of empirical literature. Section 4 elaborates theoretical framework and model. While data, and econometric methodology for analysis is described in Section 5. Section 6 deals with empirical results and their discussion. Section 7 concludes the study along with policy implications and future research directions.

2. Energy crisis of Pakistan

The energy sector of Pakistan is in crisis and has been facing many challenges for the past few years. Circular debt, fragile financial situation of energy supply firms, intense reliance on gas/oil (above 80%), declining gas production, less utilization of cheap hydel and coal resources and unexploited power production capacity are a few major limitations contributing to energy scarcity [4,11,20,21,44]. Dependence on expensive furnace oil within thermal electricity production has increased that is coupled with volatile international oil prices which has adverse implications for cost structure of electricity production and could further undermine energy shortage in Pakistan [28]. According to GoP [21], rate of growth in net primary energy supply remained 1.8 percent while rate of growth in final energy consumption remained 2.9 percent for the past six years, that is clear evidence of energy shortage. Considerable increase in the usage of electric appliances has contributed to increase in domestic demand that led to increase in the share of native users in total electricity consumption from 23 percent in 1980–81 to about 43 percent in 2012–13.

Kessides [28] has highlighted that industrialization, urbanization, agricultural and service sector growth, rising per capita income and rural electrification are considered among key factors of growth in energy demand. There are estimates that electricity shortage will rise to 8000 MW in 2017 and over 13,000 MW in 2020. Although technical and financial support has been provided by international donor agencies to enhance production capacities and performance of generation companies (GENCOs), but this enhancement is insufficient in the light of rapidly growing energy demand.

3. Literature review

The existing literature on energy economics is mainly based on three nexus; finance–energy nexus, finance–growth nexus, and energy–growth nexus. We discuss these one by one below.

3.1. Finance–energy nexus

Literature on finance–energy nexus highlights the ways by which financial development can potentially affect energy consumption. At the household level, it is easier for consumers to gain an easy and cheap access to borrowed funds to purchase energy consumable products that directly affect energy demand. At the industrial level, it is easier for entrepreneurs to gain access to financial capital in order to expand existing businesses or start a new one, thereby creating a business effect. Increased stock market activity is regarded as an indicator of economic growth because it increases risk diversification for consumers and businesses that result in increased fund availability for investment projects, and thereby creates a wealth effect. This builds up consumer and business confidence that leads to expansion in the economy and creates demand for energy intensive products [17,49]. Shahbaz and Lean [52] mention that growth in industrial sector raises energy demand in two ways; firstly due to cross-sectoral growth; and secondly, as with increase in labor

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