

# Glimpse 2020

An Anthology of BIGM Research - Abstracts

Bangladesh Institute of Governance and Management (BIGM)





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## Acronyms

ADASYN	Adaptive Synthetic Sampling Method for Imbalanced Data
ARDL	Autoregressive Distributive Lag
AUC	Area Under the Curve
BCIM	Bangladesh, China, India and Myanmar
BDHS	Bangladesh Demographic and Health Survey
BIBM	Bangladesh Institute of Bank Management
BLR	Binary Logistic Regression
CNN	Convolution Neural Network
CCR	Canonical Cointegration Regression
CRI	Country Risk Indicator
DOLS	Dynamic Ordinary Least Square
DSE	Dhaka Stock Exchange
DT	Decision Tree
ECD	Early Childhood Development
EKC	Environmental Kuznets Curve
FDA	Foreign Development Assistance
FDI	Foreign Direct Investment
FMOLS	Fully Modified Ordinary Least Squares
GHGs	Greenhouse Gases
GLS	Generalized least-squares
IAA	Innovative Accounting Approach
IRF	Impulse Response Function
ICSS	Iterated Cumulative Sum of Squares
KNN	K-nearest Neighbour
LR	Logistic Regression
ML	Machine Learning
MLP	Multilayer Perceptron
NAHS	National Adolescent Health Strategy
NB	Naïve Bayes
PCEC	Per Capita Electricity Consumption
PCGNI	Per Capita Gross National Income
PSM	Propensity Score Matching
RF	Random Forest
SARIMA	Seasonal Autoregressive Integrated Moving Average
SGMM	System Generalized Methods of Moments
SMOTE-NC	Synthetic Minority Over-sampling Technique Nominal Continuous
SVM	Support Vector Machine

VDC	Variance Decomposition
VECM	Vector Error Correction Model
VHR	Violation of Human Rights
2SLS	Two Stage Least Square

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## PREFACE

Bangladesh Institute of Governance and Management (BIGM) is a specialized post-graduate institution established in the year 2006 with the objective of creating a center of excellence in advanced studies, research and training on public policy and management. Currently this institute is offering specialized Masters Program on 03 (Three) distinct disciplines such as (I) Governance and Public Policy (GPP), (II) International Economic Relations (IER) and (III) Human Resource Management (HRM). The Institute plans to expand its academic programs through introducing masters degree in three new areas viz. (i) Masters in Project Management, (ii) Masters in Public and Private Financial Management and (iii) Masters in Procurement and Supply Chain Management. Joining the BIGM Masters program is not just about getting a degree. It is a soul-searching process that combines scientific research with a challenging human experience. The whole process is designed not only to improve the degree of efficiency in the delivery of services and the quality of governance in general but also to uplift confidence and bring about attitudinal changes in course participants. In addition different types of training courses aimed at fulfilling the felt needs of Public sector officials and Private sector executive are conducted by BIGM on regular basis.

A culture of research is ingrained within BIGM's academic and organizational fabric which got momentum since August, 2017. The faculty as well as the core members of the research cell along with the students and trainees are constantly engaged in carrying out studies and research on different national priority areas. This publication, is in fact, the compilation of some of the abstracts and extended abstracts of the research so far accomplished by them. Initially the focus of research activities of BIGM was on Macro-Economic issues. But at present the research portfolio of BIGM is multi-dimensional and multi-disciplinary in nature. Health, Development, Banking, Political Economy, Finance, Business, Artificial Intelligence and many of the contemporary burning issues come up as the major topics of research undertaken by BIGM.

Up till now, 19 (Nineteen) articles of BIGM family members have been published in various international peer reviewed indexed journals; 03 (three) scientific papers have already been accepted for publication and 18 (Eighteen) papers are under review process of different journals. The researchers of BIGM have already presented their papers in various international foras, seminars and workshops. Since 2019, BIGM researchers have been conducting primary research on issues like rural women's empowerment, impact of remittance on returnee migrants' wellbeing and glass ceiling faced by women in Civil Service of Bangladesh. This three primary research have already been completed and waiting for publication in the internationally reputed journals.

BIGM has undertaken rigorous policy research on macro and micro economic issues to provide policy inputs for achieving the country's SDGs by 2030 and to become a developed country by 2041. The Institute is expanding its outreach to collaborate and to share its expertise, talents and resources with different academies, institutes, universities, research centers and think tanks working within the country and abroad. Thus BIGM is working on different fronts with multipronged strategies to elevate it as a specialized Institute of International standard.

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## **A. GROWTH**



## 1. Endogenous Growth Model of a Labour-abundant and Land-scarce Economy

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### Abstract

The study contributes towards modelling and estimating an endogenous growth model of an economy burgeoning with young working population and declining agricultural land. The model explores the long-run impact of physical capital stock, human capital augmented labour and production index augmented agricultural land on Gross Domestic Product of Bangladesh. Theoretically and empirically the model indicates that per capita income will be rising as long as the growth and share of human capital and the growth of agricultural productivity outweigh the dragging effect of the growth of declining agricultural land and the population growth. Vector error correction model (VECM), autoregressive distributive lag (ARDL) and dynamic ordinary least square (DOLS) techniques are employed to observe the robustness of the results. The underlying production relations exhibit constant returns to scale. DOLS estimates are found more robust and significant as compared to the results in ARDL. Agricultural productivity and human capital are found as very crucial determinants of growth. Government should give more focus on creating human capital through higher spending on education and take necessary measures to increase the utilization rate of scarce agricultural land. Formulation of land zoning policy and land reclamation policy may be instrumental for effective use and protection of declining agricultural land and adverse environmental impacts.

**Keywords:** GDP growth; Augmented labour; Augmented agricultural land;  
Caved model

**JEL:** J24; Q15; O47

## **2. Aggregate Consumption Expenditure and Economic Growth: Evidence from Bangladesh**

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### **Abstract**

This paper attempts to investigate the relationship between aggregate consumption expenditure and economic growth of Bangladesh using the ARDL Bounds Test approach. The study reveals that consumption expenditure and GDP have a significant impact on each other. Granger non-causality test also has been carried out, and the test reveals that unidirectional causal relationship is running from aggregate consumption expenditure to GDP. Bilateral causality exists between GDP and capital investment. The findings suggest that consumption enhancing fiscal and monetary policies can also boost the economic growth in the context of Bangladesh. That's because Bangladesh is still operating on the relatively flatter part of its long run supply curve.

### 3. The Relationship between Income, Consumption and GDP of Asian Countries: A Panel Analysis

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#### **Abstract**

This paper attempts to scrutinize the co-integration relationship between consumption, income and GDP per capita in panel data series. We have applied unit root test, co-integration test and FMOLS estimation technique to analyze the data. Data covers 11 Asian countries of three income categories— lower middle income, upper middle income and high income. The study contemplated the annual observations of 35 years from 1980 to 2014. Study revealed that the association between consumption and income is stronger in lower and upper middle income countries. The low level of income determines its maximum use predominantly for consumption. The relation between consumption, income and GDP per capita is stronger for lower middle income countries; thereby the countries with higher income generally tend to make big investments.

**Keywords:** income; consumption; gdp; panel unit roots; panel cointegration

**JEL Classification:** c23; d31; e21

## **4. External Debt and Growth: Role of Stable Macroeconomic Policy**

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### **Abstract**

This study examines the impact of external debt on economic growth in Bangladesh within a broader macroeconomic scenario. In the process of doing so, it assesses the empirical cointegration, long-run and short-run dynamics of the concerned variables for the period of 1980-2017. Autoregressive Distributed Lag (ARDL) "Bound Test" approach to cointegration is employed for the estimation in this study. Firstly, Debt-GDP linkage explores the impact of external debt impact on economic growth using a set of macro variables, and then this linkage is also analyzed along with a newly formed macroeconomic policy variable using principal component analysis (PCA). The study results reveal negative impact of external debt on GDP growth, but the larger positive impact of macroeconomic policy index indicates that this adverse effect of debt can be mitigated or even nullified by sound macroeconomic policy and appropriate human resource policy. Dynamic effects of different shocks (external debt and macro policy variable) on economic growth by VAR impulse response function also confirm our ARDL findings.

## 5. Impact of Fiscal Policy on Economic Growth in the Presence of Country Risk Indicator: An Analysis within a Barro-Lucas Growth Framework

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### **Abstract**

This paper examines the impact of fiscal policy in its key dimensions such as government expenditure, revenue and budget deficit on per capita GDP growth within a Barro-Lucas framework in presence of a country risk indicator (CRI). We construe the country specific risk indicator taking into account twelve dimensions of governance issues that Bangladesh faces. We use the Autoregressive Distributed Lag (ARDL) technique to look into the impact of (i) government expenditure and revenue; (ii) budget deficit on growth. We calibrated these two models in the presence and absence of CRI to find the impact of CRI on growth. Under all these scenarios we find that fiscal policy is effective in Bangladesh in enhancing growth even with CRI. All the models are statistically significant as well. Moreover, we find that 1% improvement in CRI could enhance growth by more than 2% in Bangladesh. Results of Toda-Yamamoto procedure confirm that revenue and government expenditure have significant unidirectional and budget deficit has significant bidirectional causal relationship with growth.

**Keywords:** Fiscal policy; Growth; Revenue; Government investment; Budget deficit, Country risk

**JEL classification:** C22; E23; E61; E62

## 6. Twin Deficits Hypothesis in Bangladesh: An Empirical Investigation

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### **Abstract**

This study attempts to examine the twin deficit hypothesis for Bangladesh. Apart from the traditional twin deficits theory relevant to the current account and fiscal deficit, we endeavor to explore the causal relationship between the trade deficit and fiscal deficit as well. In the process of doing so, initially, we start with the investigation of the conventional twin deficit aspect within a multivariate VAR framework, which finds short-run unidirectional causation running from the budget deficit to the current account deficit up to third lag and the subsequent lags exhibit bidirectional causation. Due to the absence of cointegration between the budget deficit and trade deficit model, again we go for a multivariate VAR model, which does not support the twin deficit hypothesis, unlike the aforementioned current account model. The trade deficit model reveals reverse causality running from trade deficit to fiscal deficit. Meanwhile, our study incorporated country risk indicators to address the governance issue while analyzing the deficit scenarios in both models as an in-depth analysis of governance is inevitable for a proper understanding of the development outcome and failure. In the policy perspective, low fiscal parity is rudimentary for the amelioration of both the current account and trade deficit scenario of Bangladesh.

**Keywords:** Current account deficit; Trade deficit; Twin deficits; VAR; Granger Causality

**JEL classification:** C32; E62; F32; H62; O53.

## **7. Investigating the Role of Physical Infrastructure, Financial Development and Human Capital on Economic Growth in Bangladesh**

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### **Abstract**

The paper looks into the dynamic relationship among physical infrastructure, financial development, human capital and economic growth in case of Bangladesh, using an Autoregressive Distributed Lag (ARDL) approach for the period 1985 to 2019. Using Principal Component Analysis (PCA) method physical infrastructure index and financial development index are constructed. The empirical outcome of the current study reveals that both in the long-run and short-run the physical infrastructure has significant and positive impact on economic growth. Human capital is found to have a significant positive impact on economic growth only in the long-run. But financial development has significantly negative impact on economic growth both in long-run and short-run. A bi-directional causal relationship between infrastructure development and economic growth as well as between human capital and economic growth is confirmed by the VAR Granger Causality test. Moreover, the study finds unidirectional causality from economic growth to financial development in Bangladesh. As Bangladesh is aiming for higher growth, this paper suggests that there is a necessity for Government intervention in intensifying the physical infrastructure and human capital development in the country to achieve high and sustainable growth.

**Keywords:** Physical Infrastructure Index, Financial Development Index, Human Capital Index, Economic Growth, ARDL Approach, VAR Granger Causality, Bangladesh

**JEL Classification:** H40; C43; O40; C32



## **B. INVESTMENT**



# 1. Impact of Public and Private Investment on GDP Growth in Bangladesh: Crowding-in or Out?

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## **Abstract**

This study investigates the impact of public and private investment on GDP growth in Bangladesh over the period 1980-2016 within ARDL framework. It also enquires the causal relationship between investment (public and private) and GDP growth using Block Exogeneity Wald Test technique. The study primarily finds that there exists a significant impact of both public and private investment on GDP growth in the long run. In the short run, public investment does not affect, but private investment has a positive impact on GDP growth. The study also explores a bidirectional association between public investment and GDP growth whereas unidirectional relationships from private investment to GDP growth and from public investment to private investment. Consequently, public investment crowds-in private investment. Therefore, increase in public investment is critical to moving to the next level of the country's growth.

**Keywords:** public investment, private investment; GDP growth; crowding-in and -out effects; ARDL bounds test.

## **2. FDI Flows and Domestic Investment Nexus in Bangladesh: A Multivariate Time Series Analysis**

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### **Abstract**

This paper examines the impacts of inward and outward FDI on domestic investment in Bangladesh utilizing annual time series data over the period 1976—2017. This empirical study employs an ARDL bounds testing technique and fully modified OLS (FMOLS), dynamic OLS (DOLS) and canonical cointegration regression (CCR) procedures to get robust results. Also, a VAR-based Toda Yamamoto Granger causality test is performed to detect the direction of the association among the concerned variables. Overall results divulge that inward FDI impacts domestic investment significantly in the long run while outward FDI has no positive effect. Besides, a feedback relationship is explored between inward FDI and domestic investment in the context of Bangladesh. The study result remains robust throughout different specifications and estimators. The study contributes to the recurring debate on the efficiency of FDI in the context of Bangladesh by representing new econometric evidence. The study findings suggest that inward FDI flows can lead to the sustained domestic investment in Bangladesh if policy makers frame the pragmatic policies to encourage local firms to produce more by utilizing the cross-border investment.

## **C. HUMAN CAPITAL**



# 1. Exploring Linkage between Human Capital and Economic Growth: A Look into 141 panels of Developing and Developed countries

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## **Abstract**

As factors of production, human capital is defined in its both health and educational dimensions incorporating the qualitative and quantitative aspects. Using a panel of 141 countries (93 developing and 48 developed); we attempted to explore and compare the impact of human capital on economic growth in different development stages. For estimation, System Generalized Methods of Moments (SGMM) is employed for the period of 1980-2008. Findings reveal that all aspects of human capital positively influence growth in developing countries, especially life expectancy gain, which may be explained by the demographic transition these countries are going through. However, the scenario is different for developed countries where increased life expectancy posits a drag on economic growth, probably because of the increasing aging population and dependency ratio. Only when life expectancy is omitted, health expenditure, along with other educational measures of human capitals, help in sustaining growth in developed countries.

**Keywords:** Human Capital; Qualitative; Quantitative; Economic Growth; Developing; Developed.

**JEL classification:** C54; I15; I25; J24; O40; O57.



## **D. EXTERNAL SECTOR-REMITTANCE**



# 1. Impact of Remittances on Economic and Social Wellbeing of Returnee Migrants: A Household Level Study

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## Abstract

The study attempts to evaluate the impact of remittances on the economic and social wellbeing of returnee migrants in two districts of Bangladesh at the household level. Primary data were collected using the Multi-Stage Stratified Random Sampling technique through a structured questionnaire from Tangail and Cumilla district on several characteristics such as demographic, economic, and social issues to address the economic and social wellbeing of returnee migrants. Binary Logistic Regression model and Propensity Score Matching (PSM) method are employed to assess the impact of remittances on the wellbeing of returnee migrant households. Binary Logistic Regression has used to predict the likelihood of receiving remittances by few socio-economic indicators. In addition, the PSM technique has allowed us to assess the remittance impact on several indicators such as land possession, expenditures, income, savings, and investment. The study findings reveal that remittances exhibit a significant positive impact on different socio-economic variables of returnee migrant's wellbeing. Remittances have contributed a lot in terms of income generation and upgraded the living standards of migrants by increasing consumption expenditures, savings, and investments. To maximize and sustain the growth of remittances, we should train our migrants for utilizing their real potential, minimize the cost of their going abroad and provide necessary investment advices for the productive use of their earned money.

## **2. External Sectors and Income Growth Nexus in the Presence of the Violation of Human Rights (VHR): A Case of Bangladesh**

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### **Abstract**

This study examines the linkages between external macroeconomic determinants i.e. imports, foreign direct investment (FDI), foreign development assistance (FDA), exports, remittances and income growth in Bangladesh. The main contribution of this study is to look into this nexus in the presence of the Violation of Human Rights (VHR). The study employs an ARDL bounds testing approach using data over the period of 1980-2018. The results obtained depict that FDI, FDA, exports and remittances impact income growth positively in the long run whereas imports affect the income growth negatively. The result of the study remains robust under Canonical Cointegration Regression (CCR) estimator. Therefore, the study recommends that policy makers shall pursue appropriate policy decision to enhance the volume of exports, the inflow of remittances, and the inflow of FDI, FDA as foreign resources in order to sustain the long-run economic growth. In addition, the utilization of imported intermediary goods in the form of value added industry is critical to reach the higher growth trajectory in Bangladesh.

### 3. Testing Export-led Growth Hypothesis: Evidence from BCIM Countries

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#### **Abstract**

The paper investigates the export-led growth hypothesis for four South Asian countries e.g. Bangladesh, China, India and Myanmar (BCIM) using PMG regression technique and Pairwise DH Panel Causality tests over the years 1980-2017. Employing the bivariate (GDP and exports), the trivariate (GDP, exports and exchange rate; and the multivariate (GDP, exports, exchange rate and gross government consumption expenditure and investment) models, the study finds that exports have significantly positive impact on the GDP growth in all BCIM economies in the long run. In this backdrop, policy makers of these countries should continue the existing momentum of export promotion and search for new destinations by diversifying both export markets and commodities including services to reach spectacular growth trajectory.



## **E. ENERGY**



# 1. Electricity Consumption and GDP Nexus in Bangladesh: A Time Series Investigation

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## **Abstract**

The purpose of this paper is to assess the empirical cointegration, long-run and short-run dynamics as well as causal relationship between electricity consumption and real GDP in Bangladesh for the period of 1971–2014. Autoregressive Distributed lag (ARDL) “Bound Test” approach is employed for the investigation in this study. Both short-run and long-run coefficients are providing strong evidence of having positive significant association between electricity consumption and GDP. Our long-run results remain robust to different measurements and estimators as well. The study reveals the unidirectional causal flow running from per capita electricity consumption to per capita real GDP in the short run. The study result also yields strong evidence of bidirectional causal relationship between per capita electricity consumption and per capita real GDP in the long run with feedback. It is suggested that both electricity generation and conservation policy will be effective for Bangladesh economy. In prior studies, lack of causality between electricity consumption and GDP is due to the omitted variables. Combined effects of public spending and trade openness on GDP and electricity consumption are also considerable.

**Keywords:** Electricity consumption; GDP; ARDL bounds test; Causality test

## 2. Electricity Consumption and Income Nexus: Evidence from Bangladesh

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### **Abstract**

The purpose of this study is to examine the causal relationship between per capita electricity consumption (PCEC) and per capita gross national income (GNI) (PCGNI) in Bangladesh for the period of 1971-2014. By using Vector error correction modeling approach. The study reveals that positive short-run unidirectional causal flow running between PCEC to PCGNI without feedback which implies that an increase in electricity consumption promptly affects economic activity. The results of both long-run and joint causality yield strong evidence of bidirectional causal relationship between PCEC and per capita real GNI with feedback. Therefore, both electricity generation and conservation policy will be effective for Bangladesh economy. So, smooth supply of electricity is necessary to meet the growing electricity demand for consumption; consequently, it will lead to sustain of growth and take it even higher level.

**Keywords:** Cointegration; Energy sector; Error correction models, Electricity

## **F. ENVIRONMENT**



# 1. Econometric Analysis of the Effect of Economic Globalization, Energy Intensity, Urbanization, Industrialization and Growth on CO<sub>2</sub> Emissions of Bangladesh

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## **Abstract**

This paper examines the effect of economic globalization, energy intensity, urbanization, industrialization and growth on per capita CO<sub>2</sub> emissions of Bangladesh employing techniques of Johansen co-integration, Vector Error-Correction Models (VECM) and Vec Granger Causality Tests. To analyse the impacts of innovations in all variables on CO<sub>2</sub> emissions, this study additionally employs variance decomposition (VDC) for robust findings. The result of long run and causality test postulates that growth stimulates energy consumption and consequently causes CO<sub>2</sub> emissions. VDC result posits that in the long run, energy intensity, urbanization, industrialization and growth contribute more than 60% of the CO<sub>2</sub> emission in Bangladesh. On the other hand, effect of economic globalization becomes stronger in the long run but in explaining fluctuations in CO<sub>2</sub> emissions it contributes only 9%. To avoid adverse effect of growth implementations of energy conservation policies are needed.

**Keywords:** Johansen co-integration; globalization; CO<sub>2</sub> emissions; urbanization; industrialization

**JEL Classification:** O44; Q20; Q43

## 2. Sustainable Growth-Environment Nexus in the Context of Four Developing Asian Economies: A Panel Analysis

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### **Abstract**

This paper has used a STIRPAT model to investigate the synergistic effect of CO<sub>2</sub> emission, energy consumption, energy intensity, economic growth, population, urbanization and trade openness to demonstrate growth-environment nexus in four selected developing Asian economies. Taking a panel data set from Bangladesh, China, India and Indonesia this study applies Autoregressive Distributed Lag (ARDL) model and VEC Granger Causality/Block Exogeneity Wald Tests. The empirical results show that energy intensity, urbanization, population, and per capita GDP growth are the *raison d'être* of CO<sub>2</sub> emissions whereas trade openness is found to be negatively related with CO<sub>2</sub> emissions. On the other hand, energy consumption, urbanization, population, trade openness are positively related to per capita GDP. In addition, the study also investigates the Environmental Kuznets Curve (EKC) hypothesis and the findings substantiate an inverted U-shaped relationship. Cross-section short-run coefficients of country level data are inquired into to check the robustness of the panel outcomes. This study is distinctive as it looks into the different dimensions of growth-environment nexus in the context of four most promising economies of Asia now at different stages of development. The study recommends that environmental and energy policies should recognize the divergence in the nexus among energy consumption, economic growth, population, urbanization and trade openness.

**Keywords:** EKC hypothesis; STIRPAT model; CO<sub>2</sub> emission; Urbanization; Energy consumption

**JEL Classification:** C33; O40; Q2; Q43

### 3. Energy Environment and Growth Nexus: 2SLS Estimation

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#### **Abstract**

This study has employed Two Stage Least Square (2SLS) approach to analyze Growth-Energy-Environment Nexus of Bangladesh using data spanning from 1980 to 2016. Two models are specified and after employing the reduced form equation the two models are reduced into one to run the regression to estimate the parameters of the corresponding variables. Result postulates non-renewable energy consumption and forest depletion have profound impact on CO<sub>2</sub> emission whereas renewable energy shows no significant consequence. The issue which arises in this regard is that renewable energy consumption has not yet disembarked at a stage from where it could play substantial role for emission reduction. The paper highlights the interrelationships between CO<sub>2</sub> emission, renewable and non-renewable energy consumption, forest depletion and growth as well using 2SLS with instrument variables which is unique of this kind in Bangladesh context. Findings have espoused that improvement in energy efficiency, pollution control, less use of fossil fuels and more use of renewable energy are key options to ensure environment quality.

**Keywords:** 2SLS; Renewable Energy; Non-renewable Energy, Forest Depletion; CO<sub>2</sub> emission

**JEL classification:** C2; C52, Q4; Q5; Q43

## **4. Does FDI Harness Energy Consumption: A Case of Bangladesh**

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### **Abstract**

The paper examines the relationship between foreign direct investment (FDI) and energy consumption within the purview of economic growth and trade liberalization employing Auto Regressive Distributive Lag (ARDL) bounds testing approach over the years of 1971-2014 in the context of Bangladesh. The study result depicts that there exists a negative impact of FDI on energy consumption in both the long run and short run. More to the point that the impulse response function (IRF) of energy consumption following a positive shock to FDI increases after the impact and rises continuously upward, implying a favorable consequence of FDI on energy consumption. The study results persist robust to alternative measurements and estimators e.g. fully modified OLS (FMOLS), dynamic OLS (DOLS) and canonical cointegration regression (CCR). Therefore, the policy makers should take the pragmatic policy for the best utilization of FDI in energy consumption and reinforce local absorptive capability to wholly internalize FDI-centric information spillovers in energy conservation.

## **5. Modeling the asymmetric impact of Urbanization on CO<sub>2</sub> Emissions: Empirical Evidence from 137 Income Classified Economies**

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### **Abstract**

Urbanization is a phenomenon which is closely connected with modernization, industrialization and sociological progress. This study attempts to explore the relationship between urbanization and CO<sub>2</sub> emissions and how carbon dioxide emissions behave with the increase or decrease in urbanization whether it is symmetric or asymmetric. The present study employs panel data on the percentage of urban population and CO<sub>2</sub> emissions along with few macroeconomic variables for income classified economies (low income, lower-middle income and upper-middle income) from 1960-2017. In order to obtain the empirical assessment of urbanization effect on CO<sub>2</sub> emissions, we estimate a robust generalized least-squares (GLS) panel model of first differenced variables. The study findings reveal the presence of asymmetric relationship between growth/decline of urbanization and CO<sub>2</sub> emissions. CO<sub>2</sub> emissions reduce to a great extent when urbanization decreases than CO<sub>2</sub> emissions increase in case of urbanization growth of LICs. Besides, the reduction of urbanization has no significant impact on CO<sub>2</sub> emissions in case of upper-middle income countries but CO<sub>2</sub> emissions increases immensely when urbanization increases. The similar scenario is also evident in our global panel of all income classified 137 countries even after the incorporation of increase/decrease of economic growth and quadratic urbanization. To offset the negative externalities of carbon emissions, the development of urbanization can be managed in an environment friendly manner.

## 6. Predicting Air Quality of Dhaka and Sylhet Divisions in Bangladesh: A Time Series Modeling Approach

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### **Abstract**

Air pollution has emerged as one of the major public health threats. In recent years, Bangladesh has ranked among top air polluted countries around the globe. Air quality in Bangladesh is measured on daily basis using national standards of five pollutants – NO<sub>2</sub>, CO, Ozone (O<sub>3</sub>), SO<sub>2</sub> and particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) and presented as indexed value ranged from 0 to 500 which is further classified from good to extremely unhealthy. In this study we have applied Seasonal Autoregressive Integrated Moving Average (SARIMA) model to forecast weekly air quality of Dhaka and Sylhet divisions in Bangladesh. Our study reveals the existence of seasonal pattern of the air quality and suggests extremely unhealthy and very unhealthy air in January-March 2020. Therefore, policymaker should address this period as the air quality directly influences public health.

## 7. Nexus between CO<sub>2</sub> Emission, Energy Use and Sectoral Output: A Panel Cointegration Analysis of South Asia

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### **Abstract**

The present study contributes the existing literature on CO<sub>2</sub> emission, energy use and output nexus in a way that there are very limited number of studies that incorporated the contribution of sectoral output to understand the potential contribution of each sector while in South Asian context this kind of study is non-existent. Therefore, the study investigates the dynamic impacts of CO<sub>2</sub> emission, energy use and sectoral output for a panel of South Asian economies including Afghanistan, Bangladesh, Bhutan, India, Pakistan, Maldives, Nepal, and Sri Lanka. The analysis is done using annual panel data from 1980-2019 employing Dynamic Ordinary Least Squares (DOLS) and Fully Modified OLS (FMOLS) techniques. Empirical findings reveal the existence of a statistically significant long-run cointegrating relationship between CO<sub>2</sub> emission, energy use, urban population, globalization and sectoral output incorporating agricultural, industry and service GDP. DOLS and FMOLS result posits that in case of South Asian region agriculture GDP do not contribute to increase in CO<sub>2</sub> emission while service and industrial GDP is responsible for increasing CO<sub>2</sub> emission along with urban population and to some extent globalization. More remarkably the contribution of the service GDP is greater than the other two sectoral output in increasing CO<sub>2</sub> emission. CO<sub>2</sub> emission being a global phenomenon with cross-boundary effect, these empirical findings will contribute to formulate implementable energy and environment policies to sustain growth as well as environmental protection in the regional context.

**Keywords:** CO<sub>2</sub> emission; Urbanization; Energy Use; South Asia; FMOLS; DOLS

**JEL Classification:** C33; O44; Q43; Q56

## 8. Economic Growth and Environmental Pollution Nexus in Bangladesh: Revisiting the Environmental Kuznets Curve Hypothesis

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### **Abstract**

The paper examines the environmental Kuznets curve (EKC) hypothesis by representing the counteracting and causal relationships between economic growth and GHGs—greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O) emissions in Bangladesh using annual time series data over the period 1976-2014. In particular, we include the pertinent proxies of some control variables—trade openness, urbanization financial openness in the model employing ARDL approach to the estimation of both short and long-run relationship among the variables. We apply a VAR-based innovative accounting approach (IAA) Granger causality test to detect the causal relationship between the variables. The empirical findings depict that there is a positive long-run relationship between economic growth and CO<sub>2</sub>, CH<sub>4</sub> emissions and hence, no existence of EKC hypothesis is explored in the case of CO<sub>2</sub> and CH<sub>4</sub> emissions. But the EKC hypothesis is consistent with the case of N<sub>2</sub>O emissions due to both the short and long-run adverse effects of GDP on N<sub>2</sub>O emissions. The results are further verified by the impulse response function used for the IAA Granger causality test. Besides, Granger causality test shows the bidirectional causal relationship between GDP and CO<sub>2</sub> emissions and unidirectional causal relationship running from CH<sub>4</sub> emissions to GDP. In addition, trade openness, urbanization and financial openness are found to have more or less positive relationship with GHGs emissions, and these macroeconomic indicators thus would not wholly be favourable to improve the quality of environment in Bangladesh in the long run. Therefore, the study suggests pursuing alternative source of energy generation to improve the environmental quality by reducing GHGs emissions.

**Keywords:** EKC; GHGs emissions; trade openness; urbanization; financial openness; ARDL; Bangladesh

## **G. HEALTH & GOVERNANCE**



# 1. Bangladesh National Adolescent Health Strategy, a Step to Achieve Sustainable Development Goals by 2030: A Policy Analysis and Legal Basis

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## **Abstract**

This paper aims to critically assess the adolescent focused policies and plans of Bangladesh of the last two decades. Another aim of this article is to check how the latest National Adolescent Health Strategy (NAHS) is compatible with the global strategy and to suggest some ways to achieve Sustainable Development Goals by 2030 using policy analysis triangle framework. Authors reviewed all relevant policy documents introduced by the Government of Bangladesh during 1998-2017. This framework allows the analysis of the contextual factors that influenced the policy, the process and the entities involved in the decision making. Findings suggest Bangladesh strategy is comprehensive and aligned with global strategies but only regarding the key strategies. Thus identifying key activities including implementation and monitoring plan with a specific timeline is the urgently required. A tentative Plan of Action has been proposed and it is expected that the policy community will be benefitted to take their future actions to implement the strategy successfully.

**Keywords:** Adolescent health; health policy; mental health; policy triangle framework; policy analysis; sustainable development goals

## 2. Modeling Risk of Infectious Diseases: a case of Coronavirus outbreak in four countries

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### **Abstract**

The novel coronavirus (2019-nCoV) outbreak has been a serious concern around the globe. Since people are in tremor due to the massive spread of coronavirus in the major parts of the world, it requires to predict the risk of this infectious disease. In this situation, we develop a model to measure the risk of infectious disease and predict the risk of 2019-nCoV transmission by using data of four countries—US, Australia, Canada and China. Methods the model underlies that higher the population density, higher the risk of transmission of infectious disease from human to human. Besides, population size, case identification rate and travel of infected passengers in different regions are also incorporated in this model. According to the calculated risk index, our study identifies New York State in United States (US) to be the most vulnerable area affected by the novel Coronavirus. Besides, other areas (province/state/territory) such as Hubei (China, 2nd), Massachusetts (US, 3rd), District of Columbia (US, 4th), New Jersey (US, 5th), Quebec (Canada, 20th), Australian Capital Territory (Australia, 29th) are also found as the most risky areas in US, China, Australia and Canada. The study suggests avoiding any kind of mass gathering, maintaining recommended physical distances and restricting inbound and outbound flights of highly risk prone areas for tackling 2019-nCoV transmission.

### 3. Assessing Early Childhood Development and its Correlates among 36-59 months aged Children in Bangladesh

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#### **Abstract**

Early childhood development (ECD) is the basic foundation of health and well-being in adulthood. Different factors may constitute ECD for a child such as poor health, malnutrition, non-stimulating home environments and poverty as well. In this backdrop, this study attempts to examine the factors associated with ECD of children aged 36-59 months (n = 7352) using Bangladesh using Multiple Indicator Cluster Survey 2012-13 data. Multilevel logistic regression technique is used to identify the correlates of ECD. About 65% of the children reached their full developmental potential, with the lowest and highest rate of being on track in the literacy domain (~23%) and physical domain (~94%) respectively. The study finds that older aged children, currently being breastfed, having educated mothers and living in urban areas were more likely to be *on track* for ECD (p-value <0.05). Children who had relatives engaged with them in four or more activities, read books, and their mothers' exposure to various forms of media were more likely to remain on a regular developmental

trajectory. Children who were male, malnourished and experienced physical punishment were less likely to be *on track* for ECD. Since a large number of children are found not to be on track for ECD, policymakers should pursue both investment and tailored interventions on targeted areas so that children of Bangladesh may achieve their full development potentials in early childhood ages.

## **H. THINK TANK**



# 1. The Role of Think Tanks in Social Policy-Making: The Bangladesh Perspective

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## **Abstract**

Think tanks uphold up-to-date policies through evidence-based research, the exchange of views and ideas among multifarious stakeholders, and civic activism in most of the countries of the world. Historically, the formation of the Clarkson's Committee in the US is regarded as the first think tank, which focused its efforts against the African Slave Trade in 1782. Now, in many countries of the world, especially in Bangladesh with different nomenclatures, these think tanks are playing a crucial role in different affairs of the state and society. The prime focus of this study is to examine the role of think tanks in social aspects, such as with health, education, gender, poverty, and the environment. Based on secondary data and information derived from literature reviews, the author quite strongly argues that the think tanks of Bangladesh are playing a very positive role in social policy making through research, dialogue, programs, projects, and civic activism. However, it has also been found that Bangladesh's think tanks have witnessed some gaps in terms of performance in comparison to global think tanks when playing a role in the policy-relevant issues. Hence, some recommendations have been made to improve the roles of think tanks in Bangladesh.

**Keywords:** Think Tank; Role, Policy; Social Policy-Making; Bangladesh Entrepreneur

## 2. Rise and Trend of Think Tanks: A Policy Relevant Perspective

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### **Abstract**

Idea comes from think tanks. And the policy relevant idea that does not exclusively come from other source but think tanks to play an important role in the policy-making process of a country. From this point of view, the notion of think tank has significantly been the magnetic phenomenon to the policy makers, statesmen, administrators, donor agencies, civil society, and other stakeholders. In this backdrop, the study mainly aims to look into the rise and trend of think tanks in different countries, such as US, China, India and Bangladesh, and identify the potentials of global think tanks to exploit these into the policy-making process of Bangladesh. Based on the secondary data, the study is carried out following the content analysis method to reach the study objective. The study argues that the rise of think tanks worldwide is time-necessitated and their current trend in policy-making process is enormously traced out with their rigorous potentials. Therefore, Bangladesh as a developing country can exploit the potentials of think tanks into its policy-making process as followed by the global think tanks.

# **I. MACHINE LEARNING**



# 1. Predicting Hypertension from Survey Questionnaire Using Machine Learning Techniques

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## Abstract

Prevalence of hypertension is on rise in most of the South Asian countries including Bangladesh and India. Hypertension, along with its hazardous health effect, contributes to the development of other non-communicable diseases. Control of non-communicable diseases including hypertension involves early detection of hypertension and prevention. In this study we propose predictive models of hypertension based on multilayer perceptron (MLP) neural network and logistic regression. Instead of using clinical information – which certainly provides more accuracy and detection of hypertension, we have used simple demographic and anthropometric information in order to make the trained model usable in an easy-access manner. The data were found imbalanced and synthetic minority over-sampling technique nominal continuous (SMOTE-NC) method was used to balance the data. Family size, age, gender, marital status, diabetes, body mass index, occupation were identified as potential risk factors of hypertension. Model evaluation was carried out using sensitivity, accuracy, specificity and area under the curve (AUC) and found an average sensitivity of 72%, accuracy of 68%, specificity of 65%, and AUC of 0.75 for MLP model – which are fairly acceptable. Besides, we have deployed the trained model to real-time service for general use which will help detecting risk of hypertension in terms of probability.

## 2. A Comparative Study of Credit Card Fraud Detection Using the Combination of Machine Learning Techniques with Data Imbalance Solution

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### **Abstract**

Due to the rapid spread of fraud and cyber security risks in digital economy, fraud detection stands as a prime issue of modern technology. However, the analysis of fraud cases is computationally difficult because, fraud cases conjure less than 0.2% of the transactions. Thus to figure out the best classification technique to use for fraud detection, this paper has conducted a thorough experimentation of Machine Learning (ML) techniques. It has implemented six ML techniques i.e. Logistic Regression (LR), Support Vector Machine (SVM), Naïve Bayes (NB), Random forest (RF), Decision Tree (DT), and K-nearest neighbour (KNN) classifiers to detect credit card fraud. The investigation used five type of datasets i.e. imbalanced data, Under Sampled (US) data, Over Sampled (OS) data, sampled data using Synthetic Minority Over Sampling Technique (SMOTE) and Adaptive Synthetic Sampling Method for Imbalanced Data (ADASYN). The best combination of these classification approaches is selected based on five performance evaluation criteria i.e. Accuracy, Area Under the Curve (AUC), Precision, Recall score and f1-score. After evaluation of the classifiers it has showed that among 30 different classification approaches, RF classifier with over sampling (OS) technique was found to be the best approach in terms of all the performance criteria. It showed 99.99 % accurate and precise results with 99.99 % AUC, f1-score and 100 % Recall rate. Our choosen approach has obtained the highest accuracy over other studies on the same dataset. The banking sector as well as other financial institutions might use this suggested machine learning based combination approach to minimize (debit/credit card) frauds.

### 3. Explaining Diagnostic CNN Concepts to Promote Personalized Health Management for Predicting Hypertension

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#### **Abstract**

Analyze the concepts learnt by a state-of-the-art CNN model when predicting hypertension to promote hypertension management through changes in lifestyle. The dataset was collected through surveys done on Indian and Bangladeshi population. It has 22 lifestyle variables, and 226,953 relevant respondents (194,728 normal and 32,225 hypertensive class). We used a Convolution Neural Network (CNN) as the diagnostic model and proposed two simulation techniques to explain the concepts learnt by the CNN. We compared performance of the CNN model with other baseline models fitted with other hypertension data which included neural network, decision tree and other CNN model from literature. Besides, we applied logistic regression technique to uphold our findings from CNN. The CNN achieved a 68-70% accuracy on training and testing datasets. Comparing with other baseline models, our CNN model provided more consistent performance in terms of accuracy, sensitivity, specificity and area under ROC curve. Using the simulations, we learnt that CNN captured not only directly learn the correlation between variables and the target, but also learnt group-based interaction. Our study reveals that age, gender, diabetes status, body mass index, smoking, occupation, marital status and education are some important lifestyle factors affecting hypertension. The concepts learnt by the CNN can be used by physicians to suggest management techniques by studying fluctuating hypertension risk during the simulation. Avoiding smoking, maintaining a balanced diet to prevent unnecessary weight gaining, regular monitoring of blood sugar level for diabetic care, and stress relief exercise can reduce hypertension risk.



## **J. FINANCE**



# 1. Analyzing Volatility of Dhaka Stock Exchange (DSE) with Historical Events around Breakpoints: ICSS Algorithm Approach

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## **Abstract**

This paper inspects the types of incidence that lead to the hefty changes in the volatility of Dhaka Stock Exchange (DSE). We identify when the bulky shifts in the volatility of DSE returns takes place and then determine the local events at the time of change in volatility. An Iterated Cumulative Sum of Squares (ICSS) algorithm is used to detect the points of abrupt quakes in the variance of returns. DSE General Index & DSE Broad Index daily data are combinedly collected from 1st January, 2003 to 29 July, 2019. Our contribution is to detect each point of changes in the volatility. Then the study sightsees around the events and policy regime over those detected periods. The findings help the policy makers to modify and execute discussed rules and regulations in order to avoid such collapses in future.

**Keywords:** Bangladesh Stock market; Volatility; ICSS algorithm; DSE; GARCH; Historical Break Points



## **K. GENDER ECONOMICS**



## 1. Impact of Access to Land on Women's Empowerment: An Empirical Evidence from Rural Bangladesh

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### **Abstract**

The study aims to assess the impact of access to land of rural women in Bangladesh. Multistage, geographically clustered, probability-based sampling approach is adopted in this study. Descriptive statistics has been employed to analyze the socioeconomic profile of the respondents. Binary Logistic Regression (BLR) has been used to assess the perceptions of the women about their access to land and to assess their decision making capacity. Additionally, Propensity Score Matching (PSM) technique is used to assess the impact of land ownership on household income and own income of rural women. The study findings reveal that land has a positive impact on household income but rural women's own income do not increase significantly despite having land. It appears that income and frequency of visit to NGO are the key factors contributing the increase of their overall wellbeing. Decision making capacity of rural poor women remains very low as they are depended on husband's opinions regarding financial and land related issues. The policy makers should take into account the findings of the study in designing appropriate land ownership policy targeted for women empowerment.

## **2. Glass Ceiling Faced by Women in Workplaces: Bangladesh Public Sector Perspective**

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### **Abstract**

Workplace incivility against women is evident in a male dominated administration. In most cases, women's unexplored problems i.e. glass ceiling in the workplaces especially public administration influence incivility against women. In this backdrop, the study examines the effect of glass ceiling on workplace incivility against women by utilizing cultural theory coined by (Hofstede, 2005). This theory encompasses four dimensions of glass ceiling, including masculinity versus femininity, uncertainty avoidance, power distance, and collectivism versus individualism. First two dimensions are used in the study as "self-regarding problems" and later two as "other regarding problems" faced by women in the workplaces. By employing mixed effect logistic regression technique, the study finds that "other regarding problems" affect workplace incivility against women significantly in the sphere of civil service in Bangladesh. Therefore, the study suggests treating women employees positively by introducing civility trainings in the domain of public offices, focusing on building awareness among employees of what counts as incivility.

## **L. HUMAN RESOURCE AND ORGANIZATIONAL DEVELOPMENT**



# 1. The Influence of Knowledge Sharing on Sustainable Performance: A Moderated Mediation Study

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## **Abstract**

The past few decades showed inadequate discussion of the impact of employees' knowledge sharing and its diffusion on advancing banks' long-term sustainability. The objective of the study is to examine the role of employees' knowledge sharing on the sustainable performance of the banks operating in Bangladesh. Furthermore, this study tested the "moderated mediation model" of knowledge hiding and employees' ambidexterity on the association above. The researchers applied the deductive reasoning method through the application of quantitative techniques, using structural equation modeling. Finally, 287 respondents from different banks were chosen through a self-administered questionnaire survey in the capital city of Dhaka. The findings indicated that all the predictor variables significantly explain the outcome variable, except the influence of knowledge sharing. Mediation analysis showed that employees' ambidexterity mediated the association between knowledge sharing and sustainable performance. Surprisingly, moderation analysis revealed that the influence of knowledge sharing on employees' ambidexterity is not affected by knowledge hiding. This study adds to the existing literature by demonstrating the importance of knowledge hiding, along with explaining how knowledge sharing can

motivate and influence employees to achieve sustainable performances. In addition, the main contribution of this study is to advance knowledge and add values in the forms of knowledge creation, preservation, and dissemination among practitioners, banking professionals, and academics for utilizing their domain-specific areas to increase long-term sustainability.

**Keywords:** knowledge sharing; knowledge hiding; employees' ambidexterity; sustainable performance