NEAR EAST UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
BANKING AND FINANCE PROGRAM

THE IMPACT OF THE INDUSTRALIZATION, FINANCIAL DEVELOPMENT AND ECONOMIC FACTORS ON ENVIRONMENTAL QUALITY: EVIDENCE FROM THE SELECTED BRICS COUNTRIES

MALIKA SADIKOVA

MASTER'S THESIS

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ACCEPTANCE/APPROVAL

We as the jury members certify the “The impact of the industralization, financial development and economic factors on environmental quality: evidence from the selected BRICS countries” prepared by MALIKA SADIKOVA defended on
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Has been found satisfactory for the award of degree of Master

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I am Malika Sadikova, hereby declare that this dissertation entitled “The impact of the industralization, financial development and economic factors on environmental quality: evidence from the selected BRICS countries” has been prepared myself under the guidance and supervision of **“Assist. Prof. Dr. Nil Günsel Reşatoğlu”** in partial fulfilment of the Near East University, Graduate School of Social Sciences regulations and does not to the best of my knowledge breach and Law of Copyrights and has been tested for plagiarism and a copy of the result can be found in the Thesis.

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The defense of a master's thesis is an exciting procedure with a large share of responsibility. At the same time, this is a certain stage in the life path, which opens up new opportunities for self-realization.

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ABSTRACT

THE IMPACT OF THE INDUSTRALIZATION, FINANCIAL DEVELOPMENT AND ECONOMIC FACTORS ON ENVIRONMENTAL QUALITY: EVIDENCE FROM THE SELECTED BRICS COUNTRIES

The master's thesis was performed in the framework of the economical and environmental quality of selected countries. The purpose of this study is to analyze and emprically investigate the releationship between the variables such as industralization, economic factors and financial development on environmental quality by using time series and panel setting data for BRICS countries. Mentioned varibales are the most importatant key factors of the environmental degredation. However, this study was contucted for BRICS but only India, China and South Africa have been included to the analysis. Because of the limitations problem, as it is data not avaliable for Brazil and Russian Federation. The study exemines the data during the 1992 to 2014 periods. As the result of the tests there is a long run relationship among the estimated variables.

In the modern era, when the discrepancy between environmental pollution and financial growth in BRICS countries' industry have become one of the problems of sustainable development, we need to conduct research in order to achieve a balanced relationship between them, and provide a reliable theoretical basis for shaping environmental policy that limits countries' economic sustainable development. This requires a factor analysis of the previous dynamics of the financial and ecological state of the countries, as well as a well-grounded scenario forecast for further coordinated development. This is the task of economic and mathematical modelling, using modern information technologies and official statistics, which is the subject of this dissertation.

Keywords: Environmental Quality, Carbon (CO_2) Emissions, Industralization, Financial Development, Economic Factors, Energy Consumption.

ÖZ

THE IMPACT OF THE INDUSTRALIZATION, FINANCIAL DEVELOPMENT AND ECONOMIC FACTORS ON ENVIRONMENTAL QUALITY: EVIDENCE FROM THE SELECTED BRICS COUNTRIES

Yüksek lisans tezi, seçilmiş ülkelerin ekonomik ve çevresel kalitesi çerçevesinde gerçekleştirilmiştir. Bu çalışmanın amacı, BRICS ülkeleri için zaman serisive panel verileri kullanılarak sanayileşme, ekonomik faktörler ve çevresel gelişim üzerindeki değişkenler arasında ilişkiyi incelemektir.Söz konusu değişkenler çevresel bozulmanın en önemli anahtar faktörleridir. Ancak bu çalışma sadece BRICS ülkeleri için yapıldı. Hindistan, Çin ve Güney Afrika analizlere dahil edildi. Sınırlamalar nedeniyle veriler Brezilya ve Rusya Federasyonu için mevcut değildir. Çalışma, 1992'den 2014'e kadar olan dönemlerdeki verileri incelemek tedir. Testler sonucunda tahmin edilen değişkenler arasında uzun sürelibiril işki gözlemlenmiştir.

Modern çağda, BRICS ülkerinin endüstrisindeki çevrekirliliği ve finansal büyüme arasındaki tutarsızlık sürdürülebilir kalkınma sorunlarından biri haline geldiğinde, aralarında dengeli bir ilişki kurmak ve ülkerlerin ekonomik sürdürülebilir gelişimini sınırlayan çevre politasını şekillendirmek için güvenilir birlik ve temel sağlamak için araştırma yapmamız gerekiyor. Ülkelerin finansal ve ekolojik durumunun önceki dinamiklerinin bir factor analizinin yanısıra daha fazla koordineli kalkınma için iyi bir senaryo tahmini gerektirmektedir.

Anahtar Kelimeler: Çevre Kalitesi, Karbon (CO_2) Emisyonları, Sanayileşme, Finansal Gelişim, Ekonomik Faktörler, Enerji Tüketimi.

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INTRODUCTION

The modern world is characterized by multipolar development, an important part of which is the rapid growth of economies with emerging markets, which have an ever-increasing impact on the functioning of all spheres of the global community. In the variety of developing economies, a special role belongs to the BRICS countries, which are characterized by dynamic development, even in post-crisis, recessionary conditions. The BRICS countries have a number of features of economic activity that favorably distinguish them from other countries, in particular - the accumulated human potential; the richest reserves of natural resources (including energy resources); capacious domestic market, etc.

BRICS - a group of five dynamic developing economies of the modern world: Brazil, Russia, India, China, South Africa (joined at the III Sanya Summit, China, April 13-14, 2011). Taking into account the latter circumstance, the place of South Africa in the system of global finance is considered fragmentary and is not the subject of special analysis. The abbreviation of BRIC was first proposed by JimO'Neill, the head of the global economic research unit at Goldman Sachs in 2001. This term was formed after the first letters of the names of four developing countries (Brazil, Russia, India and China), due to the growth of which the growth of the world economy and stock markets is possible in the future.

Since countries entering to the epoch of industrialized society, mankind has made great strides in economical growth. With the development of globalization in economy, industrial expansion and urbanization have caused a satisfactory rising in costs of resource and dispansation of disposal the world's environment. Since the 1960s, ecological deterioration arising from financial development has attracted a lot of consideration from researchers around the scientific world. As an example, Rachel Carson, in "Silent Spring", in 1962 years' discusses the increasing risks of pesticides and chemical

substances, such as DDT. In 1972, published a report by members of the Club of Rome - a group of economists. A report named by "The limits of Growth". It stated that the financial development, population, investment, food productivity, leads to wasting of resources and environmental degredation - this is dramatic development; with this trend in economical development, in 100 years will achieve its limit. The meeting of the international conference on the environmental protection was held first meeting in 1972. The slogan "Only one land", and it was the first milestone in understanding the history of mankind sustanability. In 1987, the subject of the world's environment is presented. In the report of the Development Commission "Our Common Future" at the UNGA (United Nations General Assembly), represented the formulated concept of sustanability of the development in economy. Between the countries of the world in 2009, agreed a new agreement in connection with the future changes of the climate. The Conference was held in Copenhagen, regarding the "Global Warming" convened under the auspices of the United Nations. The Climate Summit, in 2015, enacted the World Declaration on Commitments about Reduction in Carbon Dioxide Emissions. Mentioned decleration will continue until 2030.

However, BRICS countries are at the phases of extremly economical development. From there form periods and openness, traditional development models and still dominant reforms such as: "high costs, high consumption, high pollution, while low quality, low efficiency, low output", or: "Pollution first, recovery later"; "first destruction, then reconstruction". The list of the main pollution in the ecological environment of BRICS countries are well known – air and water pollutions, untreated solid waste, soilerosion, and so on. BRICS have special unprecedented possibilities for rapid economical development. Furthermore, since rate of sustainable development in depends on a huge number of factors, the mixed impact of which affects energy supply and industries with pollution, and the traditional development model is still dominant, the scarcity of resources and the deterioration of the environmental ecology have become a main obstacle to sustainable

development. In the modern era, when the discrepancy between environmental pollution and financial growth in BRICS countries' industry have become one of the problems of sustainable development, we need to conduct research in order to achieve a balanced relationship between them, and provide a reliable theoretical basis for shaping environmental policy that limits countries' economic sustainable development. This requires a factor analysis of the previous dynamics of the financial and ecological state of the countries, as well as a well-grounded scenario forecast for further coordinated development. This is the task of economic and mathematical modelling, using modern information technologies and official statistics, which is the subject of this dissertation.

i. Necessity and Importance of the Research

One of the latest environmental issues is carbon dioxide (CO_2) emissions. Carbon dioxide (CO_2) occurs as a result of burning carbon as a result of burning fossil fuels. When carbon dioxide emissions exceed global emissions, this in biodiversity and an increase in environmental pollution. As a result of all this, especially in the current era, when environmental problems began to openly threaten the world, they were looking for global solutions. In recent years, sustainable development has been directed without taking into account environmental pollution. For this reason, countries are trying to minimize the damage caused by their environmental policies. The rapid growth of industralization and industrial production has turned the natural order of the world. Suddenly, growing cities and urban populations increased, cities created in cities and streams, lakes, seas, filled with pollutants, toxic gases in the air from the chimney, inaudible trash and industrial waste, as well as water, air and soil quality decreased. Although live coal is being replaced by oil over time, fossil fuel consumption is increasing every day. Global warming and climate change as a result of these negative effects

have increased the importance of the arrangements between pollution and economical development.

ii. Hypothesis of Research

This decertation examined the effects of industralition, financial development, energy use and economic factors on environmental quality of selectes countries.

Table 1. Hypothesis of Research

Variables	Hypothesis
Carbon emmission (CO_2)	H_0: Variable has a negative influance on the environmental quality of BRICS countries;
	H_1: Variables has a positive influance on the environmental quality of BRICS countries;
Financial development (FD)	H_0: Variable has a negative influance on the environmental quality of BRICS countries;
	H_1: Variables has a positive influance on the environmental quality of BRICS countries;
Industralization (MVA)	H_0: Variable has a negative influance on the environmental quality of BRICS countries;
	H_1: Variables has a positive influance on the environmental quality of BRICS countries;
Total energy consumprion (TEC)	H_0: Variable has a negative influance on the environmental quality of BRICS countries;
	H_1: Variables has a positive influance on the environmental quality of BRICS countries;
Economic growth (NY)	H_0: Variable has a negative influance on the environmental quality of BRICS countries;
	H_1: Variables has a positive influance on the environmental quality of BRICS countries;

iii.Methodology of Research in Brief

The study investigated by using the panel data and econometric tests to analyse the relations of industralization, economical factors and financial development on the environmental quality of the BRICS countries. Whether, is a long-term relationship between the variables discussed in this study, the ways and extent of this relationship and the relationship of causality between the variables will be checked by using the panel data analysis method.

iv.Research Limitations

Because of the limitation of this research is the lack of the data of Russian Federation and Brazil. Used only three countries data: India, South Africa and China.

v. Structure of the Research

This master's thesis consists of introduction, four chapters, conclusion, references of authors, six tables and four graphs

1. AN OVERWIEV OF THE BRICS COUNTRIES ECONOMIES

1.1 Gross Domestic Products

In this section, we consider the main indicators characterizing the degree of modern economic growth of the BRICS countries, such as the size and growth rate of GDP.

Based on consideredindicators, wewill determine how even and dynamic the development of the BRICS countries was, and also try to make an assessment of their economic potential.

As we can see on the graph, since the beginning of the 21st century, the BRICS countries have achieved significant success in their development.

Particularly impressive is the growth rate of the economies of China and India: for the period from 2001 to 2017. the average value of their economic growth rates was 10.17% and 7.06%, respectively.

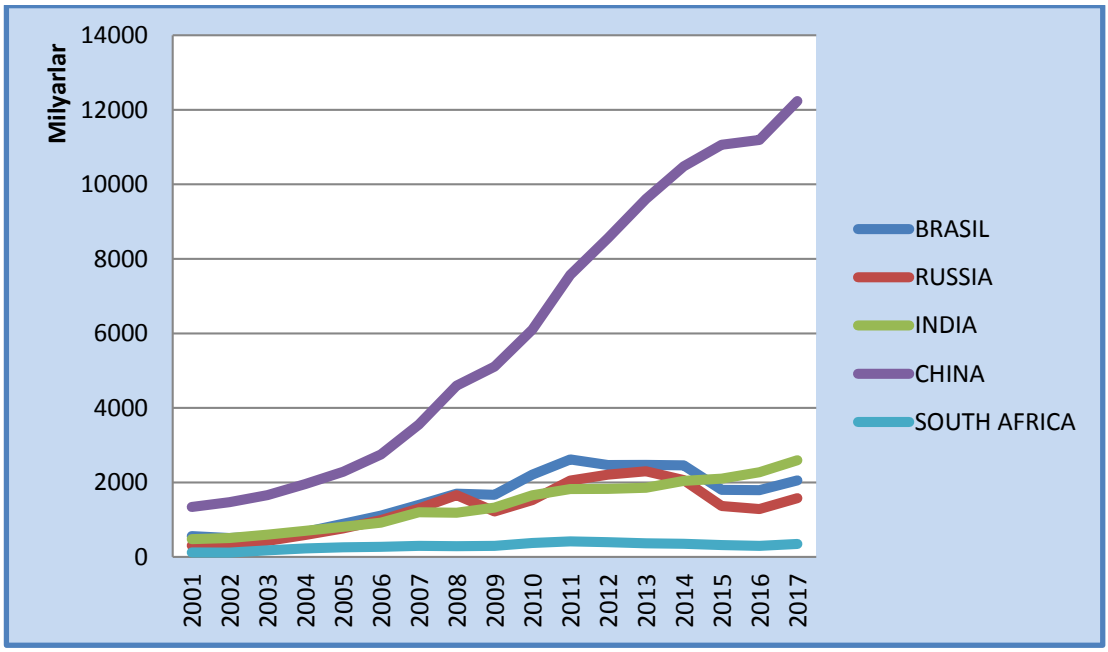

Figure 1: Gross Domestic Product (annual %) of BRICS countries

Source: The World Bank (http://databank.worldbank.org)

As a result of the rapid growth of the economies of the BRICS countries at the starting years of the 21st century, there was a reduction in the economical gap between them and the G8 countries. Currently, the G8 countries, with the exception of Russia (USA, Japan, France, Italy, Great Britain, Germany and Canada) account for about 30% of the global gross domestic product, for the BRICS countries - 18.5%, and the gap is closing all the time. Changes in

the GDP of the BRICS countries in the first period of the 21st century can be seen in the graph.

Of course, one cannot fail to note the negative influance financial crisis of the World in 2008 economies of these countries: the deterioration of external economic conditions, the fall in world demand and prices for raw materials and the outflow of investments led to a slowdown in GDP growth. It is worth noting that Brazil, China, India and South Africa recovered from the causes of the crisis fairly quickly, primarily due to a competent policy to stimulate domestic demand and demand for exported products, as well as attract investment. As for the Russian economy, for it the way out of the crisis was the longest and most difficult.

However, the BRICS countries have accumulated sufficient anti-crisis potential, which allowed them to overcome the crisis with much smaller losses than most developed countries, and to maintain steady growth.

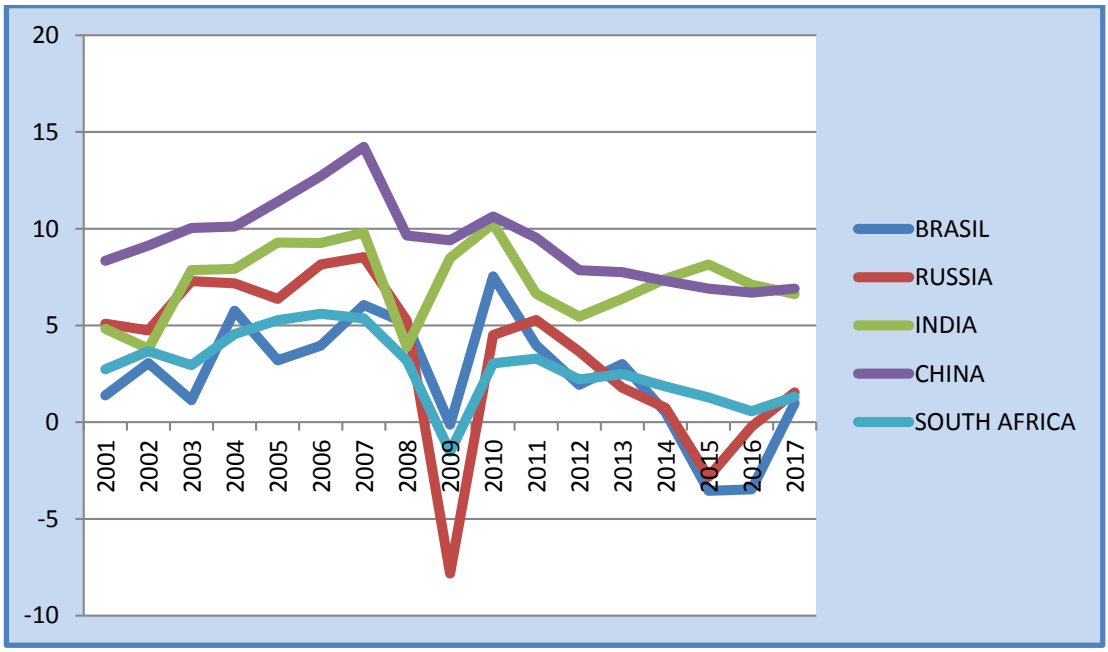

Figure 2: Gross Domestic Product (current US $) of BRICS countries

Source: The World Bank (http://databank.worldbank.org)

The highest GDP figures as of the end of 2017 in China - 8226.9 billion dollars. and Brazil - $ 2,253 billion, the lowest - from South Africa - $ 384 billion.

At present, China, Brazil, Russia and India are among the top ten countries in terms of nominal GDP: China is second, Brazil is sixth, Russia is ninth, and India is tenth. South Africa has the lowest rate - it is in the twentieth place. At the same time, China is in 86th place in terms of per capita income, Brazil is 54, Russia is 52, India is 136 and South Africa is 69. As can be seen, the national wealth of countries is very unevenly distributed.

It is also worth noting that the BRICS countries are unlikely to continue to maintain such high economic growth rates, which were observed at the beginning of the decade and reached their peak in the pre-crisis 2007 year.

Examples of countries such as Japan, Taiwan and South Korea show that when a certain level of industrialization is reached, the economic growth rates of countries tend to slow down. This situation is absolutely natural for the economy, however, the BRICS countries should think about the fact that in the future they may not be able to dominate solely due to the growth rates surpassing other countries and concentrate not on quantitative, but on qualitative development.

In addition to the slowdown in economic growth, today, a common and one of the most acute problems facing the BRICS countries is accelerating inflation, caused mainly by rising prices for food and commodities. In 2012, the inflation rate in India was 9.3%, in South Africa - 5.8%, Brazil - 5.4%, Russia - 5.1%, and in China - 2.6%

However, due to high rates of economic growth and favorable prospects for the economic development of the country, the BRICS have always been very

attractive for investment. Even during the crisis, there was an increase in foreign direct investment in the economies of these countries. The influx of investment favors the further development of these countries and the realization of their economic potential.

1.2 Banking Sector

The BRICS banking sector is represented by a strong group of private banks, state-owned (which occupy leading positions in deposit and loan portfolios), as well as banks with foreign capital.

Table 2. Top 10 banks of BRICS countries

BRAZIL	RUSSIA	INDIA	CHINA	SOUTH AFRICA
Banco do Brasil (US$ 426.65 billion)	Sberbank (US$443.20 billion)	State Bank of India (SBI) (US$420 billion)	Industrial and Commercial Bank (US$3,812 billion)	Sasfin (US$80 million)
Banco Bradesco (US$ 363.01 billion)	VTB Bank (US$219.86 billion)	ICICI Bank(US$21.38 billion)	China Construction Bank (US$3,311 billion)	Grindrod (US$720 million)
Banco Safra (US$ 46.90 billion)	Gazprombank (GPB) (US$85.24 billion)	HDFC Bank (US$130 billion)	Agriculture Bank (US$2.886 trillion)	Capitec (US$1.134 billion)
Banco Santander Brasil (US$22.14 billion)	Alfa Bank (US$21.38 billion)	Axis Bank (US$82 billion)	China Development Bank (US$26.31 billion)	Investec South Africa (US$2.940 billion)
Banco Votorantim (US$336.90 billion)	Otkritie Financial Corporation Bank (US$13.56 billion)	Kotak Mahindra Bank (US$540 million)	Postal Savings Bank (US$1,305 billion	Bidvest (US$5.314 billion)
Caixa Economica Federal (US$379.97 billion)	Russian Agricultural Bank (US$33.46 billion)	IndusInd Bank (US$1.3 billion)	Bank of Communications (US$1,325 billion)	Nedbank (US$5.317 billion)
The Brazilian Development Bank (US$288 billion)	UniCredit Bank (US$20.47 billion)	Bank of Baroda (US$1.4 million)	Industrial Bank Co Ltd (US$961 billion)	Absa Bank (US$5.320 billion)
BTG Pactual (US$33.61 billion)	AO Raiffeisenbank US$13.15 billion)	Punjab National Bank (PNB) (US$4.7 billion)	China Citic Bank Corp (US$39 billion)	Barclays Africa Group (US$6.490 billion)
Banrisul (US$22.41 billion)	Rosbank (US$15.37 billion)	YES Bank (US$14 billion)	China Merchant Bank (US$938 billion)	Standard Bank (US$8.610 billion)
Itau Unibanco (US$396.92 billion)	PromSvyaz Bank (US$21.38 billion)	IDBI Bank (US$3.9 billion)	Bank of China (US$2.886 trillion)	FirstRand (US$3.419 billion)

- Brazil

Currently, about 180 private commercial banks operate in Brazil, with almost 80 of them having deposits in excess of $ 100 billion. In addition to commercial banks, there are about 30 commercial government development banks and public savings banks, as well as issuing loans to institutions, 20 investment banks and other financial institutions. The work of the Brazilian banking system is coordinated by Banco Central do Brasil (Central Bank of Brazil).The bank was founded on October 12, 1808 and is considered the oldest in Brazil, one of the oldest in Latin America. It was not only the first Brazilian bank, but also the first Portuguese bank. The bank is a mixed company in which 68.7% of the shares belong to the federal government of Brazil. Shares of the bank are listed on the São Paulo Stock Exchange. Today, it has 9200 branches in Brazil and 32 representative offices abroad. According to data for 2013, Banco do Brasil's assets exceed $ 969 billion (more than 17% of all banking assets in the country).The second in size is the Federal Savings Bank (Caixa Economica Federal), established in 1861. This bank is 100% owned by the state. Its assets total about 790 billion dollars.

The third position is occupied by the bank Bradesco, founded in 1943. Currently, the bank is one of the largestbanks in Brazil. The bank's total assets - $ 740 billion. The offerings by Bank of Bradesco, wide range of banking and financial products and services in Brazil and abroad to individuals, large, medium and small enterprises, and also large local and international corporations and institutions.

The list of the largest includes another 10 banks with assets of more than $ 100 billion. The state controls 10 Brazilian banks, 6 of which belong to the federal government and 4 to state governments. Under the control of the state are the largest credit organizations (in particular, Banco do Brasil and Caixa Economica Federal). The rest is managed by private capital - Brazilian and foreign

- Russia

The Russian banking system is two-tier: it is represented by the Central Bank of the Russian Federation and credit organizations (banks and non-bank credit organizations).

Almost all credit organizations in Russia are joint-stock commercial banks. In general, they can be divided into four groups - state-controlled banks; controlled by foreign capital; large private banks; medium and small regional. State-controlled entities include Sberbank of Russia (assets of 17.3 trillion rubles), Gazprombank (assets of 3.9 trillion rubles), VTB 24 (assets of 5.8 trillion rubles), Agricultural Bank of Russia (assets of 1.9 trillion rubles), Bank of Moscow (assets 1.8 trillion rubles), etc.

State banks account for the bulk of total banking assets (about 50%). These credit organizations occupy a significant niche in the banking market. Inparticular, consequentlytothe data of the Central Bank of the Russian Federation, at the beginning of 2013, they accounted for about 45% of all deposits and other attracted funds of legal entities and 70% of deposits of individuals.

Currently in Russia there are also more than 100 banks under the control of non-residents. They have 25% of all banking assets. These are mainly credit organizations with 100% foreign participation.

In total there are 136 large private banks. The largest group is medium and small regional banks, there are more than 800 of them. But, despite their large number, they occupy a modest place in the banking sector, they hold 5.4% of all assets, about 3% of deposits of enterprises and organizations, only 7% deposits of the population, and loans provided to businesses and individuals, constitute 5%.

The banking sector of Russia is significantly lagging behind in development not only from the leading countries of Western Europe and the USA, but also

from such countries as China, India, Brazil. One of the reasons for this is the slow growth of Russia's GDP, low credit rating and high credit risks.

- India

India has a two-tier banking system.

The Central bank of the country is the Reserve Bank of India. He manages the central government and state governments' public debt, keeps the country's foreign exchange reserves and controls the repatriation of export earnings, the return of capital invested abroad for domestic investment and payments for imports. The Reserve Bank provides short-term loans to state governments and registered banks, and also provides short- and medium-term loans to state cooperative banks and financial and industrial institutions.

The Indian banking sector also includes commercial, cooperative, regional rural banks and non-bank financial institutions. Commercial subdivided into state-controlled, private and foreign. Of the 100 commercial banks (27 are under state control), 30 are private banks, 196 are regional rural, and 40 are foreign.

Since 2004, restrictions on the participation of foreign capital in Indian banks have been relaxed. Non-resident shareholders can now have up to 74% of the shares (up to this allowed 49%). Today, in one of the largest commercial banks - ICICI Bank, which controls up to a quarter of the entire banking services market in India, 68% of shares are owned by non-residents. In the state banks of India, the share of foreign shareholders is limited, it can not exceed 20%. State-controlled banks dominate the banking sector in India, they account for about 75% of all assets, 79% of deposits, 78% of loans, 79% of banking capital, 88% of offices. The state banking sector covers 28 credit institutions led by the State Bank of India (State Bank of India, SBI). In size, Indian leading banks are not inferior to many world-class banks.

Currently in India there are 36 foreign banks with 165 branches, as well as 68 corporate banks. Corporate banks are small institutions serving primarily

farmers, artisans and small entrepreneurs. They give out, as a rule, short and medium-term loans.

- China

The banking system of Chinaconsists of the Central Bank, targeted state financing banks, owned be state commercial banks, banks of joint-stock, urban commercial banks and non-banking financial institutions represented by urban and rural credit cooperatives, as well as investment trust companies.

Targeted state financing lending institutions are specialized banks that provide support for government economic policies. Today there are three such banks in the country - the Development Bank of China, the Export-Import Bank of China and the Bank for Agricultural Development of China. Through them, the state allocates funds to stimulate the development of individual industries or objects.

In China, there are four largest banks with state capital: the Bank of China (Bank of China), the Industrial and Commercial Bank of China (ICBC), the Agricultural Bank of China (Agricultural Bank of China) and the Construction Bank of China (China Construction Bank (CCB)).

In China, more than 10 joint-stock commercial banks. Basically they are opened by enterprises on a mutual basis, while in most cases the controlling stake is owned by the government through government agencies or state-owned enterprises. The total assets of commercial structures make up 15% of the total amount of banking assets. The main goal of urban commercial banks is to issue loans to support and develop local infrastructures. Similar financial organizations exist only in major cities of the country, such as Shanghai, Beijing, Zhengzhou.

In each city in China, there are also city cooperation banks or city commercial banks, which are limited to these cities. In this country, there are more than 100 such banks. Their total assets make up 10% of all banking assets. These credit organizations have a long history and have a developed branch network in China and a large number of branches abroad.

Other financial institutions include urban and rural credit cooperatives, rural commercial banks, investment trust companies, financial and credit companies, foreign banks, etc. This segment of nonbank institutions occupies a significant place in the financial system of China - there are more than 36 thousand (they account for 27% of all banking assets)

- South Africa

The main components of the banking system of South Africa include the Reserve Bank of South Africa (central bank), commercial banks and specialized state financial institutions. Thepublicfinanceinstitutionsincludethe Southern African Development Bank (financing infrastructure projects in the SADC region (Southern African Development Community), the Industrial Development Corporation (industrial projects), the Land and Agricultural Bank (agricultural lending).

The banking system of the Republic of South Africa is characterized by good development and is effectively regulated. Over the past couple of years, many foreign banks and investment institutions have begun operating in South Africa. In total, there are 17 registered banks, 3 unit banks, 1 cooperative bank and 14 branches of foreign banks operating in the country.

The largest banks in South Africa are: ABSA (Absa Group Limited), FirstRand Group, FNB (First National Bank), Standard Bank Group, South African Reserve Bank. ABSA (Absa Group Limited) is one of the leading financial groups in South Africa, formed in 1991. The bank has served more

than 11.7 million customers and has been a division of Barclays since 2005, which owns 55.2% of the group's shares.

The financial institution First Rand Group (established in 1988) has assets of more than $ 125 billion. Its activities include investment banking services, fund management, wealth management and advisory services.

FNB (First National Bank) is one of theoldest bank in South Africa. This bank wasestablished in 1838. It is part of the Big Four banks in South Africa and has branches in Mozambique, Botswana, Namibia, Swaziland and Zambia. Currently a division of First Rand Group.

Standard Bank Group (Standard Bank) dates back to 1862 and is the largest bank in the South African Republic in terms of assets and profits. The Bank operates in 33 countries of the world including 17 countries in Africa and has more than 600 branches in South Africa and more than 400 outside the country in the continent. Worldwide, there are more than 50 thousand employees, of which about 35 thousand are in South Africa.

The Reserve Bank of South African - Central Bank of South Africa established by the Parliament in 1921. The main function of the bank is to ensure financial stability in order to achieve sustainable economic growth in the country.

Thus, for all the BRICS countries, substantial state participation in the banking sector is typical. The largest banks that determine the state and development of the banking systems of the "developing five" are under the control of governments. It is this feature that made it possible for credit organizations of the BRICS countries to overcome the global financial crisis more easily in comparison with developed countries.

The banking sectors of these countries are characterized by different scales, structure and degree of involvement in the international financial system. The main priorities of the BRICS group are the formation of common currency and investment reserves, as well as the development of mutual settlements in national currencies. These priorities are associated not only with the instability of “Western” currencies, but also with the fact that many non-BRICS countries want to develop business ties with the countries of this group. This, in turn, requires the creation in BRICS of a common currency reserve and an investment bank in conjunction with the development of mutual settlements in national currencies and the need to increase their competitiveness.

In a short period, BRICS has initiated a number of global proposals aimed at strengthening the stability of the global community, including: the BRICS United Development Bank, the BRICS Reserve Currency Fund, the BRICS Insurance Pool, the BRICS Alliance and others.

The key to successful development of the real economy and the further industrialization of the BRICS countries is the creation of the BRICS Development Bank.

One of the Bank’s priorities will be to provide systematic support to medium and small businesses along with public sector organizations and enterprises as part of a public-private partnership.

The participating countries have already reached a consensus on the formation of a development bank with a capital of $ 100 billion. These projects are beneficial to all member countries of the group.

The start of the bank is planned for 2015–2016. The Declaration on the introduction about the BRICS Development Bank was signed by the member countries of the organization following the results of the Summit in the city of

Fortaleza, which took place from 15 to 17 July 2014. The Bank will mainly specialize in infrastructure projects in the territories of the BRICS member countries. Headquarters are planned to be organized in Shanghai, and the first president of the bank will be from India. The organization can become a competitor of the World Bank and similar regional funds

A new development bank is based in Shanghai. The multilateral development bank formerly known as the BRICS Development Bank, is a that is managedby the BRICS countries. The bank focuses on lending infrastructure projects, with allowed lending volumes of up to $ 34 billion a year. The bank has start-up capital of $ 50 billion, with a subsequent increase to $ 100 billion. Brazil, Russia, India, China and South Africa initially contributed $ 10 billion each to bring total capital to $ 50 billion.

1.3 Financial Relations

BRICS members are described as the fastest growing large countries. The advantagepositions of these countries is ensured by the availability of a huge number of importance of the resources for the global economy:

- Brazil - is rich in products of agriculture;
- Russia is the main exporter of mineral resources in theworldwide;
- India - cheap intellectual resources;
- China - in recent years, it is becoming more and more confident in leading positions in global exports of industrial products;
- South Africa - natural resources.

All BRICS countries are part of the G-20 and, thus, have the potential to form a consolidated position of emerging market countries in connection to the current problems of the current stage of the world’seconomy, including

reforming the global monetary and financial system. For this, it is necessary to analyze the role of the BRICS countries themselves in the global monetary and financial system. First of all, the heterogeneity of the BRICS association itself should be noted. In terms of the size of its economy, China leads with a large and growing margin from the rest of the world, with close figures for Brazil, India and Russia and a significantly smaller volume of South African GDP. This heterogeneity, along with other differences of the BRICS countries, of course, imposes its own restrictions on the formation of a coordinated position on the global monetary reform and financial system by this union.

Turning to the positions of the BRICS countries in the world monetary system, it should be noted that, as is known, currently the key role in it remains the US dollar: it accounts for 84.9% of the turnover of the world currency market (as of April 2010); it nominated 62.2% of world currency reserves, the currency of which it is possible to establish (at the end of 2011); 48.7% of the total volume of international debt securities (at the end of 2010, in accordance with the so-called “narrow definition”); among cross-border assets of banks denominated in foreign currency, the share of the dollar at the end of 2011 was 59%, liabilities - 60%. The most successful integrated indicator reflecting the position of a particular currency in the world monetary system is its share in operations in the world foreign exchange market. The absolute predominance of the US dollar, followed by the euro, and then the Japanese yen and pound sterling, with a significant lag.

The positions of currencies of the BRICS countries lag far behind the key world currencies and make up the fourth - the fifth echelon in the hierarchy of currencies on the world market. The leaders indicated above are followed by the Australian dollar, the Swiss franc and the Canadian dollar with market shares of 5–8%. Then come the currencies of a number of developed and emerging market countries that are ahead of the BRICS countries: Hong Kong dollar, Swedish krona, New Zealand dollar, South Korean Won (their

share in the turnover of the global foreign exchange market is 1.5 - 3%). BRICS countries are gradually approaching these currencies. Over the past 10 years, the position of the currencies of all the BRICS countries, with the exception of the Republic of South Africa, has increased in the world currency market. At the same time, according to this indicator for 2010, the gap between the BRICS countries was insignificant. However, the role of the BRICS countries in the world monetary system is determined not so much by the positions of their currencies in the world currency market, but by their value as holders of international reserve assets. China holds the leading position, but with a significantly larger margin than other indicators.

In modern conditions, the country's position in the global monetary system is primarily determined by its role in world finances. In many ways, precisely because of the US position in the global financial system, the dollar occupies a leading place in the hierarchy of world currencies. The national financial markets of the BRICS countries have grown significantly, but in many ways (primarily in India and China) they are closed. Against the general background, the stock market of China stands out among the BRICS countries. Its turnover in the share segment in 2010 was about 15% of the total turnover of the global stock exchange market. The gap between the rest of the BRICS and China on this indicator is quite significant.

However, participation in international financial markets for these countries is significantly lower. For example, the total volume of international bonds and notes to maturity issued by residents of the BRICS countries as of September 2012 was $ 332.6 billion, or about 1.5% of the world total. At the same time, the bulk of circulating securities in this case falls on Brazil ($ 148 billion) and Russia ($ 95.3 billion), which is not surprising given the presence of a significant number of currency restrictions in China and India. Thus, when formulating proposals for reforming the global monetary and financial system, the following features of the BRICS countries should be taken into account: their share in the global economy has increased significantly, while

their role in the global monetary and financial system does not match their functions in the world's economy. At the same time, BRICS is notable for its heterogeneity: the monetary and financial systems of Russia, Brazil and South Africa are more open than those of China and India.

FDI flows (both inflows and outflows) have a major influance on the development of the BRICS countries. The availability of a variety of possible sources of funding may contribute to a more active renewal of fixed assets. A possible additional source of funds could be foreign direct investment.

Considering also the total population, area, geographical location and military potential, it turns out that potentially the BRICS countries can be quite self-sufficient in economic, political and military terms. They could compensate for the economic problems of each other and create a real basis for the future multipolar world.

After analyzing the functions of the BRICS countries themselves in the global monetary and financial system, it should be noted, first of all, the heterogeneity of the BRICS association itself. In terms of the size of its economy, China leads with a large and growing margin from the rest of the world, with close figures from Brazil, India and Russia and a significantly smaller GDP of the South Africa. This heterogeneity, along with other differences of the BRICS countries, of course, imposes its own restrictions on the formation of a coordinated position on the global monetary reform and financial system by this union.

The role of BRICS countries in the world monetary system is determined not so much by the positions of their currencies in the world currency market, but by their value as holders of international reserve assets.

Thus, when formulating proposals for reforming the global monetary and financial system, the following features of the BRICS countries should be

taken into account: their share in the global economy has grown significantly, while their role in the global monetary and financial system does not match their role in the global economy. At the same time, the BRICS is notable for its heterogeneity: the monetary and financial systems of Russia, Brazil and the Republic of South Africa are more open than those of China and India. Also, acting as a single entity, the BRICS countries are demonstrating faster growth rates with which other associations cannot compete, which proves the undoubted importance of BRICS as a leading factor in global economic development.

1.4 International Agreements and Measures (Ecology above the economy)

In virtually all BRICS countries are various attempts to integrate the principles of sustainable development at the national level. Partially, this activity is stimulated by international processes, but this is largely due to the awareness of the importance of the problems for the development of the countries themselves, the solution of current economic, social and environmental tasks and the conservation of resources for future generations.

In recent years, the concept of a “green economy” is becoming increasingly common in the world. Economic activity system related to the production and of goods and services distribution, consumption that lead to an increase in mankind well-being in the long term, while not treat future generations to substant environmental risks or environmental scarcity. For the transition to a "green economy" it is proposed to use a wide range of economic instruments aimed at stimulating activities to improve the environment.At present, the global community’s efforts to reduce greenhouse gases do not meet the stated goal of containing global warming, according to the Paris Agreement in the preamble. Thus, the level of total emissions risks to reach 55 gigatons in 2030, while according to UN experts, this maximum should be

no more than 40 gigatons. In this regard, the member countries of the Paris Agreement need to take more intensive measures.The global agreement, which should replace the Kyoto Protocol, was approved in Paris at the UN World Climate Conference. 195 delegations from all over the world supported the document.

The main objective of the agreement is to achieve a significant reduction in greenhouse gas emissions and thereby keep global warming on the planet within 1.5-2 degrees Celsius relative to the average temperature of the pre-industrial era. "If this is not done, then the planet will become more and more susceptible to climatic cataclysms every year," note the scientists.

The third meeting of the ecology ministers of the BRICS countries started on June 22 in Tianjin (North China), The main task is to intensify the global fight against global climate change, to ensure the continuity of multilateral environmental agreements such as the Kyoto Protocol and the Paris Agreement.

To monitor the implementation of the Paris Agreement and the obligations assumed by countries in this area, it is proposed to form an ad hoc working group. It is planned that it will begin work in 2016. In turn, each of the signatories “every five years” undertakes to inform about the progress achieved in reducing CO2 emissions and improving energy efficiency.

1.5 Environmental Pressures

The modern world is undergoing significant transformations, among which first of all it is necessary to note the deepening of globalization, the increasing complexity and speed of processes, the constant increase in risks, the tightening of hypercompetition and the formation of its complex forms, the transition from a unipolar to a multipolar world.

The most pressing environmental problems at the moment can be called pollution by harmful emissions of water resources and air, waste disposal and neutralization of previously caused environmental damage. In addition, the issue of climate change is acute.

At the meeting, the “Ministerial Statement” was adopted, which listed the main areas of priority for all BRICS countries. In accordance with the document, there will be an exchange of experience, data and recommendations aimed at solving environmental problems. To implement it, a working group was created.

According to Donskoy, the possibility of attracting the BRICS Development Bank and other financial institutions to finance “green” technologies and other environmental projects is also being considered. The Ministers of Environment of the BRICS countries today agreed on a memorandum of understanding and announced the creation of a joint working group that institutionalizes cooperation on environmental issues.The areas of cooperation of the BRICS countries will be the fight against air pollution, water resources, effective waste management, the dissagreement against the changes of climate and the preservation of biodiversity.

BRICS ministersal so noted the need to create a platform for innovation, knowledge sharing and increasing the competence of specialists in the field of environmental protection. This may include a common site, building links between scientific institutions of the countries of the union, launching joint projects.

In our opinion, the activity of this working group is an important step towards expanding cooperation in the field of green economy between the BRICS countries, and takes it to a new level.

In order to ensure global environmental security, the formation of a "green" economy and the promotion of innovative technologies in the framework of the group's work, it seems appropriate

Consideration of the following areas of cooperation:

1. Creation of an information bank of “green” technologies with the aim of their implementation on a mutually beneficial basis with the parity introduction of technologies from thecountries of integration.

2. Highlighting your own criteria for “green” development, taking into account economic, social and cultural characteristics.

3. Conducting environmental certification of goods and production activities in order to form a register of environmentally oriented enterprises and promote their products on the markets.

1.6 Energy sectors

Despite the presence of aggressive elements in the global environment, BRICS is successfully developing. Countries are increasingly engaged in the use of a variety of energy resources. For example, Brazil became one of the first countries in Latin America, where they began to transform the energy of sea waves. And this is not surprising, because the length of its coastline is more than 8 thousand km. This is the first industrial country where alternative energy provides almost 90 percent of energy consumption. Every year they spend less and less energy production of the same amount of goods and services. In other hand, the country's economy is becoming more and more energy efficient mainly due to the active use of water and wind energy.

Due to geographical and climaticspecifities of the Russian Federation has the largest wind capability in the world. Inthe creation of the Fund and the launch

of localization projects. Thisprojects will make it possible withtwoways: new high-tech industries in Russia - the production of equipment for generation ofwind and the construction and operation of wind farms. There is more than one such example of the use and development of projects for the development of alternative energy in Russia.

The successful experience of “energy reform” in Brazil is of great interest to many states trying to move from the use of fossil energy to renewable energy. This country has the most advanced global biofueltechnology. This model of ethanol production from canesugar is considered by the UN as a role model. First of all, due to the lowest cost at the highest level of environmental safety of production.

The South African authorities, which is the fifth largest producer of coal, which provides most of the electricity demand, have taken a new path and now in their country solar and renewable energy is rapidly gaining momentum. The experience of the republic shows how renewable energy is spreading in developing countries due to its convenience in mining and use. For South Africa, the renewables program “exceeded the highest expectations,” says Breitenbach of Independent Power Producer. The program has reduced the cost of solar and wind energy, allowing the government to reduce the cost of obtaining energy from renewable sources through successful auctions.

India and Brazil also launched auctions similar to those in South Africa to increase renewable energy productivity. India is heavily dependent on imported oil: greater than 30 percent of the country's energy needs tocover by it, of which 70 percent is imported. Therefore, energy independence is one of its top priorities. The government set tasks to ensure it by 2020 and energy independence by 2030. According to the state program for the development of renewable energy, the capacity of solar power plants in 2022 should be 22 GW.

To date, among the main actions aimed at deepening and strengthening the cooperation of the "five" in the field of alternative energy can be identified the creation of a group on the development of green energy and the economy under the BRICS Business Council. In the framework of the VI Summit of Unification in 2014, the President of the Russian Federation proposed the creation of a “BRICS energy association”, a “fuel reserve bank” and the BRICS Institute for Energy Policy, but this proposal has not yet been implemented.

Projects among the BRICS countries at the bilateral level are much more successful. A solar power plant with a large capacity ofproduction wasbuiltby Suntech Power Holdingsin South Africa, which is one of the largest solar panel manufacturers in China. Active cooperation in this area is observed between China and Brazil. In the Brazilian city of Campinas, a branch of the Chinese company for the production of bio-cars was opened. There is also a forum for interaction of the BRICS countries at the trilateral level India-Brazil-South Africa (IBSA), established in 2003. Within the framework of trilateral cooperation, working groups were established to promote cooperation in such energy areas as biofuel, solar and wind energy.

Perhaps it can be concluded that at the present stage, the cooperation of the BRICS countries in the field of alternative energy leaves much to be desired. The topic was repeatedly discussed at community summits and is gradually moving from a state of “discussion” to “implementation”, as demonstrated by the BRICS New Development Bank, by providing funding for the development of renewable energy sources to four BRICS member countries. The greatest number of initiatives so far is observed at bilateral and trilateral levels of interaction of the five countries, which, in the opinion of some experts, is not surprising, since the transaction costs are lower than in the implementation of projects in the framework of five-sided cooperation.

One way or another, the BRICS countries will obviously develop in accordance with the recognized not only Roman Club, although they proclaimed the slogan: “The Old World is doomed. A new World is inevitable!”

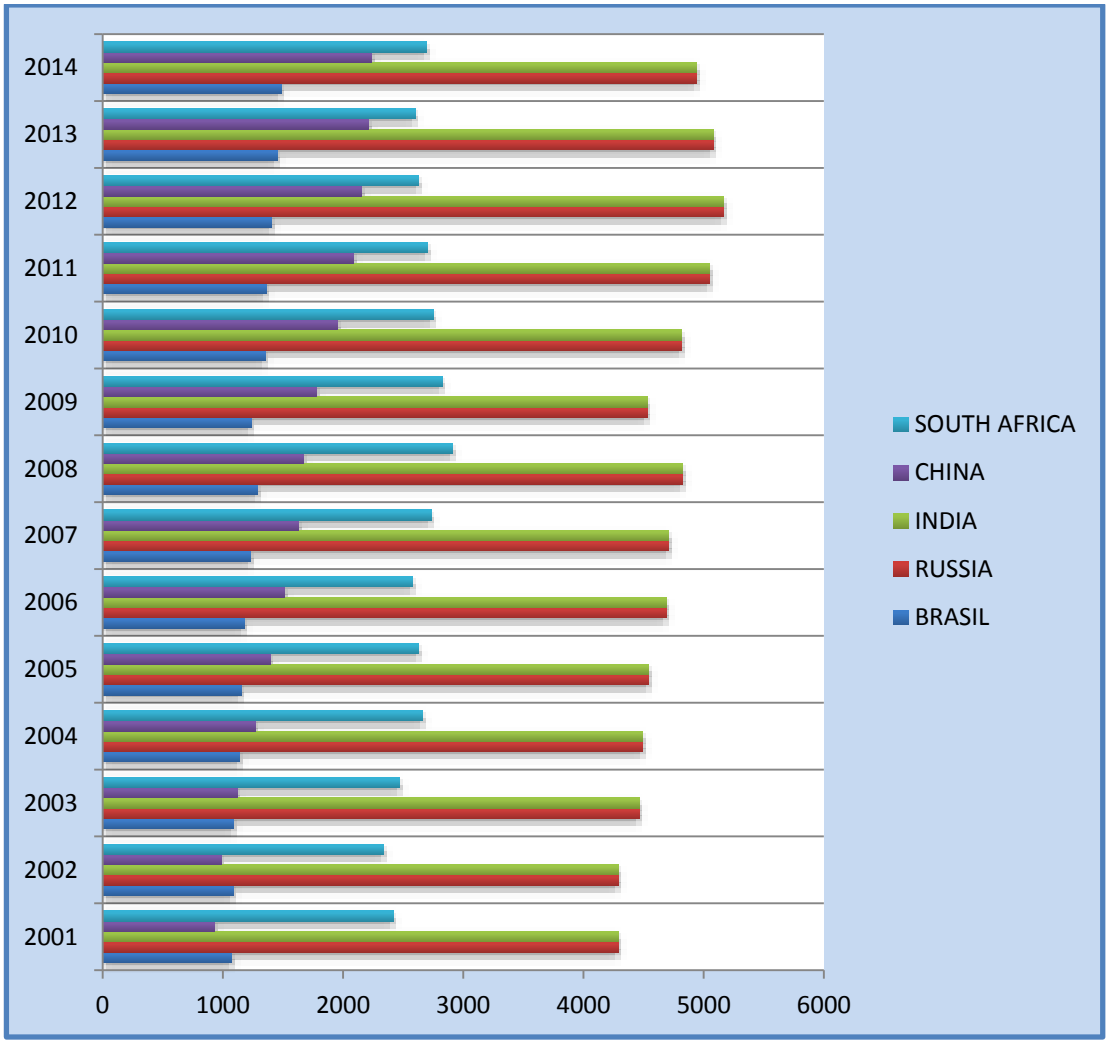

Figure 3: Energy Cunsumption of BRICS countries

Source: The World Bank (http://databank.worldbank.org)

2. THEORETICAL FRAMEWORK

Environmental pollution is associated with gaseous carbon dioxide, which is the highest level among the gases in which it is located. Indeed, in the

literature with carbon dioxide. There are many studies describing air pollution. These studies can be viewed in three categories. First, the relations between the variables such as energy consumption and economic growth, the second - the relationship between environmental pollution and economic growth, and the third - relations between economic growth, energy consumption and pollutant emissions (Farhani & Rejeb 2012). It has been observed that research in this area has rised over the past twenty years (Dritsaki & Dritsaki 2014).World population growth and economic development have led to environmental problems. Simon Kuznets, who won the Nobel Prize in Physics in the World in 1955; With the increase in national per capita income in countries, expenditures will increase, while environmental pollution will begin to increase. When this income reaches a certain threshold, it is emphasized that households and countries will increase their sensitivity to the environment, and pollution will begin to decrease with the help of measures to be taken (Dam, 2014).

There are close and interdependent relations between production and consumptionas well as between economic development and environmental problems. Depending on technological changes and population growth, financial and economic development (Yıldırım, 2004). Therefore, the relationship between the economy and the environment increasing from production and consumer activity. The linkage between the environment and the economy is associated with an economic contraction resulting from the interruption of production.

On the other hand, there is a mutual and positive relations between economic growth and energy use. Although energy use increases economic development, it increases due to increased energy consumption in economic development. As countries grow, demand for energy in industry, agriculture and the services sector grows. Therefore, the level of development of the country's economy and the energy sector of this country is in close relationship.

As an economic and social development increased the energy demand, awareness of environmental issues led countries to achieve sustainable development with respect to the environmental growth. Regarding to this new development strategy based on the understanding that economic and social development cannot be viewed separately from the environment, it is expected that the destruction of economic development in the environment is expected to be reduced.

Wastes that are causes environmental problems occurs at all stages of energy production, which is an important source of industrialization and economic development of countries (Akova, 2008). Environmental concerns have begun to be taken into account with the understanding that carbon emissions resulting from meeting energy needs with the consumption of fossil energy sources are causing world's climate change. At the local, national or international level, various measures are taken to limit the consumption of fossil fuels, which is one of the most important causes of environmental problems. In accordance with the Kyoto Protocol, for this purpose, countries are committed to reducing green house gas emissions by 5 per cent level below in 1990 (Akova, 2008). Energy-based CO2 emissions are expected to be around 14 billion tons in developed countries and from 16 billion tons to 28 billion tons in developing countries. Although the demand for electricity from the industrial sector in developing countries increased annually by 1.8 per cent per year from 2007–2035, the annual rising in demand for energy can be realized only by 0.2 per cent, since production in developed countries has shifted from manufacturing to the industry services (Yılmazer, 2013).

3. LITERATURE REVIEW

3.1 Introduction

Recently, global warming and climate change have increased rapidly. Politicians began to attract attention. Impact of CO2 emissions and global warming. It differs between countries. This situation is unique in the natural and social. This is due to its structure (Diallo and Masih, 2017). Economic activity fast while increasing environmental problems; environmental issues and economic development adversely affects the structure. For this reason, Efficient use of environmental resources is extremely important. Also in the world industrialization growth, urbanization and population growth also began to grow. Countries wishing to increase economic growth, world increasing energy consumption throughout the country fossil fuel use has increased carbon dioxide (CO2) emissions.

3.2 Financial development and Carbon dioxide emissions

There are many academic studies in the literature for one country and country groups, to study the relations between economic growth and environmental degredation. In present years, financial development has been recognized as an important determinant of the environment. An advanced financial sector can attract foreign direct investment, which affects economic growth and environmental quality. In addition, financial development allows the transfer of financial resources to environmental projects. A well-functioning financial sector also helps public institutions obtain financial resources for such projects. In addition, financial development can drag technological innovation, and these technological developments can help reduce emissions through the energy sector (Shahbaz et al., 2013). Jalil and Feridun (2011), Shahbaz et al. (2013) and Ali et al. (2017) had a negative impact on carbon emissions in financial growth, while Butabba (2014),

Farhani and Ozturk (2015), Shahzad et al. (2017) and Solarin et al. (2017) indicated a positive relationship between these two variables.

One of the important factor that is effective in determining the quality of the environment is financial development. You can reduce CO2 emissions from financial development and improve the quality of the environment in three ways. (i) Direct inflows of foreign capital and spending on research and development that accelerates economic growth is growing rapidly due to financial liberalization and development. This has a positive effect on the quality of the environment. (ii) Financial development provides to the countries with the opportunity to use new technologies. (iii) The advanced financial sector can improve the quality of the environment by providing more financing at lower costs, including investment projects in the field of the environment. (Tamazian et al., 2009). You can put together ways in which financial development can increase CO2 emissions and distort the quality of the environment.

Investors in financing channels for the purchase of new objects and investments in new projects are increasing. Thus, investors finance their investments at low prices. New investments raise in energy use and CO2 emissions. (i) Financial development allows for increased FDI, which has accelerated economic growth. Due to foreign investment in the country, CO2 emissions increase. (ii) Thanks to financial development, consumers can easily access low-cost funds from financial markets. This makes it easier for consumers to purchase products such as cars, houses, refrigerators, etc., which leads to an increase in CO2 emissions (Omri et al., 2015). Regarding to the company's financial development, it is easier to achieve clean and advanced technologies that reduce CO2 emissions. Domestic production (Moghadam and Dehbashi, 2017).

In another important study by Omri (2015), 12 MENA countries between the period of financial development 1990–2011, CO2 emissions, the panel analyzed the relations between trade and economic growth with the data transfer method. In the analysis, it was noted that there is a bi-directional

causal relationship between CO2 emissions and economic development. Similarly, there is a bi-directional causal relationship between economic growth and commercial openness. From financial development to economic growth, it was observed that there is a one-sided causal relationship from commercial discovery to carbon emissions. Empirical results have confirmed the existence of the Kuznets environmental curve. Ayech et al., (2016), 1985-2014 periods 40 European countries between periods of economic growth, financial development, the relationship between trade openness and carbonemissions panels data tests. The results of economic growth and financial development, economic growth and trade openness, economic growth and CO2 emissions, financial development and trade openness between trade openness and CO2 emissions to be bi-directional causality were analyzed. The linkage between economic growth and CO2 emissions confirms the existence of environmental criticism from Kuznets. Ng et al., (2016). The cause of economic and financial liberalization of CO2 emissions in eight ASEAN countries from 2000 to 2010 was analyzed using panel data. Analysis showed that economic and financial development had a positive effect on CO2 emissions. In addition, energyusage has a positive affect on CO2 emissions.

In another study on this issue, Diallo and Masih (2017) analyzed the influance of economic and financial development on CO2 emissions in the United Arab Emirates between 1975 and 2013 on the ARDL border test. The results of the research showed that in the long run there is a connection between cointegration of variables. In addition, economic and financial development have been shown to reduce CO2 emissions. Siddike (2017) analyzed the influenceof energy consumption, financial development, trade, and economic growth on CO2 emissions for Pakistan between 1980 and 2015 on the ARDL border test. The results of the analysis showed a long-term relationship between the variables. In addition, energy consumption, financial andeconomicaldevelopment, tradeincreases CO2 emissions. Jamel and Maktouf (2017), the relationship between economic growth, CO2 emissions, financial development and commercial openness from 1985 to

2014 was analyzed using panel data for 40 European countries. Analysis results, economic growth - CO2 emissions, economic growth development, economic growth - commercial openness, financial development - commercial openness, commercial openness - CO2 emissions showed that there is a bidirectional cause-effect relationship.

3.3 Industrialization and Carbon dioxide emissions

The rapid growth of industrialization and industrial production has turned the natural order of the world. With growing cities and urban settlements, cities are being built up into cities and pollutants flowing into rivers, lakes, seas, toxic gases from chimney air, waste that is indiscriminate and industrial waste, and the quality of water, air and soil. Although coal, which once lived in the golden age with the use of steamers, left its place for oil in time, the consumption of fossil fuels increased every day. Global warming and climate change as a result of these negative effects have increased the importance of the relationship between pollution and economic growth.

Rüstemoğlu and Rodriguez (2016) analyzed CO2 emissions in two different countries: Brazil and Russia from 1992 to 2011, analyzing and deconstructing CO2 emissions in sectors (agriculture, industry and services). Taking into account the influence of four important factors (economic activity, population, energy density and carbon density), the authors noted that CO2 emissions in Russia decreased due to economic crises before 2000; They stressed that emissions in Russia have decreased. In Brazil, while the effect of economic activity increased CO2 emissions in all sectors, they noted that both countries have more steps to register for environmental sustainability. The authors also presented key solutions for reducing energy and carbon intensity.

3.4 Energy consumption and Carbon dioxide emissions

As we know, energy consumption is carried out in the form of oil, coal, electricity and fossil fuels. The most common use of energy occurs in the form of oil and coal. Energy in developed countries are more sensitive than developing countries. The energy used in the production process to increase economic growth is one of the most important factors increasing CO2 emissions (Hassan and Haq, 2017).

Luukkanen et al. (2015) analyzed changes in the Cuban energy system. Scientists who described the analysis of the decomposition of energy consumption and the factors released in carbon emissions studied. The Cuban energy revolution, which began in 2006, is a response to balance of payments problems created by imported oil, interruptions caused by old technology and unproductive central electricity production, as well as transmission and distribution issues caused by hurricanes. they have changed. In households, the use of electricity instead of kerosene in cooking and the use of stoves with energy-saving potential in homes increase energy efficiency. In addition, the authors emphasize the safety of power supply. They stressed that they increased and increased efficiency by replacing old power plants with small new power plants. Finally, the scientists emphasized that the energy revolution has not yet shown sufficient influence in Cuba in such industries as industry, transport and agriculture.

Mirza and Kanval (2017) used energy usage, carbon emissions and economic growth in their study in Pakistan. As a result of the analysis between these three variables, in the short and long term, a strong two-way relationship of the Granger causation was determined.

Özokör, Özdemir (2017), per capita energy usage and variable emissionsper capita for 26 OECD countries from 1980-2010 using the data tested approach EKC. The study used methods for analyzing data from groups, and as a result, long-term relationships were determined with the N form.

3.5 GDP and Carbon dioxide emissions

In 1997, there was an increase in the number of studies conducted between the Kyoto Protocol in Kyoto and the linkage between the environment and economic development. There are also studies conducted using time series on a country basis, as well as methods for analyzing data from panels that have a horizontal section size and time.

Discussions about economic growth were beneficial because economic growth increased demand due to excessive consumption and population growth, and the environment suffered from overuse of resources, and economic growth was beneficial due to technological advances (Mazi and Tan, 2009). Uncertainty about whether technology has a risk factor in providing new opportunities, be it the ability to solve problems, has led to the emergence of discussion groups that are optimistic, pessimistic and moderate at the height of economic growth, which can cause big problems in solving problems (Karabychak and Armagan , 2004: 213-214; Yilmaz, 2007; 533).

Wang et al. (2016) examined the linkage between CO2 emissions, energy consumption and economic growth, considering the periods 1995–2012 for China. As a result of the study using panel data and methods of causal relationship of the panels. Theresultsstated that there is a one-sided relationship of causality from economic growth to CO2.

Unlike economic growth in this processJS Mill, who voiced quite radical measures, such as zero growth against losses, became another name that attracted attention (Karabychak and Armagan, 2004: 211, Mazi and Tan, 2009). Following the chronological order and, finally, mentioning Almaz, after he said that all collapses are not considered only for environmental and environmental reasons, the collapse does not mean that it is caused by the destruction of the ecological resources of people and society. According to him, overcrowded societies survived the collapse. In addition, while new technologies may offer a way out of problems, this carries some risks. It

depends on the fact that technology development can solve problems more than new problems caused by problems. Almaz claims that the decision will have political will, not technology (Yılmaz, 2007; 103,105).

In 2012, Ahmed and Long used the annual data for 1971–2008 in Pakistan to include carbon emissions, growth, trade, and population. As a result of research using the method of cointegration by the method of boundary tests. Regarding to the results, found that energy consumption, economic growth and environmental pollution were detected.

Table 3. illustrates previous studies and researches regarding the relationships between economic growth and energy consumption on carbon dioxide. Furthermore, we can indicate that there is a positive and significance influance relations between the economic growth, energy consumption on carbon emissions.

Table 3. Literature review summary

Authors	Countries and periods	Variables	Methologies	Findings
Adel Ben Youssef, Mohamed Aurouri, M'henni and Rault (2012)	12 MENA countries (1981-2005)	Economic growth, energy consumption and etc.	Techniques of cointegration and Unit root tests	Energy consumptiona and economy growth rate have positive significance inluence on carbon emission.
C-J Chen and Y-C Huang (2014)	36 countries	GDP per capita, CO_2 emissions per capita, consumption of oil and natural gas.	PSTR	Results claims of significant impact of oil, natural gas consumption on CO_2.

MesutBalibey (2015)	Turkey (1974-2011)	Foreign direct investment, CO_2 emission, GDP	Regression model approach and EKC model forms	Economic growth impact possitivly and significant to enviromental degradation.
M. H. Sharif (2011)	NIC (newly industralized) countries (1971-20070	Urbanization, GDP per capita,	Cointegration and unit root tests	Urbanization has a negative effect on carbon emission. All other variables have positive and significant impact on CO_2.
P. Narayan and S. Narayan (2010)	43 developing countries (1980-2004)	CO_2 per capita and GDP per capita	Pedroni panel cointegration tests and panel VECM	İnvestigated long run relations between the variables. Elasticity of the income was long run than the two panels of the EKC.
F. Halicioglu (2009)	Turkey (1960-2005)	GDP, energy use, CO_2 emission	Tests of panel cointegration, GC	By energy consumprion and GDP determined that the energy growth has significant and possitive effect on carbon emission.
Iranzo and Aslanidis (2009)	77 non OECD countries (1971-1997)	income per capita, CO carbon emission	Panel smooth transition regressions PSTR	No evidence of EKC (enviromental Kuznets curve)

Ahmed, Rehman and Ozturk (2017)	5 South Asian countries (1971-2013)	Energy use, trade openness, population and carbon emissions	Pedroni, Kao and Johansen Fisher panel cointegration tests	Energy consumprion, trade openness, and population have negative effect on CO_2 emission in the long run.
L.Charfedine and Z.Mrabet (2017)	15 MENA countries (1975-2007)	EF, energy consumption, RGDP, life expectancy at birth	Pedroni panel cointegration and VECM Grange panel	EKC hypothesis volidated only for oil exporting countries, not in non oil exporting countries. Long term effects founded in life expectancy at birth and urbanization. Between the RGDP, energy use variables found the bidirectional casuality

4. METHODOLOGY AND DATA

4.1 Model Estimation and Data

In this thesis the influance of industralization and urbanization on carbon emisson (CO_2) for 3 countries of BRICS during the 1992 to 2014 periods. This study utilised Co_2 as a proxy to measure pollution via carbon emission (metric tons per capita). Furthermore, domestic credit to private sector % of the gross domestic product is used as proxy to measure the financial development and is represented by FD. Industralization (value of manufacturing added % of gross domestic product) as MVA, total energy consumption per capita (kg of oil equivalent) as TEC and NY and NY2 as gross domestic product and its square (with constant 2010 US$). All data is downlaoded from the World banks database.

This research considering by the below equation, which provides the link between the CO_2 carbon emissions and other dependent variables.

$$CO_2 = f\,(FD, MVA, NY, NY^2, TEC)$$

Table 4. Descriptions of selected variables

Variables	Symbols	Description	Expected sign	Economic consequence
Carbon emission	CO_2	Carbon emission in metric tons per capita	N/A	- (dependent variable)
Financial development	FD	Domestic credit to private sector percentage of GDP	±	By presenting financial reforms to keep clean the enviromental degradation we ustilitized financial development as an implement variable
Industralization	MVA	Value of manufacturing added percentage of	±	Sectors of industry influence to increase the enviromental indicator impact

		GDP		
Total energy consumption	TEC	Total energy consumption per capita (kg of oil equivalent)	±	At one level energy cunsumption may impact negatively to the enviroment, if will be used some forms of energy it may possitivly effect the carbon deoxide emissions.
Economic growth	NY	Gross domestic product (GDP) per capita in constant 2010 US $ and its square	±	Economic growth is frequently specified asthe reason for the natural issues based on the representation that the increasing in production implie s the rising the enviromental pollution.

4.2 Empirical Methodology

4.2.1 Unit root test – panel data

In the reaserch examined stationarity hypothesis of the panel datas. Here used two types of panel unit root tests: 1. common persistence parameters (LLC); 2. uncommon persistence parameters (IPS).

$$\Delta y_{it} = a_i + p_i y_{it-1} + \theta_i t + \sum_{k=1}^{p} \beta_{it} \Delta y_{it-k} + \varepsilon_{it}$$

All types of panel unit root test LLC and IPS, based on the Augmented Dickey-Fuller test (ADF) equation, as shown above. Where the parameters of persistence - p_i, dependent variables -Δ (checked the variable's stationarity), f_i – component of the fixed effects (individual intercept). Homogeneity and common persistance parameters of this equetion tested by the LLC test. Further assumpstion, $p_i=p$ and H_0(null hypothesis) = will be as $p=0$, H_1(alternative hypothesis) =will be $p<0$.By IPS test we are expecting the heterogeneity between the cross sections. In contrast of heterogeneity assumptin, homogeneity state as$p_i=0$ in null hypothesis, and $p_i<0$ İn alternative hypothesis. Meaning of the accepting of null hypethesis, for both

types of tests LLC and IPS, that the series charactirized by the presence of panel unit root test.

4.2.2 Pedroni, Panel cointegration test (1999,2004)

There is a various tests of cointegration panel, in the econometric science. Pedroni test used for presence of cointectation between rows represented by panel data. To further analyze the long term relationship, is is necessary to determine the cointegration of process. Decision on cointegration processes were accepted if the null hypothesis was rejected fir three or more statistics from seven.

These statistical tests grouped into 2 categories: ‘whithin dimention’ test known as primary group and ‘between dimensions’ test known as secondary group. All these tests are supported the residuals of the below mentioned estimation:

$$y_{it} = a_i + \theta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \cdots + \varepsilon_{it}$$

In this equation CO_2 variable stated as y_{it} and other variables assumed as ($x_{1i,t}$, $x_{2i,t}$,.... $x_{5i,t}$) = (LFD_{it}, $LMVA_{it}$, LNYit, $LNY2_{it}$, $LTEC_{it}$). Individual intercept represented by the a_i coefficients and individual trend intercept reptesented by θ_i. Accordings to the findings of the Pedroni statistics are normal when the assymptotic distributions for each of seven panel and groups are there.

4.2.3 Kao Residual Cointegration Test (1999)

The long-run relations between variables such as the dependent and independent (especuially relations between financial development, energy use, economic growth) confirmed by the Kao test’s empirical findings. According the Kao Residual Cointegration test H_0 has no cointegration at the 1% significance and rejected. Mentioned test based on residuals and variances of (ADF) Augmented Dickey and Fuller (1979). Following regression equation declared for Kao test:

$$W_{i,t} = \alpha_i + \beta X_{i,t} + \varepsilon_{i,t}$$

here,$W_{i,t} = \sum_{t=1}^{T} u_{i,t}; X_{i,t} = \sum_{t=1}^{T} v_{i,t}; \forall t = 1, \dots, Ti = 1, \dots N$

4.2.4 Long run results under FMOLS and DOLS

FMOLS and DOLS recomended as alternative techneques for evaluation of the panel's cointegration. While Kao and Chiang (2000) recomended for ordinary least square's dynamic. Endogeneity corrections were mad by FMOLS estimation and for serial correlation used the ordinary least square (OLS) estimator. For endogeneity corrections and to obtain of the long-run parameters of the unbaised estimator, used DOLS. This estimation used first differences of the leads, values of the regressors and lags by adjusting the errors of augmented the regressions. According the other tests and results of them such Kao and Chiang (2000), this estimations (FMOLS and DOLS) are limiting normal properties.

5. EMPIRICAL RESULTS

5.1 Panel unit root test

Table 5. Unit root results for Panel data

Variables	Levin, Lin and Chu t				Im, peseran and Shin W-stat (IPS W-stat)			
	Individual intercept		Indiviual intercept and trend		Individual intercept		Indiviual intercept and trend	
	Level	Δ	**Level**	Δ	**Level**	Δ	**Level**	Δ
LCO_2	0,28199 (0,6110)	-3,7034*** (0,0001)	-1,13774 (0.1276)	-2,316** (0,0103)	1,50809 (0,9342)	-3,80*** (0,0001)	-0,02622 (0,4895)	-2,364*** (0,0090)
LFD	0,09431 (0,5376)	-4,7681*** (0,000)	0,04868 (0,5194)	-5,493*** (0,000)	0,96325 (0,8323)	-4,433*** (0,000)	-0,45797 (0,3235)	-4,433*** (0,000)
LMVA	0,78818 (0,7847)	-4,9364*** (0,000)	0,62132 (0,7328)	-3,957*** (0,000)	1,49479 (0,9325)	-4,936*** (0,000)	0,41934 (0,6625)	-3,500*** (0,0002)
LNY	0,80504 (0,7896)	-2,9044*** (0,0018)	0,48008 (0,6844)	-2,434*** (0,0074)	3,87518 (0,9999)	-2,768*** (0,0028)	-0,57389 (0,2830)	-1,591*** (0,0557)

LNY2	1,5005 (0,9345)	-2,6799*** (0,0037)	-0,58918 (0,2779)	-2,360*** (0,0091)	4,46883 (1,0000)	-2,470*** (0,0068)	-0,51710 (0,3025)	-1,513 (0,0650)
LTEC	1,58118 (0,9431)	-2,9177*** (0,0018)	-0,76509 (0,2221)	-1,899** (0,0287)	2,69670 (0,9965)	-3,111*** (0,0009)	-0,57685 (0,2820)	-1,998** (0,0228)

Note: ∆ - indicates first difference. ** and*** indicated significance at 1% and 5% at level Intercept and trend also included to the panel unit root tests. (,): mentioned probability.

As mentioned in the methodlogy section of this study, that integration order of the variables need to be identified before proceeding towards cointgeration tests. Since the cointegration tests can only be applied to those series that are having unique order of integration. Therefore, in this connection various first generation unit root tests are applied to determine the order of integration of series both at level and with first difference. The results of the panel unit root tests are reported in Table 4. The results according to the Levin, Lin and Chu T suggests that all the variables are non- stationary at level. However, they become stationary at first difference. The robustness of the Levin, Lin and Chu T are identified using Im, Pesaran and Shin W-stat test. Both the unit root tests are supporting the results of each other in terms of stationarity. This implies that all the variables in this research are non-stationary at level. Furthermore, they beome stationary by taking the first difference. The unique order of integration allow us to apply various cointegration test to identify the existance of a long-run relationship amongst the estimated variables in the model.

5.2 Panel Cointegration test

After the identification of integration order among the series, the next step is to estimate the existance of a long-run relationship among the estimated variables. The panel cointegration tests is applied to investigate the null hypothesis of no cointegration against the alternative hypothesis of cointegration. As previously mention in the methodology section that used three cointegration tests (Pedroni, Kao and Johansen cointegration test)

before arriving to the conclusion of existance of long-run relationship among the estimated variables in the model. In this regard we noted that out of 11 tests, 6 are statistically significant that depicts the evidance of a long-run relationship among the avriables. Furthermore, Kao's residual cointegration test also confirms the t-stat for ADF test is -4.75 with a probability of less then 5% . This implies the evidance of a a long-run relationship among the estimated variables. This further suggests that financial development, energy consumption, carbon dioxide emission and industriliasation are in a long-run relationship. This further implies that all these variables are moving together in a long-run.

Table 6. Pedroni Residual Cointegration test results

Within dimension	**t-stat**	**prob**
Panel v-stat	1,107205	0,1341
Panel rho-stat	-0,456199	0,3241
Panel PP-stat	-3,619327	0,0001***
Panel ADF-stat	-3,140029	0,0008***
Within dimension (weighted)	**t-stat**	**prob**
Panel v-stat	1,020010	0,1539
Panel rho-stat	-0,175198	0,4305
Panel PP-stat	-2,773567	0,0028***
Panel ADF-stat	-2,664746	0,0039***
Between dimension	**t-stat**	**prob**
Panel rho-stat	0,414938	0,6609
Panel PP-stat	-3,254923	0,0006***
Panel ADF-stat	-3,197535	0,0007***

Note: *** and ** mentioned critical values at 10%, 5% and 1% levels of significance, respectively.

H_0= no cointegration.

Table 7. Kao Residual Cointegration Test (1992,2014)

	t-stat	prob
ADF	-4,751991**	0,0000
Residual variane	0,000680	
HAC variance	0,000445	

Note: ** - denoted as at 5% significance of critical value. Variables are not cointegrated - null hypothesis (H_0).

5.3 Long-run coefficients under the Framework of FMOLS and DOLS

After the indentification of long-run relationship among the estimated variables, the next step is to investigate the effect of financial development, energy consumption, economic growth and the square of economic growth and industrilisation on Co_2 emission. The FMOLS and DOLS which are the long-run cointegrating equation are applied to investigate this relationship. The results of both FMOLS and DOLS have been showed in Table 7.

Table 8. Long run results under FMOLS and DOLS

Variables	FMOLS				DOLS			
	coefficients	Std. error	t-Statistic	Prob.	coefficients	Std. error	t-Statistic	Prob.
LFD	0,070046	0,030666	2,284147	0,0260**	0,048684	0,034084	1,428364	0,1583
LMVA	-0,039237	0,041914	-0,936129	0,3531**	-0,044438	0,048876	-0,909205	0,3668
LNY	0,812679	0,181779	4,470707	0,0000**	0,896486	0,202887	4,418637	0,00**
LNY2	-0,071101	0,012230	-5,813390	0,0000**	-0,073000	0,014054	-5,194409	0,00**
LTEC	1,550178	0,071965	21,54074	0,0000**	1,467385	0,079112	18,54827	0,00**

Note: Probability values represented in seperate columns. 10% and 5% significance levels denoted as * and **, respectivly.

Table 6. shows that that financial development has a positive impact on CO_2 emission. This implies that financial development influences Co_2 emissions positively. This further suggests that if financial development rises by 1%. This will cause increase in CO_2 emission by 0.07%. This increase in the Co_2 emission is due various big ticket items adopted by the general public for domestic use. Furthermore, the Government also advances credits at the cost of environmental degradations. Moreover industrilisation have a negative, but statistically insignificant impact on CO_2 emission. The energy consumption has positive and staitsically significant impact on Co_2 emission. This implies that a 1% rise in energy consumption will cause the Co_2 emission to rise by 1.55%. Moreover, the energy consumption is producing out put at the cost of environmental pollution. Furthermore, the economic growth has a positive and statistaically significant impact on CO_2 emission. However, at the same time coefficient of square of economic growth is negative and statostically significant impact. This implies that initially the economic growth increases with the increase in CO_2 emission. However, after reaching to threshold point the Co_2 emission decreases. This further confirms the validity of EKC hypothesis in this case. The results of FMOLS are also confirmed by DOLS with coefficients bearing the same. This add robustness to our estimations.

6. CONCLUSION

This study investigates the relationship between total energy consumption, economic growth, financial development and industrialisation covering the sample period 1992 to 2014. However, this study was conducted for BRICS but only India, china and South Africa have been included in the analysis beacuse of the data limitation problem as it is not available for Brazil and Russia. This study used panel unit root tests to identify the integration order of the series. Additionally, various cointegrating methods such as Pedroni and Kao cointegration method are applied to investigate the existance of a long-run relationship among the estimated variables. Both the methods supports the results of each and confirms a strong evidence of cointegration among the selected variables. Moreover, the FMOLS and DOLS cointegrating equations are applied to investigate the effects of the selected variables on CO_2 emission. It was found that financial development add into CO_2 emission. Total energy consumption also effects CO_2 emission positively and significantly. Moreover, this study also confirms the evidence of an inverted U-shaped relationship between economic growth and CO_2 emission. This further confirms the validity of EKC hypothesis for the case of China, India and South Africa.

Table 9. Brief results

Variables	Symbols	Description	Results	Other reaserchers findings with same results
Financial development	FD	Domestic credit to private sector percentage of GDP	$\Downarrow CO^2$	Tamazaian et al. (2009) Feijen (2007)
Industralization	MVA	Value of manufacturing added percentage of GDP	$\Uparrow CO^2$	Rustemoglu and Rodriguez (2016)

Total energy consumption	TEC	Total energy consumption per capita (kg of oil equivalent)	⇓ CO^2	Alkhathlan and Javid (2013) Halicioglu (2009) Narayan (2007)
Economic growth	NY	Gross domestic product (GDP) per capita in constant 2010 US $ and its square	⇑ CO^2	Zang and Cheng (2009) Boutabba(2013) Feridun (2011) Shahbaz et al (2011)

Note: ⇑ CO^2 – increasing carbon emission (posisitve effect on environment), ⇓ CO^2 – decreasing carbon emission (negativly effect).

It is important to reduce the level of CO_2 emission prevailing in these selected BRICS countries. The Government must imposed environmental tax for sustainable growth. Additionally, the financial development in these countries must advance credits with the directives to adopt energy efficient technology that must reduce CO_2 emission. At the same time the Governemnt must closed down those firms who are producing products at the cost of environmental degradation. Industralization and urbanization on other hand in these countries must be controlled with care so as to decrease the environmental pollution. Vehicles must be installed with a fuel that should be environmentally friendly. The use of fossil fuel must be promoted by the government so as to reduce the CO_2 emission. The old technology must be replaced with the new and envirmental friendly technology that reduces CO_2 emission.

On a final note this study can further be extended by constructing the financial development index using the banking sector proxy. Additionally, the non linear term of financial development must be included to investiagate the role of financial development in decreasing environmental pollution. This is left for furture research in this regard.

Based on the above conclusions, the study recommends a number of things that should take into consideration the environment and its problems in order to find ways to alleviate pressure on environmental resources, given that the environment is the foundation of any sustained economic growth so, the study recommend:

1. Reduction of the usage of polluting energy, which result from the burning of oil and its derivatives, and using the environmentally-friendly sources such as wind and sun based on the energy consumption result.

2. The import of production techniques that are less polluting to the environment, including the reduction of fuel imports, as it is the main polluter of the environment, and focusing on the imports of electric cars, and light electric rail instead of traditional polluting vehicles based on the trade openness result.

3. Encouraging the financial sector to focus on improving the quality of the environment through granting them loans that contribute to the investment in low pollution projects that help in protecting the environment and enabling firms in adopting advanced cleaner and environment friendly techniques

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APPENDIX

Appendix 1: Data

Table 1: Data of India during the period 1992- 2014.

YEAR	CO2 per capita carbon emissions	Financial development	Industrialization (manufacturing value-added % of GDP)	Primary energy consumption per capita	Total energy consumption per capita	GDP per capita
1992	0,771602203	25,03215582	18,13488658	216,6	364,3951392	548,8957838
1993	0,783172984	24,1542603	18,08568907	222,0	365,8344205	563,7496877
1994	0,811640203	23,96704902	19,1317667	233,8	372,564551	589,7087876
1995	0,844952257	22,81511615	20,4311306	251,6	386,4709924	622,3036831
1996	0,901348777	23,71883866	20,00507271	261,7	390,8077708	656,697144
1997	0,92007238	23,87378892	18,70994227	276,2	398,7705197	670,6101216
1998	0,921501664	23,99786555	17,71425389	292,6	400,8788435	699,0688547
1999	0,962521771	25,76657453	17,23488176	299,6	416,3739694	747,2520357
2000	0,979870442	28,72269657	18,07486766	316,0	418,6842801	762,3133408
2001	0,97169808	29,00634455	17,2869044	318,0	417,3819934	785,3446281
2002	0,967381128	32,74326674	17,55647027	332,0	422,6273282	801,5079327
2003	0,992391683	32,05384679	17,58926348	345,4	425,6327906	850,2932649
2004	1,025027608	36,68111025	18,00808926	365,9	441,0647829	902,9057944
2005	1,068563218	40,63665469	18,16583562	393,6	451,1383065	971,2297607
2006	1,121981504	44,57317056	18,95934819	414,0	467,5457576	1044,89394
2007	1,19320986	46,22127594	18,87988339	450,2	486,5504816	1130,090071
2008	1,310097833	50,05802075	18,21716106	475,7	503,0355807	1156,932527
2009	1,431844254	48,77678557	17,82227893	513,2	546,1767267	1237,339786
2010	1,397008906	51,13514945	17,46817729	537,1	563,1592957	1345,770153
2011	1,47668635	51,28923313	17,39231484	568,7	579,4087432	1416,403391
2012	1,598098637	51,88850765	17,09105204	611,6	600,4432348	1474,967674
2013	1,591437853	52,38570952	16,53407669	621,5	606,8742801	1550,14223
2014	1,730000432	51,97736669	16,40803752	663,6	637,4286299	1646,781252

Table 2: Data of China during the period 1992- 2014.

YEAR	CO2 per capita carbon emissions	Financial development	Industrialization (manufacturing value-added % of GDP)	Primary energy consumption per capita	Total energy consumption per capita	GDP per capita
1992	2,309463675	86,37288169	32,41025398	755,6	752,6286625	888,9110041
1993	2,442800659	96,90263442	33,64696044	812,7	788,1287236	1000,61181
1994	2,565993892	85,88258577	33,32411993	862,7	816,16289	1118,499577
1995	2,755754966	84,2060507	33,35434813	888,8	866,8343743	1227,556407
1996	2,844309582	89,45558158	33,21442909	935,1	881,6537374	1335,36268
1997	2,820567891	96,72581944	32,87397596	940,6	871,7563238	1443,774742
1998	2,67674598	105,1932233	31,54468054	941,6	869,3586073	1542,06413
1999	2,648649247	110,3835246	31,28212286	974,3	878,5245355	1645,987996
2000	2,696862433	111,1229709	31,77763524	1007,9	898,9873131	1771,741506
2001	2,742120813	110,0445907	31,29110488	1064,6	928,8114337	1905,61078
2002	3,007083197	117,4986986	31,05771664	1161,0	984,8107146	2065,718579
2003	3,524074093	125,6714326	32,46627151	1353,5	1118,431773	2258,912105
2004	4,037990651	118,636103	31,97506997	1583,8	1268,132904	2472,586556
2005	4,523178064	111,8429248	32,09392433	1800,4	1393,691324	2738,20546
2006	4,980314197	109,1583872	32,45232806	1974,7	1515,173678	3069,304781
2007	5,334909929	105,7327242	32,36658269	2147,8	1630,171029	3487,845766
2008	5,701915025	101,9170721	32,09217588	2229,0	1672,90412	3805,025999
2009	6,010102433	124,2071396	31,54522277	2328,1	1778,433519	4142,038286
2010	6,560520007	126,3002879	31,54309082	2491,1	1954,722556	4560,512586
2011	7,241515419	122,7536878	31,97564254	2690,3	2086,486904	4971,544929
2012	7,424750916	128,4961774	31,42428488	2797,4	2155,164788	5336,060143
2013	7,557211045	133,804493	30,55346604	2905,3	2213,759327	5721,693819
2014	7,543907641	140,1473966	30,37704711	2970,6	2236,729908	6108,238775

Table 3: Data of South Africa during the period 1992- 2014.

YEAR	CO2 per capita carbon emissions	Financial development	Industrialization (manufacturing value-added % of GDP)	Primary energy consumption per capita	Total energy consumption per capita	GDP per capita
1992	7,664787409	99,37615963	21,96438831	86,7	2250,649075	5485,441127
1993	7,966457429	105,0228762	21,26250951	87,3	2355,770961	5423,58795
1994	8,228462083	111,0089414	21,04917888	91,1	2381,635527	5474,19693
1995	8,6071527	116,0001419	21,35436446	95,1	2460,158551	5528,169471
1996	8,494483982	116,7189034	20,36136444	97,2	2466,510033	5657,32791
1997	8,844657689	113,3613609	20,07931066	99,4	2489,169143	5706,174804
1998	8,512704309	115,1679271	19,60156056	97,8	2433,052995	5643,261485
1999	8,327718097	131,0482394	18,7379843	101,1	2424,933368	5688,308512
2000	8,280764795	130,3122229	19,1738347	101,1	2384,548086	5837,885178
2001	8,020756082	138,7925028	19,26228478	101,5	2417,852592	5912,670121
2002	7,58381406	110,7183677	19,37410287	98,7	2339,763072	6045,963188
2003	8,48835057	115,8622017	18,9763311	107,1	2469,205547	6142,940312
2004	9,330795766	126,9323461	18,61751567	116,8	2662,483456	6343,029747
2005	8,539756118	138,1594291	18,13966278	110,6	2626,981372	6599,356525
2006	9,073199769	156,9762122	16,42708259	113,2	2579,245622	6892,362413
2007	9,352664746	160,1247848	16,07615549	115,4	2732,917941	7185,752999
2008	9,854218952	140,3498765	15,98814331	124,4	2913,130072	7337,840174
2009	9,870596936	145,9411555	15,00378105	124,3	2824,464363	7145,784123
2010	9,190698716	148,9813957	14,37752018	125,3	2748,363501	7275,382112
2011	9,004033387	139,6023093	13,31276611	123,6	2703,178887	7416,716185
2012	8,845033039	146,4798013	12,99975212	121,9	2628,44834	7475,776223
2013	8,673962823	149,2415655	12,90020107	123,6	2598,95973	7552,260671
2014	8,980119297	151,0255554	13,41038484	125,2	2695,733764	7571,875985

Appendix 2: Tests

Table 1: Unit root results for Panel data Summary

($LnCO_2$ Level with individual intercept)

Panel unit root test: Summary
Series: LCO2
Date: 05/08/18 Time: 20:32
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.28199	0.6110	3	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.50809	0.9342	3	65
ADF - Fisher Chi-square	3.98035	0.6793	3	65
PP - Fisher Chi-square	3.47410	0.7474	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

($LnCO_2$Level with individual intercept and trend)

Panel unit root test: Summary
Series: LCO2
Date: 05/08/18 Time: 20:34
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.13774	0.1276	3	65
Breitung t-stat	0.74772	0.7727	3	62
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.02622	0.4895	3	65
ADF - Fisher Chi-square	6.32242	0.3881	3	65
PP - Fisher Chi-square	2.90088	0.8212	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnCO2 with individual intercept at first difference)

Panel unit root test: Summary
Series: D(LCO2)
Date: 05/08/18 Time: 20:35
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.70344	0.0001	3	62
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.80071	0.0001	3	62
ADF - Fisher Chi-square	25.6758	0.0003	3	62
PP - Fisher Chi-square	25.2116	0.0003	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

($LnCO_2$) with individual intercept and trend at first difference

Panel unit root test: Summary
Series: D(LCO2)
Date: 05/08/18 Time: 20:36
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.31575	0.0103	3	63
Breitung t-stat	-1.71964	0.0427	3	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.36453	0.0090	3	63
ADF - Fisher Chi-square	17.9186	0.0064	3	63
PP - Fisher Chi-square	18.3923	0.0053	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnFD Level with individual intercept)

Panel unit root test: Summary
Series: LFD
Date: 05/08/18 Time: 20:42
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.09431	0.5376	3	66
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.96325	0.8323	3	66
ADF - Fisher Chi-square	3.11231	0.7946	3	66
PP - Fisher Chi-square	2.98998	0.8101	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnFD Level with individual intercept and trend)

Panel unit root test: Summary
Series: LFD
Date: 05/08/18 Time: 20:42
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.04868	0.5194	3	64
Breitung t-stat	-0.13141	0.4477	3	61
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.45797	0.3235	3	64
ADF - Fisher Chi-square	6.16750	0.4047	3	64
PP - Fisher Chi-square	7.43843	0.2822	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnFD with individual intercept at first difference)

Panel unit root test: Summary
Series: D(LFD)
Date: 05/08/18 Time: 20:43
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.76816	0.0000	3	62
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.09491	0.0000	3	62
ADF - Fisher Chi-square	28.1137	0.0001	3	62
PP - Fisher Chi-square	40.0931	0.0000	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnFD with individual intercept and trend at first difference)

Panel unit root test: Summary
Series: D(LFD)
Date: 05/08/18 Time: 20:43
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.49394	0.0000	3	63
Breitung t-stat	-4.01915	0.0000	3	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.43347	0.0000	3	63
ADF - Fisher Chi-square	26.6987	0.0002	3	63
PP - Fisher Chi-square	29.6461	0.0000	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnMVA Level with individual intercept)

Panel unit root test: Summary
Series: LMVA
Date: 05/08/18 Time: 20:43
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.78818	0.7847	3	66
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.49479	0.9325	3	66
ADF - Fisher Chi-square	1.53414	0.9572	3	66
PP - Fisher Chi-square	1.87367	0.9309	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnMVA Level with individual intercept and trend)

Panel unit root test: Summary
Series: LMVA
Date: 05/08/18 Time: 20:44
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.62132	0.7328	3	66
Breitung t-stat	-0.23216	0.4082	3	63
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.41934	0.6625	3	66
ADF - Fisher Chi-square	3.36760	0.7615	3	66
PP - Fisher Chi-square	3.87816	0.6932	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnMVA with individual intercept at first difference)

Panel unit root test: Summary
Series: D(LMVA)
Date: 05/08/18 Time: 20:44
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.93641	0.0000	3	63
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.69141	0.0000	3	63
ADF - Fisher Chi-square	30.6744	0.0000	3	63
PP - Fisher Chi-square	31.8324	0.0000	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnMVA with individual intercept and trend at first difference)

Panel unit root test: Summary
Series: D(LMVA)
Date: 05/08/18 Time: 20:45
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.95704	0.0000	3	63
Breitung t-stat	-2.53770	0.0056	3	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.50017	0.0002	3	63
ADF - Fisher Chi-square	21.4874	0.0015	3	63
PP - Fisher Chi-square	22.2589	0.0011	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnY Level with individual intercept)

Panel unit root test: Summary
Series: LNY
Date: 05/08/18 Time: 20:45
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.80504	0.7896	3	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	3.87518	0.9999	3	65
ADF - Fisher Chi-square	0.20616	0.9998	3	65
PP - Fisher Chi-square	0.48847	0.9980	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnY Level with individual intercept and trend)

Panel unit root test: Summary
Series: LNY
Date: 05/08/18 Time: 20:45
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.48008	0.6844	3	61
Breitung t-stat	1.13557	0.8719	3	58
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.57389	0.2830	3	61
ADF - Fisher Chi-square	7.74274	0.2576	3	61
PP - Fisher Chi-square	2.49137	0.8694	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnY with individual intercept at first difference)

Panel unit root test: Summary
Series: D(LNY)
Date: 05/08/18 Time: 20:46
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.90443	0.0018	3	63
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.76845	0.0028	3	63
ADF - Fisher Chi-square	18.3676	0.0054	3	63
PP - Fisher Chi-square	18.2548	0.0056	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnY with individual intercept and trend at first difference)

Panel unit root test: Summary
Series: D(LNY)
Date: 05/08/18 Time: 20:46
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.43496	0.0074	3	63
Breitung t-stat	-1.82925	0.0337	3	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.59171	0.0557	3	63
ADF - Fisher Chi-square	11.9489	0.0631	3	63
PP - Fisher Chi-square	11.7393	0.0680	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnY2 Level with individual intercept)

Panel unit root test: Summary
Series: LNY2
Date: 05/08/18 Time: 21:04
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.51005	0.9345	3	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	4.46883	1.0000	3	65
ADF - Fisher Chi-square	0.12886	1.0000	3	65
PP - Fisher Chi-square	0.13991	0.9999	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnY2 Level with individual intercept and trend)

Panel unit root test: Summary
Series: LNY2
Date: 05/08/18 Time: 21:05
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.58918	0.2779	3	61
Breitung t-stat	0.85570	0.8039	3	58
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.51710	0.3025	3	61
ADF - Fisher Chi-square	7.90188	0.2454	3	61
PP - Fisher Chi-square	1.95396	0.9239	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnY2 with individual intercept at first difference)

Panel unit root test: Summary
Series: D(LNY2)
Date: 05/08/18 Time: 21:05
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.67994	0.0037	3	63
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.47024	0.0068	3	63
ADF - Fisher Chi-square	16.7196	0.0104	3	63
PP - Fisher Chi-square	16.5753	0.0110	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnY2 with individual intercept and trend at first difference)

Panel unit root test: Summary
Series: D(LNY2)
Date: 05/08/18 Time: 21:06
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.36071	0.0091	3	63
Breitung t-stat	-1.86644	0.0310	3	60
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.51399	0.0650	3	63
ADF - Fisher Chi-square	11.7575	0.0676	3	63
PP - Fisher Chi-square	11.5358	0.0732	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnTEC Level with individual intercept)

Panel unit root test: Summary
Series: LTEC
Date: 05/08/18 Time: 21:06
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.58118	0.9431	3	64
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	2.69670	0.9965	3	64
ADF - Fisher Chi-square	2.23106	0.8973	3	64
PP - Fisher Chi-square	2.12746	0.9076	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnTEC Level with individual intercept and trend)

Panel unit root test: Summary
Series: LTEC
Date: 05/08/18 Time: 21:07
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.76509	0.2221	3	61
Breitung t-stat	1.08101	0.8602	3	58
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.57685	0.2820	3	61
ADF - Fisher Chi-square	8.63082	0.1954	3	61
PP - Fisher Chi-square	2.35315	0.8845	3	66

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnTEC with individual intercept at first difference)

Panel unit root test: Summary
Series: D(LTEC)
Date: 05/08/18 Time: 21:07
Sample: 1992 2014
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.91776	0.0018	3	61
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.11165	0.0009	3	61
ADF - Fisher Chi-square	20.9912	0.0018	3	61
PP - Fisher Chi-square	21.1145	0.0017	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

(LnTEC with individual intercept and trend at first difference)

Panel unit root test: Summary
Series: D(LTEC)
Date: 05/08/18 Time: 21:07
Sample: 1992 2014
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.89997	0.0287	3	62
Breitung t-stat	-1.46689	0.0712	3	59
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.99891	0.0228	3	62
ADF - Fisher Chi-square	15.5426	0.0164	3	62
PP - Fisher Chi-square	15.4715	0.0169	3	63

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table 2: Pedroni Residual Cointegration Test

Pedroni Residual Cointegration Test
Series: LCO2 LFD LMVA LNY LNY2 LTEC
Date: 05/08/18 Time: 20:24
Sample: 1992 2014
Included observations: 69
Cross-sections included: 3
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
User-specified bandwidth: 1 and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	1.107205	0.1341	1.020010	0.1539
Panel rho-Statistic	-0.456199	0.3241	-0.175198	0.4305
Panel PP-Statistic	-3.619327	0.0001	-2.773567	0.0028
Panel ADF-Statistic	-3.140029	0.0008	-2.664746	0.0039

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	0.414938	0.6609
Group PP-Statistic	-3.254923	0.0006
Group ADF-Statistic	-3.197535	0.0007

Table 3: Kao Residual Cointegration Test

Kao Residual Cointegration Test
Series: LCO2 LFD LMVA LNY LNY2 LTEC
Date: 05/08/18 Time: 20:25
Sample: 1992 2014
Included observations: 69
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
User-specified bandwidth: 1 and Bartlett kernel

	t-Statistic	Prob.
ADF	-4.751991	0.0000
Residual variance	0.000680	
HAC variance	0.000445	

Table 4: Johansen Fisher Panel Cointegration Test

Johansen Fisher Panel Cointegration Test
Series: LCO2 LFD LMVA LNY LNY2 LTEC
Date: 05/08/18 Time: 20:26
Sample: 1992 2014
Included observations: 69
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	133.1	0.0000	64.47	0.0000
At most 1	102.5	0.0000	56.08	0.0000
At most 2	72.43	0.0000	32.05	0.0000
At most 3	47.34	0.0000	24.03	0.0005
At most 4	33.70	0.0000	24.23	0.0005
At most 5	21.59	0.0014	21.59	0.0014

Table 5: Long run results under FMOLS

Dependent Variable: LCO2
Method: Panel Fully Modified Least Squares (FMOLS)
Date: 05/08/18 Time: 20:27
Sample (adjusted): 1993 2014
Periods included: 22
Cross-sections included: 3
Total panel (balanced) observations: 66
Panel method: Pooled estimation
Cointegrating equation deterministics: C
Coefficient covariance computed using default method
Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFD	0.070046	0.030666	2.284147	0.0260
LMVA	-0.039237	0.041914	-0.936129	0.3531
LNY	0.812679	0.181779	4.470707	0.0000
LNY2	-0.071101	0.012230	-5.813390	0.0000
LTEC	1.550178	0.071965	21.54074	0.0000

R-squared	0.999392	Mean dependent var	1.222765
Adjusted R-squared	0.999319	S.D. dependent var	0.903163
S.E. of regression	0.023566	Sum squared resid	0.032210
Long-run variance	0.000445		

Table 6: Long-run results under DOLS

Dependent Variable: LCO2
Method: Panel Dynamic Least Squares (DOLS)
Date: 05/08/18 Time: 20:29
Sample: 1992 2014
Periods included: 23
Cross-sections included: 3
Total panel (balanced) observations: 69
Panel method: Pooled estimation
Cointegrating equation deterministics: C
Static OLS leads and lags specification
Coefficient covariance computed using default method
Long-run variance (Bartlett kernel, Newey-West fixed bandwidth) used for coefficient covariances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFD	0.048684	0.034084	1.428364	0.1583
LMVA	-0.044438	0.048876	-0.909205	0.3668
LNY	0.896486	0.202887	4.418637	0.0000
LNY2	-0.073000	0.014054	-5.194409	0.0000
LTEC	1.467385	0.079112	18.54827	0.0000

R-squared	0.999410	Mean dependent var	1.207491
Adjusted R-squared	0.999342	S.D. dependent var	0.907584
S.E. of regression	0.023278	Sum squared resid	0.033054
Long-run variance	0.000635		

YAKIN DOĞU ÜNİVERSİTESİ

BİLİMSEL ARAŞTIRMALAR ETİK KURULU

03.01.2019

Sayın Malika Sadikova

Bilimsel Araştırmalar Etik Kurulu'na yapmış olduğunuz **"The Impact Of The Industrıalızatıon Fınancıal Development And Economıcal Factors On Envıronmental Qualıty: Evıdence From The Selected Brıcs Countrıes"** başlıklı proje önerisi, sadece ikincil kaynak kullanıldığı için Etik Kuruluruna girmesine gerek yoktur. Bu yazı ile birlikte sadece ikincil kaynak kullanmak şartıyla araştırmaya başlayabilirsiniz.

Doçent Doktor Direnç Kanol

Bilimsel Araştırmalar Etik Kurulu Raportörü

Direnc Kanol

Not: Eğer bir kuruma resmi bir kabul yazısı sunmak istiyorsanız, Yakın Doğu Üniversitesi Bilimsel Araştırmalar Etik Kurulu'na bu yazı ile başvurup, kurulun başkanının imzasını taşıyan resmi bir yazı temin edebilirsiniz.

YAKIN DOĞU ÜNİVERSİTESİ

BİLİMSEL ARAŞTIRMALAR ETİK KURULU

03.01.2019

Dear Malika Sadikova

Your project **"The Impact Of The Industrıalızatıon Fınancıal Development And Economıcal Factors On Envıronmental Qualıty: Evıdence From The Selected Brıcs Countrıes"** has been evaluated. Since only secondary data will be used the project it does not need to go through the ethics committee. You can start your research on the condition that you will use only secondary data.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of the Scientific Research Ethics Committee

Direnc Kanol

Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.